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ThermoFlow™

Electrophoresis Temperature Control

Instruction Manual

NOVEL EXPERIMENTAL TECHNOLOGY

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Table of Contents

Introduction - 1

Safety Design Features of the ThermoFlow System - 2

Safety Considerations (including French & German Translations) - 3

ThermoFlow System Warranty - 6

Unpacking the ThermoFlow System - 7

Installation
- Installing the ThermoFlow ETC Unit - 8
- Installing the Heat Exchanger into the ThermoFlow ETC Unit - 9
- Installing the ThermoFlow Mini-Cell and Connecting the Buffer Recirculation System - 10
- Setting up the External Recirculating Water Bath - 12

Setting the Temperature - 13

Instructions for Use - 16

Appendix 1: Troubleshooting Guide - 23

Appendix 2: Maintenance
- Cleaning & Maintenance - 25
- Replacing the Peristaltic Tubing - 26
- Replacing the Fuse(s) - 28

Product Specifications - 29

Ordering Information - 30

To ensure safe, reliable operation, always operate the XCell II™ Mini-Cell and all NOVEX™ products according to the manufacturer's instructions. Wear protective gloves and safety glasses when working in a laboratory environment.

NOVEX products are intended for *in vitro* use only.

Novex is not responsible for injuries or damages caused by improper use.

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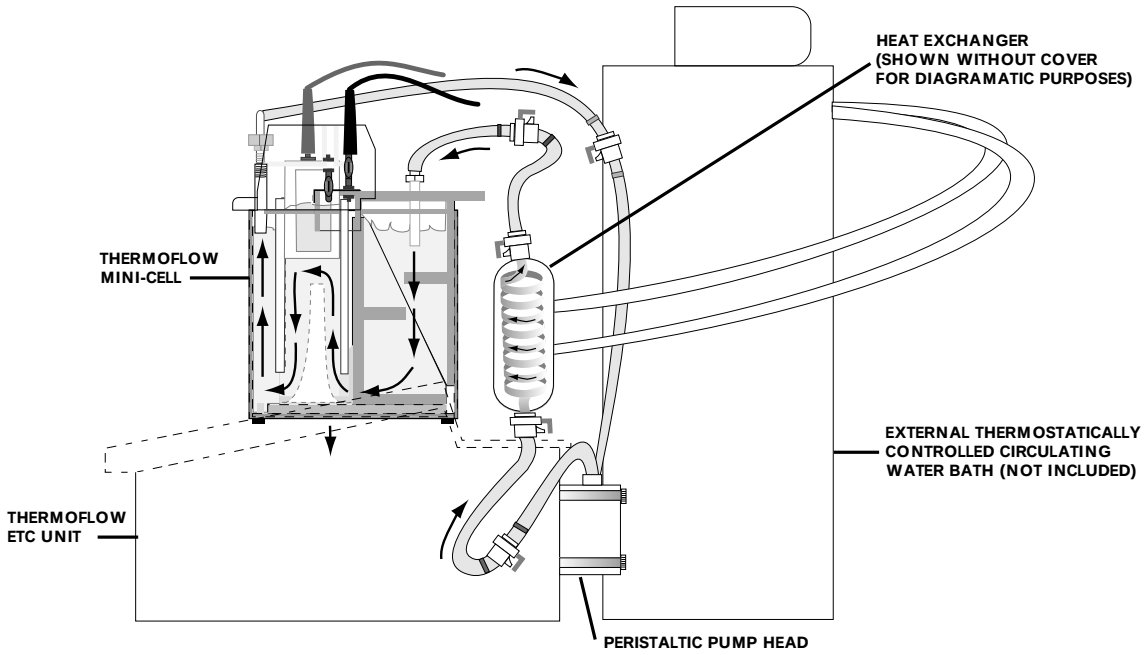
I. Introduction:

The NOVEX™ ThermoFlow Electrophoresis Temperature Control (ETC) System provides an elegantly simple method for accurate temperature control in an electrophoresis system. The ThermoFlow Mini-Cell directs the flow of a circulating buffer over both surfaces of two gels to efficiently remove heat which is generated during the run.

The temperature of the circulating buffer is precisely controlled by passing it through a coil in a jacketed glass heat exchanger. Water from an external thermostatically controlled recirculating water bath flows through the jacket of the heat exchanger providing accurate, consistent temperature control.

NOTE: An external thermostatically controlled recirculating water bath must be provided by the user.

1. User can select any temperature between 4 and 60°C and maintain it throughout the run at ±1.0°C when voltage does not exceed 300V.
2. The gels are completely submerged in rapidly flowing thermostatically controlled buffer. (~500ml/min)
3. Fast temperature adjustment - buffer temperature changes in 20 minutes.
4. Requires only 900ml of buffer.
5. Runs one or two gels at a time.
6. Compact size. Only 18cm wide.
7. The ThermoFlow ETC System controls the temperature for all electrophoresis applications including SSCP, isoelectric focusing, SDS-PAGE, native PAGE and blotting.



SIDE VIEW

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II. Safety Design Features of the ThermoFlow ETC System:

WARNING: FAILURE TO FOLLOW SAFETY INSTRUCTIONS OR FAILURE TO USE THE EQUIPMENT IN THE MANNER SPECIFIED BY THE MANUFACTURER MAY RESULT IN PERSONAL INJURY, PROPERTY DAMAGE OR DAMAGE TO THE UNIT.

1) The XCell II™ ThermoFlow Mini-Cell is designed so that power from the power supply is disconnected when the lid is removed.

2) The buffer intake and outlet tubes are intentionally short so that no more than 50ml of buffer will be pumped out if the lid has been removed or a leak develops in the tubing.

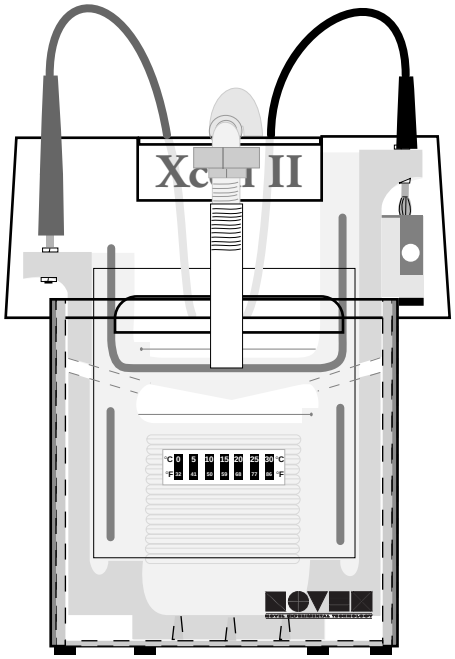
3) The ThermoFlow ETC system keeps the recirculated buffer contained in a closed system to eliminate the risk of electrical shock.

4) The tubing connections are color-coded to ensure proper connections between the ThermoFlow Mini-Cell and the ThermoFlow ETC unit.

5) All-plastic quick disconnects are used.

6) The NOVEX ThermoFlow System complies with the following:
   - EN 61010-1 Amendment 1 (Safety Requirements for Laboratory Equipment)
   - EN 55014 of the EMC directive for electromagnetic emission
   - EN 60601-1-2:1993 and IEC 801-4:1991 for electromagnetic immunity

CE



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III. Safety Considerations:

The lightning flash with arrowhead symbol within an equilateral triangle, is intended to alert the user to the presence of a potential electrical shock hazard if the circulating buffer is contacted while power is being supplied to the Mini-Cell.

To avoid electrical shock:

- Do not use metal thermometers, metal probes, or uncoated probes to monitor the temperature in the cell. Use only glass or teflon-coated thermometers and probes.
- Do not pump buffer from the Mini-Cell out of the enclosed ThermoFlow unit into any external open container or into the thermostatically controlled recirculating water bath when power is being supplied to the Mini-Cell.
- Use only with power supplies featuring current leak detection or ground fault interrupt safety features.
- Do not turn on power supply if there are any leaks. If a leak develops during a run, make sure the power supply is OFF.
- Use a properly grounded electrical outlet of correct voltage and current handling capacity.
- Use the NOVEX ThermoFlow ETC unit only with NOVEX ThermoFlow Mini-Cells.
- Do not disconnect any tubing while power is being supplied to the Mini-Cell.
- Replace tubing after 200 hours of use to avoid unexpected tubing failure. Use only 1/4" ID all-plastic quick disconnect fittings.

To avoid personal injury:

- Wear hand and eye protection at all times when in the laboratory.
- Do not use in the presence of flammable or combustible materials.
- Do not use this unit with radioactive samples. The peristaltic tubing may leak unexpectedly after extended use causing an exposure hazard.

To avoid damage to the unit:

- Do not set temperature of the external circulating water bath so that the temperature inside the Mini-Cell is lower than 4°C or higher than 60°C. Doing so may result in damage to the gels and/or damage to the unit.
- Keep area around the ThermoFlow system clean and dry. Do not place the ETC unit in a tray which will accumulate fluids.
- Keep the area on all sides of the bottom of the ThermoFlow System clear for adequate ventilation and cooling. The exhaust fan is located on the bottom of the unit.

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II. Instructions de Sécurité pour le Système ThermoFlow ETC

ATTENTION: LE NON SUIVI DES INSTRUCTIONS PRÉCONISÉES PAR LE FABRIQUANT PEUT ENTRAINER DES DOMMAGES POUR LES PERSONNES, LES BIENS OU POUR LE SYSTÈME LUI MÉME.

1) La Mini Cuve XCell II™ ThermoFlow est concue de telle manière que le générateur est mis hors tension quand le couvercle est enlevé.
2) Les tubulures sont suffisemment courtes pour que pas plus de 50ml de tampon ne soit éliminé à l´extérieur si le couvercle est enlevé ou si une fuite se passe au niveau de la tubulure.
3) Le système ThermoFlow ETC garde le tampon de recirculation dans un sytéme clos (confiné) pour éliminer les risques de choc électrique.
4) Les connecteurs ont des codes couleurs pour s´assurer de connexions correctes entre la Mini-Cell ThermoFlow et l´unité ThermoFlow ETC.
5) Des raccords rapides tout plastiques sont utilisés.
6) Le Système ThermoFlow de NOVEX satisfait aux directives suivantes:
   - EN 61010-1 Amendement 1 (Conditions de sécurité pour les équipements de laboratoire)
   - EN 55014 de la directive EMC pour les émissions électromagnétiques.
   - EN 60601-1-2 :1993 et IEC 801-4:1991 pour l´immunité électromagnétique.

III. Securité:

La flèche lumineuse située dans le triangle, avertit l´utilisateur du risque potentiel d´un choc électrique si le tampon de recirculation est en contact lorsque la Mini-Cell est sous tension.

Pour éviter les chocs électriques:

- Ne pas utiliser de thermomètres en métal, de sondes métalliques ,ou sondes non recouvertes pour mesurer la température dans la cuve. Utiliser uniquement des thermomètres et sondes en verre ou recouvertes de teflon.
- Ne pas transferer le tampon de la Mini-Cell de l´unité ThermoFlow (fermée) vers un récipient extérieur ouvert ou dans la bain à recirculation thermostaté quand la Mini-Cell est sous tension.
- Utiliser uniquement avec des générateurs ayant des systèmes de sécurité et de détection de fuites à la terre.
- Ne pas brancher le générateurs si une fuite est détectée. Si une fuite apparaît pendant la migration ,s´assurer qe le générateur est mis hors tension.
- Utiliser une prise életrique de terre avec le voltage et l'ampérage appropriés.
- Utiliser l´unité NOVEX ThermoFlow ETC ,uniquement avec la Mini-Cell ThermoFlow de NOVEX.
- Ne pas déconnecter les tubulures quand le courant est appliqué à la Mini-Cell.
- Remplacer la tubulures après 400 heures d´utilisation. Utiliser uniquement les raccords rapides tout plastique 1/4'' de diamètre interne.

Pour éviter les risques corporels:

- Porter des gants et des lunettes à tout moment dans le laboratoire.
- Ne pas utiliser en présence de matériels inflammables ou combustibles.
- Ne pas utiliser ce système avec des échantillons radioactifs. La tubulure peut fuire après une utilisation soutenure et causer une exposition à la radioactivité.

Pour éviter tout dommage à l'unité:

- Ne pas porter la température du bain marie extérieur à une température telle que la température à l´intérieur de la Mini Cuve soit inférieure à 4°C ou supérieure à 60°C.
- Conserver la surface autour du système ThermoFlow propre et sèche. Ne pas placer l'unité ETC dans un réservoir pouvant accumuler des liquides.
- Garder tous les côtés du système ThermoFlow libres d´accès pour une ventilation et un refoidissement suffisants. Le ventilateur est situé sur le bas de l´unité.

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II. Sicherheitseinrichtungen des ThermoFlow Systems:

WARNUNG: Ein Nichtbeachten der Sicherheitsinsinstruktionen kann zu Personenverletzungen, Eigentumsschäden oder Geräteschäden führen.

1) Die XCell II™ ThermoFlow Mini-Cell wurde so knozipiert, daß der Strom bei offener Abdeckung ausgeschaltet wird.
2) Die Puffer-Eingangs/Ausgangsschläuche sind absichtlich kurz gehalten, so daß nicht mehr als 50ml Puffer gepumpt wird, wenn der Deckel entfernt ist oder sich eine Leackage im Schlauch befindet.
3) Das TermoFlow ETC System behält den zirkulierten Puffer in einem geschlossenem System, um eine Electroschochgefahr zu vermeiden.
4) Die Schlauchanschlüsse sind farbkodiert, um sichere Anschlüsse zwischen der ThermoFlow Mini-Cell und dem ThermoFlow ETC Gerät zu gewährleisten.
5) Sämtliche Plastik-Schnellanschlüsse werden benutzt.
6) Das NOVEX ThermoFlow System stimmit mit den folgenden Normen überein:
   • EN 61010-1 Anhang 1 (Sicherheitsbestimmungen für Laborgeräte)
   • EN 55014 der EMV-Richtlinie für Abstrahlungen
   • EN 60601-1-2 :1993 und IEC 801-4:1991 für Störfestigkeit

III. Sicherheitsmaßnahmen:



Elektroschockgefahr, wenn der Puffer berührt wird, während die Mini-Cell unter Strom steht.

Um eine Elektroshockgefahr zu vermeiden:

- Keine Metallthermometer, Metallsonden oder unbeschichtete Sonden verwenden, um die Temperatur in der Zelle zu überwachen. Nur Glas- oder Teflonbeschichtete Thermometer und Sondon verwenden.
- Keinen Puffer von der Mini-Cell aus dem ThermoFlow Gerät in einen externen, offenen Kontainer pumpen oder in das zirkulierte Wasserbad, während der Strom eingeschaltet ist.
- Nur mit Netzteilen verwenden, die Schutz gegen Stromleckagen oder Unterbrechungsschalter aufweisen.
- Den Strom nicht einschalten, sollten Leckagen vorhanden sein.
- Eine sachgemäß geerdete Steckdose mit korreketer Spannung und Stromeinstufung verwenden.
- Das ThermoFlow ETC Gerät nur mit der NOVEX Mini-Cell ThermoFlow verwenden
- Keine Schläuche abtrennen, während der Mini-Cell Strom hinzugeführt wird.
- Die Schläuche nach 400 Stunden Gebrauch ersetzen, um ein Versagen zu vermeiden. Nur 6mm Plastikanschlüsse verwenden.

Um Personenverletzungen zu vermeiden:

- Zu allen Zeiten im Labor einen Hand- und Augenschutz tragen.
- Nicht in der Anwesenheit brennbarer Anästhetika verwenden.
- Dieses Gerät nicht mit radioaktiven Materialien oder Puffer verwenden, die gefährliche Stoffe enthalten. Die perstaltische Pumpe könnte nach langem Gebrauch unerwartet lecken, was zu Gefahren führen kann, werden diese Puffer verwendet.

Um Geräteschäden zu vermeiden:

- Die Temperatur des externen, zirkulierenden Wasserbades so einstellen, daß das Innere der Mini-Cell nicht niedriger als 4 Grad Celsius und nicht höher als 80 Grad Celcius ist. Ein Nichtbeachten könnte die Gele oder das Gerät beschädigen.
- Die Umgebung des ThermoFlow Systems sauber und trocken halten. Das Thermometer nicht in ein Tablett legen, das Flüssigkeiten ansammeln könnte.
- Die Umgebung des ThermoFlow Systems frei halten, so daß Ventilation und Abkühlung möglich sind. Der Ventilator befindet sich auf der Unterseite des Gerätes.

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IV. ThermoFlow System Warranty:

NOVEX warrants that this product will be free from defects in material and workmanship for a period of one (1) year from date of purchase. If you find a defect, NOVEX will, at its option, repair, replace or refund the purchase price of this product at no charge to you, provided you return it during the warranty period. This warranty does not apply if the product has been damaged by accident, abuse, misuse or misapplication. This warranty also excludes certain parts subject to ordinary wear and tear. For your protection, items being returned must be carefully packed to prevent damage in shipment and must be insured against possible damage or loss. This warranty shall be limited to the replacement of defective products. IT IS EXPRESSLY AGREED THAT THIS WARRANTY WILL BE IN LIEU OF ALL WARRANTIES OF FITNESS AND IN LIEU OF THE WARRANTY OF MERCHANTABILITY.

Repair & Replacement Policy

On Receiving Your Instrument:

Examine the unit carefully for any damage inflicted in transit. Any damage claims must be filed with the carrier. The warranty does not cover in-transit damage.

Covered by the Warranty:

This warranty covers all parts and components of the instrument except those such as fuses, gaskets, and peristaltic tubing and other items of normal wear that require frequent replacement. This warranty does not cover items broken or damaged, including glass items, caused by improper handling or use.

If There is a Problem Requiring Service:

1) Check the troubleshooting section of this instruction manual.

2) Contact NOVEX technical support as we may be able to remedy the problem over the phone.

3) If the unit must be shipped back to the factory for repair, please contact NOVEX or your distributor for a Return Authorization Number and shipping instructions. The unit will be repaired as quickly as possible and returned to you.

For Technical Assistance in the U.S., please contact:
NOVEX Technical Support
11040 Roselle Street
San Diego, CA 92121 U.S.A.

1-800-456-6839, 619-452-6634, Fax: 619-452-6635

For non-U.S. technical inquires please contact your local NOVEX representative.

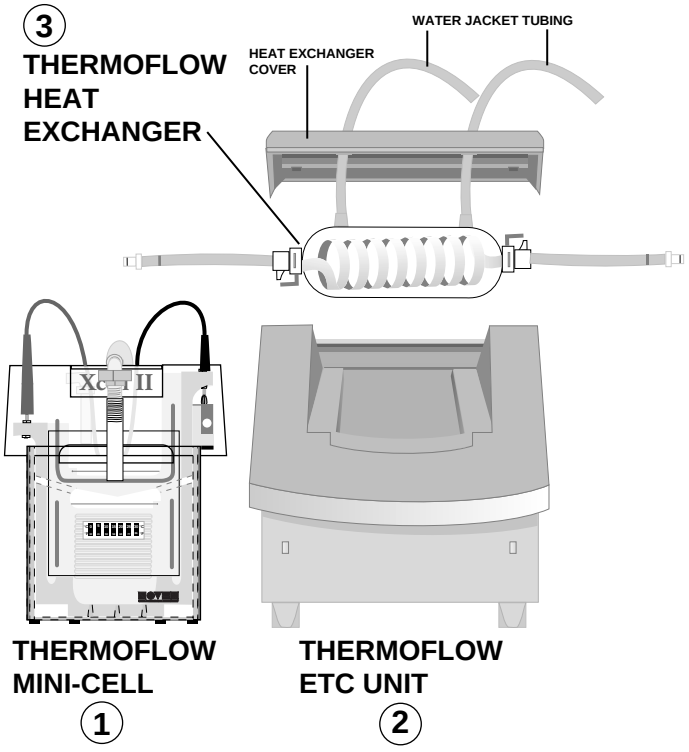
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V. Unpacking the ThermoFlow System

Please verify that your NOVEX ThermoFlow Electrophoresis Temperature Control (ETC) System arrives complete with the following components:

Description	Number
(1) The ThermoFlow Mini-Cell contains	
Lower Buffer Chamber	1ea
ThermoFlow Buffer Core with Temperature Indicator Strip	1ea
Cell Safety Lid with Cables and Buffer Outlet Fitting	1ea
Front Wedge	1ea
Rear Wedge with Buffer Inlet Fitting	1ea
Buffer Dam	1ea
Gel Knife	1ea
Warranty Card	1ea
Instruction Manual	1ea
(2) The ThermoFlow ETC Unit contains:	
ThermoFlow ETC unit	1ea
Extra Fuses	2ea
Power Cord	1ea
Extra tubing	1m
Tubing Replacement Tool	1ea
Warranty Card	1ea
Instruction Manual	1ea
(3) The ThermoFlow Heat Exchanger	1ea

NOTE: An external thermostatically controlled recirculating water bath is required and must be provided by the user.



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IV. Installation:

Installing the ThermoFlow ETC Unit

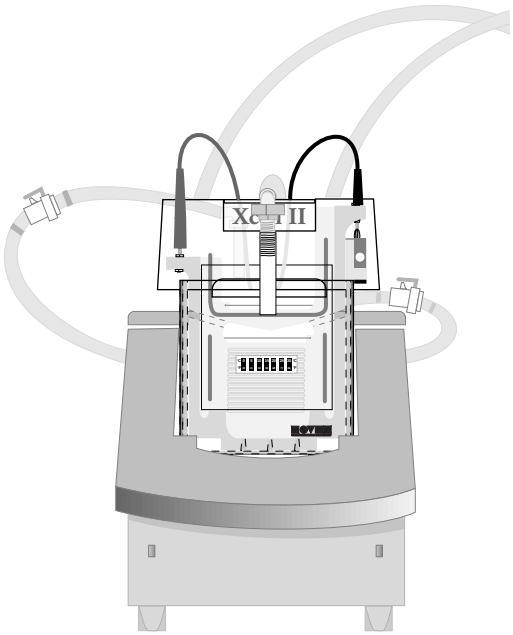
1. Unpack the ThermoFlow ETC Unit and place it on a level bench so the ThermoFlow logo is facing you and the peristaltic pump head is located at the rear of the unit.

2. The On-Off switch and the power cord attachment module are located on the right-rear side of the ThermoFlow ETC unit. Position the unit so that these are easily accessible.

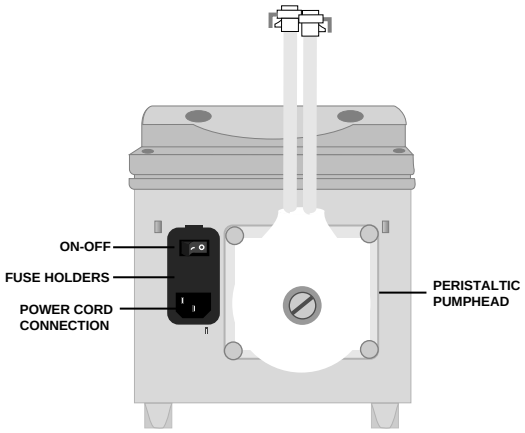
3. Attach the power cord to the connection at the right-rear of the unit. Check the label at the rear of the ThermoFlow ETC unit to ensure that the unit is of the proper voltage. Use only properly grounded AC outlets.

4. The ventilation fan of the ThermoFlow ETC unit is located on the bottom of the unit.
   - Do not place the unit on any flammable materials, paper towels or on a soft surface which may block the ventilation of the unit.
   - Do not place the ThermoFlow ETC unit in a container which may accumulate fluids.

5. Keep the area around the ThermoFlow unit clear to allow adequate ventilation.



FRONT VIEW
THERMOFLOW



REAR VIEW
THERMOFLOW

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Installation (continued):

Installing the Heat Exchanger into the ThermoFlow ETC Unit

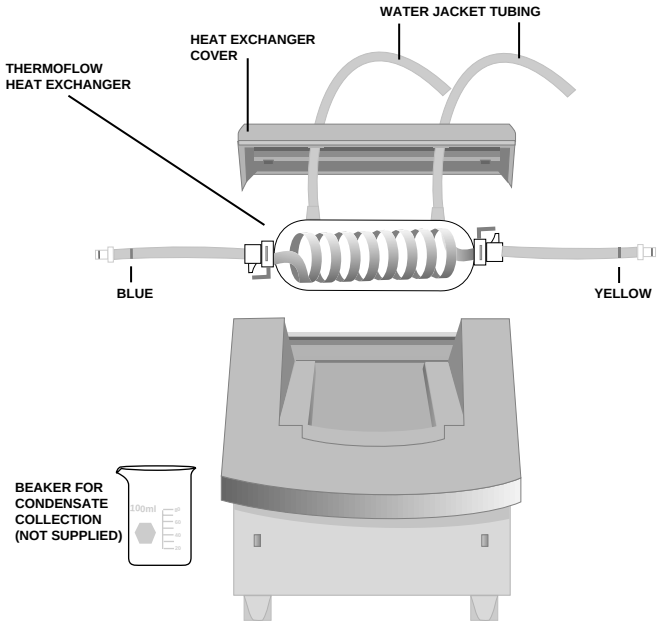
1. Unpack the ThermoFlow Heat Exchanger.

2. Remove the two screws from the top of the Heat Exchanger Cover and lift cover off the ThermoFlow ETC unit.

3. Place the ThermoFlow Heat Exchanger in the recess so that the blue labeled tubing is on the left, yellow labeled tubing is on the right. Thread the water jacket tubing through the holes in the cover as shown below.

4. Replace the cover and tighten screws with proper screwdriver (Do not over tighten).

5. The ThermoFlow ETC unit allows condensate from the heat exchanger or any splashes from the Mini-Cell to drain off from the rear left side of the unit. Place a small beaker under the lip to collect these fluids. A significant amount of condensate may be generated during a run at low temperature.



THERMOFLOW ETC UNIT

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Installation (continued):

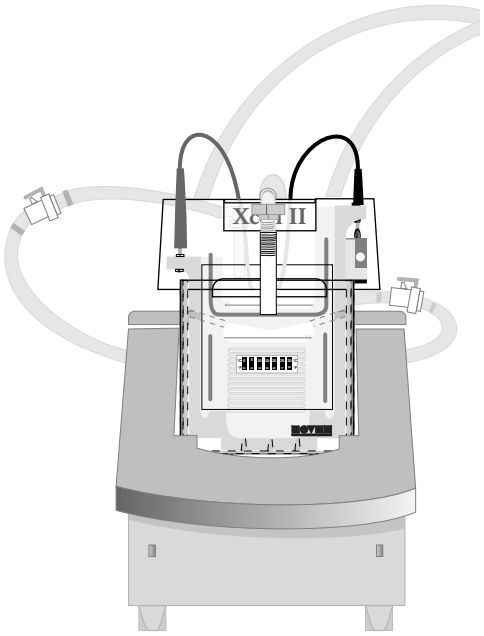
Installing the ThermoFlow Mini-Cell and Connecting the Buffer Recirculation System:

1. Unpack the ThermoFlow Mini-Cell and place it in the square recess on top of the ThermoFlow ETC unit (Diagram 1).

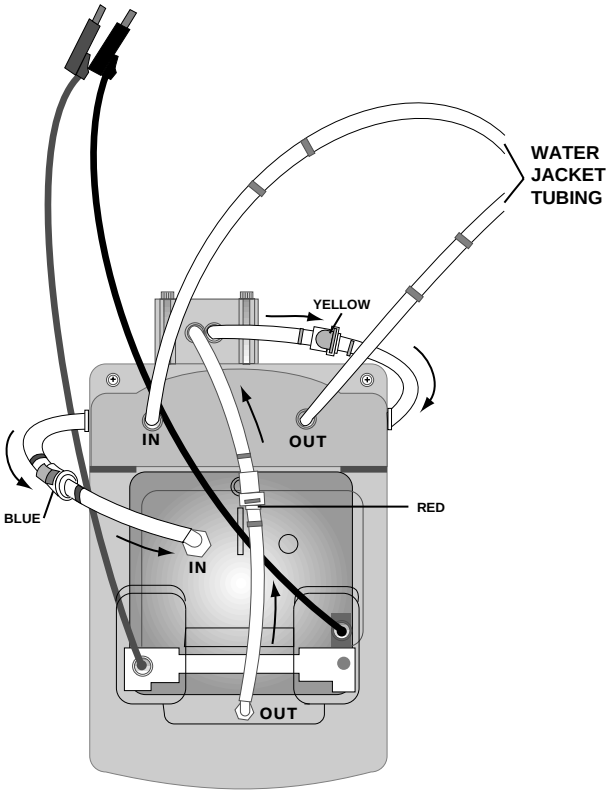
2. The tubing for the buffer recirculation system is color-coded for easy assembly. Attach like colors together as shown in Diagram 2. The arrows show the direction of the buffer flow.

3. To disconnect fittings, press down on the gray tab and twist tubing while gently pulling until released.

4. Do NOT connect the water jacket tubing at this time.



FRONT VIEW
DIAGRAM 1



TOP VIEW
DIAGRAM 2

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Installation (continued):

4. To check for the correct installation, fill the Mini-Cell with DI water (approx. 900ml). With buffer core, wedges and the lid in place (these will fit loosely as there are no gels in place at this time), turn on the ThermoFlow ETC unit by pressing the ON switch at the rear of the unit.

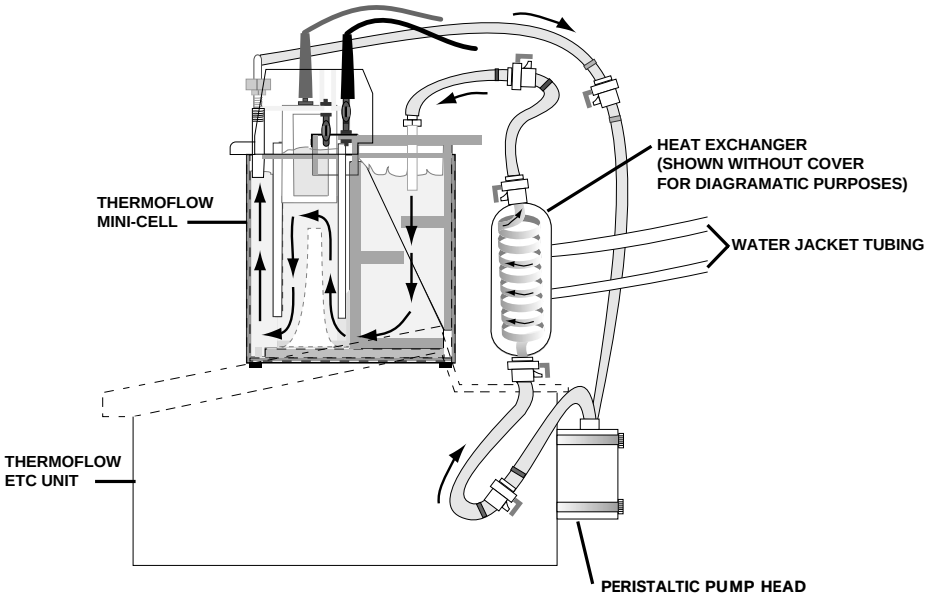
5. When the unit is properly installed, the buffer in the lower buffer chamber should follow the flow path as shown in the diagram below:

   a. Buffer flows into the Mini-Cell through the inlet in the rear wedge.
   b. Buffer flows out of the Mini-Cell through the outlet in the front of the Mini-Cell lid and into the left side of the peristaltic pump head.
   c. Buffer flows from the right side of the peristaltic pump head into the right side of the ThermoFlow Heat Exchanger.
   d. Buffer flows from left side of the Heat Exchanger back into the Mini-Cell through the rear wedge, completing the cycle.

   The flow rate should be between 450 and 550ml/min in order to maintain a constant buffer temperature. If the flow rate is lower than this you may need to replace the tubing in the peristaltic pumphead.

- Do not add restrictive devices or additional fittings to the buffer tubing as this will reduce the flow rate and may result in inadequate heat exchange capability. Fittings should be 1/4" ID. all-plastic.

- Do not add extra tubing to the inlet or outlet on the inside of the Mini-Cell. Doing so will prevent adequate buffer coverage of the gels and could result in the entire 850mls of buffer being pumped out of the Mini-Cell in the event of a leak.



SIDE VIEW

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Installation (continued):

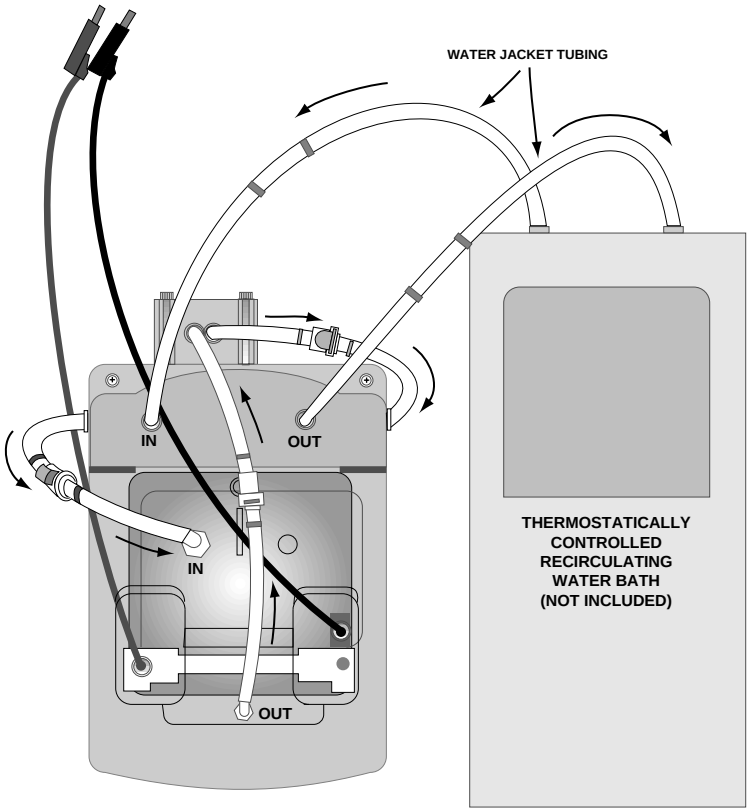
Setting up the External Recirculating Water Bath:

1. Set up the external recirculating water bath according to the manufacturer's instructions. For the ThermoFlow application, temperatures in the external recirculating water bath may have to be set as low as -2°C to achieve a buffer temperature of 4°C in the Mini-Cell (see page 11 for more information). Add glycerol or the manufacturer's recommended additive to keep the water in the water bath from freezing.

2. The external recirculating water bath may be placed on either side of the ThermoFlow unit.

3. To prevent accidental damage to the ThermoFlow Mini-Cell or gels, set the automatic temperature safety shut off levels on the external recirculating water bath to 60°C.

CAUTION: Do not allow the buffer temperature on the Mini-Cell to go higher than 60°C or lower than 3°C. Doing so may damage the gels or the ThermoFlow ETC unit.



TOP VIEW

Connecting the External Recirculating Water Bath to the Heat Exchanger:

Attach the water jacket tubing located on the top of the Heat Exchanger Cover to the external recirculating water bath as shown using the appropriate fittings. Keep the tubing as short as possible to minimize the temperature differential due to changes in ambient temperature. The arrows indicate the direction water flow direction.

CAUTION: Do NOT attach the color coded buffer tubing to the external recirculating water bath.
Water from the external recirculating water bath should never be circulated through the Mini-Cell.

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VII. Setting the Temperature:

The ThermoFlow System utilizes the simple principle of heat exchange between the water from the external thermostatically controlled water bath and the recirculating buffer. Due to heat losses or gains through the exposed tubing and the walls of the Mini-Cell, the temperature in the external water bath is often not the same as in the Mini-Cell. For example:

Typical Temperature Variance

Water Bath Set Temperature	**Mini-Cell Buffer Temperature**
0°C	3.5°C
10°C	12.0°C
20°C	21.0°C
30°C	30.0°C
40°C	40.0°C
50°C	48.0°C
60°C	56.0°C

NOTE: The exact temperature variance in each lab will depend on the length of the tubing between the external recirculating water bath and the ThermoFlow Heat Exchanger and the ambient temperature. Keep the tubing as short as possible or insulate it.

Bringing the buffer to the desired temperature:

To reach a specific buffer temperature:

1. Set the desired temperature on the external recirculating water bath. Let it reach the set temperature. Water from this bath should be circulating through the water jacket tubing and the outer jacket of the ThermoFlow Heat Exchanger.

2. Place gels and buffer inside the ThermoFlow Mini-Cell (See Section VIII).

3. Turn on the ThermoFlow ETC unit so that buffer circulates through the inner coil of the ThermoFlow Heat Exchanger and through the Mini-Cell.(See page 9).

4. Wait 20–30 minutes until the buffer temperature in the Mini-Cell stabilizes.

5. Make minor adjustments to the set temperature on the external recirculating water bath needed to reach the exact buffer temperature desired in the Mini-Cell.

6. Wait five minutes to make sure the buffer temperature is stable before loading samples and beginning the run.

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Alternate Temperature Screening Technique:

When performing a series of runs at different temperatures, for example, for single strand conformation polymorphism (SSCP) method development, start with the higher temperature settings first as these runs will be faster.

Rather than taking the time to make fine temperature adjustments during a temperature screening experiment, one can simply make runs at a series of temperatures set on the external recirculating water bath while recording the resulting buffer temperatures inside the Mini-Cell.

For example, run a gel at each of the following water bath settings:

External Water Bath Temp Settings: 40° 35° 30° 25° 20° 15° 10° 5° 0°

Resulting Buffer Temperatures: (This is an example; please measure actual temps)
38° 34° 30° 25° 20° 17° 12° 9° 5°

About Temperature Measurement:

A green color on the temperature indicator strip on the ThermoFlow buffer core provides a rough temperature estimate, however, this strip is not intended for accurate temperature measurement.

The accuracy and precision of temperature monitoring devices varies significantly. Listed in order from highest accuracy to lowest:

Thermometer	Accuracy	Comments
Thermistor	0.3°C	Recommended
Thermocouple	0.5°C	Recommended
Glass thermometers	0.05°C to 1.0°C	Recommended
LCD display thermometers	1.0°C	Not Recommended
Compact panel-mount LCD thermometers	2.0°C	Not Recommended

Probes:

Use only teflon coated or non-metallic probes. Do not use metal thermometers because of shock hazard.

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Actual "In-Gel" Temperature vs Buffer Temperature:

For most applications, controlling the buffer temperature is all that is required to achieve the desired results.

The actual temperature of the gel inside the cassette is affected by buffer strength, gel types, gel and buffer composition, voltage, etc. The gel temperature normally fluctuates slightly during the run due to changes in the ion composition during the run. The gel is also partially insulated by the plastic cassette.

To maintain reproducibility of the method, all of the above variables should be held constant while adjusting the buffer temperature.

If needed, the in-gel temperature can be measured with special temperature probes.

For the most consistent gel temperature, NOVEX recommends running the gels using constant watts instead of constant current or voltage.

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VIII. Instructions for Use:

1. Removing Gel Cassette from Pouch:

a. Cut open the gel cassette pouch with scissors and remove cassette.

b. Drain away the gel packaging buffer.

c. Remove the gel cassette from the pouch and rinse with D.I. water.
NOTE: Always handle the cassette by its edges only.

Warning

Always wear protective clothing when performing laboratory tests.

To avoid contamination from possible residual acrylamide, wear protective gloves when loading and unloading the Mini-Cell and when preparing, staining/destaining, and drying gels.

2. Preparation for Sample Loading

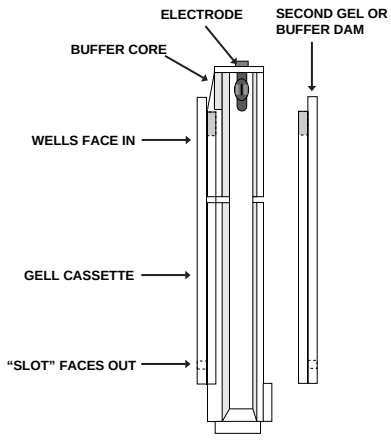
a. Peel off the tape covering the slot on the back of the gel cassette.

b. In one fluid motion, pull the comb out of the cassette, exposing the gel loading wells.

c. Use a pipet to gently wash the cassette wells with 1x running buffer. Fill the sample wells full of running buffer. **NOTE:** Be sure to displace all air bubbles from the sample wells as they will affect sample running.

d. Lower the buffer core into the lower buffer chamber so that the negative electrode fits into the opening in the brass plate on the lower buffer chamber.

e. Insert the front wedge (without fitting) behind the buffer core. Make sure the vertical face is parallel with the buffer core and the tapered end is pointing upwards.



RIGHT SIDE VIEW
DIAGRAM 1

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Instructions for Use (continued):

f. Insert the gel cassettes into the lower buffer chamber. Place one cassette behind the core and one cassette in front of the core. For each cassette, the shorter "well" side of the cassette faces in towards the buffer core. The slot at the bottom backside of the cassette must face out towards the lower buffer chamber. Make sure gels are firmly seated.

NOTE: If you are running only one gel, the square Buffer Dam replaces the rear gel cassette.

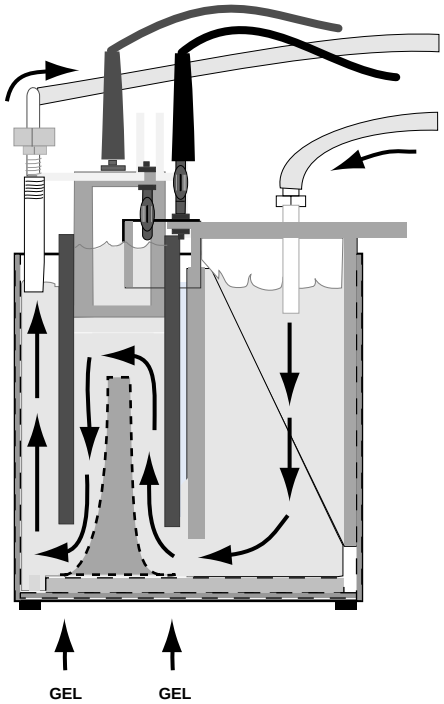
g. Slide the rear wedge into the lower buffer chamber behind the front wedge with the tapered end pointing down.

h. Using thumb pressure only, push down firmly until the rear wedge is seated, but not flush, with the top of the lower buffer chamber.

Caution

The rear wedge (with fitting) does not have to be flush with the top of the gel box to achieve a seal. Thumb pressure is adequate to secure the rear wedge.

Assembled XCell II Mini-Cell gel box: Cassettes and buffer core are in place and rear wedge is loosely seated.



SIDE VIEW
THERMOFLOW MINI-CELL

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Instructions for Use (continued):

3. Fill Buffer Chambers

a. The Upper Buffer Chamber (cathode) is the void formed between the two gel cassettes (or one cassette and the buffer dam) on each side of the upper section of the buffer core.

b. Fill the Upper Buffer Chamber with running buffer (~50ml).

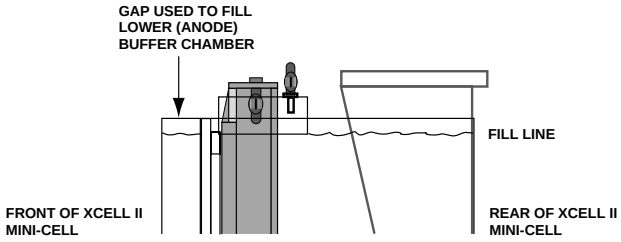
Note: Use enough running buffer to ensure that the running buffer completely covers the sample wells.

c. Ensure that the Upper Buffer Chamber is not leaking. If the level of running buffer drops, the electrophoresis core and cassettes are not properly seated. Repeat step 2.

d. Fill the Lower (anode) Buffer Chamber, by pouring approximately 850ml of running buffer through the gap between the front gel and the front of the lower buffer chamber.

NOTE: It is required that you fill the lower buffer chamber completely (850ml) as this will help dissipate heat during the run and will allow the buffer to be recirculated.

FILLING LOWER BUFFER CHAMBER



e. Align the lid on the buffer core. The lid can only be firmly seated if the (-) electrode is aligned over the banana plug on the right. Make sure the buffer outlet tubing is submerged in buffer.

NOTE: If the lid is not properly seated no power will go through the Mini-Cell.

4. Turn on the ThermoFlow Unit:

To equilibrate the buffer and the gels to the desired temperature

a. Place a glass thermometer or non-metallic probe in the hole in the rear wedge.

b. Turn on the power switch at the right-rear of the ThermoFlow ETC unit. This will turn on the peristaltic pump circulating the buffer. Check for leaks at the fittings, etc. Make sure the outlet tubing in the front lid of the Mini-Cell is still submerged in buffer at this time.

c. Make sure water from the external recirculating water bath has reached its set temperature and is circulating through the jacket of the ThermoFlow Heat Exchanger.

d. Let the buffer circulate for about 30 minutes with the power supply off until the desired buffer temperature is achieved.

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Instructions for Use (continued):

5. Load Samples

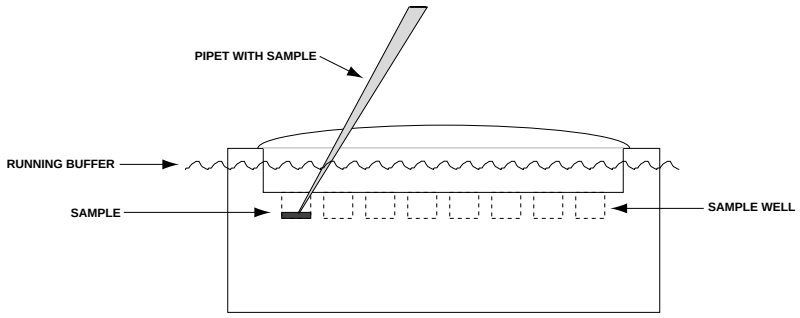
a. Turn off the ThermoFlow unit momentarily while loading samples.

b. Remove lid. Do not remove wedges.

c. Load samples into wells. Placing a light either directly above or behind the unit will make the wells easier to see. You may also wish to mark the bottoms of the wells with a marking pen before inserting the gels.

d. Use a pipet equipped with a round sample loading tip (Catalogue No. LC1001) to under lay the samples into the gel wells (see right). Carefully lower the tip to the bottom of the sample well and gently pipet sample into well.

"UNDERLAYING" THE SAMPLE



Alternate Sample Loading Procedure

This alternate procedure allows easier access to sample wells.

a. Assemble the Mini-Cell as shown below with the buffer core in place and the cassettes protruding above the top of the lower buffer chamber. The rear wedge should sit loosely to hold the cassettes in place.

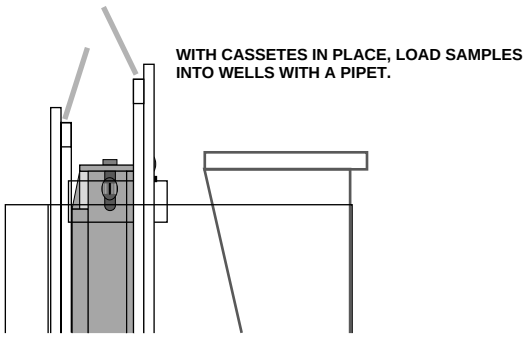
b. Make sure the sample wells in the cassettes are completely filled with running buffer, and underlay the samples.

Note: If the wells are not filled with running buffer, samples from one well will flow into the adjoining wells by means of capillary action.

c. Loosen the rear wedge by rocking it from side to side. Gently lower the buffer core and cassettes into place. Push the rear wedge down until it is seated.

d. Fill the upper buffer chamber with running buffer (~50ml). Be careful not to disturb the contents of the wells.

ALTERNATE SAMPLE LOADING PROCEDURE



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Instructions for Use (continued):

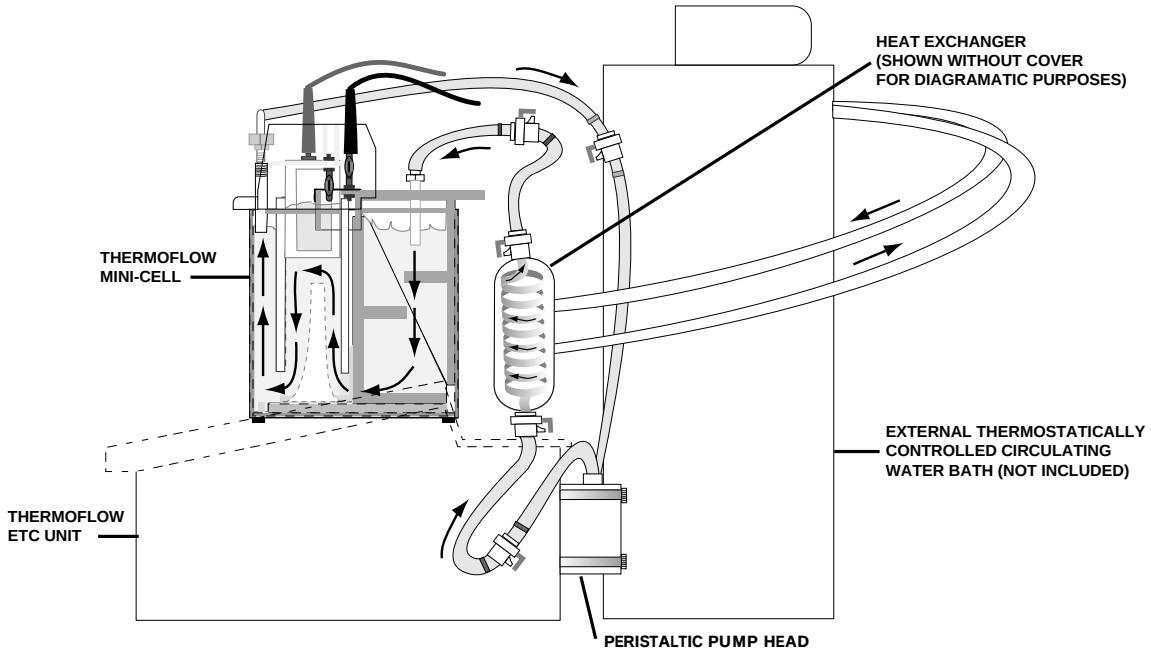
6. Start Run

a. Replace lid on Mini-Cell.

b. With the power supply OFF, connect the electrode cords to power supply (red to [+] jack, black to [-] jack).

c. TURN ON the ThermoFlow ETC unit.

d. TURN ON the power supply and start run.



SIDE VIEW

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Instructions for Use (continued):

7. Opening the Gel

a. Upon completion of the run, turn off the power supply and disconnect the cables from the power supply.

b. Turn off the ThermoFlow ETC unit.

c. Remove the buffer core and gels. Loosen the rear wedge using hand pressure only, by rocking it from side to side.

Caution
Always handle gel cassettes by their edges only.

d. Remove the gel cassettes from the assembly. Handle gel cassettes by their edges only.

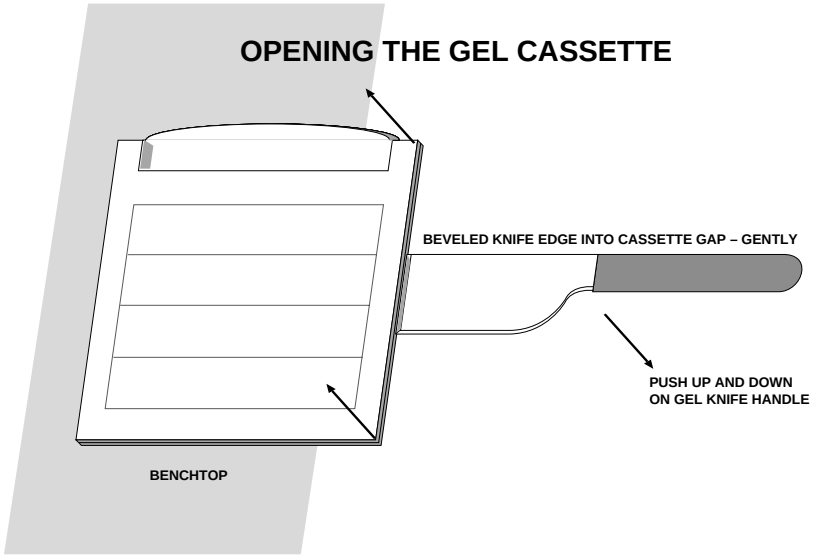
e. Lay the gel cassettes (well side up) on a flat surface, such as the benchtop. Allow one edge to hang ~1cm over the side of the benchtop.

f. Carefully insert the Gel Knife's beveled edge into the narrow gap between the two plates of the cassette.

NOTE: Do not push the knife forcefully between the cassette plates or you may cut into the gel.

g. Push up and down gently on the knife's handle to separate the plates. You will hear a cracking sound which means you have broken the bonds which hold the plates together. Repeat until you have broken the bonds on one side.

h. Rotate the cassette and repeat steps f through g, until the two plates are completely separated.



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Instructions for Use (continued):

i. Upon opening the cassette, the gel may adhere to either side. Carefully remove and discard the plate without the gel, allowing the gel to remain on the other plate.

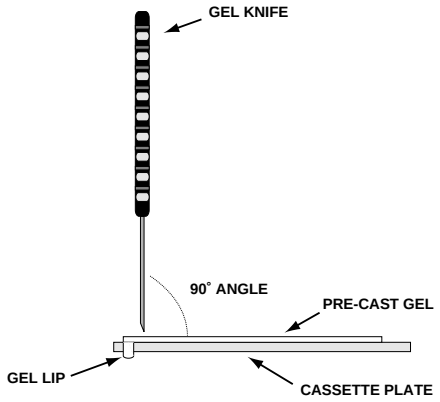
NOTE: Trying to remove the gel at this point may result in the gel tearing. Proceed to step j before removing the gel.

j. If staining, remove the gel from the cassette plate by one of the following two methods:

I. If the gel remains on the shorter (notched) plate, use the sharp edge of the Gel Knife to remove the bottom foot of the gel. The Gel Knife should be at a 90° angle to the gel and the slotted cassette plate. Push straight down on the knife to cut the gel. Repeat the motion across the gel to cut the entire lip. Repeat the motion across the gel to cut the entire foot. Hold the cassette plate and gel over a container with the gel facing downward. Use the knife to carefully loosen the lower corner of the gel and allow the gel to peel away from the plate.

II. If the gel remains on the longer (slotted) plate, hold the cassette plate and gel over a container with the gel facing downward. Gently push the gel knife through the slot in the cassette, until the gel peels away from the plate. Cut the lip off the gel after fixing and staining, but before drying.

REMOVING BOTTOM LIP OF GEL



k. Immediately fix, stain or transfer as desired.

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Appendix 1: Troubleshooting Guide

PROBLEM	CAUSE	REMEDY
Pump not starting or stops running.	A. Fuse is blown. B. Power cord is loose or is not connected.	A. Replace the fuse(s). B. Check the power cord.
There is no current when power is applied to the Mini-Cell.	A. The wells of the gels are not covered with running buffer in the upper chamber. B. The electrode in the lower buffer chamber is not covered with running buffer. C. The buffer core is not seated in the Mini-Cell properly. D. There is a current or buffer leak in the system and the power supply has shut down in response. E. The tubing is not connected properly so that the buffer is not being recirculated.	A. Fill the upper buffer chamber completely (about 50ml) until wells are covered. B. Fill lower buffer chamber with 850ml of buffer to completely submerge the gels and the electrode wire. C. Make sure buffer is not leaking from the upper chamber to the lower chamber and that there are no other leaks in the system. D. Make sure that the buffer is only circulating within the closed Mini-Cell system and is not being circulated to the external thermostatically controlled water
The temperature of the running buffer is not stable during the run.	A. The buffer is not circulating properly. B. The buffer level in the Mini-Cell is too low. C. The ThermoFlow unit was not turned back on after loading samples. D. The pump motor is not working. E. The thermostatically controlled recirculating water bath is not functioning properly. F The current or voltage is excessively high. G. The gels and buffer were not fully equilibrated to desired temperature before starting run. H. The tubing between the chiller and the ThermoFlow Heat Exchanger is excessively long allowing changes in ambient temperature to affect the temperature of the water in the heat exchanger jacket. I The tubing may be worn out so the buffer is not recirculating quickly enough. J. There is a leak in the tubing so the buffer level has fallen below the buffer intake.	A. Make sure the outlet tube in the lid is submerged in buffer. Fill the lower buffer chamber with 850ml of buffer. B. After bringing the thermostatically controlled water bath to the desired temperature, allow the temperature of the running buffer and gels to stabilize at the desired temperature by filling the ThermoFlow Mini-Cell and circulating the buffer over the gels for at least 30 minutes before starting the run. C. Keep the tubing between the thermostatically controlled recirculating water bath and the heat exchanger as short as possible or wrap it in insulating material. D. Replace the tubing inside the peristaltic pump head.

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Appendix 1: Troubleshooting Guide (continued)

PROBLEM	CAUSE	REMEDY
Run taking longer than usual.	A. Buffers are too diluted. B. Upper buffer chamber leaking.	A. Check buffer recipe; remake if necessary. B. Make sure the buffer core is firmly seated, the gaskets are in place and the rear wedge is pushed down.
Current reading on power supply is zero or very low.	A. Tape left on the bottom of the cassette. B. Connection to power supply not complete. C. Buffer level not sufficient.	A. Remove tape from bottom of cassette. B. Check all connections with a volt meter for conductance. C. Make sure the upper buffer (cathode) is covering the wells of the gel. Make sure there is sufficient buffer in the lower buffer chamber to cover the electrode wire.
Run is faster than normal with poor resolution.	A. Buffers are too concentrated or incorrect. B. Voltage, current or wattage is set too high.	A. Check buffer recipe; dilute or re-make if necessary. B. Decrease power conditions to recommended running conditions.
Cannot see the sample wells to load sample.	A. The Buffer core cross bar is blocking the back gel. B. There is little contrast between the sample well and the rest of the gel.	A. Use the Alternate Sample Loading Procedure. B. Mark cassette at the bottom of the wells with a lab marker prior to assembling the Upper Buffer Chamber. Illuminate the bench area with a light source placed directly behind the XCell II unit.

Please call Technical Service at 1-800-456-6839 or 1-619-452-6634 between 7:00 a.m. and 5:00 p.m. PST if you have any questions.

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Appendix 2: Maintenance

Cleaning & Maintenance:

- Unplug the ThermoFlow ETC unit when not in use and cleanup spills promptly.

  Do not immerse the ThermoFlow ETC unit for cleaning.

- Wipe the surface of the ThermoFlow ETC unit with a non-abrasive, non-flammable cleaner to keep surface clean.

- There are no serviceable parts inside the ThermoFlow ETC unit. If service is required, please call NOVEX or your NOVEX representative.

- No lubrication of the pump head is required.

- Check for leaks at the peristaltic pump head every time unit is used. The tubing should be replaced after 400-500 hours of use, or if the flow rate drops below 400ml/min.

- Rinse the ThermoFlow Mini-Cell with DI water between runs. After emptying the Mini-Cell of buffer, refill it with DI water and pump the water through the tubing. Empty the Mini-Cell again, then turn on the pump briefly to expel any water which is still in the tubing.

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Appendix 2: Maintenance (continued)

Replacing the Peristaltic Tubing

IMPORTANT:
The tubing for the peristaltic pump is a consumable part and should be replaced every 200 hours to avoid unexpected tubing failure.

Use only Size 24 Masterflex™ Tubing (catalog no. EI8080). Follow the instructions for replacing the tubing.

1) Disconnect the tubing between the peristaltic pumphead and the glass heat-exchanger and the Mini-Cell lid.

2) Remove the four finger-tight screws located on each corner of the pump head. Remove the pump head.

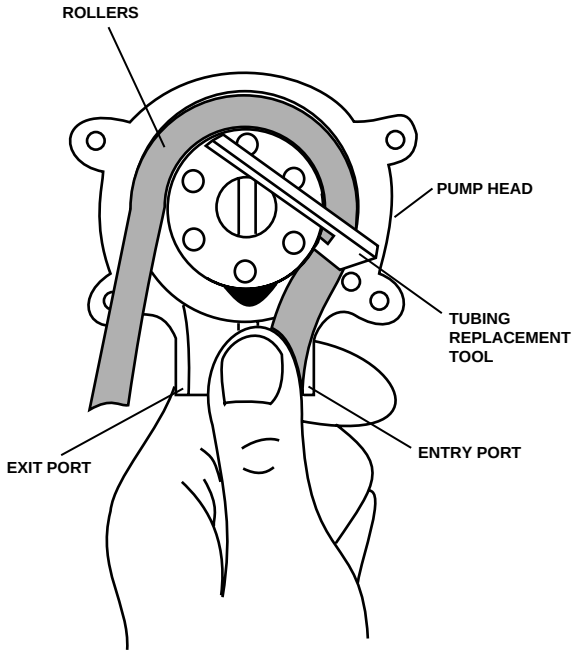
3) Separate the pump halves. Remove the old tubing (save all plastic quick disconnect fittings) and discard.

4) Cut a piece of Size 24 Silicone tubing to 14 inches (36cm) long.

5) Hold the pump head as shown in figure 1, with rollers in the 2,6, and 10 o'clock positions.

6) Wrap the tubing around the rollers so that about 8 inches of tubing is protruding from the exit port on the left side.

7) Insert the slot of the Tubing Replacement Tool (EI8050) as shown in Figure 1, on the rotor so the bottom edge of the tool is pressing the tubing into the pump cavity.



TUBING START POSITION
FIGURE 1

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Appendix 2: Maintenance (continued)

Replacing the Peristaltic Tubing (continued)

8) Push down and turn the tool counterclockwise around the shaft to guide the tubing deep into the cavity as shown in Figure 2.

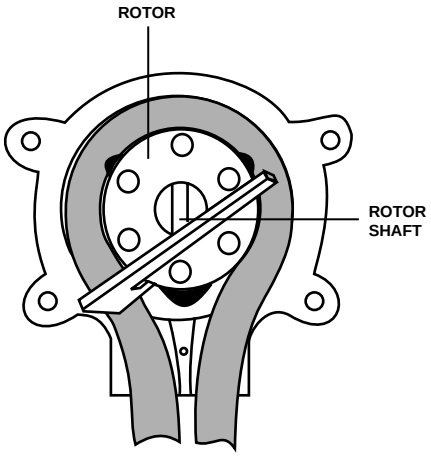
9) Hold the tubing and rotor in the pump head and remove tool carefully.

10) Place second half of pump head on the rotor shaft and squeeze halves together until the halves are touching on all sides.

    Be careful not to pinch tubing between pump halves.

11) Mount the assembled pump head so that the key of the rotor shaft is inserted into the slot in the pump rotor. Attach the four corner screws securely to the pump.

12) Reconnect tubing to the heat exchanger and Mini-Cell lid. Please refer to diagram on page 8.



TUBING LOADED
FIGURE 2

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Appendix 2: Maintenance (continued)

Replacing the Fuse(s)

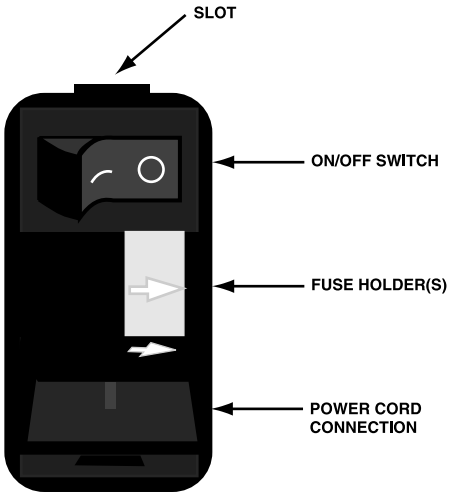
1. Turn off the system and detach the power cord from the rear of the unit. The fuse compartment is inside the Power Entry Module and will not open with the power cord in place.

2. Open the fuse compartment by inserting a small flat blade screwdriver into the slot above the ON/OFF switch. Turn the screwdriver to gently pry open the fuse compartment.

3. Pull the fuseholder out of the compartment and inspect the fuse. If the fuse is burned or there is a break in the fuse element, replace the fuse with the identical type fuse. (See below.)

4. Place the fuse holder(s) back into the compartment, making sure that the arrow(s) on the fuseholder point in the same direction as the arrows on the inside of the fuse compartment, as shown.

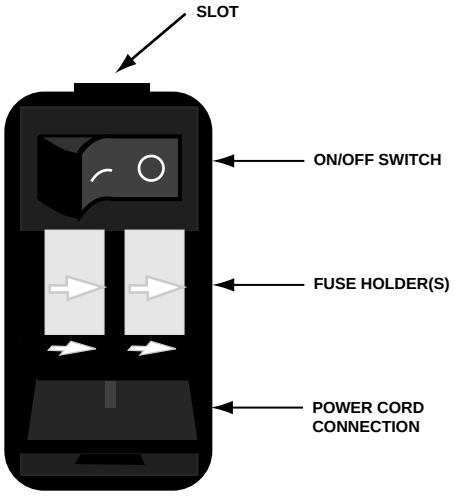
5. Snap the cover closed.



15V AND 100V UNIT

(1) 2A 250V 3AG Slow blow fuse
(Catalog no. EI8038)

Voltage for US, Canada, Japan, Taiwan are 100/120 VAC.



230V UNIT

(2) 2A 250V 5x20mm time lag fuses
(Catalog no. EI8039)

Voltage for Europe, Australia and parts of Asia are 220/240 VAC.

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Product Specifications:

ThermoFlow ETC Unit

Dimensions (without Mini-Cell) :	24.5cm(L) x 18cm(W) x 16.5 cm(H)
Weight:	5.2kg
115VAC:	108-132, 60Hz, 0.2A
Fuses:	1 - 2A/250V/3AG, slow blow fuse
230VAC:	198-264, 50Hz, 0.2A
Fuses:	2 - 1A/250V/5x20mm time lag fuses
100VAC:	90-110, 50Hz, 0.2A
Fuses:	1 - 2A/250V/3AG, slow blow fuses
Pump Specification:	~550 ml/min flow rate (fixed flow rate—not reversible)
Environmental Operating Conditions:	For indoor use only, temperature range 15–40°C.

XCell II ThermoFlow Mini-Cell

Dimensions:	11 x 12 x 16cm
Upper Buffer Chamber Capacity:	50 ml
Lower Buffer Chamber Capacity:	850 ml
Gel Cassette Size:	10cm x 10cm
Gel Thicknesses:	1.0mm or 1.5mm
Number of Gels:	1 or 2
Buffer Core Material:	HDPE
XCell II Mini-Cell Material:	Polycarbonate
Chemical Resistance:	The XCell II Mini-Cell is resistant to alcohol but is not compatible with chlorinated hydrocarbons (e.g., chloroform), aromatic hydrocarbons (e.g.,toluene, benzene) or acetone.
Maintenance:	Rinse with deionized water after each use.

Peristaltic Tubing

- Silicone (Peroxide-cured) “Masterflex”—Size 24 only
- 3/8" OD, 1/4" ID
- Estimated lifetime of 400–500 hours
- Temperature Range: -51 to 232°C
- NOT RECOMMENDED for use with organic solvents, oils, acids or dilute NaOH

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Ordering Information:

Code	Description
EI8101	115V ThermoFlow System (Includes ETC Unit, Mini-Cell and Heat Exchanger)
EI8105	230V ThermoFlow System (Includes ETC Unit, Mini-Cell and Heat Exchanger)
EI8103	100V ThermoFlow System (Includes ETC Unit, Mini-Cell and Heat Exchanger)
EI8100	115V ThermoFlow ETC Unit
EI8500	230V ThermoFlow ETC Unit
EI8300	100V ThermoFlow ETC Unit
EI8001	ThermoFlow Mini-Cell
EI8106	ThermoFlow Heat Exchanger
EI8014	ThermoFlow Buffer Core
EI8016	ThermoFlow Buffer Core Gaskets
EI8057	ThermoFlow Mini-Cell Lid with Fitting
EI8012	ThermoFlow Rear Wedge with Fitting
EI9013	Front Wedge
EI9011	Lower Buffer Chamber
EI9010	Gel Knife
EI8072	Quick Disconnect Fittings
EI8080	Size 24 Peristaltic Tubing (1m)
EI8050	Tubing Replacement Tool
EI8038	Fuses 2A/250V/3AG Slow Blow (115V and 100V units) (2)
EI8039	Fuses 2A/250/5x20mm Time Lag (230V units) (4)

NOVEL EXPERIMENTAL TECHNOLOGY

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E-mail Address: nvxinfo@novex.com • Website: http://www.novex.com

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