Criterion® Dodeca™ Cell

Instruction Manual

Catalog Number
165-4130

BIO-RAD

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Section 1
General Information

1.1 Introduction

The Criterion Dodeca Cell is a multi-cell for mini-vertical gel electrophoresis. It can run one to twelve Criterion gels simultaneously.

Table 1. Specifications

Tank and lid	Acrylic
Upper electrode assembly	Polycarbonate with 241 cm, (95 inches) platinum wire
Lower electrode assembly	Polycarbonate with 201 cm (79 inches) platinum wire
Drain line	Tygon[1] tubing
Drain line connectors	Delrin[2]
Cooling coil	Acrylic
Cooling coil connector tubing	Tygon
Total buffer volume (upper and lower buffer chambers combined)	6 liters maximum (running one gel), 5.34 liters minimum (running 12 gels)
Overall size	49 cm (L) x 18.8 cm (W) x 19.2 cm (H)
Precast gel compatibility	Criterion precast gels
Handcast gel compatibility	Gels prepared in empty Criterion cassettes
Recommended power supply	PowerPac 200 power supply
Safety limits	600 V, 250 W
Weight	4.66 kg (10.25 lb)

Note: Dodeca Cell components are not compatible with acetone or ethanol. Use of organic solvents voids all warranties.

1.2 Safety

Power to the Criterion Dodeca Cell is supplied by an external DC voltage power supply (not included). The output of the power supply must be isolated from external ground to insure that the DC voltage output floats with respect to ground. All Bio-Rad power supplies meet this important safety requirement. Regardless of the power supply used, the maximum specified operating parameters for the Criterion Dodeca Cell are as follows:

600 VDC	voltage limit
250 watts	power limit
40 °C	ambient temperature limit

The current to the cell enters the unit through the lid assembly that provides a safety-interlock to the user. The current to the cell via the lid's upper electrodes is broken when the lid is removed. Always turn off the power supply before removing the lid. **Do not attempt to use the cell without the safety lid**.

[1] Tygon is a registered trademark of Norton Co.

[2] Delrin is a registered trademark of E.I. DuPont de Nemours.

Note: This Bio-Rad instrument is designed for laboratory use only and is certified to meet EN-61010 safety standards. Operation of this product is subject to the condition that no harmful radio interference is caused and that any interference must be accepted. Certified products are safe to use when operated in accordance with the instruction manual. This instrument should not be modified or altered in any way. Alteration of this instrument will

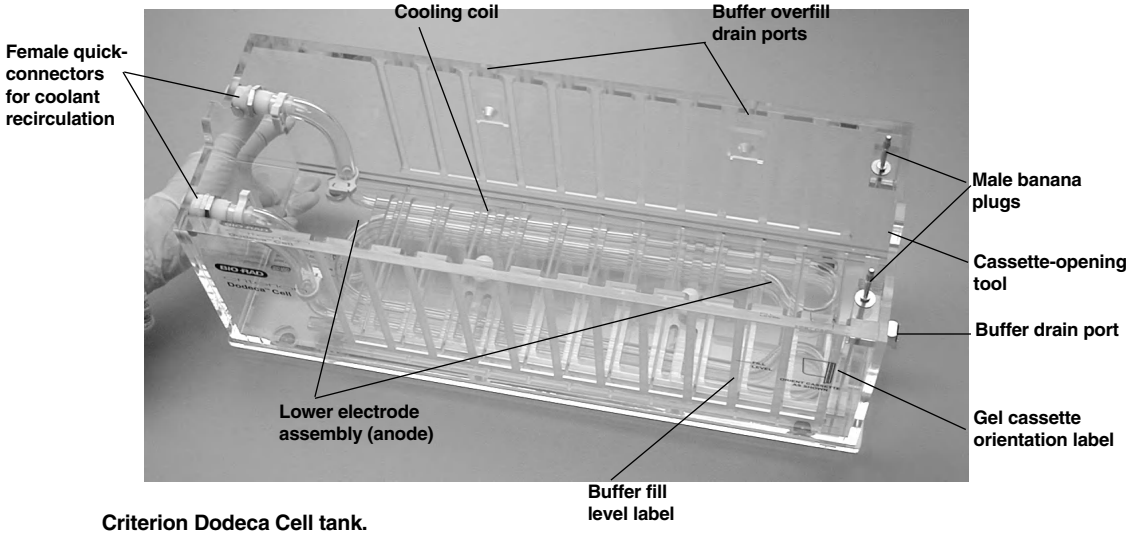
- Void the warranty
- Void the EN61010-1 certification, and
- Create a potential safety hazard

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

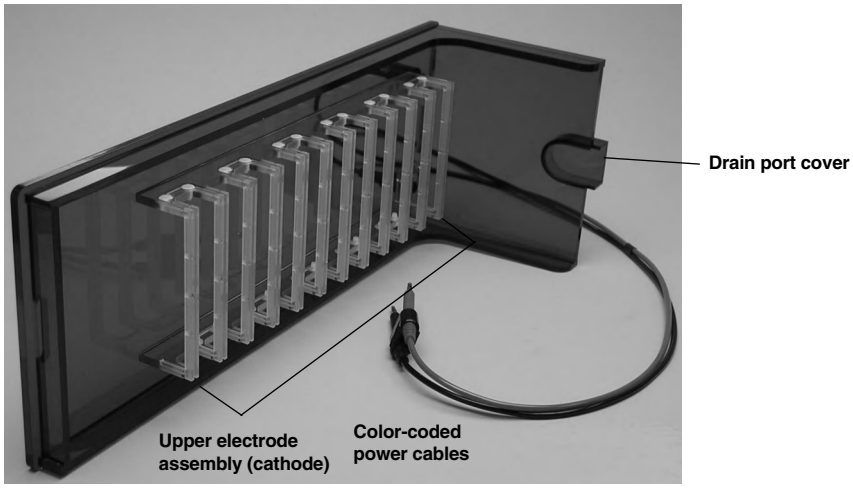
* EN61010-1 is an internationally accepted electrical safety standard for laboratory instruments.

1.3 Components

To get the best performance from your Criterion Dodeca Cell, familiarize yourself with the components by assembling and disassembling the cell before using it for the first time.



Criterion Dodeca Cell tank.



Criterion Dodeca Cell lid with power cables.

Table 2. Description of Parts

Buffer tank and lid	The buffer tank and lid combine to fully enclose the inner chamber during electrophoresis. The lid cannot be removed without disrupting the electrical circuit. The buffer fill level and gel cassette orientation are indicated with labels.
Cooling coil	The integrated cooling coil chills the lower buffer chamber. The cooling core can be connected to a refrigerated circulator (not included).
Electrode assembly	The lower buffer chamber (tank) contains the anode. The lid of the Dodeca Cell houses the cathode.
Drain port	The drain port allows buffer to be removed from the tank. The drain line attaches via a quick-connect fitting (this assembly is provided with the cell). The buffer drains by gravity out from the open end of the drain line into an appropriate-size vessel. To ensure safety, the cell cannot be drained while the lid is on.
Buffer overfill drain ports	For user safety, buffer overfill drain ports do not allow the buffer level to reach the upper electrode assembly and create a dangerous short condition within the cell.
Gel cassette	A Criterion precast gel or a handcast gel in a Criterion cassette is referred to as a gel cassette.
Cassette-opening tool	The cassette-opening tool is a wedge built into the tank. It offers a convenient way to crack open gel cassettes after electrophoresis.

Section 2
Setting Up the Dodeca Cell for Electrophoresis

2.1 Preparing the Buffers

Prepare 6 liters of running buffer for electrophoresis. Buffer may be chilled prior to electrophoresis. If the SDS precipitates out of the buffer, insure it is completely redissolved before electrophoresis.

Table 3. Standard Running Buffer Formulations

Tris/Glycine/SDS	25 mM Tris-Base (M.W. 121.1), 192 mM Glycine (M.W. 75.07), 0.1% SDS, pH 8.3, (Do not adjust the pH with acid or base. If the pH is not accurate remake the buffer).
Tris/Tricine/SDS	100 mM Tris-Base (M.W. 121.1), 100 mM Tricine (M.W. 179.2), 0.1% SDS, pH 8.3, (Do not adjust the pH with acid or base. If the pH not accurate remake the buffer).
Tris/Boric Acid/EDTA (TBE)	89 mM Tris-Base (M.W. 121.1), 89 mM boric acid (M.W. 61.83) 2 mM EDTA (M.W. 372.26), pH 8.3, (Do not adjust the pH with acid or base. If the pH is not accurate remake the buffer).

Tris/Acetic Acid/EDTA (TAE)	40 mM Tris, 20 mM acetic acid, 1 mM EDTA, pH 8.0

Premixed buffers are available (see Section 4.) Dilute the premixed 10x buffers (10x Tris/Glycine/SDS, 10x Tris/Glycine, 10x Tris/Tricine/SDS, 10x TBE, and 50x TAE) to a working concentration of 1x. Mix one liter of the premixed 10x buffer with 9 liters of distilled water to prepare 10 liters of running buffer.

2.2 Preparing the Criterion Precast Gel

All gels in a single electrophoresis experiment must be of the same gel type, with the same buffer and the same % acrylamide.[3] Complete instructions for Criterion precast gels may be ordered using catalog number 345-0000. Instructions are also available on the internet at www.discover.bio-rad.com in the precast gels literature section (bulletin 4110001).

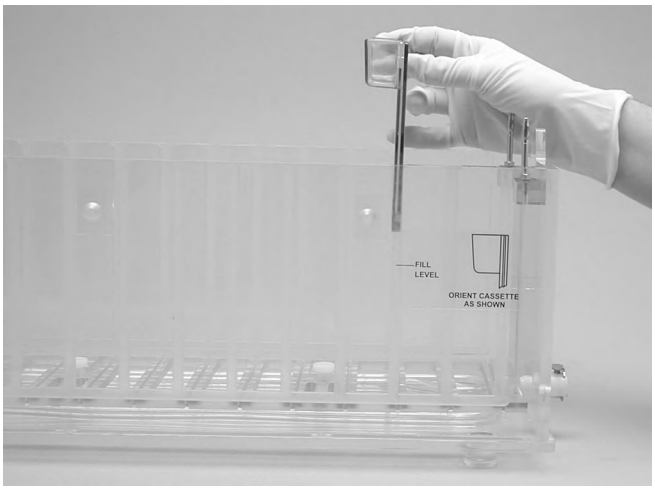
a. Each Criterion gel is packaged individually in a plastic storage tray. Remove the cover by gently pulling the square corner tab up and diagonally across the package. Remove the gel cassette from the package.

b. Remove the comb and gently rinse the wells with dd H_20 or running buffer.

c. Remove the white tape from the bottom of the cassette by pulling the tab across the gel.

2.3 Assembling the Cell

a. Place the Dodeca Cell on a stir plate. Fill the tank half full and drop a 38 mm (1.5") stir bar into the buffer tank. (This step must be done prior to loading the cassettes into the cell.)



Inserting Criterion gel cassette into tank.

b. Insert each Criterion gel into one of the slots in the Criterion Dodeca Cell. Ensure that the integral buffer chamber is facing the chiller hook-ups. Gel cassette orientation is indicated with a label on the tank.

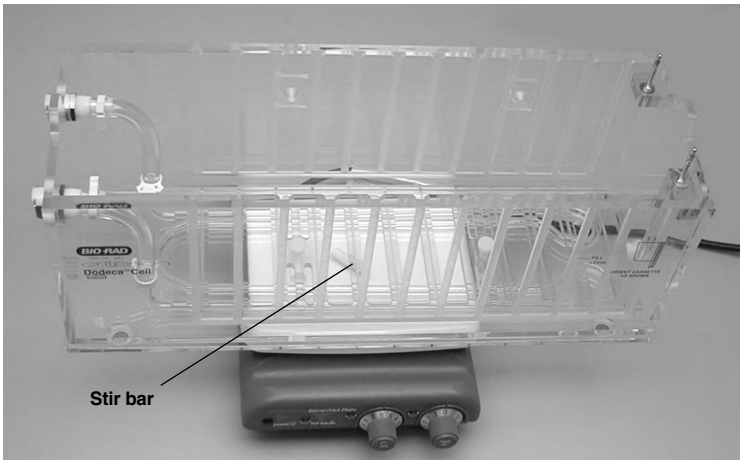
c. Fill the upper buffer chamber of each cassette with approximately 60 ml buffer.

[3] If running gels with different buffers or % acrylamide, the run progress should be monitored closely and gels can be removed as neccessary.

d. Load samples with a Hamilton syringe or a pipette with gel loading tips. Alternatively, use the sample loading guide to align the pipet tip with the sample wells.

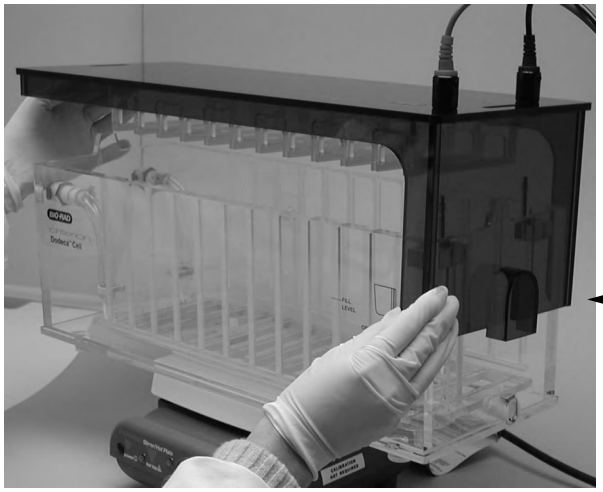
Note: If sample diffusion is of concern during loading, 2 or 3 gels may be loaded outside the tank and then transferred into the tank to be run under very low voltage (10–20 volts). Then the next 2 or 3 gels may be loaded and inserted into the tank and run at 10–20 volts. This process is continued until all gels are loaded and ready to run. Buffer levels in both the upper and lower chambers should be checked to insure they are appropriate.

e. Fill tank to the Fill Level line indicated on the tank. See Table 1 for total buffer volumes.



Tank sitting on stir plate

f. Place the lid on the tank, aligning the color-coded banana plugs and jacks. It is easiest to align the side with the banana plugs and drain cover first and then slide the lid down in to place.



Placing lid on tank

g. Set the power supply to recommended conditions and start the run. See Table 4 for recommended running conditions.

Table 4. Running Conditions (for 12 Criterion precast gels, 1.0 mm thickness)

Gel and Buffer System	Voltage	Initial Current (approximate)	Final Current (approximate)	Run Time (approximate)
Tris-HCl Tris/Glycine/SDS or Tris/Glycine	**200 V**	1.0–1.4 A	400–500 mA	56 minutes
The PowerPac 200 power supply will be limited at maximum power of 200W for a few minutes (5–10 minutes) at this time the voltage will read less than the indicated voltage setting (about 180 V). The Bromophenol Blue dye was run to the bottom of the gel.				
Tris-Tricine Tris/Tricine/SDS	**125 V**	1.6 A	850 mA	110 minutes
The PowerPac 200 power supply will be limited at maximum power of 200W for a few minutes (20 minutes) at this time the voltage will read less than the indicated voltage setting (about 115 V).				
TBE Tris/Boric Acid/EDTA	**200 V**	500 mA	400 mA	76 minutes
The gels were run until the first dye (Bromophenol Blue) cleared the gel.				
TBE-Urea Tris/Boric Acid/EDTA	**200 V**	500 mA	250 mA	76 minutes
The gels were run until the second dye (Xylene Cyanole) was at the very bottom of the gel, the first dye (Bromophenol Blue) was run off the gel				

Note: Precast and Tris-Tricine gels will run slightly warmer then handcast, Tris-HCl and TBE gels. Precast gels are prepared with Tris-HCl pH 8.6 and most handcast gels are cast using Tris-HCl pH 8.8, this minor variation will alter the run times slightly, precast gels will run a little faster.

2.4 Opening Criterion Cassettes and Removing the Gel

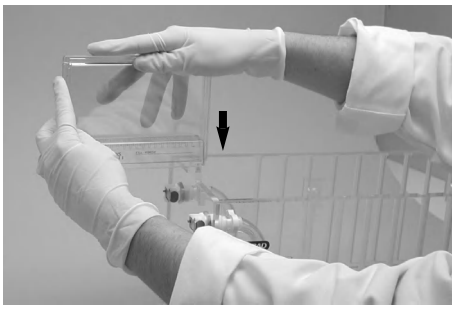
a. After electrophoresis is complete, turn off the power supply and disconnect the electrical leads.

b. Remove the cell from the stir plate. Be sure to pick up the tank from the bottom. Remove the lid from the tank.

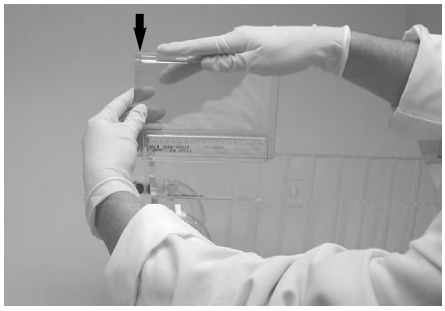
c. Remove the gel cassette. Pour off and discard the buffer from the Integral Buffer Chamber.

   Note: If the lower buffer will be reused, do not pour the depleted buffer from the integral upper buffer chamber into the tank. The lower buffer can be reused up to 10 times depending on usage (see guidelines in Section 3).

d. Invert the cassette and place the end of the Integral Buffer Chamber of the gel cassette on the cassette-opening tool which is built into the Criterion Dodeca Cell tank. Holding the cassette upside down with two hands, position one end of the integral buffer chamber directly over the top of the wedge protrusion on the tank. Firmly press down on the cassette to crack the cassette weld. Repeat for the other end of the integral buffer chamber.

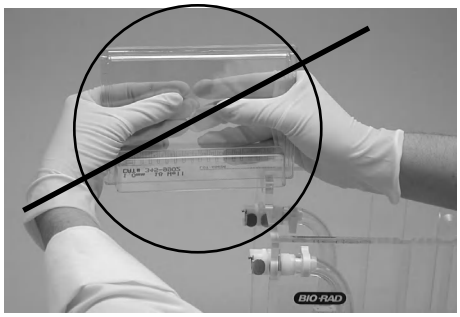


First crack the weld on one side.



Then crack the weld on the other side.

Note: Be careful not to squeeze the cassette in the middle. This may cause distortions or other damage to the gel.



Do NOT squeeze the gel cassette in the middle.

e. Pull the two halves of the cassette apart to completely expose the gel. Be careful, the gel may partially stick to both sides. Open slowly to avoid tearing the gel.

f. Remove the gel by either floating the gel into a fixing or staining solution, or by carefully lifting the gel from the cassette while holding the bottom of the gel.

g. Repeat c–f for each gel in the tank.

2.5 Accessories for Cooling

The Criterion Dodeca Cell has a cooling coil with quick connect fittings that can be connected to a refrigerated circulator. The refrigerated circulator must be able to maintain the buffer temperature of 18 to 20 ºC in the tank during electrophoresis.[4] Tubing with 3/8" ID (not included) connects the Dodeca Cell to the refrigerated circulator. To connect the Dodeca Cell to the refrigerated circulator,

a) Insert the male fittings (supplied in a separate bag) into the tubing on the refrigerated circulator inlet and outlet tubing.

[4] For example, the refrigerated circulator used during development of the Dodeca Cell was set to 15 ºC and had a flow rate of 3.8 liters per minute. Under these conditions and using the recommended volume of buffer, the buffer temperature during electrophoresis was maintained at 18 to 20 ºC.

b) Connect the male fittings from the refrigerated circulator to the female fittings on the Criterion Dodeca Cell. The cooling coil in the Dodeca Cell has no specific orientation, so it is not important which direction the flow goes.

A refrigerated circulator is not required for running Tris-HCl, TBE and TBE-Urea gels because the large volume of buffer serves as a sufficient heat sink. However, a refrigerated circulator is recommended to maintain a set temperature while running a large number of Tris-Tricine gels since they produce more heat during electrophoresis. Nonetheless, the cooling option offers additional control over the running conditions when desired.

Note: The Dodeca Cell MUST be used with a stir bar and stir plate. Stirring the buffer is essential in maintaining a constant buffer temperature throughout the entire cell. Without this control, the run times between the twelve gels in the tank may vary, thus altering the migration patterns of the samples from gel to gel.

Section 3
Maintenance

3.1 General Maintenance

The Criterion Dodeca Cell lid should be rinsed after use. The tank should be rinsed thoroughly each time it is emptied.

3.2 Draining the Tank

To drain the tank, insert the male quick-connect fitting into the drain port on the end of the tank and allow to drain by gravity. Be sure that the open end of the tubing is placed into a receptacle of the appropriate size, since buffer will flow out as soon as the connection is made. Alternatively, pick up the entire tank and pour off the buffer.

3.3 Guidelines for Reusing Tank Buffer

The buffer in the lower tank may be reused up to 10 times. Sodium azide (final concentration of 0.02%) is recommended to help minimize contamination.

The number of times the buffer is used depends on the number of gels run each time and the conditions at which the runs are performed. The primary concern is ion depletion. Prepare fresh buffer if the following problems appear:

- changes in protein mobility
- decrease in band sharpness
- longer run times
- a band at the bottom of the gel which is difficult or impossible to destain

Section 4
Troubleshooting Guide

Problem	Cause	Solution
1 Smile effect – band pattern curves upward at both sides of the gel	a. Center of the gel running hotter than either end	a. Improper cooling. Ensure buffer level is to the fill line indicated on the tank. Use cooling coil and refrigerated circulator to maintain buffer temperature of 20 ºC
	b. Power conditions are excessive	b. Decrease voltage from 200 V to 150 V.
2. Run takes unusually long time.	a. Ion depletion in running buffer (lower tank)	a. Prepare and use fresh buffer.
	b. Running buffer too concentrated.	b. Check buffer protocol and dilute buffer if necessary.
3. Changes in protein mobility or band sharpness.	a. Ion depletion in running buffer (lower tank)	a. Prepare and use fresh buffer.
4. SDS is precipitating.	a. Running buffer is too cold.	a. Set the refrigerated circulator to maintain a buffer temperature of 18–20 ºC.
5. Vertical streaking of proteins.	a. Sample overload or protein precipitation	a. Dilute sample, selectively remove predominant protein in the sample, or reduce the voltage by about 25% to minimize streaking.
		b. The ratio of SDS to protein should be enough to coat each protein molecule, generally 1.4:1. It may require more SDS for some membrane samples.
		c. Ensure sample is suspend-ed completely in sample buffer prior to loading.
6. Lateral band spreading	a. Diffusion out of the wells prior to turning on the current	a. Minimize the time between sample application and power start up.
	b. Ionic strength of sample lower than that of gel	b. Use same buffer in sample as in gel or stacking gel
7. Skewed or distorted bands	a. Salts in sample	a. Remove salts by dialysis, desalting column, etc.
8. Lanes constricted at the bottom of the gel.	a. Ionic strength of sample higher than that of surrounding gel.	a. Desalt sample and neighboring samples.

Problem	Cause	Solution
9. End gels are running faster than the center gels.	a. Buffer is warmer at the ends of the cell than the center.	a. Ensure the stir bar is freely rotating to maintain a constant buffer temperature.
10. Sample not migrating	a. Tape is still on the bottom of the gel.	a. Remove the white tape prior to electrophoresis.
	b. No electrical connection.	b. Check continuity of electrode wires in lid and tank.

Section 5
Product Information and Accessories

Catalog Number	Description
Criterion Dodeca Cell and Accessories	
165-4130	**Criterion Dodeca Cell**
165-4135	**Lower Electrode Assembly with Platinum Wire**
165-4104	**Replacement Drain Line**
165-4136	**Replacement cooling coil**, includes connector tubing
165-2948	**Replacement power cables**
165-4137	**Replacement lid**
Power supply	
165-5052	**PowerPac 200 power supply**, 100/120 V
165-5053	**PowerPac 200 power supply**, 220/240 V
165-5062	**PowerPac shelf**; attaches to the underside of a shelf and holds the PowerPac 200
Premixed Electrophoresis Buffers	
161-0772	**10x Tris/Glycine/SDS**, 5 L
161-0757	**10x Tris/Glycine**, 5 L
161-0760	**10x Tris/Tricine/SDS**, 6 x 1 L
161-0770	**10x Tris/Boric Acid/EDTA**, 5 L
161-0773	**50x Tris/Acetic Acid/EDTA**, 5 L

Section 6
Warranty Information

The Criterion Dodeca Cell 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. Repairs or modifications performed by anyone other than Bio-Rad Laboratories or their authorized agent.
3. Damage caused by accidental misuse.
4. Damage caused by disaster.
5. Common replacement parts including platinum wire and power cables.
6. Damage caused by the use of organic solvents.

For inquiries or to request repair service, contact your local Bio-Rad office.

Warranty Information

Model _____

Catalog Number _____

Date of Delivery _____

Serial Number _____

Invoice Number _____

Purchase Order Number _____