

# Farrar Scientific Intermediates™



- Base Servers
- Line Sets
- Energy Exchange System Configuration
- Controls, Monitoring and Predictive Maintenance

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Each Intermediate™ system is based on the exclusive Farrar Scientific EnergyBalance™ process that combines off-the-shelf components, refrigerant chemistry, lubrication and electronic controls into an efficient and properly apportioned end product for applications in cold traps, chillers, testing platforms and similar uses.

Farrar Scientific offers the Intermediate™ line of low and ultra-low temperature servers to take advantage of standardization in core industry markets. Although customer applications are always unique, many custom products possess similar components, controls and design architecture which form prerequisites for end-use systems.

To take advantage of core commonality in low and ultra-low temperature products, and to meet the demand for highly specific products that are built, tested and delivered in relatively short lead times,

Farrar Scientific has developed standard server systems manufactured to an *intermediate* point, placed in inventory, and available for final configuration to match customer specifications and quick turn-around.

Marketed as Farrar ULT Intermediates™, the product line includes a selection of conventional and ultra-low temperature platforms, line sets, evaporators and control systems matched to fulfill custom requirements only when orders are received.

## Base Servers

The Intermediate™ base server product line includes several performance groups providing a range of load, Watt@°Temp and BTU/Hr removal capacities. Farrar Intermediate™ servers are manufactured to a build-out point, paused in production and placed into inventory for retrieval and quick completion to meet individual customer specifications for energy transfer and delivery.

*Note: For smaller or larger servers contact the Farrar thermal engineering group. To determine BTU/Hr multiply watts by 3.415179.*

- Base servers are configured from standard air- or water-cooled reciprocating compressors, or scroll compressors, depending on performance and energy exchange requirements, voltage and site preferences, and throughput considerations.

- Once the final specifications are received, each server is completed, fully charged, helium leak tested and factory tested to both Farrar Scientific and customer-supplied criteria.

**Farrar Intermediate™ Base Servers**

Size	Refrigeration	Tem°C	Farrar Model	Nominal Energy Capacity Watts @°C (SST*) <small>*Saturated Suction Temperature</small>	Temperature Rang <small>Custom Ranges Available</small>	Compressor
Small	Single Stage	-40°C	C4	Available Upon Request.	30°C to -40°C	Hermetic
			C6			
			C9			
			C12			
	Cascade	-90°C	C6/4	0.5kw @ -80°C SST	0°C to -90°C	
			C9/6	0.8kw @ -80°C SST		
		C12/9	1.1kw @ -80°C SST			
Medium	Single Stage	-40°C	Z6	Available Upon Request.	30°C to -40°C	Scroll
			Z8			
			Z11			
			Z13			
			Z15			
			Z18			
	Cascade	-90°C	Z11/6	1.1kw @ -80°C SST	40°C to -90°C	
			Z13/8	1.5kw @ -80°C SST		
			Z15/11	2.1kw @ -80°C SST		
			Z18/13	2.4kw @ -80°C SST		
			Z24/15	2.8kw @ -80°C SST		
			Z33/18	3.3kw @ -80°C SST		
			Z48/24	4.5kw @ -80°C SST		

## Line Sets

Energy transfer line sets include tubing, manifolds and other suction/discharge configurations available from standard sources, custom fabricated or customer

provided. Designed to interface with Intermediate™ base servers, line sets include flexible or hard tubing with brazed or quick-connect fittings.

## Energy Exchange System Configuration

Energy exchange points or “transfer nodes” where ultra-low temperatures are applied to the system or process can be designed around standard manifolds, coils, milled plates or other highly specific tooling provided by the

customer or developed by Farrar Scientific in conjunction with an extensive network of resource alliances. Typically, transfer nodes are categorized as Direct Exchange, Chiller or Storage systems.

Farrar System Configurations			
<b>Node Type:</b>	Direct Exchange	Chiller	Storage
<b>Watt Density:</b>	High	Medium	Low
<b>Load:</b>	Highly Focused	Utility	Storage or Space
<b>Relative Uniformity:</b>	Very High	Medium	Low
<b>Engineering Required Per Node:</b>	High	Minimal to None, Plug and Play	Low to High
<b>Intellectual Property Sensitivity (Customer)</b>	High		Variable
<b>Relative Integration Effort Expected:</b>	High		Low
<b>Typical Applications:</b>	Plates, manifolds, three-dimensional or molded shapes for high point or large heat loads in concentrated location. Used for semiconductor and electrical component testing; temperature sensitive deposition; pharma processing and testing; reaction control.	Fluid baths, manifolds, liquid coils. Used as off-the-shelf additions to OEM products, cold traps, electron microscopes, process equipment and instrumentation.	Blast, -70°C process or storage freezers; reach-in and walk-in freezers. Used for pharmaceutical production, archiving, lifescience, biotechnology and industrial processing.

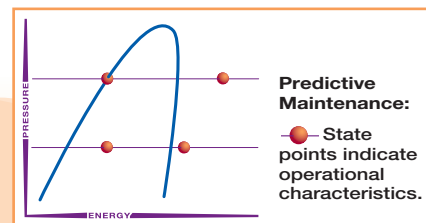
## Controls, Monitoring and Predictive Maintenance

Farrar Intermediate™ servers can be configured for use with standard or custom instrumentation. Instrumentation can be specified per customer specification, custom designed or acquired from open market sources.

All designs include strategic *operational* monitoring considerations as well as general *performance* and monitoring functions to optimize process management and control.

- Operational monitoring is achieved through data acquisition from thermocouples and transducers imbedded within the system during manufacturing to monitor *state points* or thermodynamic properties of selected refrigerants.

- The combination of *state point* monitoring, together with real-time data logging of electrical current, ambient temperature and other key parameters creates an accurate view of functional relationships necessary for predictive maintenance through local or remote monitoring.



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