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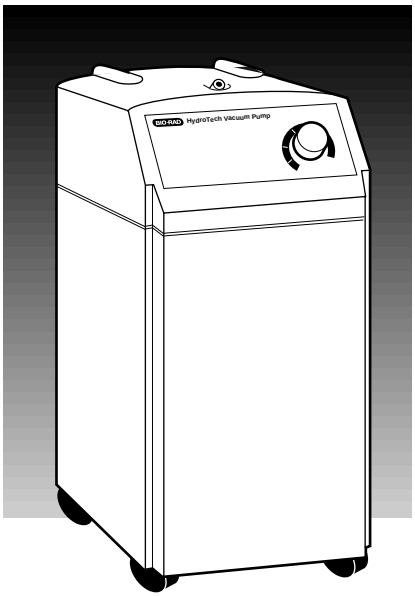
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HYDROTECH™ VACUUM PUMP

INSTRUCTION MANUAL

Catalog Numbers
165-1781
165-1782
165-1789
165-1790

BIO-RAD

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SAFETY



Caution/Warning
No user-serviceable parts are inside. Refer servicing to Bio-Rad service personnel.

This instrument is intended for laboratory use only.

This product conforms to the “Class A” standards for electromagnetic emissions 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.

This instrument should not be modified or altered in any way. Alteration of this instrument will void the manufacturer’s warranty, void the safety and emission certification, and create a potential safety hazard for the user.

Bio-Rad is not responsible for any injury or damage caused by the use of this instrument for purposes other than for which it is intended or by modifications of the instrument not performed by Bio-Rad or an authorized agent.

1. Always connect the unit to a power receptacle using a 3 prong plug. Always use a receptacle which has proper earth grounding and, preferably, ground fault protection.
2. Never enclose the unit in an unventilated space or closet.
3. The fluid circulated in the Hydrotech may be considered toxic and/or corrosive. Exercise appropriate caution when handling the unit, disconnecting lines or opening the reservoir.

Note: This product conforms to EN55014 for electromagnetic emissions. It is possible that emissions from the product may interfere with some sensitive appliances when placed nearby or on the same circuit as these appliances. The user should be aware of this potential and take appropriate measures to avoid interference

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1.0 INTRODUCTION

Bio-Rad's HydroTech Vacuum Pump is designed for use with the Model 583 Gel Dryer or any other conventional slab gel dryer. It uses water, not vacuum pump oil, so it is easy to use, environmentally friendly, and practically maintenance free. All parts are corrosion resistant, for long life and trouble-free operation.

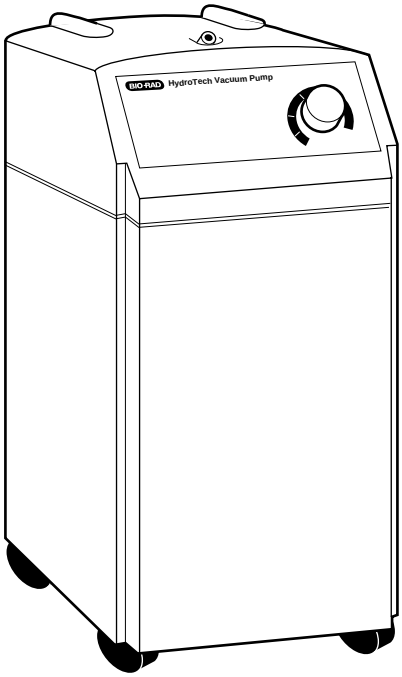


Figure 1. HydroTech Vacuum Pump

1.1 FEATURES

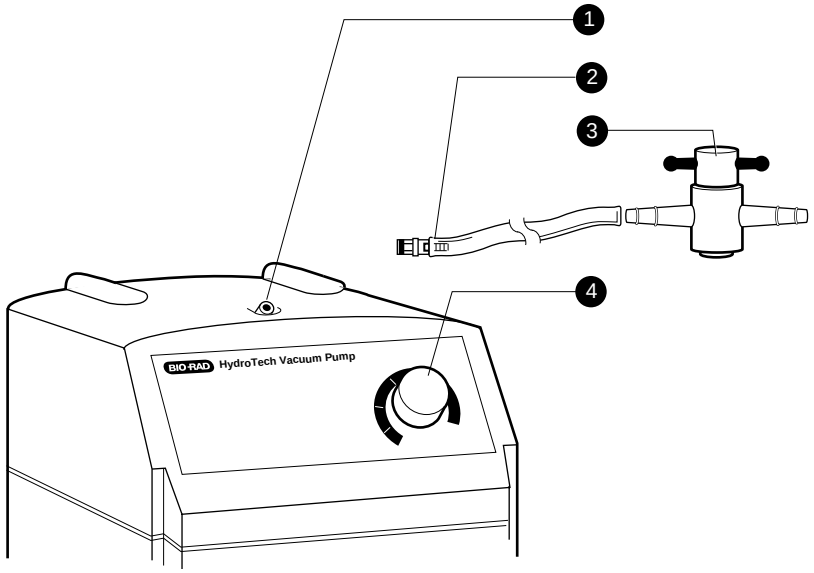
The HydroTech Vacuum Pump features include:

- No vapor or liquid trap required
- No oil or expensive oil-related maintenance required
- Continuous cooling that ensures steady vacuum
- No expensive diaphragms to replace every other year
- Free air capacity sufficient to seal two gel dryers

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1.2 PHYSICAL DESCRIPTION

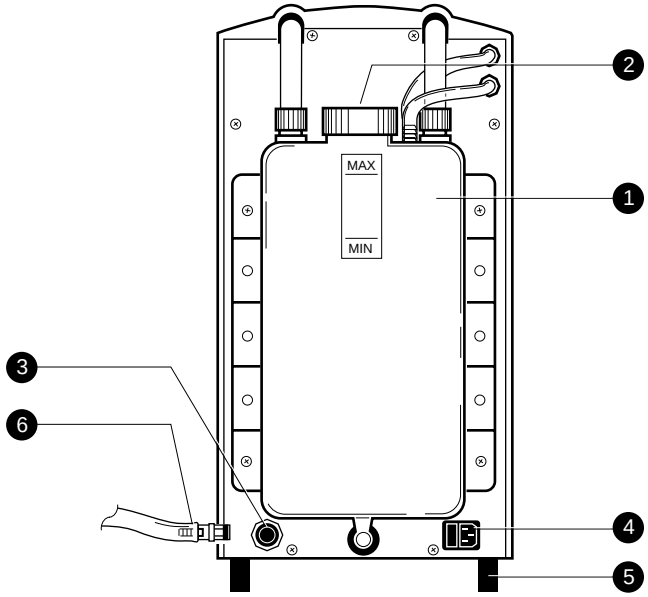
Table 1.
Front View Physical Features



Feature	Description
1. Vacuum Inlet Port	Quick disconnect valve for connecting to the gel dryer's vacuum line.
2. Vacuum Line	Pre-assembled with 1/4" quick disconnect fitting and 1/4" vacuum tubing.
3. Two-way Valve	Prevents foaming when the HydroTech is operating but the gel dryer is not in use. This valve is plumbed into the vacuum line.
4. Power On/ Off Timer	This switch can be set for 0 to 3 hours of operation or continuous operation.
5. Vacuum Gauge (optional; not shown)	Provides vacuum pressure indicator. This gauge is plumbed into the vacuum line.

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Table 2.
Rear View Physical Features



Feature	Description
1. Reservoir	Storage tank for recirculating water.
2. Reservoir Cap	Screw-on cap for water reservoir. The cap is ventilated to prevent pressure building up in the reservoir.
3. Reservoir Drain Port	Quick disconnect valve for draining the Reservoir.
4. AC Power Connection	Three-prong AC power input.
5. Locking Casters	Casters allow the HydroTech to be moved. Once in position, the casters can be locked.
6. Drain Line	Pre-assembled with 3/8” quick disconnect fittings and 3/8” tubing for draining the reservoir.

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2.0 SET UP AND BASIC OPERATION

The HydroTech Vacuum Pump is shipped fully assembled. To use the pump, simply fill the reservoir with water and attach the vacuum tubing from the gel dryer to the HydroTech's inlet port.

2.1 UNPACKING

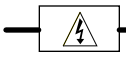
Carefully inspect the shipping carton for any damage which may have occurred in shipping. Severe damage to a carton may indicate damage to its contents. If you suspect that the contents have been damaged, immediately file a claim with the carrier in accordance with their instructions before contacting Bio-Rad Laboratories.

Cut the shipping straps and open the top flaps of the shipping box. Remove the foam inserts, and lift the top portion of the shipping box over the vacuum pump. The vacuum pump should now be fully accessible and can be easily removed from the bottom box.

Check the contents of the box against the supplied packing list. Remove the plastic bag from the unit and inspect the unit for external damage. If any part is missing or damaged, contact Bio-Rad Laboratories immediately.

2.2 SET UP

Follow the steps in Table 3 for setting up the HydroTech Vacuum Pump.



Warning
Do not continually operate the pump with less than the "MIN" level of water in the tank. It could damage the pump.

Table 3.
HydroTech Set Up

Step	Procedure	Description
1.	Fill the HydroTech reservoir to the MIN mark.	Remove the reservoir cap and add deionized or tap water. The water level should reach the MIN fill line marked on the tank. Re-install the cap.

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Table 3 (continued)
HydroTech Set Up

Step	Procedure	Description
2.	Connect the AC power cord.	Plug the AC power cord into the HydroTech power input module and into a nearby AC outlet.
3.	Turn the Power On/Off switch to run the pump for two minutes.	This ensures the pump is fully primed and air bubbles have been flushed out.
4.	Turn off the pump and check the water level in the pump reservoir.	The level should be between the MIN and MAX marks on the reservoir. If the level is below MIN, add water; if it is above MAX, drain water.
5.	Connect the pre-assembled vacuum line supplied with the HydroTech pump.	a. Plug the quick disconnect fitting end of the pre-assembled vacuum line into the vacuum inlet port. b. Plug a barbed two-way connector (shipped with the Model 583 Gel Dryer) into the other end of the pre-assembled vacuum line.
6.	Connect the vacuum tubing from the dryer to the pre-assembled vacuum line.	**Note**: Minimize the length of vacuum tubing between the dryer and the vacuum pump to achieve the best system efficiency.
7.	In an easily accessible stretch of the vacuum tubing, cut the tubing and insert the two-way valve that's included with the HydroTech pump.	This valve keeps the pump under vacuum when the dryer's vacuum seal is broken. **Warning**: Always turn the valve to the Closed position when the dryer is not in use. The Closed position shuts off air flow to the vacuum pump and prevents the water in the reservoir from foaming.
8.	If you purchased the optional HydroTech vacuum gauge, cut the vacuum line and insert the gauge.	This gauge displays the vacuum pressure.

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2.3 BASIC OPERATION



Warning
Turn the vacuum line's two-way valve to the closed position when the dryer is not in use; the vacuum pump then can continue operating without foaming.

Table 4.
HydroTech Operation

Step	Procedure	Description
1.	Turn on the Power On/Off Timer switch.	Choose either "continuous on" by turning the knob counter-clockwise or "timer" by turning clockwise. Maximum timed operation is 3 hours.
2.	Turn the vacuum line two-way valve to the Closed position.	This prevents reservoir foaming when the vacuum is running but the gel dryer is not in use.
3.	Position the gel in the gel dryer and seal the gel dryer.	
4.	Turn the vacuum line's two-way valve to the Open position.	The pump will now pull a vacuum on the gel dryer.
5.	When the gel is dry, break the vacuum seal.	Lift the Sealing Gasket of the gel dryer. Keep the vacuum pump running to prevent liquid in the vacuum line from flowing back into the gel dryer.
6.	Turn the vacuum line's two-way valve to the Closed position.	This prevents reservoir foaming when the HydroTech is running but the gel dryer is not in use.
7.	Turn off the HydroTech pump.	

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3.0 MAINTENANCE AND TROUBLESHOOTING

3.1 MAINTENANCE

The HydroTech pump's reservoir water should be changed at least once a month or if frequent use of the HydroTech has caused the water level to reach MAX. Regular reservoir maintenance helps maintain pump performance and reduces foaming. To change the water, follow the steps in Table 5.

Table 5.
Maintenance Guide

Step	Procedure	Description
1.	Turn off the Vacuum pump.	Do not connect the drain line unless the pump is turned off.
2.	Connect drain line to the Reservoir Drain Port.	Firmly push the drain line quick connect fitting into the reservoir drain port to open the drain valve. (See Table 2.)
3.	Place drain line into a large bucket or sink.	Secure the open end of the drain line before turning on the pump, or it may begin spraying.
4.	Turn on the pump.	Draining the reservoir requires approximately 30 seconds. **Warning**: Do not run the pump without water for extended periods of time.
5.	Turn off the Pump.	Disconnect the drain line by pushing the button on top of the reservoir's drain port. The drain port will automatically close.
6.	Refill the reservoir with water.	Fill the reservoir to the MIN mark with deionized or tap water. Reinstall the cap.

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3.2 TROUBLESHOOTING GUIDE

Refer to Table 6, Troubleshooting Guide, for HydroTech Vacuum Pump troubleshooting. For further assistance, call 1-800-4BIORAD in the U.S.A.; or contact your local Bio-Rad representative.

Table 6.
Troubleshooting Guide

Indication	Problem	Action
HydroTech Vacuum Pump will not start	No power	Check electrical source, power connections, and fuse. To replace the fuse, unplug the dryer. Then pry open the cover on the power switch and pull out the fuse holder. (See Appendix B for replacement fuse specifications.)
Reservoir is foaming	Pump is running but not pulling vacuum	Check the connections in the vacuum line.
	Pump is pulling vacuum	Drain the reservoir and, using deionized or tap water, refill to the MIN mark.
	Reservoir is above the MAX level	Drain the reservoir and, using deionized or tap water, refill to the MIN mark.
No vacuum in gel dryer	Vacuum line is blocked	Check the vacuum line for kinks, clogs or other blockages. Make sure the two-way valve is open.
	Gel Dryer is blocked	Vacuum line may be kinked inside gel dryer. Refer to the gel dryer instruction manual.
No vacuum from HydroTech Vacuum Pump	Quick connect fitting is clogged	Check that the quick connect fitting is properly connected and not clogged.
	No water in reservoir	Make sure the reservoir is filled to the MIN level.
	Foaming in reservoir	Drain the reservoir and, using deionized or tap water, refill to the MIN mark.
Declining vacuum over time (longer gel drying time)	Ambient temperature above 35°C	Run the pump in a cooler environment, or refill the reservoir with chilled water.
	Foaming in reservoir	Drain the reservoir and, using deionized or tap water, refill to the MIN mark.

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APPENDIX A. APPROXIMATE GEL DRYING TIMES

The following table provides approximate drying times for various gel concentrations, given the gel dryer's temperature and vacuum are kept at 80°C and 28" Hg, respectively.

Table 7.
Suggested Drying Times for Single Percentage Gels

Acrylamide Concentration	Slab Thickness	Time at 80° C
3% to 10%	0.375 mm	30 min.
10% to 20%	0.375 mm	30 min.
3% to 10%	0.5 mm	40 min.
10% to 20%	0.5 mm	40 min.
3% to 10%	0.75 mm	40 min. to 60 min.
10% to 20%	0.75 mm	60 min. to 120 min.
3% to 10%	1.5 mm	45 min. to 60 min.
10% to 20%	1.5 mm	60 min. to 120 min.
3% to 10%	3.0 mm	60 min. to 120 min.
10% to 20%	3.0 mm	120 min. to 180 min.

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APPENDIX B. SPECIFICATIONS

Vacuum	
Starting	> 29” Hg (23.4 Torr)
After 10 hours	> 28” Hg at 22° C (48.8 Torr)
At 35° C RT	> 26” Hg at start (99.6 Torr)
Flow rate	
60 Hz	> 28 liters per minute
50 Hz	> 21 liters per minute
Fluid Capacity	
Minimum (MIN)	4 liters
Maximum (MAX)	5 liters
Function Modes	Continuous or timed operation
Timer Control	0 to 3 hours, fully adjustable
Operating Conditions	
Temperature	4 to 35° C
Humidity	10 to 90% relative humidity
Dimensions (D x W x H)	40 x 25 x 51.1 cm
Weight (dry)	14 kg (30 lbs)
Electrical connection	3-wire power cord.
Power requirements	
115 V AC models	90-140 V AC, 50/60 Hz, 6 Amps
230 V AC models	200-264 V AC, 50/60 Hz, 4 Amps
Fuses required	Type T, 250 V AC
115 V AC models	8 Amp; 5 x 20 mm; slo blo (2)
230 V AC models	6.3 Amp; 5 x 20 mm; slo blo (2)
Regulatory	
Certified to	I.E.C. 1010/Low Voltage Directive 73/23/EEC
Certified to	E.M.C. Directive 89/336/EEC (220 V only)/ EN55014 Emissions EN50082-2 Immunity

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APPENDIX C. WARRANTY AND ORDERING INFORMATION

The HydroTech Vacuum Pump is warranted for 1 year against defects in materials and workmanship. If any defects should occur during this warranty period, Bio-Rad Laboratories 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 with fittings or other spare parts not specified by Bio-Rad Laboratories.
4. Damage caused by deliberate or accidental misuse.
5. Damage caused by disaster.
6. Tubing and fittings.

For inquiry or request for repair service, contact your local Bio-Rad office.

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WARRANTY INFORMATION

Model: _____

Serial Number:_____

Date of Delivery: _____

Warranty Period: _____

ORDERING INFORMATION

Catalog Number	Description
Gel Dryer and Vacuum Systems	
165-1789	**HydroTech Gel Drying System**, 100/120 V, includes Model 583 Gel Dryer, HydroTech Vacuum Pump, tubing and connectors.
165-1790	**HydroTech Gel Drying System**, 220/240 V, includes Model 583 Gel Dryer, HydroTech Vacuum Pump, tubing and connectors.
165-1781	**HydroTech Vacuum Pump**, 100/120 V, includes pump, quick disconnect fittings for 1/4-inch and 3/8-inch ID vacuum tubing, vacuum tubing, drain tubing, and instructions.
165-1782	**HydroTech Vacuum Pump**, 220/240 V, includes pump, quick disconnect fittings for 1/4-inch and 3/8-inch ID vacuum tubing, vacuum tubing, drain tubing, and instructions.
165-1788	**HydroTech Vacuum Gauge,** includes fittings to connect to the HydroTech vacuum line.

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