PERMEGEAR

...the standard for your lab.

ILC07
Automated Diffusion System

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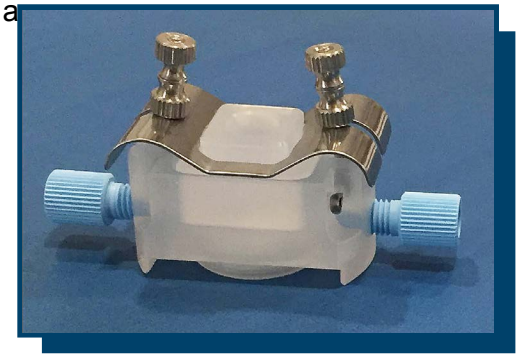
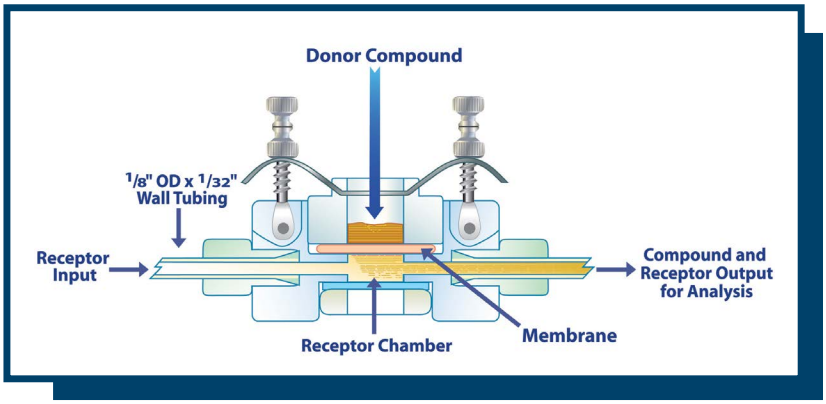
Introduction

PermeGear's ILC07 Automated Diffusion System incorporates In-Line Cells, a peristaltic pump, a fraction collector, and a heater/circulator into a versatile system for analyzing diffusion over time. Collection vials are at the option of the user, racks for 20ml 28mm diameter scintillation vials a provided. Adapters are available to allow the use of many different vials popular with many HPLC autosamplers. Because of the varied requirements of individual users, vials must be provided by the user, PermeGear will supply appropriate racks.



PermeGear's ILC07 Automated Diffusion Systems are based on the continuous flow principle. A multi-channel peristaltic pump draws receptor solution from a reservoir through a distribution manifold and sends it to the In-Line Cells. The cell temperatures are adjusted by a heater/circulator that pumps water through the Cell Warmer in which the In-Line Cells are located. After filling the receptor chambers of the cells and purging the system of bubbles, the subject compound is then placed in the donor chambers of the cells. From that time, the fluid is collected in the vials of the fraction collector at user set time intervals. The vials are taken for analysis manually after the sampling time has elapsed.



Component Orientation

The ILC07 components are properly arranged when the fraction collector (FC33) is on a bench top with the heater/circulator to its right. The peristaltic pump and 2-liter glass reservoir are located on the stainless steel shelf attached to the back of the FC33. The peristaltic pump is placed so the cassettes are centered left to right with respect to the FC33. The 2-liter reservoir bottle is located to the right of the peristaltic pump and the distribution manifold is directly behind the pump.

Note: All references made to direction in this manual, unless otherwise specified, assume that the equipment is being viewed from the normal operating position with the displays of the fraction collector and heater/circulator facing the user. The peristaltic pump is placed on the shelf behind the FC33 so that the controls are on the right end and the cassettes are on the left.

Assembly

1 - Fraction Collector and Shelf: Two stainless steel components and six screws assemble together to make the shelf. The screws are intended to be installed first through the top of the shelf, the piece with the inverted U cross-section, and then into the six threaded holes in the upper end of the shelf support, the piece with the three rubber feet attached to it. Tighten the screws only when all six have been installed.

Carefully remove the FC33 from its packaging materials. DO NOT LIFT IT BY ITS ARM. Take care not to put undue force on the black anodized aluminum Cell Warmer, stainless steel Tubing Guide, or the 5/16" ID Tygon® tubing. Place the FC33 on a bench, with the control panel facing to the left or right. Remove the three upper screws in the rear panel and save for immediate reuse. Relocate the FC33 in its normal operating position so the control panel is facing you. Place the shelf assembly behind the FC33 so the left end of the shelf is aligned with the left side of the FC33 and the top of the shelf is even with the top of the FC33. Replace the three screws thereby attaching the shelf to the FC33. Adjust the shelf to be flush with the top of the fraction collector. Do not overtighten the screws as the fraction collector case will be damaged!

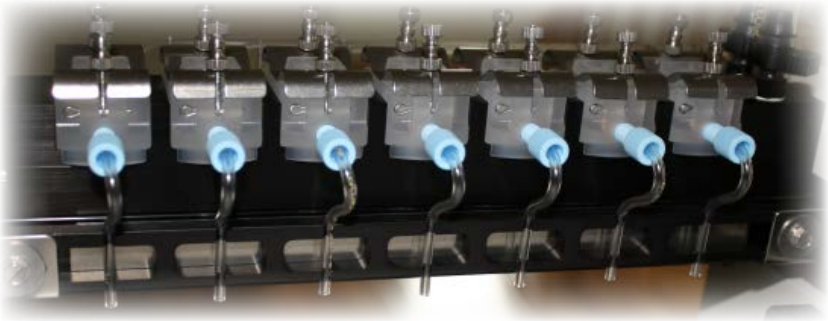
IMPORTANT! - When the fraction collector is turned on the arm will move all the way to the right and then return to the left side of the fraction collector. It is critical that nothing be in the way of the arm while the fraction collector performs this operation. Be certain that all vials, tubing, and hardware are safely out of the way of the arm's travel before turning the fraction collector on. When the fraction collector is turned on, it moves the arm to the far right and makes a loud ratcheting noise. This is normal operation for initializing the arm to move to the correct positions during a run. It also resets the arm if it is accidentally obstructed by the user.

2 - Cell Warmer & Heater/Circulator: The Cell Warmer comes with two factory installed black plastic fittings and 5/16" Tygon® tubing. The tubing was installed in the tubing support which is intended to prevent the tubing from tangling with the vials and vial racks. Extra tubing is supplied to help with connections to the heater/circulator.

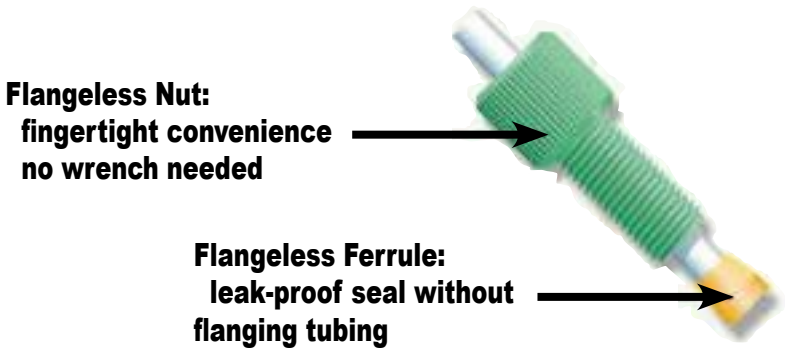
The heater/circulator comes with stainless hose barb fittings for use with the 5/16" hose supplied. Be sure the stainless hose barb connectors are correctly seated in the fittings of the heater/circulator. Install the power cord in the power entry module on the rear of the unit. Place the heater/circulator on the right side of the fraction collector so the numerical display is facing you, its right side is even with the right end of the stainless steel shelf, the fraction collector may be further toward the right if desired. Attach the 5/16" ID Tygon® tubing from the Cell Warmer by putting the two tubing clamps supplied with the heater/circulator onto the tubing prior to slipping the ends of the tubing sections onto the stainless hose barbs of the heater/circulator. Circulate the water to test for leaks at both the water bath and the Cell Warmer connections. If the system is to sit unused for a long period of time, either drain the water from the Cell Warmer or periodically circulate water through the Cell Warmer to prevent sludge and/or bacterial growth. Additives may be purchased for the water that help prevent the water from becoming unsuitable for use.

Assembly - Continued

3 - In-Line Cells: The In-Line Cells have standard 1/4-28 UNF flat bottom ports, intended to be used with 1/8" OD x 1/16" ID Tygon® tubing. In-Line Cells are symmetrical and can be placed in the cavities of the Cell Warmer either way. Tubing sections from the peristaltic pump connect to the left-hand HPLC ports of the In-Line Cells, the right-hand ports are the outlet ports. The tubing sections need to be adjusted individually to be no longer than necessary to connect to the peristaltic pump tubing elements and allow travel for the fraction collector arm. Short tubing sections cut to about 3 ¼" (8cm) long are used in the outlet ports and are properly installed when threaded down through the tubing guide and extended about ½" (12mm) below it as shown in the photo to the right.



The HPLC connectors supplied are manufactured by Upchurch Scientific and are called Flangeless Fittings and are finger tight connectors. To properly use these connectors, cut the end of tubing lengths using the Upchurch A327 tubing cutter supplied with the system to make square-cut faces on the ends of the tubing lengths. Slide the Flangeless nut over the tubing with the threads facing the tubing end being connected. Slip the Flangeless ferrule over the tubing with the tapered portion of the ferrule facing the nut so the tubing extends out of the ferrule .010" to .020" (.25mm to .50mm). The tubing should seat against the bottom of the 1/4-28 port, the yellow ferrule should not. (Tip: The ferrule fits snugly over the tubing, applying a bit of water on the end of the tubing will help ease the ferrule onto the tubing although it is not necessary.) Insert the tubing with the ferrule in place into the receiving port, and, while holding the tubing down firmly into the port, tighten the nut finger tight. It is critical not to overtighten the nut as this will decrease the flow rate of receptor solution and may even stop the flow completely. The drawing below, taken from the Upchurch Web site, shows the proper arrangement of the Flangeless Fitting components.



Assembly - Continued

Peristaltic Pump: Please refer to the directions in the peristaltic pump manual to familiarize yourself with the components and use of the pump. Place the pump on your bench so the controls are away from you and you can read them properly. Each cassette has an arrow pointing from left to right which is the preferred direction of flow. Remove the cassettes from the pump and insert a cassette adaptor into each slot on the ends of the cassette. Prepare each tubing element by shortening one end to extend about ¾" (19mm) past one of the stops. Insert a small double ended hose barb into the end that is cut to ¾" long. Install a tubing element in each cassette by hooking the stop of the end with the ¾" length into a cassette adaptor at the output side of the cassette. Stretch the tubing over to the other adaptor being careful not to twist the tubing between the stops. Reinsert each cassette into the pump by pressing down on it until it snaps into the release mechanism below. Place the peristaltic pump onto the shelf attached to the FC33 and center it from left to right so the cassettes are centered over the FC33. The cassette nearest the controls is #1. The rearmost In-Line Cell in the fraction collector is #1. Connect the end of the input tubing going into its left side to the small hose barb attached to the tubing element in Channel 1 of the peristaltic pump. Connect the other In-Line Cells in the same manner maintaining the pump channel and In-Line Cell order relationship to help with troubleshooting later. Test the movement of the arm across the full length of the fraction collector to ensure the Tygon® tubing sections are not obstructed. If needed, you may use a wire tie or something similar to bundle the Tygon® tubing sections together. **Properly placing the Tygon® outlet tubing lengths in the Guide is important to prevent them from coming in contact with the vials.**

5 - Reservoir and Distribution Manifold: Locate the 2-liter glass reservoir and the 3/8" ID Tygon® tubing that came with it and press the Tygon® tubing onto the hose barb port at the bottom of the reservoir. Then slip the white tubing clamp onto the Tygon® tubing so it's about in the middle. Locate the Distribution Manifold and its components. Insert the stainless steel hose barb fitting into one end of the Distribution Manifold and the pipe plug into the other end using pipe thread tape or sealer compatible with your receptor solution. Connect the tubing from the reservoir to the hose barb fitting in the Distribution Manifold. Locate the 1/4-28 to hose barb adapters and install them in one row of 7 ports in the Distribution Manifold. A wrench may be used but these plugs need only be installed snugly so as not to leak. Place the Distribution Manifold on the shelf behind the peristaltic pump and connect the tubing elements from the pump to the hose barb fittings on the Distribution Manifold. Please refer to the picture below.

Programming the Fraction Collector

Photo 1 below shows the ILC07 display immediately after the unit is turned on.

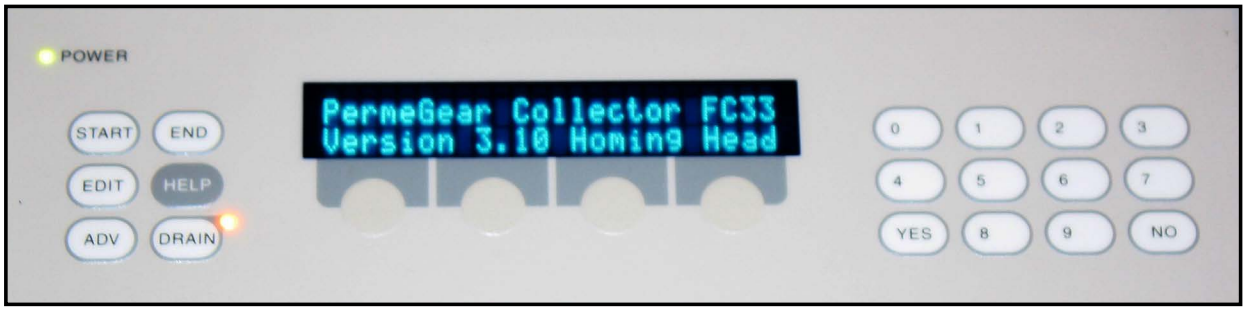


Photo 1

When the arm and Cell Warmer return to the home position at the left side of the ILC07 the display changes to what is shown in Photo 2.

Photo 2

Different vials require you to select the proper rack configuration. Vials up to 15mm in diameter use either the 22 or 29 rack configuration. 20ml scintillation vials use the 24 configuration. The default startup state is for the 20 rack configuration. To change the rack configuration press the circle below Edit in the display. You will then see the display become what is shown in Photo 3.

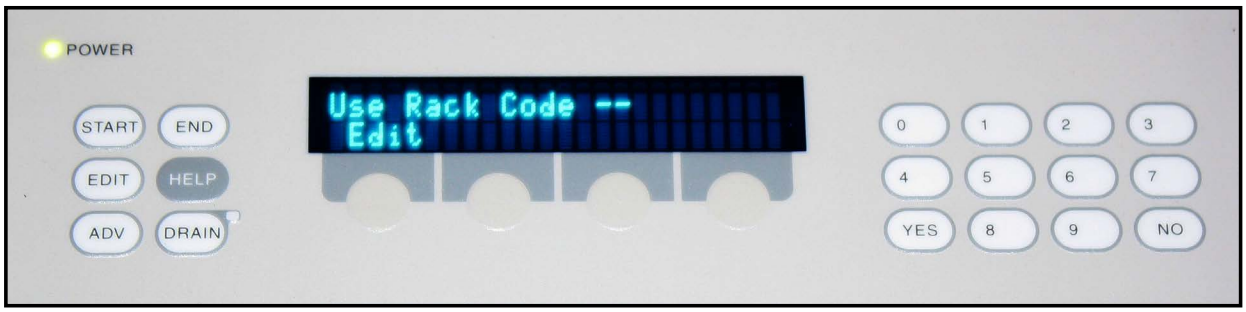


Photo 3

Programming the Fraction Collector - Continued

Program the ILC07 for your rack configuration by pressing numbers from the keypad to the right of the display. If you choose 24, Photo 4 shows how the display appears.

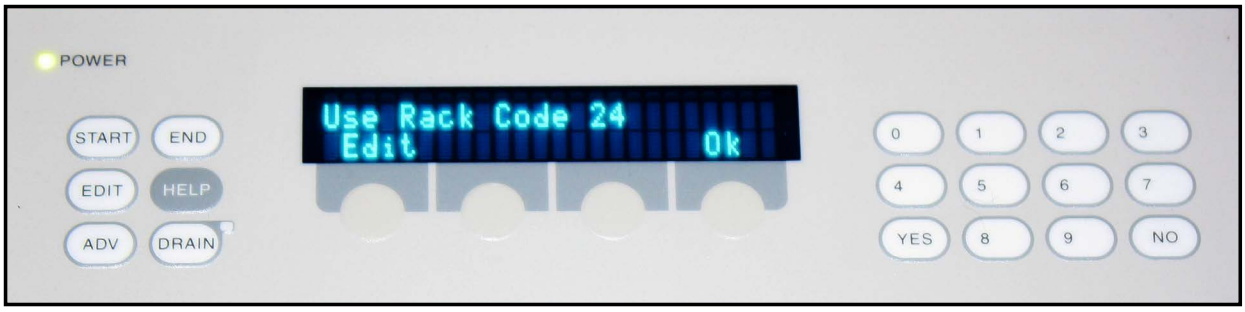


Photo 4

Press OK to set your selection, and you will see what is shown in Photo 5. 50 time points can be programmed into the ILC07. Each time point must be at least one minute long, and no longer than 9999 minutes. Each time point corresponds to a row of vials. A row of vials extends from the front of the ILC07 racks to the rear and does not go side to side. After deciding how many time points are needed for your study, you must enter that number into the ILC07.

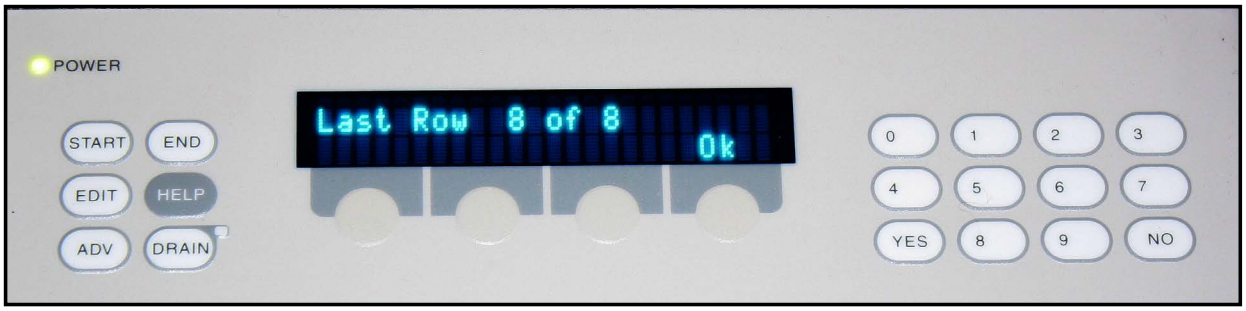


Photo 5

If 8 time points are appropriate for your study, press the circle below Ok. If you need a different number, enter it by pressing numbers from the keypad to the right of the display. If you chose 16 time points, or rows of vials, the display will appear as in Photo 6.

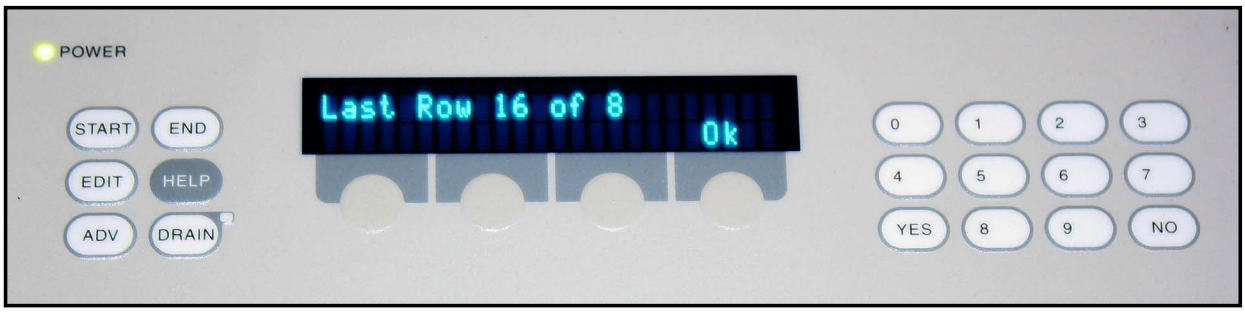


Photo 6

Programming the Fraction Collector - Continued

After making your selection press the circle below Ok. The ILC07 will not allow a number of time points greater than 50 to be entered, and will default to 50 if done. Once you have chosen the number of time points you would like, once again press the circle below Ok and the display will change to what is shown in Photo 7.

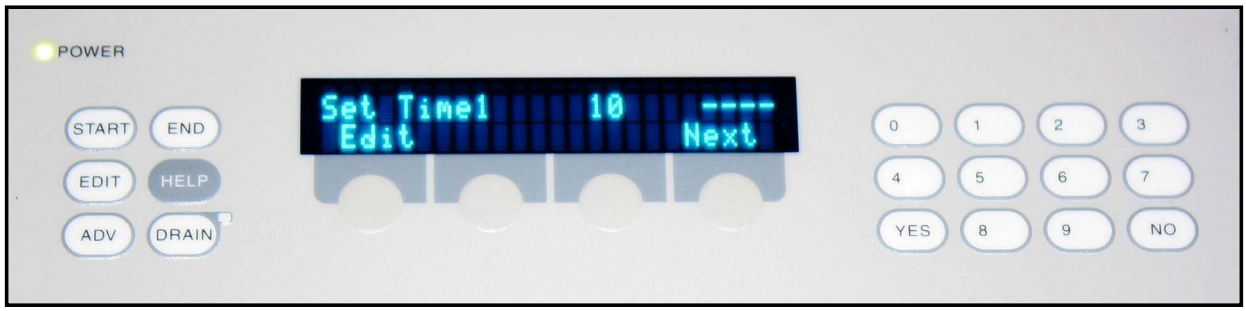


Photo 7

You can now begin to program the length of time for each time point. The ILC07 default time for all the time points is 10, which is 10 minutes in length, as shown in Photo 7. To change the amount of time for time point 1, Time1 on the display, press the circle below Edit. Photo 8 shows what appears, the hyphens in the upper right corner of the display have changed to a zero.

Photo 8

Using the keypad, enter the desired time and observe that the zero has changed to the values entered. Photo 9 shows how the display appears if 20 is entered.

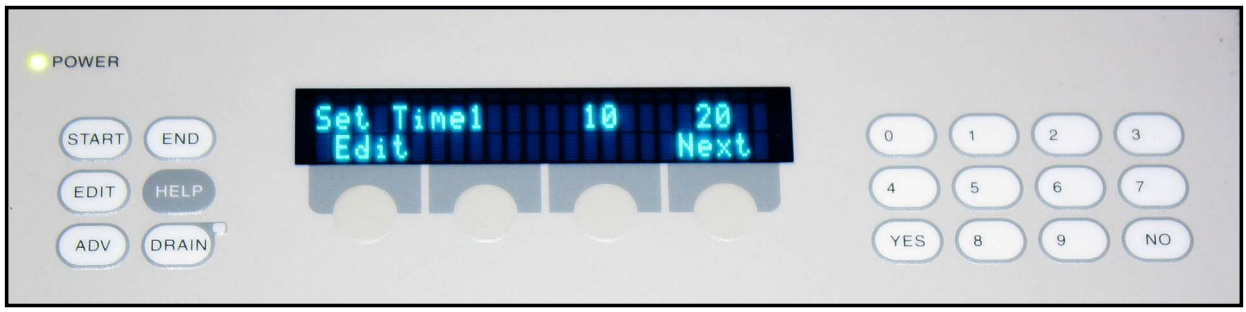


Photo 9

Programming the Fraction Collector - Continued

As shown in Photo 9, the length of time for the first time point, Time1, is 20 which is 20 minutes. You can input as many digits as needed for your time point including zero if you made a mistake. The value shown will not be entered into the ILC07 until you press the circle below Next on the display. After doing so the display will appear as in Photo 10. Photo 10 for the second time point, Time2, is identical to Photo 7 for the first time point, Time1, except for the time point itself.

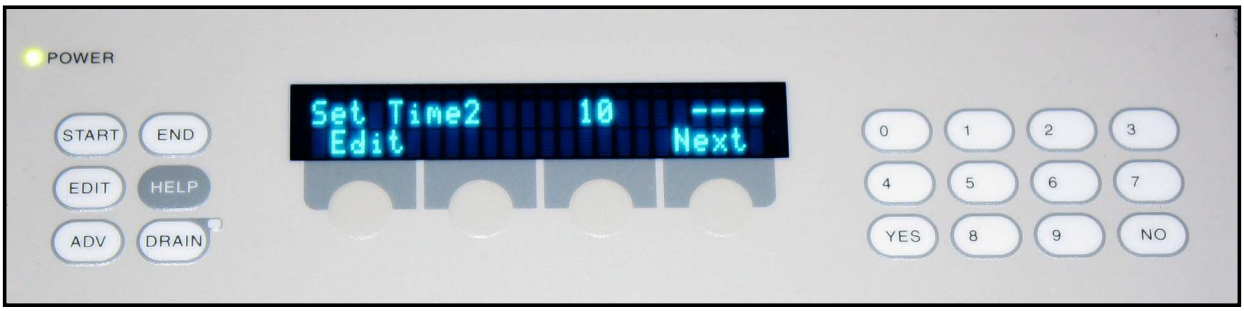


Photo 10

To input the value for the second time point, repeat the steps for the first time point. Continue as above until all of the required time points have been entered. After programming the final time point, the ILC07 display will return to Time1 with the time point you programmed into earlier and the display will again appear as shown in Photo 7. The ILC07 is now ready for operation. Press Start to begin. The display will now appear as shown in Photo 11. The remaining time for Row 1/16 wil count down i the lower right corner of the display. The data for the next rows will appear until the program is completed.

Photo 11

You may stop the program at any time during operaton by pressing te END button on the control panel. You will then see what is shown in Photo 12. To confirm you wish to stop the program, push END again and the dispay will reset to Row 1 to begin again as shown in Photo 7.

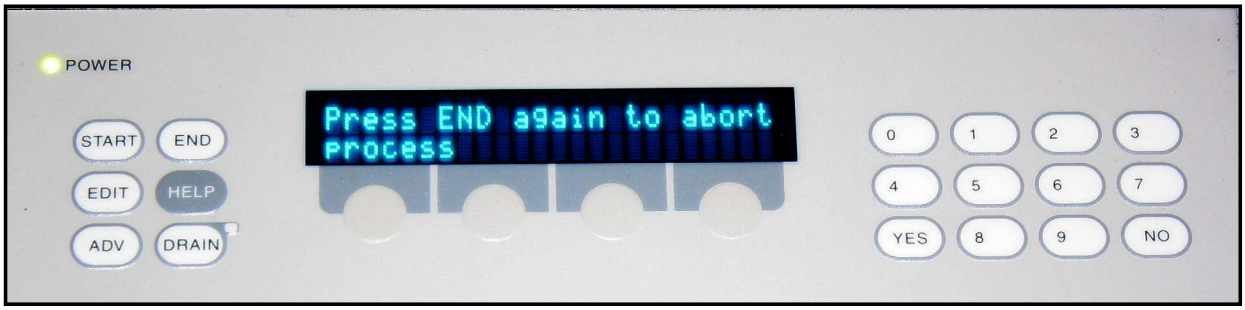


Photo 12

Your System Includes:

1. FC33 Fraction Collector with In-Line Cell Warmer and Tubing Guide
2. Heater/Circulator (recirculating water bath)
3. In-Line Cells
4. Ismatec 8-channel Peristaltic Pump with tubing cassettes and 2-stop tubing elements
5. 2-liter glass receptor solution and Reservoir and Distribution Manifold
6. Shelf

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