F900

Precision Thermometry

- F900 Performance Validation Report
- F900 Noise model

TYPICAL APPLICATIONS
- Primary Thermometer Calibration
- Research
- Oceanography

www.isotechna.com
In world class metrology, the most important consideration is the quality of the fundamental measurement. ASL's F900 AC bridge technology represents a new peak of performance in resistance thermometer measurement and exploits the inherent advantages of AC bridge technology to maintain repeatable measurements of the highest precision under practical operating conditions.

25.5Ω SPRT referenced to a 25Ω reference resistor. AC bridge technology will always out-perform measurements made using DC technology with slow current reversal. These benefits are inherent to the fundamentals of electrical measurement and not just the implementation.

The F900 includes a wide range of features specifically tailored for temperature metrology. These include accurate programmable excitation current, √2 current, analogue outputs, selectable source impedance matching, gain and filter bandwidth. Manual or automatic bridge balancing together with manual or automatic control (IEEE interface) of the instrument ensure that the F900 can provide solutions in a wide range of measurement applications.
### FEATURES

<table>
<thead>
<tr>
<th>Digital display</th>
<th>R\textsubscript{i}/R\textsubscript{s} digital display 0.000 000 000 to 1.299 999 999</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bandwidth</td>
<td>Selectable: 0.5, 0.2, 0.1, 0.05, 0.02, 0.01, 0.005, 0.002, 0.001 Hz.</td>
</tr>
<tr>
<td>External Standard</td>
<td>AC/DC standard resistor or resistance thermometer.</td>
</tr>
<tr>
<td>Sensor current</td>
<td>0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50mA or x \sqrt{2} any value.</td>
</tr>
<tr>
<td>Sensor current frequency</td>
<td>User selectable frequencies: 25 or 75 Hz with 50 Hz supply 30 or 90 Hz with 60 Hz supply Phase locked to supply frequency.</td>
</tr>
<tr>
<td>Bridge balancing modes</td>
<td><strong>Automatic:</strong> via full self balance algorithm. <strong>Manual:</strong> via front panel switches (to 0.01ppm) and analogue meter</td>
</tr>
<tr>
<td>Lead connections</td>
<td>True four wire connections for resistance thermometer (R\textsubscript{i}) and standard resistor (R\textsubscript{s}). Accuracy is unaffected by series lead resistance, permitting measurements with long cables (100 metres for 25.5Ω SPRT referenced to a 25Ω reference resistor).</td>
</tr>
<tr>
<td>Quadrature balance</td>
<td>Eliminates effects of thermometer, resistor and cable reactance.</td>
</tr>
<tr>
<td>Active input guard</td>
<td>Eliminates effects of leakage from any terminal to ground.</td>
</tr>
<tr>
<td>Analogue output</td>
<td>Null balance: ±10V (unfiltered). Programmable: 0 - 10V (3 scale ranges).</td>
</tr>
</tbody>
</table>

### ACCESSORIES

- **SB148**: 10 channel auto/manual multiplexer, with individual preset "keep warm" current.
- **SB148.01**: As SB148, with 4 individual "keep warm" currents per channel.
- **SB158**: Driver/interface for up to 2 x SB148 or SB148.01 multiplexers (Specify RS232 or IEEE).
- **SB158.01**: Driver/interface for up to 6 x SB148 or SB148.01 multiplexers (Specify RS232 or IEEE).
- **F900/AS1 System**: F900 complete with SB148 and SB158 multiplexer in 19"/16U cabinet complete with power distribution and cutout.
- **F900/AS2 System**: As AS1 system, but with SB148.01 multiplexer.
- **RW1, 10, 25, 100, 300**: "Wilkins" AC/DC standard resistor. Values: 1, 10, 25, 100 and 300Ω.
- **RWTE**: Thermal enclosure for RW resistors.
- **FA-1**: Co-axial cable set converting from BNC to spade terminals.
- **FA-2**: Co-axial cable set with BNC connectors at one end.
- **FA-3**: 4 terminal to 2 x BNC connector, adaptor box.
- **F/ACC**: FA-1, FA-2 and FA-3 cable set.
### Specifications

**Accuracy**

<±20ppb  This is equivalent to a temperature of ±5μK for a 25.5Ω SPRT at 0°C referenced to a 25Ω standard resistor, or ±20mK for a 25.5Ω SPRT using a 100Ω standard resistor (κ = 2).

<table>
<thead>
<tr>
<th>Ratio Resolution</th>
<th>Standard Resistor</th>
<th>SPRT</th>
<th>Temperature Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEEE</td>
<td>0.5ppb</td>
<td>100Ω</td>
<td>25Ω</td>
</tr>
<tr>
<td>Front Panel</td>
<td>10ppb</td>
<td>100Ω</td>
<td>25Ω</td>
</tr>
</tbody>
</table>

**Measurement time**

- 20 seconds for full balance.
- 2 seconds for incremental balance.

**Warm up time**

None - first reading meets specification.

**Thermometers**

R₀.₀₁ of 100Ω, 25.5Ω, 2.5Ω, 0.25Ω and any intermediate value.

**Standard resistor range**

1Ω to 300Ω AC/DC resistance.

**Measurement range**

0 to 1.299 999 999 ratio of two resistors, R₁ to Rₛ, via IEEE-488 interface and 1.299 999 99 via front panel LED display using any value of Rₛ between 1Ω and 300Ω. e.g. 0 to 129.999 999 9 in 0.1μΩ steps (Rₛ = 100Ω).

Differential measurements between two external resistors or SPRTs can be made. e.g. an SPRT on each R₁ and Rₛ input.

**Operating conditions**

10°C to 29°C (50°F to 85°F), 10 to 90% RH.

**Power requirements**

240, 220, 120, 100 VAC (±10%) selectable on rear panel, 50 or 60 Hz, 250VA max

Specifications are subject to change without prior notice.

---

Isotech North America  
158 Brentwood Drive, Unit #4  
Colchester, VT 05446

Phone: (802) 863-8050  
Fax: (802) 863-8125  
sales@isotechna.com  
www.isotechna.com