The Rotary Cell Culture System™

Using Disposable Vessels
RCCS-D, -2D, -4D, -8D, -4DQ & -8DQ

OPERATION MANUAL

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RCCS-8D & - 8DQ
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1.0 **General Introduction to the Rotary Cell Culture System**

Synthecon, Incorporated is the industry leader in the design and manufacture of the “Rotary Cell Culture system”, (RCCS)—a unique line of bioreactors designed for the creation and propagation of three-dimensional tissue assemblies and fragile, hard-to-cultivate cells. The RCCS is a new, advanced technology for the growth of cells that has many advantages:

- Fragile cell lines can be cultured that cannot grow in other systems
  - Cells can be grown with or without solid supports (scaffolding, microcarrier beads)
  - Versatility—over 50 different cell types have already been successfully cultivated
  - Standard culture medium formulations for cell growth are successfully used
- Cells exhibit unique properties in the RCCS;
  - Increased gene expression
  - Enhanced production of bioproducts
  - Spontaneous formation of 3D tissue assemblies
  - Spontaneous differentiation of some cell types
  - Propagation of mono- or co-cultures

The RCCS rotates the cell culture chamber horizontally to constantly suspend the inoculated cells in the culture medium. The RCCS provides an exceptional cell culture environment that enhances cell and tissue growth through:

- Minimal shear forces
- Absence of air bubbles in the zero head space cell culture vessel
- High mass transfer of nutrients
- Effective waste removal
- Efficient oxygenation.
The RCCS-D disposable Vessel Systems are composed of the following parts:

**Culture vessel** - disposable, presterilized clear plastic circular units with two sampling or injection Luer lock ports and a ½” drain/ fill port. Vessels are available with 10 and 50 ml volume capacities.

**Rotator Base** - serves to support and rotate the culture vessels. The -4D, -8D and 8DQ have 4 & 8 rotation stations with single speed control. The -4DQ and 8DQ have rotation stations with independent control. The systems are constructed of white Delrin/ Acetyl plastic plate.

**Power supply** - control box containing the electronic motor speed controls. The front panel dial is used to adjust vessel rotation speed. A flat, multicolored, ribbon cable connects the rotator base to the power supply control box. The -D and -2D do not have tachometers.

**CAUTION: THE POWER SUPPLY SHOULD NEVER BE STORED IN AN INCUBATOR WHILE NOT IN OPERATION**

![Image of RCCS-4D and RCCS-2D systems](image)

**RCCS-4D**
Rotator Base, Vessels & Power Supply

**RCCS-2D**

## 2.0 Read before using-Limited Warranty, Limited Liability

SYNTHECON, INC. warrants that, for three hundred sixty-five days (365) days, under normal operating conditions and use, this equipment will be free from defects of materials and workmanship. SYNTHECON, Inc. will repair or replace defective parts at our option provided the customer returns the equipment to SYNTHECON, INC. immediately upon discovery of such a defect.

In no event shall SYNTHECON, INC. or its suppliers be liable for any indirect, special, or consequential damages, including but not limited to, loss of cells, medium, data, labor or equipment incurred by the purchaser or any third party arising from the use of, or inability to use this equipment. Alteration of the equipment voids the warranty on this equipment. In no case shall SYNTHECON, INC. be responsible for any modifications or alterations to this equipment performed by anyone other than SYNTHECON, INC.
The RCCS is currently intended for **RESEARCH USE ONLY**.

**Caution:** performing any of the following can invalidate the warranty.

- Do not attempt to reuse or resterilize disposable vessels.
- Avoid creating a vacuum within the vessel by forcefully pulling back on a syringe attached to a port **without both ports being open and a compliant syringe containing culture medium on the second port**. The plunger on the compliant syringe must be gently pulled while the plunger on the other, medium containing syringe is pushed. Failure to follow this procedure can break the oxygenation membrane and render the vessel unusable.
- Use of corrosive chemicals such as chromates will damage the parts and abrasive cleaners or strong organic compounds such as acetone will destroy the plastic and void all warranties.
- Do not autoclave the rotator base (see Figure 1).
- Storage of the rotator base in an incubator **while NOT in use** will corrode the motor eventually resulting in loss of function. **Synthecon reserves the right to make discretionary determination of the cause of damage with returned rotators and deem whether the repair is covered under the limited warranty.**
- Placing the power supply/control box inside an incubator will result in loss of function. The flat ribbon power cable easily passes through the cell culture incubator door seal without compromising the interior incubator environment. The power supply can be conveniently located on top of or on either side of the incubator.

### 3.0 Getting Started- Unpacking and Inspection

The RCCS is carefully packaged for shipment to ensure the arrival of an intact, functional unit. Unfortunately, on rare occasions, the RCCS may incur some damage during handling by the freight carrier.

- Upon receipt, carefully unpack the system and visually inspect each component closely for visible or concealed damage.

- **IF DAMAGE IS EVIDENT OR SUSPECTED, DO NOT ASSEMBLE OR OPERATE THE UNIT.** Please call Synthecon, Inc. at (800) 853-0740 if you are in the USA. For assistance outside the USA, please call your closest distributor **listed in section 10.0 of this manual.**
4.0 **Culture Vessel preparation required before culture initiation**

1. Prepare the 10 or 50 ml vessel by rinsing with sterile culture medium (serum free is acceptable) or sterile phosphate buffered saline using the fill port (see Figure 2). All procedures should be performed under sterile conditions in a laminar flow hood.

   **Unscrew the one half-inch diameter fill port and place on a sterile alcohol prep pad.** Fill the vessel by pipetting the medium through the open fill port until full. Replace the fill port cap. Wipe any medium that is spilled on any surface with alcohol preps and/or 70% ETOH.

   **Allow the vessel to incubate** for 5 minutes to overnight in the rinsing solution.

   **Discard the solution used for rinsing before inoculating cells.** Using the same procedure as above, open the fill port and use a sterile Pasteur pipette attached to a vacuum source to aspirate all of the medium. **Take care not to puncture the membrane at the back of the vessel with the sharp end of the pipette.**

2. Clean any spilled media from the rotator base and/or culture vessel using 70% ETOH as this can encourage the growth of bacteria and fungi.

![Figure 2: 50 & 10 ml Disposable Vessels](image)
5.0 Cell culture Initiation

1. No special medium formulations are required for the growth of cells in the RCCS. Each cell type and application is unique. Cell culture medium formulations that you have previously used successfully with other cultivation methods (i.e., petri dishes, flasks, roller bottles, etc.) have generally been found to be appropriate for the RCCS. See the Bibliography (Section 11) and SYNTHECON website www.synthecon.com (bibliography periodically updated) for medium formulations successfully used in the past with the RCCS.

2. If microcarriers are to be used in growing the cells, these must be prepared and sterilized in advance according to the manufacturer’s instructions. For the RCCS, a suggested starting concentration for microcarrier beads is 5 mg/ml of Cytodex beads.

3. Prepare single cell suspension according to the methods routinely used in your laboratory and specified for the cell lines being harvested. Obtain estimates of cell number using a Coulter counter or hemocytometer. **Culture vessels should be inoculated with a minimum of 200,000 cells/ml. Please refer to Table 1 (below) and the bibliography included in this manual for example cell concentrations and additional information regarding cell concentrations and culture conditions that have been previously successfully used.**

4. Once the desired cell concentration suspension has been prepared, it can be pipetted into the vessel through the fill port. Additional media is added until the vessel is nearly full and the fill port cap is replaced. Note that the lip of the fill port and fill port cap should be wiped with an alcohol swab to prevent contamination. Any solid support structures should also be introduced into the bioreactor at this time if being used.

   Microcarriers and small pieces of scaffolding material (1-3 mm) can be injected with the cell suspension using a syringe.

   Larger pieces of scaffolding material are best introduced through the fill/drain port.

5. After replacing the fill port cap there will be a bubble remaining which must be removed. This is done by placing a syringe on each syringe port, one of which has 2-3 ml of media in it. The ports are opened and the bubble is maneuvered underneath the port with the empty syringe attached. The bubble is pulled into the empty syringe while approximately the same volume of media is injected through the other syringe port. When all bubbles are removed, the valves are closed and any residual media is removed with a Pasteur pipet. The valve stems and covers are wiped with alcohol swabs and the covers replaced.

6. Attach the RCCS onto the rotator base by slowly turning in a clockwise direction. Then, place the RCCS and rotator base into the cell culture incubator. Alternatively, the RCCS can be attached to the rotator base while it is in the incubator. Turn on the power supply and make certain that the multicolored ribbon cable is attached to both the power supply and the rotator base.
NOTE: Make certain that the incubator is properly humidified (some incubators are designed with water trays in the bottom that must be filled). This will prevent excess medium evaporation from the vessels which can cause bubble formation.

Incubators should also be cleaned regularly according to manufacturer's instructions to reduce the risk of contamination.

7. Rotation Rate- initial settings

For anchorage dependent cells with microcarrier beads or scaffolding, begin rotation of the vessel at a speed of about 10-12 rotations per minute (RPM). Cells will attach to the microcarrier beads while the vessel is rotating. Attachment is usually complete within 24 hours after culture inoculation.

Sit and Spin Cycles—An alternative procedure that can enhance cell attachment in some cases is as follows. After placing the inoculated vessel on the rotator base in the incubator, allow it to rotate for 5 minutes to thoroughly mix the cells. Stop vessel rotation for 5 minutes. Rotate vessel for 5 minutes. Stop vessel rotation for 5 minutes. Repeat cycle one more time and then allow vessel to rotate continuously.

For cells not requiring solid support structures (microcarrier beads or scaffolding) such as tumor cell lines and lymphocytes, a beginning rotation rate of 8-10 RPM is recommended.

For minced particles of primary tissue, the rotation rate must be determined empirically due to size variations of the tissue pieces. Adjust the rate until the minced pieces remain suspended in the culture medium and do not hit the vessel wall.

8. Rotation rate- essential need for adjustment with culture time

The rotation speed must be adjusted with culture time as most types of cells form aggregates and the aggregates gradually enlarge. This results in an increased sedimentation rate of the aggregates within the culture vessel. Without adjustment, the cells will rapidly sediment toward the bottom and contact the walls of the vessel. This is detrimental to cell growth.

Adjust the rotation rate until the visible cell aggregates form a fluid orbit within the vessel, exhibit continual free fall, and do not contact the vessel wall. Rotation rate may need to be adjusted several times during the course of an experiment as cell cultures grow to form larger aggregates.

9. Monitoring Cell Cultures

It is recommended that that cultures be monitored daily to assess the condition of the cells and ensure the absence of contamination. Samples of cells can be removed using a syringe and the syringe port in the culture vessel. This can be performed while the RCM
is rotating in the incubator if desired or the RCM can be removed and taken to a laminar flow hood for this purpose.

During cell culture, multicellular tissue assemblies are often formed. As tissue assemblies increase in size, the rotation rate of the culture vessel should be gradually increased to keep them in suspension inside the culture vessel and avoid hitting the wall of the vessel.

6.0 Replenishing Culture Medium

As cell growth occurs with time, the culture media must be replenished. The time interval required before the medium needs to be replenished varies with the number of cells inoculated as well as cell type and must be determined specifically for the cells and conditions you are using. It is recommended that the pH, dissolved oxygen, and dissolved CO₂ be monitored using a blood gas analyzer if available.

1. Turn off the power to the rotator base. Remove the culture vessel from the rotating base by slowly turning in a counterclockwise direction. Restart rotation if using a multi-vessel rotator base.

2. Transport vessel to a sterile laminar flow hood. Remove the fill port and syringe port caps and place them on sterile alcohol pads.

3. Prop the vessel at approximately a 45 degree angle with the fill port at the highest point and allow the aggregates or microcarriers to settle into the opposite end of the vessel from the fill port. (A Styrofoam test tube rack can be used to prop the vessel) Open the fill port and remove as much media as possible with a Pasteur pipet attached to vacuum source without disturbing the cells. Approximately 2/3 of the media can be removed with this procedure. The vessel can then be placed flat and fresh media added. The fill port cap is replaced and the bubbles removed as in step 5 of Cell Culture Initiation. In some cases, such as single cell suspension cultures, cells will settle very slowly. In such a situation, it may be preferable to remove all the media and cells from the vessel, spin down the cells in a centrifuge, remove the spent media and resuspend the cells in fresh media and then reintroduce them into the vessel.

4. After completion of medium change, remove bubbles as detailed above and replace vessel on the rotator base in the incubator.
### Table 1-Selected list of type and number of cells successfully inoculated into rotary culture systems

<table>
<thead>
<tr>
<th>Cell Type</th>
<th>Cells/ml Inoculated</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chondrocytes</td>
<td>5-6 X 10^5</td>
<td>Baker &amp; Goodwin, 1997</td>
</tr>
<tr>
<td>Human intestine mesenchymal</td>
<td>2 X 10^5</td>
<td>Goodwin et al., 1993</td>
</tr>
<tr>
<td>Thyroid</td>
<td>4 X 10^5</td>
<td>Martin et al., 2000</td>
</tr>
<tr>
<td>Rat PC12</td>
<td>5.5 X 10^5</td>
<td>Lelkes et al., 1998</td>
</tr>
<tr>
<td>LN CaP human prostate</td>
<td>2 X 10^5</td>
<td>Zhau et al., 1997</td>
</tr>
<tr>
<td>LN1 mixed mullerian human ovarian cancer</td>
<td>2 X 10^5</td>
<td>Goodwin et al., 1992</td>
</tr>
<tr>
<td>Human cervical primary tumor</td>
<td>2 X 10^5</td>
<td>Chopra et al., 1997</td>
</tr>
<tr>
<td>16 different tumor cell lines</td>
<td>5-20 X 10^2</td>
<td>Ingram et al., 1997</td>
</tr>
<tr>
<td>MIP 101 human colon cancer</td>
<td>3 X 10^5</td>
<td>Francis et al., 1997</td>
</tr>
<tr>
<td>HepG2 human hepatoblastoma</td>
<td>1 X 10^6</td>
<td>Khaoustov et al., 1999</td>
</tr>
<tr>
<td>HT-29 colon adenocarcinoma</td>
<td>2 X 10^5</td>
<td>Goodwin et al., 1992</td>
</tr>
</tbody>
</table>

### 7.0 Sampling Procedures

It is desirable to periodically (daily is recommended) check the cell culture to monitor cell morphology, aggregation, ensure absence of contamination, glucose utilization, gases, etc.

1. **To take a cell and/or medium sample from the culture vessel, an empty syringe and media-filled syringe must be connected to the Luer lock ports.**

   This can be accomplished while the vessel is rotating to maintain a homogeneous sample.

   Remove the syringe port caps and place on a sterile alcohol swab.

   Wipe the ports with an alcohol swab, attach a sterile empty sampling syringe (1, 5, or 10 ml size) to one port and syringe with culture medium to the other port (10-20 ml size).

   Open both syringe port valves, turn on the power to allow the cells and/or tissue aggregates to become evenly distributed (2 min).

   Push medium into the vessel from the filled syringe into the vessel. A light pull on the sampling syringe will facilitate sample collection. Since the vessel is still rotating, this takes dexterity and may require some practice but provides a homogeneous, representative sample.
2. Alternatively, a sample may be taken with the vessel removed from the rotator base. With Luer lock syringes attached, slowly turn and rotate the vessel to evenly distribute the cells, tissue aggregates, or explants within the vessel. Open both sample ports, and withdraw a sample as described above.

After removing the sample, close both syringe ports and remove the syringes. Place the syringe cap on the sampling syringe. Wipe the port with a sterile alcohol swab and replace the caps.

8.0 Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause/ solution</th>
</tr>
</thead>
</table>
| Bubbles present in cell culture vessel | Incubator could be dry causing excessive evaporation  
Make certain that the trays in the bottom of the incubator are clean, filled with water and/or the humidifier system is functioning properly. |
| Culture medium leaking from vessel or observed on the rotator base | Check that valves are closed and fill port securely closed  
Check that oxygenation membrane is not leaking in the back of the vessel |
| Vessel rotation is inconsistent | Check that the settings on the power supply are correct—make certain that the toggle switch is set for the correct rotation speed; i.e., high or low depending on the rotation rate.  
Check that the multicolored ribbon cable is fully inserted into both the connection to the rotator base and the power supply. |
| Vessel will not turn | Check that the power supply is plugged into a functional electrical outlet, the ribbon cable is securely connected between the power supply and the rotator base, and that the power switch is on |
9.0 *Example Cell Culture Protocols for first time users*

It is often instructional for first time users of the system to become acquainted with the RCCS by first using the system with an established protocol before proceeding to actual experiments.

If microcarriers or scaffolding will be used, they should be prepared first for inoculation into the vessel according to the manufacturer’s instructions. An example protocol for microcarrier beads is provided below.

**Pharmacia Cytodex 3 Microcarrier Beads**

The properties of these beads are as follows: a density of 1.04 g/ml, 175 µm size, a swelling factor of 15 ml/g dry weight, and 3 X 10⁶ microcarriers/g dry weight. Cytodex 3 consists of a layer of denatured collagen coupled to dextran beads. It is the microcarrier of choice for cells known to be difficult to grow in culture, for differentiated cell culture systems and cells with an epithelial-like morphology. It is commonly used as a general purpose microcarrier.

1. Weigh 1 gram of the dry microcarrier beads on a suitable balance and place into a 100 ml clean glass bottle. (Bottle should be pretreated with a siliconizing agent according to the manufacturer’s instructions or excessive loss of beads will occur due to adherence to the glass).

2. Add 50-100 ml of 1X Ca²⁺ and Mg²⁺ free phosphate buffered saline (PBS) to the bottle and incubate at room temperature for at least 3 hours to allow the beads to swell.

3. Remove supernatant by aspirating with a Pasteur pipette and vacuum source.

4. Wash microcarriers once with gentle agitation for a few minutes with PBS w/o Ca²⁺ and Mg²⁺. Use 30-50 ml/g Cytodex of PBS.

5. Discard PBS and replace with fresh PBS w/o Ca²⁺ and Mg²⁺ adding 30-50 ml/g Cytodex of PBS.

6. Sterilize by autoclaving at 115°C, 15 min, 15 psi. Make certain that the cap of the bottle is loose before sterilization. CAUTION: If microcarriers are autoclaved at higher temperatures and/or longer time intervals, beads may turn brown and performance affected.

7. Prior to use, sterilized microcarriers are allowed to settle, the supernatant removed by aspiration as above and microcarriers rinsed in warm 37°C culture medium (serum is not required in culture medium).

8. Microcarriers are now ready to use for culturing and are extremely stable. Cytodex that has been hydrated and sterilized as above can be stored sterile in PBS for at least two years at 4°C.
**Practice Protocol for Cell Culture using Cytodex 3 microcarrier beads**

Perform procedures in a biological safety cabinet (sterile tissue culture hood).

1. A commonly available cell line to use for practice is baby hamster kidney (BHK-21). These can be obtained from the American Type Culture Collection (Rockville, MD) or colleagues. Alternatively, the same protocol can be used with MCF-7, a breast cancer cell line, also available from ATCC.

2. Before beginning, obtain a presterilized Synthecon cell culture vessel (10 or 50 ml size) and rinse with culture medium or phosphate buffered saline as described in Section 4, step 1 above.

3. Remove BHK-21 cells from culture flasks or dishes: Remove culture medium, add 0.25% trypsin/0.075% EDTA, incubate for 3-5 minutes. Check at minimum time to determine if cells are detaching from flask/dish by observation with an inverted microscope. **Be careful not to over expose cells to trypsin/EDTA as this can result in loss of cell viability.**

4. After determining that the cells are detaching from the culture flask/dish by observation in an inverted microscope, add sterile, pre-warmed DMEM culture medium (containing 10% fetal bovine serum and penicillin/streptomycin or other antibiotic).

5. Remove the cells from the culture flask/dish by vigorously pipetting the medium (with the assistance of a Pipet Aid device) across the entire cell growth surface at least 5 times. This ensures that all cells are removed and facilitates creation of a single cell suspension. Inadequate pipetting of the cell suspension will result in a clumpy cell suspension which will not produce optimum results.

6. Place cell suspension in a sterile tube. Determine cell number using either a Coulter counter or hemocytometer.

7. Inoculate cells at a final concentration of 2-4 X 10^5/ml and microcarriers at 5 mg/ml (4,000 beads/mg) according to instructions in Section 5.

8. Place inoculated vessel carefully onto the rotator base by slowing turning in a clockwise direction. Place rotator base in culture incubator if not already in that location. Make certain that the ribbon cable is connected between the rotator base and power supply and that the power supply is plugged in. Begin the vessel rotation at a speed of 10-12 rpm.

9. The day after culture initiation, take a sample according to the procedures described in Section 7 above. If available, use a Beckman glucose analyzer and blood gas analyzer to assess glucose use, dO2, dCO2, and pH. Part of the sample should be placed in a small petri dish or on hemocytometer for observation. Cells should be visibly attached to the beads and some beads may be aggregated together in groups of two or three.
10. Day 3- Change medium according to procedures in Section 6 above and take another cell sample. Cell viability can be checked using trypan blue dye exclusion assay (Goodwin et al., 1992).

11. Day 4- A mixture of bead aggregates ranging from 2-16 should be seen.

**Practice Protocol for Cell Culture without solid support**

1. Before beginning, obtain a presterilized Synthecon cell culture vessel (10 or 50 ml size) and rinse with culture medium or phosphate buffered saline as described in Section 4, step 1 above.

2. Remove cells from culture flask/ dish as described in the protocol for microcarrier beads above.

3. Determine the number of cells/ml using a Coulter counter or hemocytometer. Inoculate 8-1.0 X 10^6 cells/ml into the vessel.

4. Place inoculated vessel carefully onto the rotator base by turning in a clockwise direction. Place rotator base in culture incubator if not already in that location. Make certain that the ribbon cable is connected between the rotator base and power supply and that the power supply is plugged in. Begin the vessel rotation at a speed of 10-12 rpm.

5. The day after culture initiation, take a sample according to the procedures described in Section 7 above. If available, use a Beckman glucose analyzer and blood gas analyzer to assess glucose use, dO2, dCO2, and pH. Part of the sample should be placed in a small petri dish or on hemocytometer for observation. Cells should have aggregated and formed loose aggregates.

6. Change medium on days 2 and 4. Loose aggregates will be observed to condense and may form rounded structures.
SYNTHECON™ Inc. grants the purchaser a non-exclusive right to use the Rotary Cell Culture System equipment solely for the purpose of conducting research and specifically excluding use of this equipment for any purpose other than research. Synthecon technology is not intended for use on/in humans. Any desire by end user to manufacture commercial products in Synthecon, Inc. technology will require the end user to obtain a User’s License from the National Aeronautics and Space Administration and/or Synthecon, Inc. Its use must comply with all laws, ordinances, and regulations relating to the possession, use, or maintenance of the equipment, including registration and/or licensing requirements, if any.

**Patents in Force**

The Rotary Cell Culture System™ is protected by patents exclusively licensed from the National Aeronautics and Space Administration (NASA) and patents owned by Synthecon Inc., with others pending. The patents Synthecon Incorporated operates under are listed below:

- Patent number 5,437,998 “GAS PERMEABLE BIOREACTOR AND METHOD OF USE” Patent issued August 1, 1995
- Patent number 5,153,131 “HIGH ASPECT RATIO VESSEL AND METHOD OF USE” Patent issued October 6, 1992
- Patent number 5,155,035 “METHOD FOR CULTURING MAMMALIAN CELLS IN A PERFUSED BIOREACTOR” Patent issued October 13, 1992
- Patent number 5,153,133 “METHOD FOR CULTURING MAMMALIAN CELLS IN A HORIZONTALLY ROTATED BIOREACTOR” Patent issued October 6, 1992
- Patent number 5,998,202 “MULTIPLE CHAMBER DIFFUSION VESSEL” Patent issued December 7, 1999
- Patent number 5,989,913 “CULTURE VESSEL FOR GROWING OR CULTURING CELLS, CELLULAR AGGREGATES, TISSUES AND ORGANOIDS AND METHODS FOR USING THE SAME” Patent issued November 23, 1999

**Alterations**

Alteration of the equipment voids the warranty on this equipment. In no case shall SYNTHECON™, Inc. be responsible for any modifications or alterations to this equipment performed by anyone other than SYNTHECON™, Inc.
IMPORTANT NOTICE

Limited Warranty: Limited Liability

SYNTHECON™ Inc. warrants that, for one year, under normal operating conditions and use, this equipment will be free from defects of materials and workmanship. SYNTHECON™ Inc. will repair or replace defective parts at our option. Contact SYNTHECON™ Inc. immediately upon discovery of a defect. SYNTHECON™ will provide you with a return authorization number and shipping instructions.

Components

Oxygenator Membrane
The oxygenator membrane is a very delicate component consisting of silicone rubber, .005 inches thick, covering a polyester cloth backing. Care and attention should be given to the membrane during cleaning, sterilization, and removal of cultured material. Synthecon reserves the right to make discretionary determination as to the cause of damage with returned oxygenators, and deem whether the repair is covered under the Synthecon Limited Warranty. See Operators Manual for appropriate procedures.

Rotator Base
Storage of the Rotator Base in an incubator while not in use will result in damage to the rotator components. Synthecon reserves the right to make a discretionary determination as to the cause of damage with returned rotators, and deem whether the repair is covered under the Synthecon Limited Warranty.

The equipment must be used and operated in a careful and proper manner. In no event shall SYNTHECON™ Inc. or its suppliers be liable for any indirect, special, or consequential damages, including but not limited to, loss of cells, medium, data, labor or equipment incurred by the purchaser or any third party arising from the use of, or inability to use this equipment.

Service

For service during and after the expiration of the warranty, contact SYNTHECON™, Inc. at (713) 741-2582 during 9 a.m. to 5 p.m., US Central Time Zone. Equipment being returned for service should be shipped to: Synthecon,- Customer Service Dept, 8044 El Rio, Houston, TX, 77054. Please include a short description of the problem, service required or reason for the return. Please pack equipment being returned in sturdy containers with adequate packing materials. Synthecon will not be liable for damage sustained during shipment.

SYNTHECON™, Inc. also provides biology and engineering contract support services. Special custom designed equipment can be built to meet the customer’s needs. Customers can provide cell samples of their cell and tissue lines, and SYNTHECON™ Inc. will conduct growth and feasibility studies of the customer’s cells on a contract fee basis. Sub-licenses are available which would include design, scale-up, and manufacture of production equipment.

SYNTHECON™ Inc. grants the purchaser a non-exclusive right to use the Rotary Cell Culture System equipment solely for the purpose of conducting research and specifically excluding use of this equipment for any purpose other than research. Any desire by end user to manufacture commercial products in Synthecon, Inc. technology will require the end user to obtain a User’s License from Synthecon, Inc. Its use must comply with all laws, ordinances, and regulations relating to the possession, use, or maintenance of the equipment, including registration and/or licensing requirements, if any.
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