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Model 2110 Fraction Collector

Instruction Manual

Catalog Numbers

731-8120

731-8122

BIO-RAD

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Warranty

Model _____

Serial No. _____

Date of Delivery_____

Warranty Period _____

Unless otherwise specified, instruments sold by Bio-Rad Laboratories are under warranty for 1 year against defects in materials and workmanship.

If any defects should occur during this warranty period, Bio-Rad will replace the defective parts without charge. However, the following defects are specifically excluded:

1. Defects caused by improper operation
2. Repair or modification done by anyone other than Bio-Rad Laboratories or their authorized agent.
3. Use of fittings or other spare parts supplied by anyone other than Bio-Rad Laboratories.
4. Damage caused by deliberate or accidental misuse.
5. Damage caused by disaster.
6. Damage due to use of improper solvent or sample.

This warranty does not apply to tubing and fuses.

For inquiry or request for repair service, contact Bio-Rad Laboratories after confirming the model and serial number of your instrument.

For Technical Service Call Your Local Bio-Rad Office or in the U.S. call **1-800-4BIORAD**(1-800-424-6723)

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Section 1
Safety



Disconnect supply before servicing. No user serviceable parts inside, refer servicing to Bio-Rad service personnel.



High leakage current, ensure proper grounding.

This instrument is intended for laboratory use only.

This product conforms to the "Class A" standards for electromagnetic emmissions intended for laboratory equipment applications. It is possible that emissions from this product may interfere with some sensitive appliances when placed nearby or in the same circuit as those appliances. The user should be aware of this potential and take appropriate measures to avoid interference.

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Section 2
Introduction

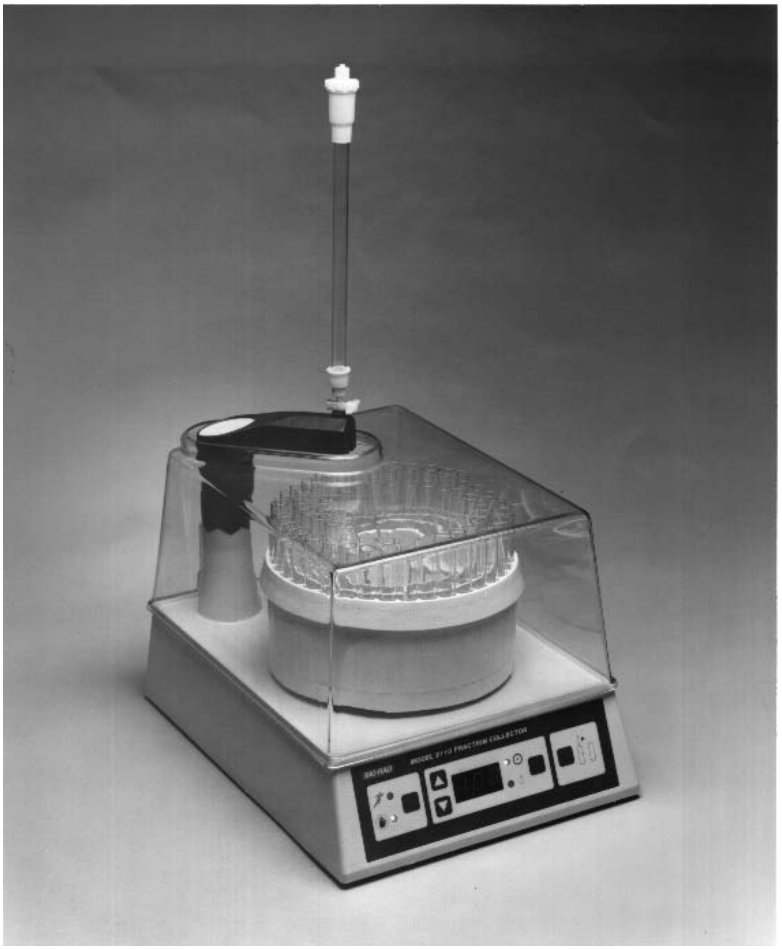


Fig. 2.1. Model 2110 Fraction Collector.

The Model 2110 Fraction Collector (Figure 2.1), shown with the optional instrument dust cover, is designed to be used with gravity feed columns, preparative electrophoresis and liquid chromatography systems.

The Model 2110 Fraction Collector will accurately collect up to 80 fractions, at a flow rate of up to 40 ml/min. The Model 2110 Fraction Collector accepts standard 13 x 100 mm test tubes or, with an optional adaptor, 1.5 ml micro test tubes. Tubes are advanced by a motor-driven

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carousel where tube changes are initiated upon reaching a predetermined drop count (1-999 drops) or time interval (0.05-99.9 minutes), or upon command from an external source.

The silicone drop former insures uniform drop size for accurate drop count measurement. The drop former will accommodate either 11/48-inch or 11/416-inch inlet tubing, without the need for additional fittings.

The Model 2110 Fraction Collector is spill-proof and solvent resistant. A drain tube at the rear of the case channels all spills to waste. The membrane front panel is sealed to the case and the carousel drive is positioned in such a way that it will not be affected by spills.

Section 3
Unpacking and Voltage Conversion

3.1 Unpacking Instructions

Lift the instrument out of its packing by grasping the instrument case. Do not lift by the drop arm. Remove the power cord and bag of accessories. Remove the fraction collector from its protective bag. Check off all parts against the supplied packing list. You may want to retain the original packaging material in the event the instrument needs to be returned for service. If repackaging is necessary, be careful to position the carousel so that it is not resting against the motor drive gear.



Warning: The Model 2110 Fraction Collector is shipped in its 120 V version. For 220 V operation, refer to the procedure below.

3.2 Voltage Conversion

Prior to connecting the power cord to the power entry module and power mains, make sure the voltage indicated on the fraction collector power entry module matches your line voltage. If it does not, use the following procedure to make the conversion. (See Figure 3.1.)

1. Insure that the unit is disconnected from the wall socket.
2. Remove the fuse drawer with a small-blade screwdriver or similar tool.
3. Pull the fuse holder out of the fuse drawer and ensure that the voltage shown in the window corresponds to the voltage you are using (100, 120, 220, 240 V). To change the voltage, grasp the fuse drawer and withdraw it (see Figure 3.1). Rotate the fuse drawer so that the voltage shown is correct, and reinsert it. The fuse holder is keyed and cannot be installed improperly. The Model 2110 Fraction Collector uses 0.20 A fuses for 100/120 V operation, and 0.10 A fuses for 220/240 V operation.

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4. Reinsert the fuse drawer in the power entry module, with the locking tab to the left. The voltage indicator will read right-side-up if the drawer is oriented correctly. Push the fuse drawer in gently until it snaps into place.
5. Connect the power cord to the power entry module and power mains.
6. There is no power switch on the fraction collector. When connected to an AC power source, the Model 2110 Fraction Collector will come on in the Stop or Set mode.

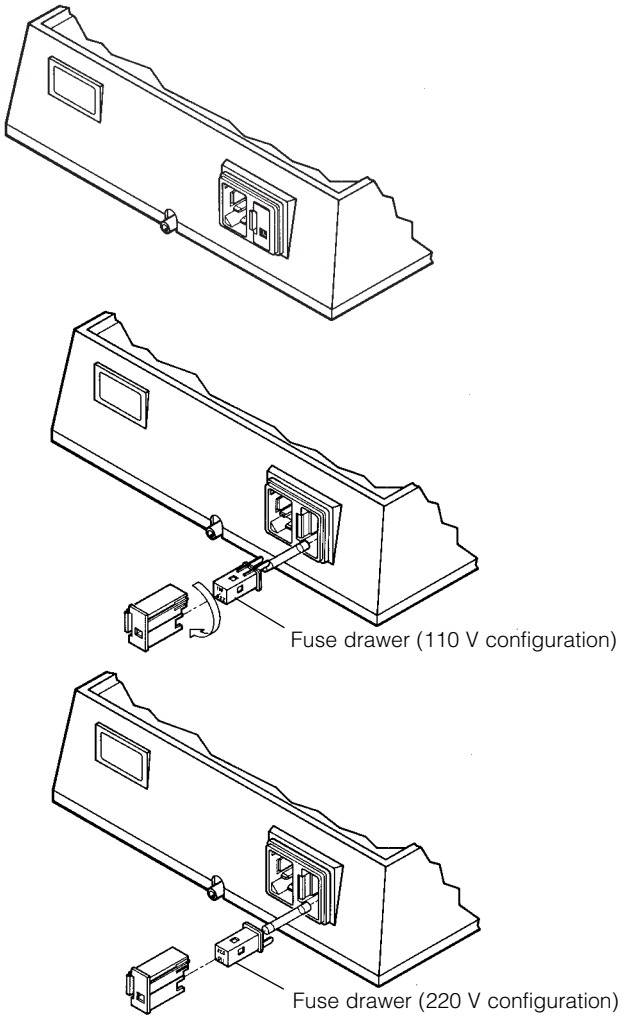


Fig. 3.1. Voltage conversion.

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Section 4
Physical Description and Control Features

4.1 Physical Description

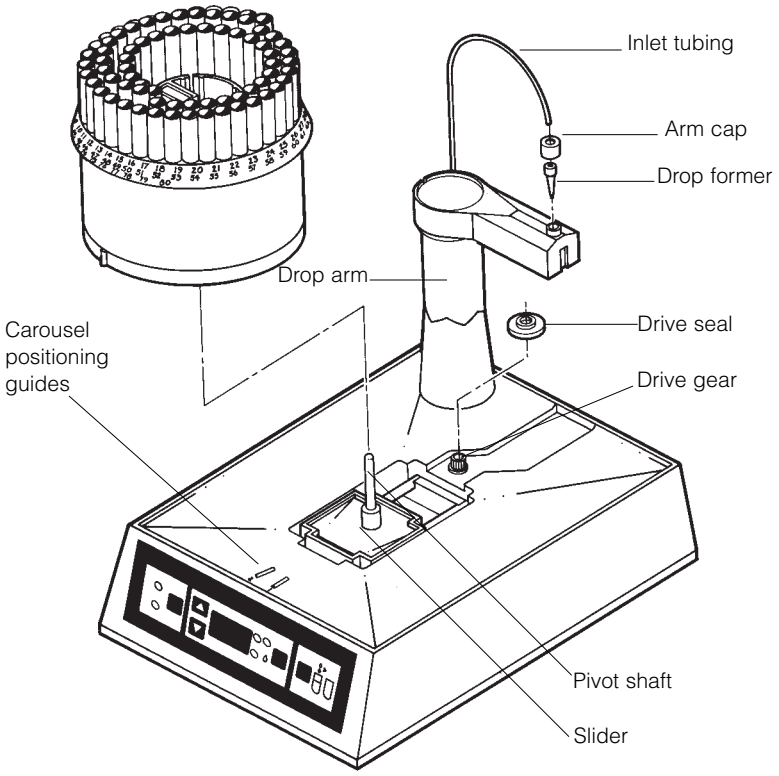


Fig 4.1. Model 2110 Fraction Collector features.

Feature	Function
Drop arm	Directs flow to the collection tubes. • Collection position, rotated forward, the drop arm is directly above each collection tube. • Standby position, rotated rearward, the drop arm allows installation of the carousel or allows flow to drip onto the case and to waste. To change positions, gently lift and rotate the drop arm.

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Feature	Function
Carousel	Holds the collection tubes. The tube positions are numbered 1-80 on the flange of the carousel, and line up with the center of each tube. The carousel is designed so that any liquid spilled in it will flow to the center and out the rear of the base. The carousel may also be used for storage of test tubes.
Drop former	Seals against the inlet tubing (11/16" or 11/8" OD) to form uniform size drops.
Arm cap	Holds the drop former in place.
Drive gear	Engages the carousel and advances it.
Drive seal	Protects the electric drive from direct spills.
Waste line	Collects drainage or spills and directs it to waste. See Section 5.5 for connection.
Inlet tubing	Inlet tubing (not included) can be any rigid or flexible tubing with 11/16" or 11/8" OD, usually coming directly from a detector.

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4.2 Front Panel Functions

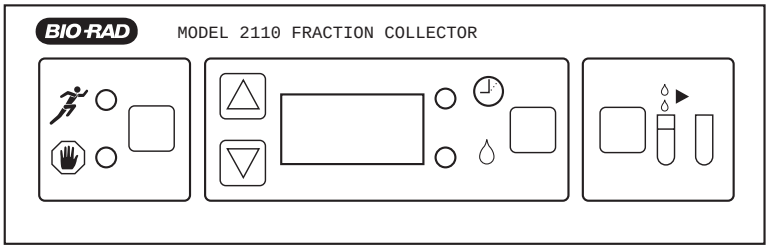
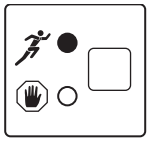
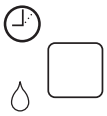
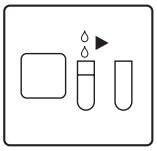


Fig. 4.2. Front panel controls.

	Feature	Function
	**Run/Stop key**	The Run/Stop key is used to select standby or active mode. In the active mode, the collector will collect by time or drops, or accept an external signal. When the collector is controlled by a system, both the standby and active mode lights will be lit, and the LED display will read "---".
	**Time/Drop key**	The Time/Drop key is used to select collection by time or by drops.
	**Arrow keys**	The Arrow keys are used for increasing or decreasing the length of time for collection in each tube, or changing the number of drops to be collected in each tube.
	**LED multi display**	This three-digit display will show decimal minutes or drop count that has progressed for the tube currently collecting. When the collector is controlled by a system, both the standby and active mode lights will be lit, and the LED display will read "---".
	**Advance key**	Pressing the advance key will advance the carousel one position.

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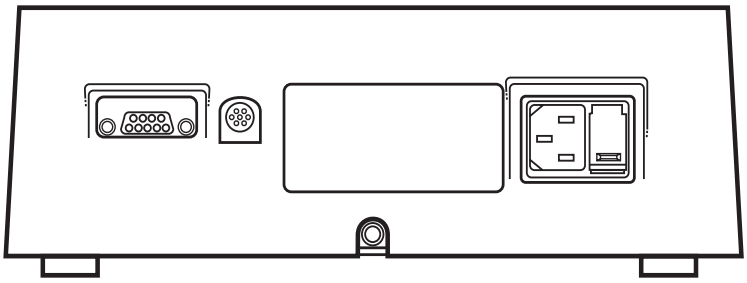
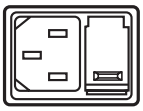


Fig. 4.3 Rear Panel connections.

4.3 Rear Panel Functions

	Connection	Function
	**Power entry module**	Grounded 3-pin receptacle for the power cord. Also contained within is a four-position 100 V/120 V/ 220 V/ 240 V line voltage selector. The collector is shipped in its 120 V or 220 V version. For operation at other voltages, refer to Section 3.2.
	**9-pin "D" connector**	For remote operation of the collector. The Model 2110 can be controlled by Bio-Rad's Model EP-1 Econo Pump, the BioLogic LP low pressure chromatography system, or the BioLogic System, a high resolution liquid chromatography system. The Model 2110 can also be controlled by other non-Bio-Rad equipment. See Section 7 for additional information.

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Section 5
Instrument Set-Up

5.1 Tubing Installation

1. Insert the drop former, narrow end downward, into the drop arm, pressing it firmly in the hole (see Figure 4.1).
2. Using a twisting motion, press the arm cap onto the drop arm to hold the drop former in place.
3. Insure that the end of the inlet tubing is cleanly cut and not flattened or deformed.

   Insert tubing into the drop former, pushing down on the tubing until the drop former starts to stretch. Do not use excessive force. Then, gently pull out on the tubing until the drop former returns to its original shape.
4. The inlet tubing may be routed through the tubing holder fitting at the rear of the movable portion of the drop arm.

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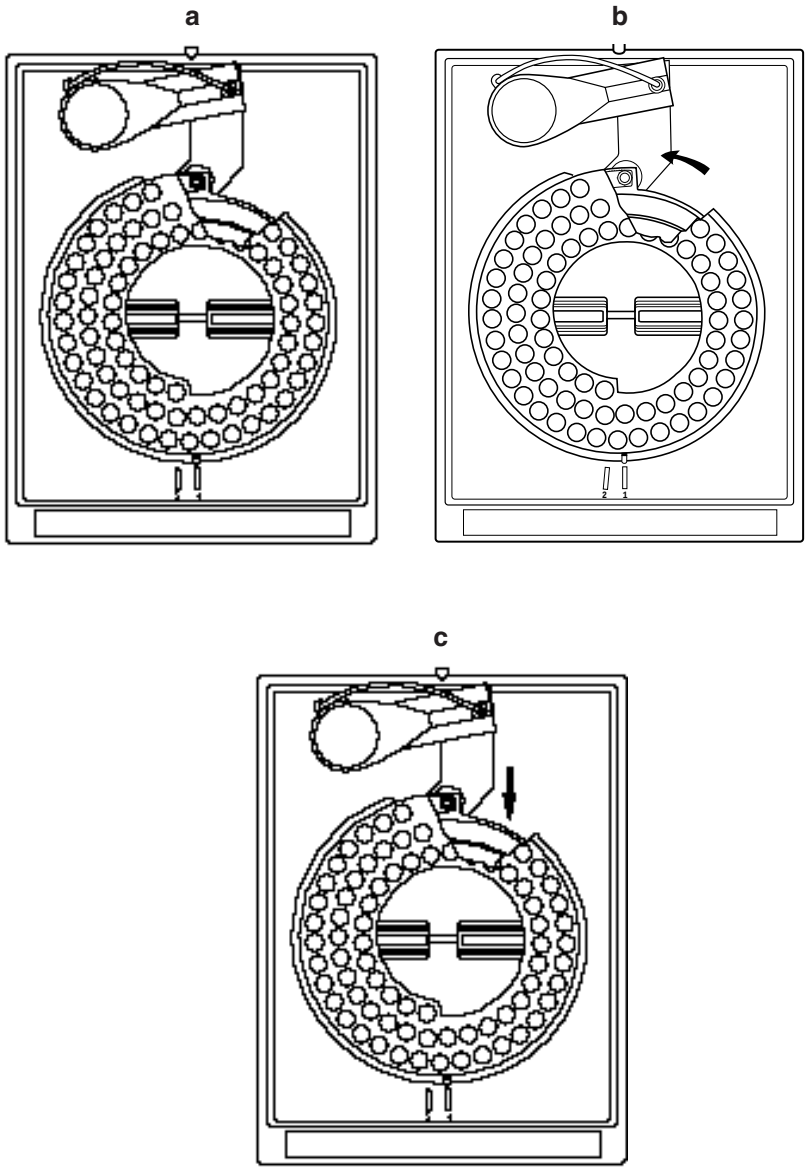


Fig. 5.1. Carousel installation.

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5.2 Carousel Installation

The Model 2110 Fraction Collector fills tubes from the outside of the carousel inward. Load as many tubes as desired into the carousel, starting at the outside end of the spiral and moving inward. The carousel need not be fully loaded, since any eluant flowing after the last tube will drain through the carousel into the well in the case and out the central drain tube located at the rear of the instrument.

1. Swing the drop arm to the waste (rear) position by gently lifting and rotating (Figure 5.1a).
2. Hold the carousel so that the notch in its outline is toward the rear of the instrument.
3. Place the carousel on the pivot shaft, holding it about 11/42" above its seated position.
4. Push the carousel and the pivot shaft toward the rear of the instrument, settling it down over the drive gear so that the gear is trapped near the start of the spiral.
5. Holding the gear teeth free from engagement, turn the carousel counterclockwise until it stops against the gear (Figure 5.1b). Release the carousel and it will spring into engagement on the drive gear. Engagement may be confirmed by trying to move the carousel gently (Figure 5.1c).
6. Check the alignment with the two positioning guides located on the top front of the instrument case. The number corresponds to the first tube that will be filled.

Swing the drop arm into the collect (front) position. Make sure the drive gear is fully seated into the grooved underside of the carousel. This automatically aligns the drop former over the first tube.

5.3 Collection Tube Installation

Load the carousel with up to eighty 13 x 100 mm test tubes. You may find a tube which fits too tightly into the carousel. It is best to discard these rather than risk breaking the tube upon installation. Tubes 39 through 53 are raised above tubes 1-38 to make tube removal easier.

To locate an individual tube in a carousel, find its number on the angled flange. The tube is in line with the number and the center of the carousel. The top row of numbers corresponds to the outermost row of tubes, the middle row corresponds to the next row of tubes, and the bottom row to the innermost row of tubes. To divert a large amount of eluant to waste at the beginning of a run, you can simply remove the first

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collection tube, and the eluant will flow through the carousel to waste out the rear of the collector.

5.4 Waste Collection Port

All spills on the top of the case and carousel, as well as waste eluant within the carousel, drain to a central waste-collection port at the rear of the instrument case. From this port, a drain tube passes out through the rear of the case. This tube may be directed into a waste-collection vessel, or an extension tube may be attached to the provided barbed union fitting.

Note: To provide proper drainage, the waste-collection vessel must be positioned so that the exit of the drain tube is no higher than the bottom of the fraction collector case.

Section 6
Stand Alone Operation

This section describes the stand-alone operation of the Model 2110 Fraction Collector. Refer to Section 7 for information about connecting the Model 2110 to the Model EP-1 Econo Pump, the BioLogic LP, the BioLogic System, or Bio-Rad's preparative electrophoresis systems..

6.1 Stop (Standby) and Run

The Model 2110 Fraction Collector powers up automatically in the Stop or Standby mode, with the ✋ LED lit. When in the Stop mode, the collection mode, either Time or Drops can be selected, and the time interval or number of drops to be collected per tube can be set. When in the Run mode, the Arrow keys △▽ are inactivated.

6.2 Collection Modes

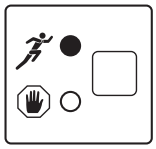
The Model 2110 Fraction Collector will collect fractions by counting the number of drops or by a specified time interval per tube. The collection mode is selected using the ◷/💧□ key on the front panel. In either mode, time and drop count are continuously monitored, so that you can switch between the two collection modes, monitoring time and drop count since the last tube advance.

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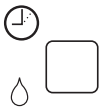
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Drop Collection Mode

The fraction collector counts drops at flow rates up to ~5 ml/min. Drop counting is performed by the sensor in the drop arm. If the flow rate exceeds 5 ml/ min., counting will not be accurate, and use of the Time mode is recommended.



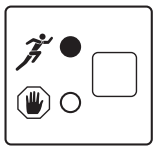
1. Plug the Model 2110 Fraction Collector into a grounded wall outlet. The collector will power up in the Stop, or Standby mode, with the LED lit.



2. Press the Time/Drop key until the LED is lit.



3. Select the number of drops to be collected per collection tube by pressing the keys. The LED display will display the number of drops to be collected.



4. Insure that the carousel is in the desired position, and press the Run/Stop key to begin collection. The LED will be lit.

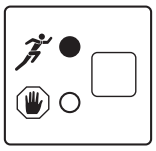


5. The fraction collector will reset the display to '0' and begin counting drops up to the drop limit set, and then advance. The display reads 'A' during each carousel advance.

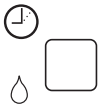
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Time Mode

The fraction collector collects fractions at intervals of .01 minutes, for times per tube in the range of .05 to 9.99 minutes, and at.10 minute intervals for times per tube in the range of 10.0 to 99.9 minutes.



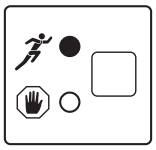
1. Press the Run/Stop key until the ✋ LED is lit.



2. Press the Time/Drop key until the 🕘 LED is lit.



3. Select the time interval per tube by pressing the △▽ keys. The LED multi-display will display the time interval selected.



4. Insure that the carousel is in the desired position. Press the key 🏃/✋ to begin the program. The 🏃 LED will be lit.



5. The fraction collector will reset the display to '0', and begin counting time up to the set time interval, and then advance.

Note: When the Model 2110 Fraction Collector reaches the preset time interval in a time mode collection scheme, it will collect one extra drop prior to advancing. This minimizes the chance of a drop falling between tubes during carousel advance. If the delay between drops is greater than 5% of the preset time interval, the collector will advance to the next fraction instead of waiting for one extra drop.

6.3 Operation without Direct Connection to a System

The Model 2110 can be used in stand-alone mode with any system. Simply set up the collector in time mode or drop mode and press "start" at the initiation of the method.

Alternatively, a light-weight gravity feed column (such as 2 ml Poly-Prep® columns, Econo-Pac® columns, and small Econo-Column® chromatography columns) can be connected directly to the Model 2110 Fraction Collector, avoiding the need for interconnecting tubing. A two-way stopcock is used to make the connection and control eluant flow.

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1. Attach the stopcock into the hole in the top of the drop arm. Position the stopcock so that its handle overhangs the end of the arm and is free to turn.
2. Attach the column to the stopcock, making sure both stopcock and column are firmly connected.

6.4 Manual Advance

The Model 2110 Fraction Collector may be manually advanced to the next tube by pressing the ▢ key. This key is functional in both Stop/Standby and Run modes. When pressed during a run, the drop and time counts will automatically reset to 0, and restart the time or drop count.

6.5 Reset/End of Run

If the Model 2110 Fraction Collector is allowed to complete 80 advances, the display will read END. To reset, push ▢ twice. (Note: Manual advances are not counted.) Reposition the carousel to begin collection again.

Section 7
Remote Operation of Model 2110

The Model 2110 Fraction Collector may be controlled remotely.

7.1 Remote Operation with Model EP-1 Econo Pump

Use System Cable 1 (catalog number 731-8261) to connect the Econo Pump to the fraction collector. Connect the 9-pin "D" connector to rear of the Model 2110, and the mini-DIN plug to the rear port of the Econo Pump with the collector icon. (See Econo Pump manual if further explanation is required.) In order for the Econo Pump to remotely operate the Model 2110, a method must be programmed into the Econo Pump that calls for fraction collection. You will be prompted to program the fraction size (volume), the void volume, and the total volume collected. Please note that to correctly use the void volume function, a Model SV-3 Diverter/Bypass valve (catalog number 731-8322) must be connected. When programming is complete, the LED display underneath the fraction collector icon on the front panel of the Econo Pump will light and the Model 2110 display will read "---" indicating that the collector is controlled by a system.

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7.2 Remote Operation with BioLogic LP

Use System Cable 1 (catalog number 731-8261) to connect the BioLogic LP to the fraction collector. Connect the 9-pin "D" connector to rear of the Model 2110, and the mini-DIN plug to the rear port of the BioLogic LP controller in the port marked FRACTION COLLECTOR. (See BioLogic LP manual if further explanation is required.) The BioLogic LP enables sophisticated collection, including programmed collection windows, peak detection, and a combination of peak detection and collection windows. The BioLogic LP sends "advance" commands to the fraction collector.

7.3 Remote Operation with BioLogic System

Use System Cable 5 (catalog number 731-8265) to connect the BioLogic System to the fraction collector. Connect the 9-pin "D" connector to rear of the Model 2110. Connect the black wire to the FC ADV port of the AUX connector, which is port #5. Connect the white wire to the GND port of the AUX connector, which is port #9. Refer to the separate instruction sheet for the wiring diagram and color code for System Cable 5.

To connect the wires to the AUX port of the BioLogic System, turn the small flathead screwdriver counterclockwise to back out the screw. Insert the bare wire into the port and turn the screwdriver clockwise to secure the connection. The BioLogic System enables sophisticated collection, including programmed collection windows, peak detection, and a combination of peak detection and collection windows. The BioLogic System sends "advance" commands to the fraction collector.

7.4 Remote Operation with other Instruments

Use System Cable 5 (catalog number 731-8265) to connect the Model 2110 Fraction Collector to other instruments. Signals are accessible via the 9-pin "D" connector on the back of the instrument. All of the input and output signals, with the exception of the Advanced Contact pins 7 and 8, are TTL active low.

Drop counting is performed by the sensor in the drop arm.

Pin	Function	Signal Type
1	External Advance	Input
2	Drops	Output
3	Advanced	Output
4	Ready	Output
5	Alarm	Output

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Pin	Function	Signal Type
6	External Start	Input
7	Advanced Contact 1	Output
8	Advanced Contact 2	Output
9	Logic Ground	

External Advance (Pin 1)

The External Advance line performs two functions. It causes the instrument to enter the Remote mode when held low for longer than two seconds, and it causes the carousel to advance one position each time a high-going pulse is applied. To use the control line to advance the carousel, connect pin 1 of the 9-pin "D" connector to pin 9 and hold for at least 100 msec, then release. Alternatively, the carousel will advance by applying an external signal (TTL low logic level) to pin 1 for at least 100 msec (with a return to TTL high logic level state). Be sure to connect the controlling instrument's ground to the fraction collector's logic ground, pin 9. When remote mode is entered (by holding pin 1 low for greater than 2 seconds) the time and drop mode features of the collector are disabled and the front panel control function is lost, with the exception of the manual tubing advance key, which will function normally. The remote mode is indicated by three horizontal bars on the fraction collector display.

Drops

The fraction collector will generate a 50 msec TTL pulse on pin 2 every time a drop is detected.

Advanced

Each time the carousel is advanced, a low-going TTL pulse is generated on pin 3. This signal is useful for triggering the event mark input of a chart recorder to indicate fraction intervals. If the recorder being used does not support TTL signals, then see below under "Advanced Relay Contacts to trigger the event input.

Ready

A low level signal on pin 4 indicates that the fraction collector is functioning properly and that it is ready to accept input from a controlling device.

Alarm

If the fraction collector is unable to carry out an external advance command due to a malfunction (such as a jammed carousel), a low level will be held on pin 5 until the problem is cleared.

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External Start

The external start line is used to allow another instrument to remotely start and stop the fraction collector's programmed functions. Applying a low pulse of at least 100 msec to pin 6 has the same effect as pressing the Run/Stop key on the front panel. That is, the first pulse will start the previously selected mode (drops or time) and the second pulse will stop the program.

Advanced Relay Contacts

Pins 7 and 8 provide a normally open set of contacts that are momentarily closed each time the carousel is advanced. This signal is a convenient way to interface with equipment that does not support TTL level signals. The maximum current and voltage which can be put across these pins is 24 V DC and .25 A.

Section 8
Accessories

8.1 Instrument Dust Cover

The dust cover (catalog number 731-8136) is intended for use only when the drop arm is in the collect (forward) position. The inlet tube may be directed out the top opening or through the small opening at the bottom/rear of the instrument.

8.2 Micro Tube Adaptor

The micro tube adaptor is intended to convert a carousel for use with 1.5 ml micro test tubes (catalog number 223-9500).

Align the step in the outline of the adaptor with the step of the outline of the carousel. Position the adaptor so that its four legs fit into the four openings in the inner wall of the carousel. Push the adaptor downward until it is fully seated on the carousel.

Operation with micro tubes is identical to operation with standard test tubes. To prevent splashing, collect no more than 1 ml of eluant in each micro tube.

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Section 9
Cleaning and Maintenance

The Model 2110 Fraction Collector requires very little maintenance to insure reliable operation. Two procedures are outlined below.

9.1 Drop Sensor

The Model 2110 Fraction Collector counts drops through an optical sensor located in the drop area inside the drop former arm. Precipitates or other foreign debris may obscure the optical path and cause erroneous drop counts. To prevent this problem, the drop sensor should be cleaned periodically. An ordinary cotton swab moistened with water can be used to clean the sensor.

9.2 Instrument Case, Carousel, and Drainage Tube

During normal operation, spills and splashes may result in precipitates forming on the case and carousel. Use a squirt bottle and soapy water to wash down carousel and case. The water will drain out the back of the unit through the drainage tube. Prior to squirting the instrument case, make sure the rubber seal around the gear device is in place. Insure that the waste tube is draining properly to avoid instrument damage.

Section 10
Troubleshooting

Problem	Cause	Remedy
Drops miss tubes	Carousel misaligned	Reposition carousel
	Drop former missing	Replace drop former
	Drop head misaligned	Align
	Unit not level	Place unit on level surface
Drops miss tube during advance	Flow rate greater than 5 ml/min	Reduce flow rate
Drops not counted or E08 error code	Drop sensor is dirty	Clean drop sensor
	Flow rate greater than 5 ml/min	Use Time collection mode
	Operating in a windy environment	Try relocating unit, or put a piece of tape over slot in drop arm
No power	Fuses	Check fuses, replace if necessary

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Fraction Collector Error Codes

There are several self-diagnostics built into the software of the Model 2110 Fraction Collector. Below are the principal error numbers and codes which occur. If other error codes appear, try unplugging and replugging the instrument, or call Bio-Rad Technical Service.

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Error Number	Cause	Remedy
E00 E01 E04	Hardware failure	Unplug and replug to mains power. If error persists, contact your local Bio-Rad representative.
E02	Motor jam	Reposition carousel; unplug and replug to mains power. If problem persists, apply WD-40 to the motor shaft. If motor must be replaced, order part number 8006484.
E08 E10	Drop sensor	If problem persists after cleaning the drop sensor with a wetted cotton swab, follow the Procedure for Adjusting Drop Detector Signal Level. See Appendix B. If drop sensor must be replaced, order part number 8006481.

Appendix A
Technical Specifications

Capacity	Eighty 13 x 100 mm glass or plastic test tubes, or 1.5 ml micro test tubes, when using adaptor (catalog number 731-8135)
Collection basis	1 to 999 drops in 1 drop increments 0.05 to 9.99 minutes in 0.01 minute increments 10.0 to 99.9 minutes in 0.1 minute increments See Econo Pump manual for other collection options when connected to the Econo System
Materials of construction	Case and carousel: polypropylene Front panel: hard-coated polycarbonate Drop former: silicone rubber Waste outlet tube: polyurethane

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Operating temperature	+ 4 to + 40 °C
Storage temperature	- 5 to + 71 °C
Line voltage	90-132 VAC or 180-265 VAC, 47 Hz to 63 Hz
Power consumption	25 VA max, 15 W max, fused
Fuse rating	
100,120 V Operation	200 mA, 250 V, 5 x 20 mm, Fast Acting, UL/CSA approved Ref: Schuter 034.3923 or Bussmann GMA200mA
220,240 V Operation	100 mA,250 V, 5 x 20 mm, Time Lag (FST), VDE approved Ref: Schuter 034.3107
Size	24.0 x 33.0 x 25.0 cm (W x D x H) Carousel does not overhang base at any point in operation
Weight	2.3 kg
Output signals	See Section 6.5 of the manual
Regulatory	CSA: C22.2 No. 151-M1986
Compliance	TÜV: EN61010-1: 1993 CE: EN55011: 1991 CLASS A, EN50082-2: 1995

Appendix B
Model 2110 Fraction Collector
Procedure for Adjusting Drop Detector Signal Level

This procedure should be performed:

1. After replacing the drop arm on the Model 2110 Fraction Collector.
2. Whenever "EO8" is displayed. In this situation, clean the optical window and light source prior to performing this procedure.

Safety: The Model 2110 Fraction Collector should be purged of all hazardous chemicals and be disconnected from the main power supply prior to conducting this procedure. Ensure the case is dry. Perform this procedure on a dry surface. **During the actual adjustment of the signal level (step 10), potentially dangerous voltages are present inside the case - *do not touch exposed wires. Use a plastic-handled screwdriver to minimize the risk of electric shock.***

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Tools required: Small phillips-head screwdriver, small slot-head screw driver.

Procedure:

1. Disconnect the Model 2110 collector from the power source.
2. Disconnect any tubing leading to the fraction collector, remove the yellow plastic arm cap, white rubber drop former, and carousel.
3. Clean the optical window and light source (located in drop arm), using the a cotton swab moistened with water.
4. Set fraction collector on its side with underside of the instrument facing toward you.
5. Remove the four phillips-head screws from the underside of the instrument. Pull gently on the rubber feet to remove the underside panel.
6. Locate the large circuit board with the power transformer. On this board, locate a small rectangular potentiometer, identified as "R3" on the circuit board. R3 is located near where the ribbon cable connects to the circuit board.
7. **Read safety warning above.** ***Use a plastic-handled screwdriver to minimize the risk of electric shock.***
8. Press and hold down both the "up" and "down" arrow keys on the front panel.
9. While continuing to press down arrow keys, connect the fraction collector to the power source. Continue to press down both keys for five seconds, then release.. The "time" LED will glow steadily, and the display will show a decimal point, followed by three characters (._ _ _). The fraction collector is now in a "diagnostic" mode.
10. Using a small flat-bladed screwdriver, adjust R3 by turning the small screw until the display reads between "0A0" and "0A5".
    If a reading between "0A0" and "0A5" cannot be obtained, contact your local Bio-Rad representative.
11. Disconnect unit from the power source.
12. Replace underside panel.
13. Connect fraction collector to a power source. The Model 2110 Fraction Collector is now ready for operation.

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Appendix C
Ordering Information

Model 2110 Fraction Collector

Catalog Number	Product Description
731-8122	**Model 2110 Fraction Collector,** 100/120 VAC (USA power cord), includes 80-tube carousel and tubing connectors
731-8120	**Model 2110 Fraction Collector,** 220/240 VAC (no power cord), includes 80 tube carousel and tubing connectors
731-8130	**Carousel,** 80 tube capacity
731-8131	**Replacement Drop Former Kit,** includes 2 drop and 2 drop caps
731-8135	**Micro Tube Adaptor**
731-8136	**Instrument Dust Cover**
731-8261	**Econo System Cable 1,** 8-pin Mini-DIN to DB-9 connector, to connect the Model 2110 Fraction Collector to the Econo Pump or BioLogic LP
731-8265	**Econo System Cable 5,** DB-9 connector to bare wires, to connect the Model 2110 Fraction Collector to the BioLogic System or other external instruments
731-8268	**Econo System Cable 8,** 8-pin standard DIN to DB-9 connector, for connecting the Model 2110 Fraction Collector to Model 1327 Recorder
731-8322	**Model SV-3 Diverter/Bypass Valve**

Model EP-1 Econo Pump

731-8140	**Model EP-1 Econo Pump,** 100/120 VAC (USA power cord), includes tubing set and starter fittings kit
731-8142	**Model EP-1 Econo Pump,** 220/240 VAC (no power cord), includes tubing set and starter fittings kit

Bio-Rad sells a complete line of integrated chromatography systems for protein purification. For information on the BioLogic System family of products, contact your local Bio-Rad representative.

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