Hardware Description

The Space Tissue Loss-A (STL-A) Module, currently renamed the Cell Culture Module (CCM), is a completely automated cell culture facility designed specifically to aid in the study of microgravity effects at the cellular and embryonic levels. The entire hardware unit fits inside a Shuttle middeck locker. The system offers a variety of biological sample maintenance systems, variable temperature settings, options for media delivery and collection of conditioned media samples, and programmed additions of drugs, hormones, radioactive labels, and other experiment requirements.

Subsystems

Biological Samples: The STL-A has space for four separate experiments, each housed in a separate module, or Bioreactor Rail Assembly. The rails hold a variable number of bioreactor cartridges, which are inlaid with hollow fibers to provide an exchange surface for nutrient media, gas, and the removal of waste products. Hollow fiber bioreactors allow for culture growth in three dimensions. Fiberless cartridges are also available for culturing larger pieces of tissue.

Incubation/Refrigeration: The unit can be programmed to maintain a constant temperature or be adjusted during orbit. Temperature regulation from 10 to 40 °C is available.

Media Delivery: Nutrients and gas are provided to the growing cells via a closed-loop flowpath. The one-way flow of liquid has two different nutrient delivery options. The recirculating flow path option directs media flow through the media bag, oxygenator, pump, biochamber, and back to the media bag, allowing growth factors and other products to accumulate. An intermittent feed option periodically pumps fresh media into a short-flow path that recirculates in the same manner as the first option, but the media is eventually diverted to a sump and replaced with fresh media.

Injections: The injection system can be used to add drugs, hormones, fixatives, and chemical labels to the media.

Sampling: The STL-A allows for automated collection of media samples, which can be paired with the injection system.

Specifications

Dimensions: Occupies 1 middeck locker
Weight: 57 lbs control
Power: 100 W
Temperature: standard 37 °C and a separate 4 °C reagent or sample cooling chamber
Cartridge Capacity: 24 Bioreactor cartridges (standard)

Data Acquisition

Event execution log, pressure, temperature, and acceleration

Related Ground-Based Hardware

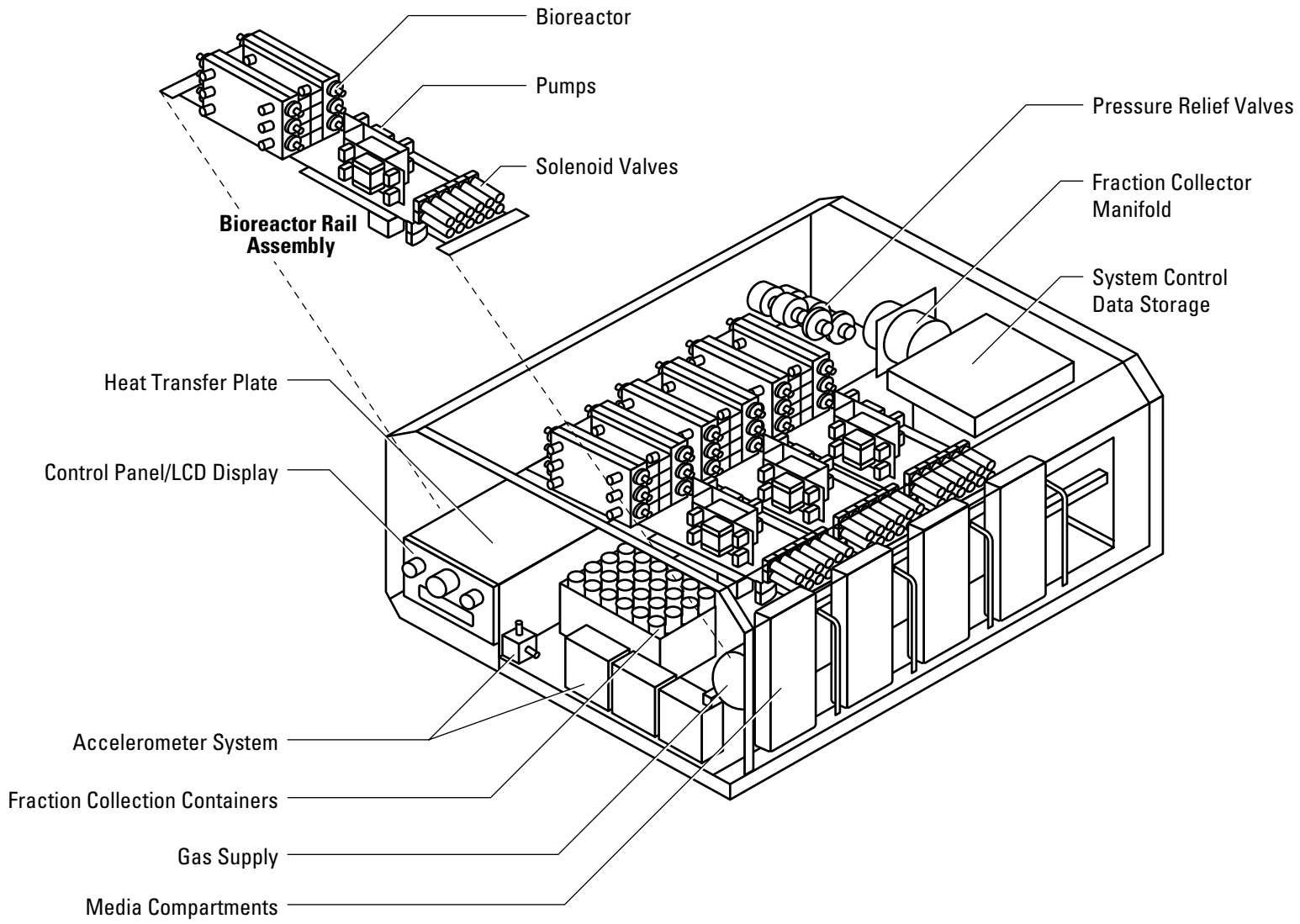
PI Laboratory Trainer: The trainer is a fully functional nonflight version of the STL-A, used as a training and demonstration unit.

Hardware Publications

- *Life Sciences Laboratory Equipment (LSLE) On-line Catalog.* NASA, 1998. http://lifesci.arc.nasa.gov:100/lsle/.

Missions Flown 1991-1995

NIH.C1/STS-59, NIH.C2/STS-66, NIH.C3/STS-63, NIH.C4/STS-69


Bioreactor
Pumps
Solenoid Valves
Bioreactor Rail Assembly
Pressure Relief Valves
Fraction Collector Manifold
System Control Data Storage
Heat Transfer Plate
Control Panel/LCD Display
Accelerometer System
Fraction Collection Containers
Gas Supply
Media Compartments