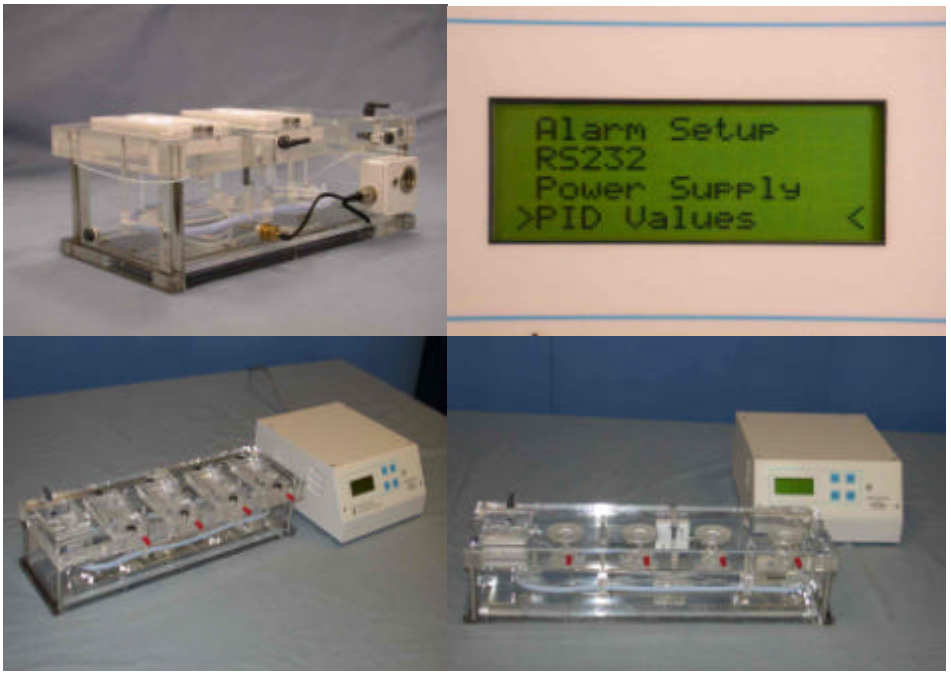
Campden Instruments Ltd.

A Lafayette Instrument Company

745 Model Series
IN-VITRO SLICE CHAMBERS
and
HIGH RESOLUTION TEMPERATURE CONTROLLER
(Interface and Submerged Chamber)
(Electrophysiology and Biochemistry Models)
(Single, Dual, Quad and Hex Chambers)



January 2005

General Description.

The six channel multiple slice chambers are for biochemistry and the two and four chamber systems are for electrophysiology as well as biochemistry. The four channel chambers are used in the fully automated Synchroslice system.

All two and four chamber tissue baths come with a high resolution temperature controller with a built in sensor in the water bath and hand held probe to monitor the temperature of the perfusate in the tissue well. Tubing lengths are constant for all chambers to insure consistent oxygenation and temperature control. In addition to the 2 or 4 recording chambers, there is a incubation chamber of four small wells for staging additional slices. There are several options in this line of tissue baths.

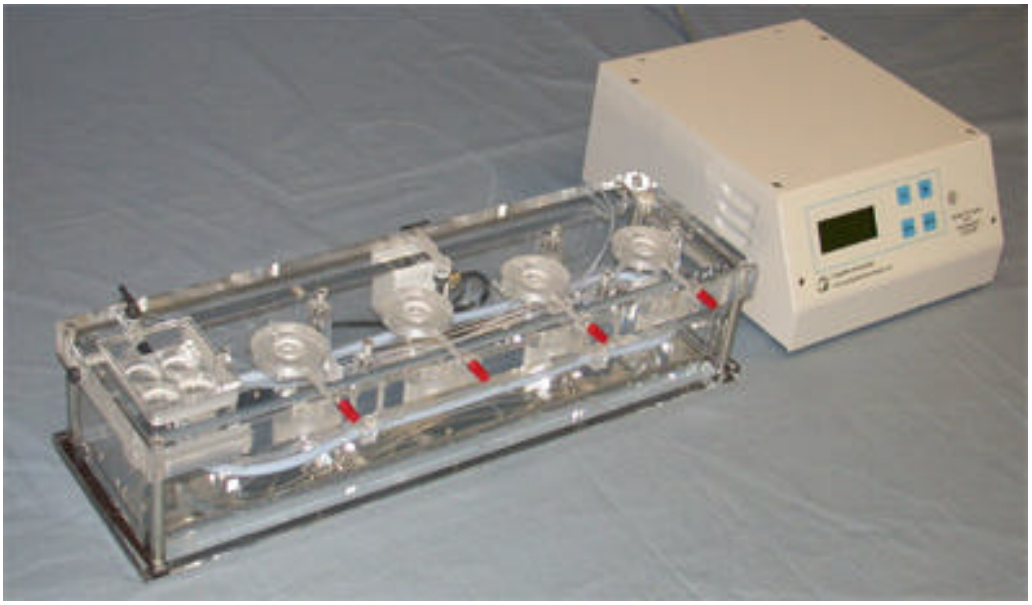
1. Chamber Type: Select the Oslo type for submerged procedures. A 20mm diameter ring is provided for attaching a support mesh. This type also requires an 8-channel peristaltic pump to maintain the proper perfusate level. Select the Haas type for air/fluid interface with humidified atmosphere above the tissue slice. This chamber type is rectangular in shape and includes a drain from which the perfusate is pumped. Ask about our 2, 4 & 8 channel 'Smoothflow' Peristaltic Pumps. Make sure the pump you use provides a smooth consistent flow of perfusate.

2. Chamber Material: The water bath and chamber head are made of Plexiglas as are standard inserts; however, for pharmacological or toxicological studies, order tissue baths where the chambers and tubing are supplied in chemically inert p.t.f.e. (Teflon) to avoid possible contamination between samples due to adhesion of the drug.

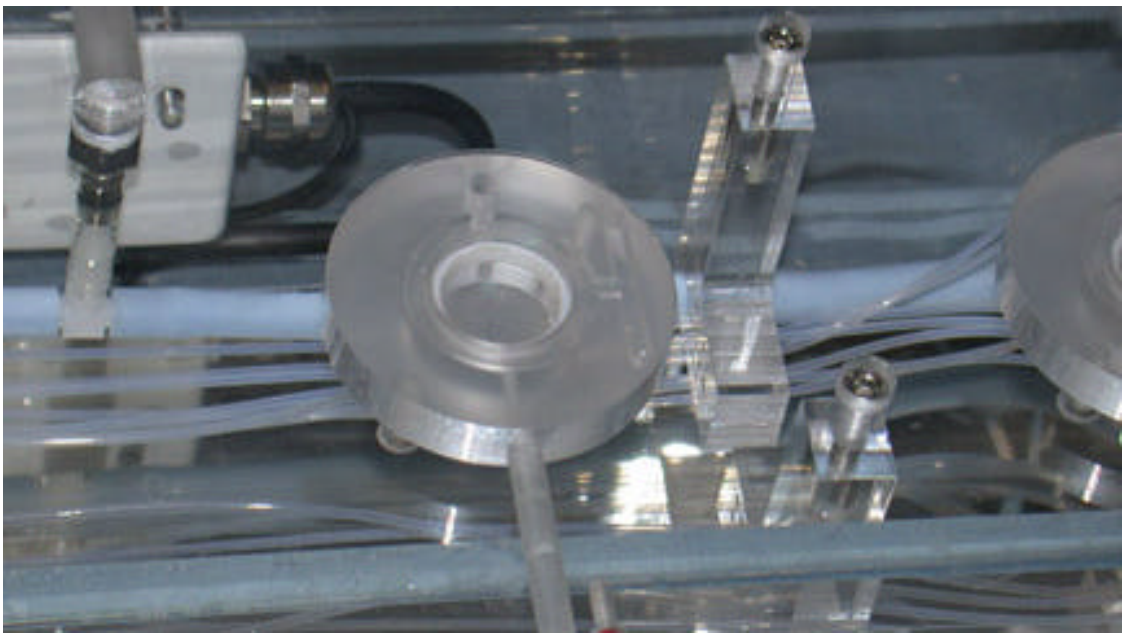
3. (E) v's (B). For electro-physiology studies select the (E) chambers which include a silver/silver chloride electrode reference disk at the bottom of the tissue well wired to a convenient binding post along the edge. The (B) chambers may be used for biochemical and anatomical studies as well as those pharmacological studies not requiring electrophysiological recording or stimulation.

Additional optional accessories include passive anti-vibration base plates, threaded rods, and a tilting head assembly for micromanipulators, 'Smoothflow' peristaltic pumps, suction needles and suction needle mounts (Oslo type only), replacement or spare electrodes, wells, and tubing sets.

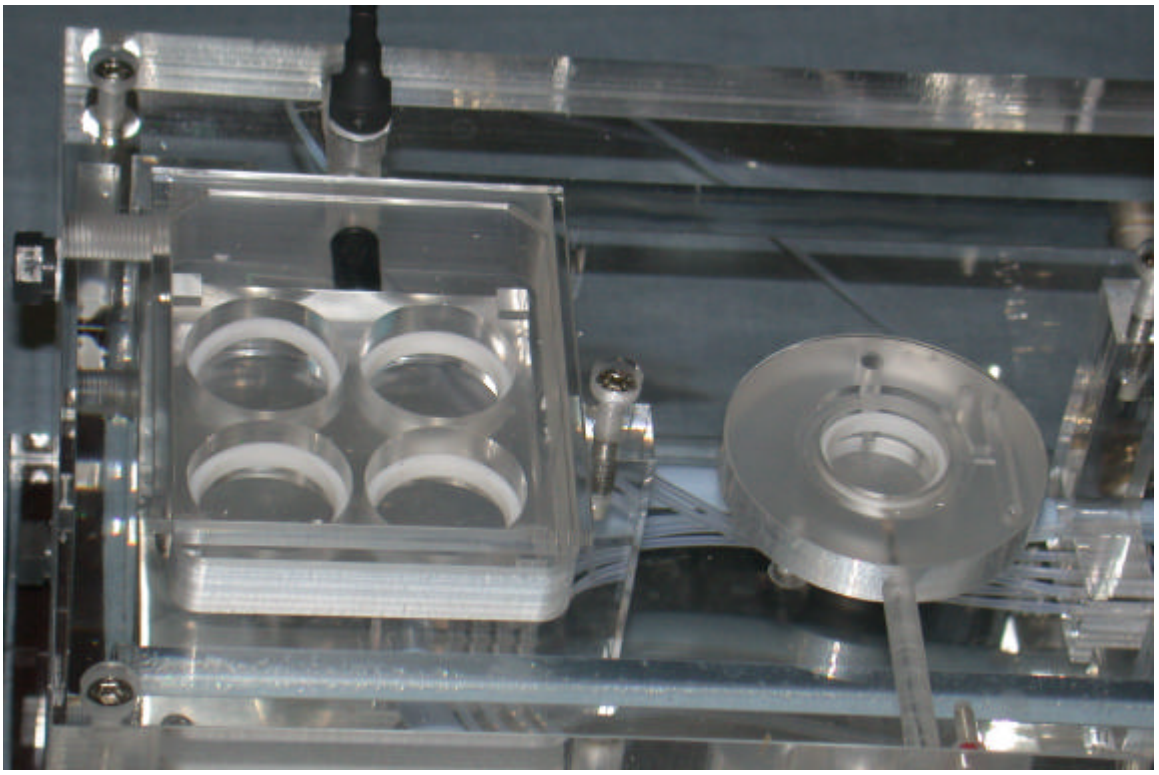
Detailed Descriptions



Model 745S-4A(E) A 4 channel chamber with submerged (Oslo) type cells in acrylic. The red posts on the front are connected to a reference electrode disk in the bottom of each cell. The (B) version is identical without the electrode and binding post. Both are also available with P.T.F.E. (Teflon®) cells and tubing which is recommended when using pharmacological agents.

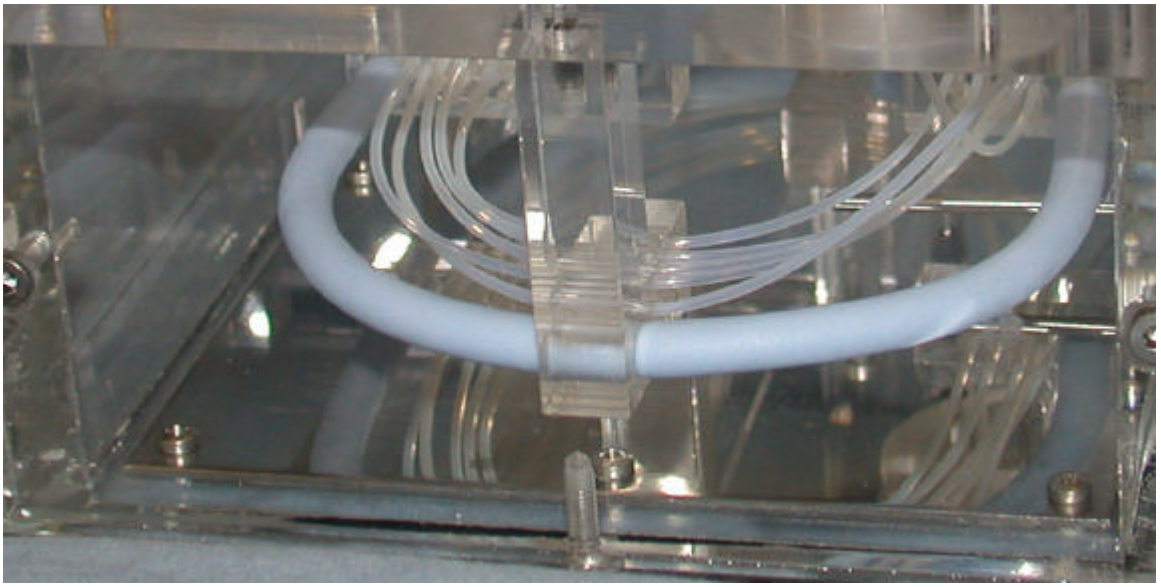


Close up of the Oslo (submerged) cell. The cell diameter is 20 mm. The white ring comes out and is used to hold a nylon mesh. Also visible in this photo are the coils of tubing that carry the perfusate within the temperature controlled water bath. All four are equal in length (~3 meters) to insure equal temperature and oxygenation. The larger blue tube is a bubbling tube that should be connected to a carbogene (5% CO_2 and 95% O_2) supply. Bubbling the water bath keeps the oxygen pressure high to prevent oxygen from coming out of the superfusate solution as the temperature rises and also serves to agitate the water bath to promote an even temperature throughout.

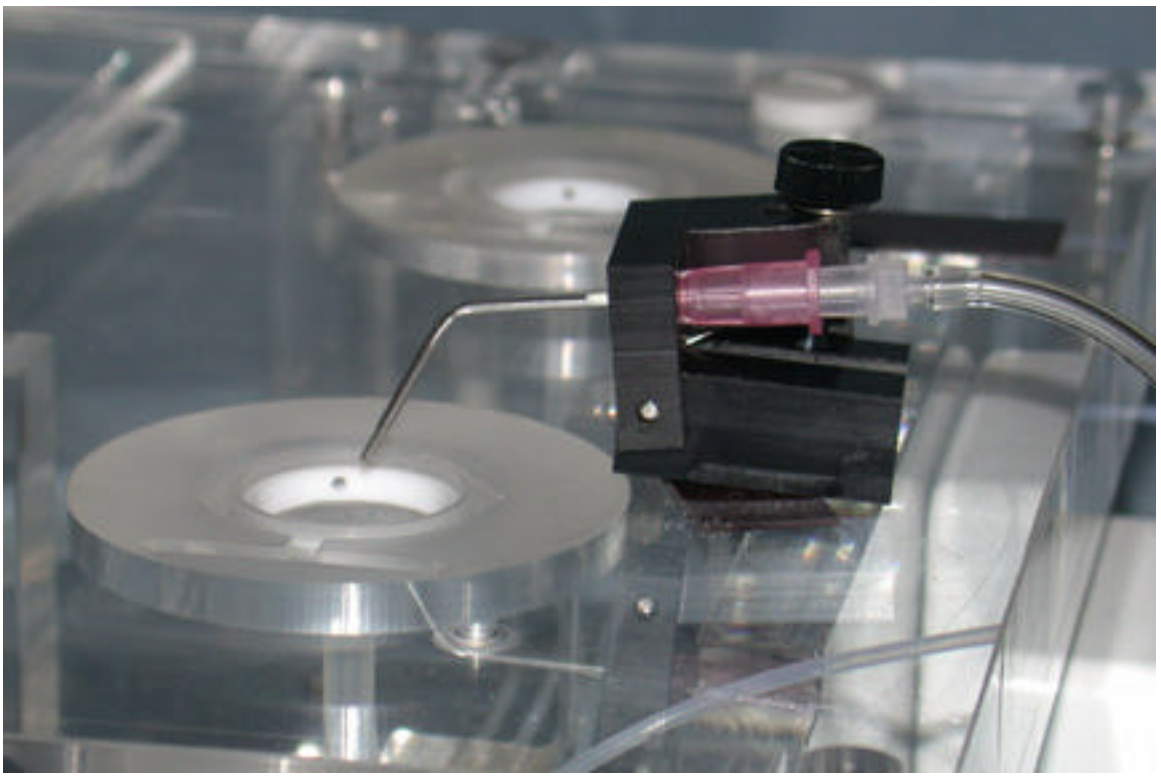


A close up of the holding chamber found on the left side of Model 745S-4A(E).

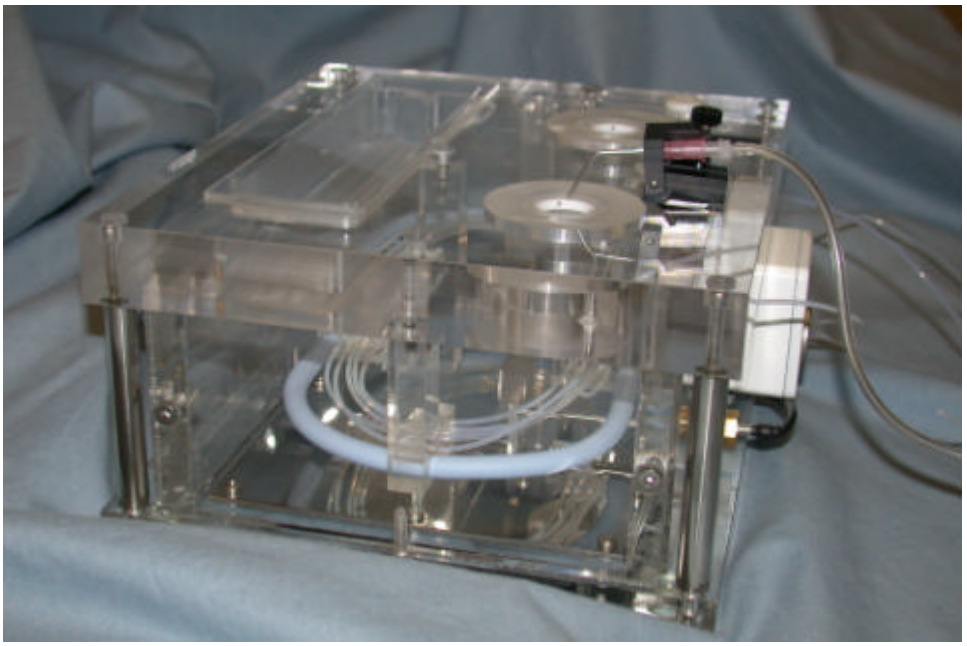
A close up of the temperature control. There is a temperature sensor in the water bath itself as well and a hand held probe to monitor the temperature in each cell.



The heater element is underneath the stainless steel floor of the bath, The metal floor conducts the heat efficiently and evenly to the water. The shiny stainless also serves to reflect light so that when looking at the slice from the top it is possible to see some of the internal anatomy of the tissue. The bubbling tube and perfusate tubing is also clearly shown in this close-up.



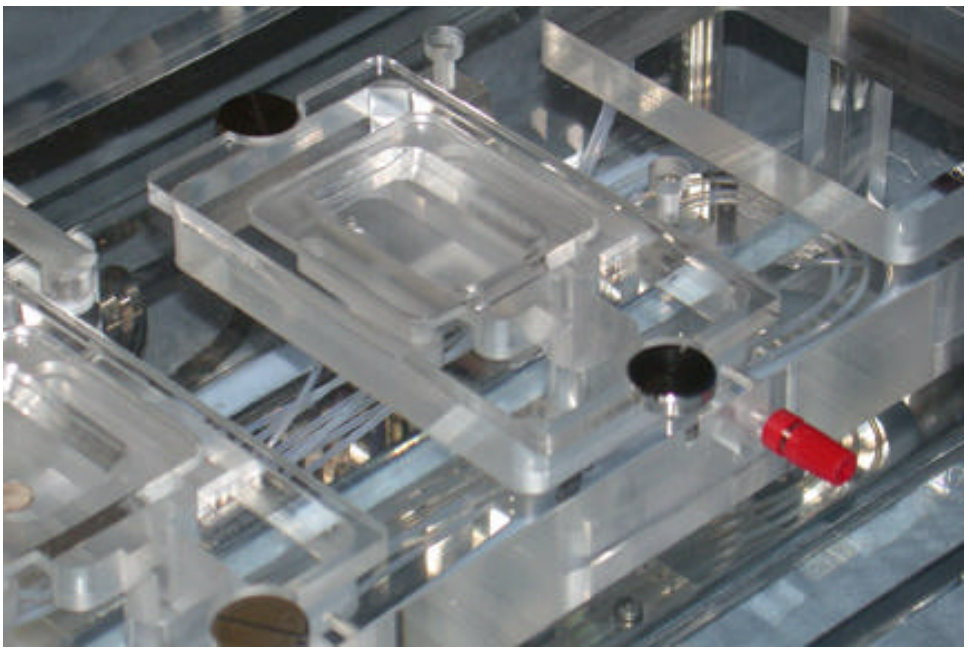
Model 745-7 Adjustable Mounting for Suction needle shown with submerged (Oslo) type cell. Two peristaltic pump channels are required per cell for the submerged type. The height of the suction needle is adjusted by turning the small black knob on top which in turn sets the level of the liquid inside the chamber.



Model 745-7 Shown with a two cell submerged (Oslo) Type Chamber

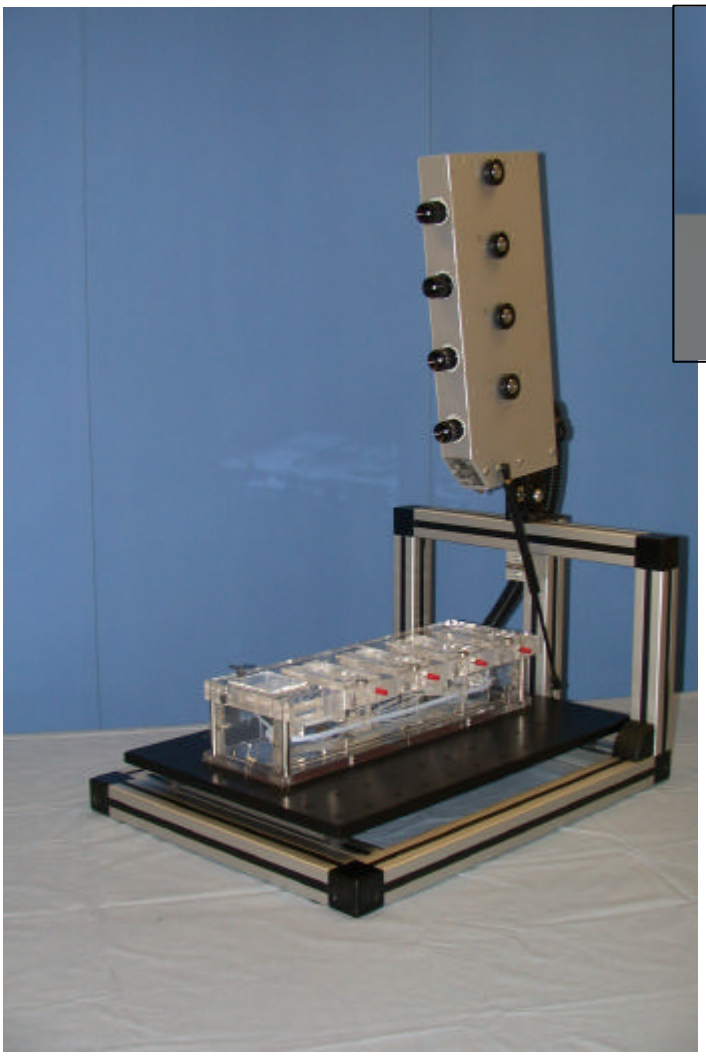
Interface (Haas) Type Cells.

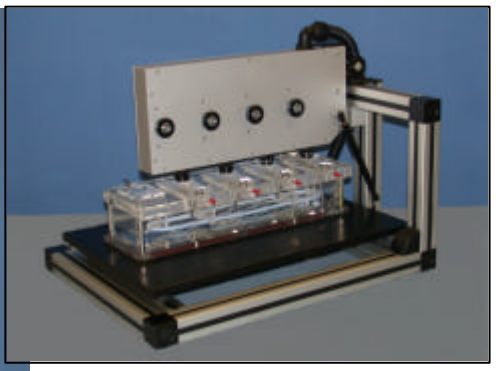
Interface chambers are likewise available in (E) Electrophysiology or (B) Biochemistry options in acrylic or P.T.F.E. (Teflon®). The precision temperature controller and water bath design are identical to the above. Interchangeable top plates are available for labs using both methods. A close-up of the Interface (Haas) Type cell is shown overleaf.



The partial cover plate over the Interface (Haas) type cell insures a flow of warm moist air over the exposed tissue. This again is an (E) version with the red binding post connected to a reference electrode in the bottom of the cell. Only one channel of the peristaltic pump is needed per cell as excess perfusate is removed via a gravity drain.

Optional Accessories for Slice Chambers:





These photos illustrate several optional components for the In Vitro Slice Chambers.

764-700 Base Plate with Anti-Vibration Frame

746-600 Base Plate Only

746-SCS Complete Slice Work Station.

764-600 Base Plate

This stress free satin black anodised aluminium base is precision machined for a precision flat surface and drilled and tapped in a pattern to accept the mountings for optional manipulators. It sits on conventional rubber feet.

746-700 Base Plate with Anti-Vibration Frame

This unit takes the 764-600 Base Plate and supports it on a rugged aluminium frame with additional anti-vibration mounts. The upright part of the frame is included for future cameras or to mount any other device such as stereoscope for example.
746-SCS Complete Slice Work Station (pictured on previous page)

In addition to the base plate and anti vibration frame, this package adds a 4 camera system for slice chambers with focus adjusters, frame grabber and quad processor. The four chamber tissue chamber is sold separately. The cameras give an overall magnification is x15. The cameras have 380 TV lines and 16mm F2.5 lenses fitted. This would enable structures in a hippocampal slice, for example, to be clearly seen.

A monitor is not normally supplied because these are available from any number of video equipment dealers. As a basic guideline we would recommend a TFT (Thin Film Transistor) LCD (Liquid Crystal Display) video monitor with VGA and video input.

Working with multiple chamber set ups.

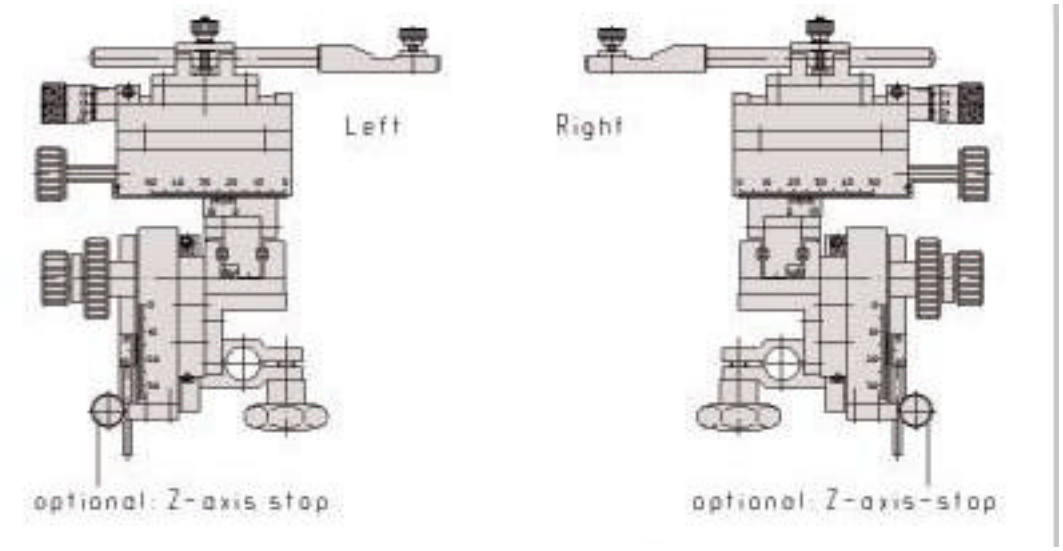
The scaling up from one to two or four chambers makes working space and working practice very critical. For efficient operation all devices must be close at hand so that control is easy and tubing bringing superfusate is kept short. This has been carefully worked out in the design of the Slice Workstation and the larger Synchroslice system.

A microscope is generally unsuitable for multi chamber electrophysiology systems for a number of reasons, as follows:
Only one slice can be viewed at a time.
Every time the scope is moved there is the potential to disturb the electrodes that are already placed in the previous slice - resulting in a ruined preparation.
The microscope's bulk and size may get in the way of the manipulators and prevent the electrodes from being inserted from both sides along the four chambers.
And, it must be swung completely out of the way to get slices in and out of the chambers. If it is necessary to exchange a slice because it fails a viability test the problem is compounded.

By contrast the camera system is slim and does not hinder access by the electrodes, swings up out of the way to give easy access to all slices and can view all cells simultaneously to make sure the electrode placements are undisturbed.

The choice of manual manipulators is for the same ergonomic reasons.
Whilst remotely operated manipulators could be used, this would mean that 4 sets of controls must be close by, this in turn takes space and forces the superfusate tubing to be longer. Confusion between manipulators is also easy with remote operation.
With the manual manipulator set up, 4 tissue slices can be set up and ready for recording in 15 to 20 minutes.

Manipulators:



746-MM-LH Micromanipulator, Left Hand
746-MM-RH Micromanipulator, Right Hand

Use the 100mm and 150mm threaded rods to attach these units to the tissue chamber base plate. These Compact micromanipulators provide manual movement in three axes (X,Y,Z) The scales along the guide ways provide 0.1 mm coarse adjustment while the micrometer screw provides 0.01 mm fine adjustment. All control knobs are mounted in line on the rear for easy access when placed right next to each other. The following travel ranges are provided:

X-axis	37 mm
Y-axis	20 mm
Z-axis	25 mm
Fine Adjustment	10 mm

Controller Specification

Voltage rating: 115/230V Switchable. Power Rating: 300W. Fused at T4A.
DC output when used with 745 chamber: 5V to 27VDC continually variable. 8A maximum. Ripple and noise <60mV @ full load
DC output when used with 3rd party heater mat: 5V to 27VDC continually variable or manually set. Connect only to a resistive load of not less than 5ohms.
Water Bath temperature probe accuracy +/- 0.25 °C. Hand held probe temperature accuracy +/- 0.1·

Chamber Specifications

	Outer chamber nominal size			Chamber size*	Bath volume litre		Minimum aeration gas delivery	Heater wattage (max)	Water bath temperature stability	Maximium bath settable temperature	Ag/AgCl electrode diameter x length	PID Controller	
	L	W*	H									Voltage	Wattage
	mm	mm	mm		min	max	litre/min	W	°C	°C	mm x mm (electrophys only)	V	W
Interface				L x W mm x mm									
1 channel	300	167	110	52 x 20	1.1	1.3	2.5	85	+/- 0.1	50	8 x 1	115/230	300
2 channel	300	167	110	52 x 20	1.1	1.3	2.5	85	+/- 0.1	50	8 x 1	115/230	300
4 channel	500	167	110	52 x 20	1.9	2.3	3.5	170	+/- 0.1	50	8 x 1	115/230	300
Submerged				diameter x volume mm x cm^3									
1 channel	300	150	110	18 x 2.5	1.1	1.3	2.5	85	+/- 0.1	50	2 x 4	115/230	300
2 channel	300	150	110	18 x 2.5	1.1	1.3	2.5	85	+/- 0.1	50	2 x 4	115/230	300
4 channel	500	150	110	18 x 2.5	1.9	2.3	3.5	170	+/- 0.1	50	2 x 4	115/230	300
6 channel	500	150	110	18 x 2.5	1.9	2.3	3.5	170	+/- 0.1	50	n/a	115/230	300

*W = width of top plate excluding electrical terminals (add 18mm)

*Chambers available in acrylic or p.t.f.e (Teflon®)