

## Hazardous Temperature Locator / Valuator System

### Common Fire Alarms Detect Fires



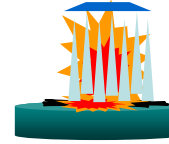
Developing situation ...



becomes a fire ...



if detected ...

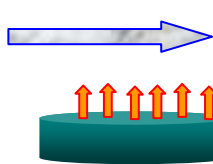


triggers extinguishing ...



ending in loss

### Early Abnormal Temperature Detection and Intervention



Developing situation ...

Intervention Now



is detected ...

located ...

Loss Averted



evaluated ... and abated ...

without loss

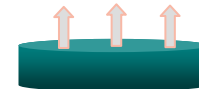
### Total Temperature Information Management



Determines normative temperature behavior, monitors and logs it.

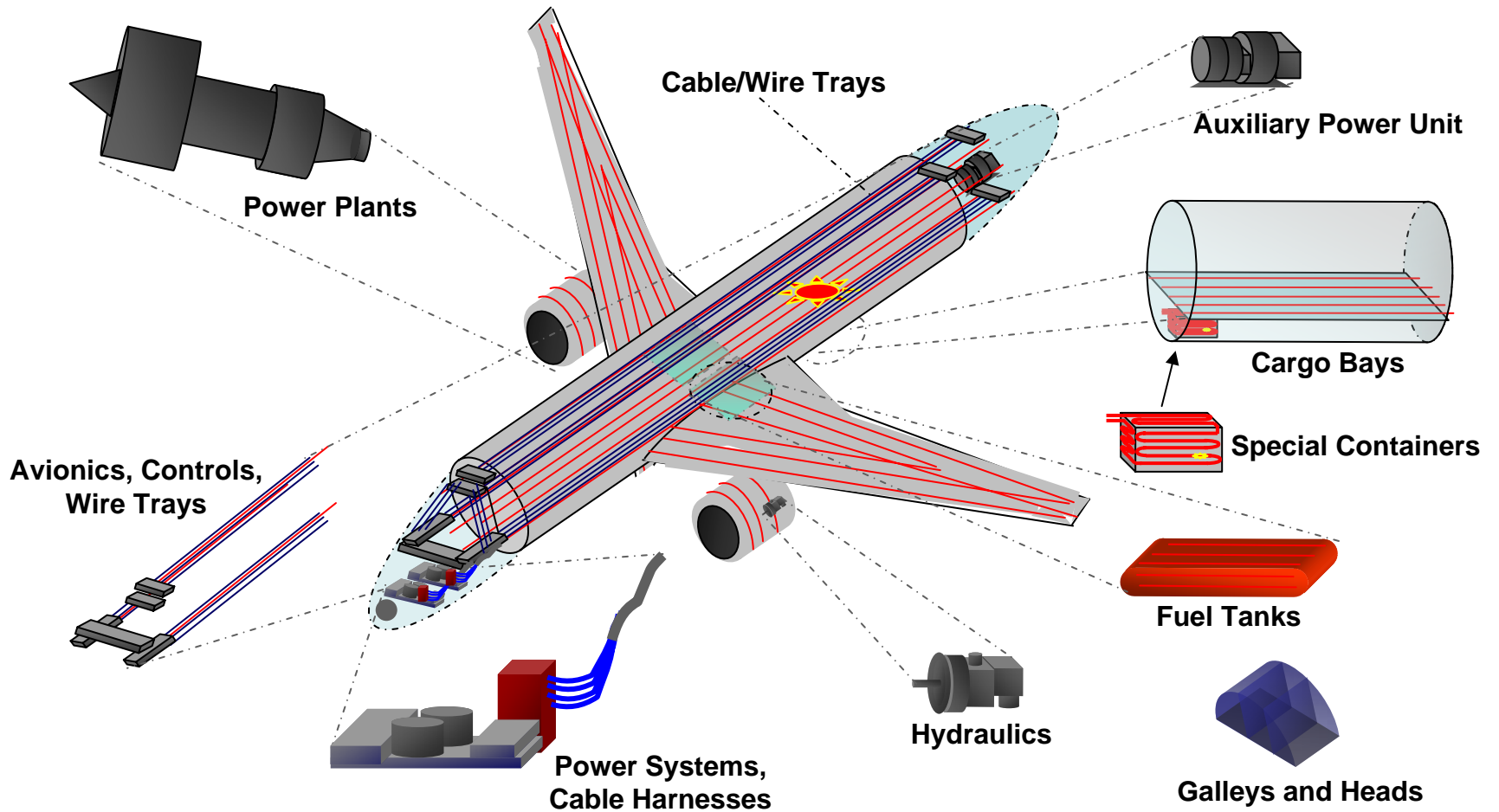


Detects abnormal temperature behavior, evaluates level of intervention needed, provides alerts and takes action, logs event.



Archival information provides key analysis tools to investigate abnormal events to prevent reoccurrence. Allows assets to operate consistently in their normal temperature zones.

## Hazardous Temperature Locator / Valuator System Provides Total Temperature Information Management in a Wide Range of Aircraft Applications



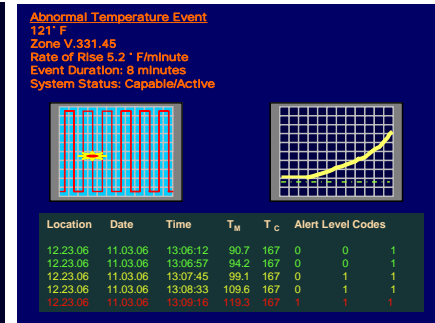
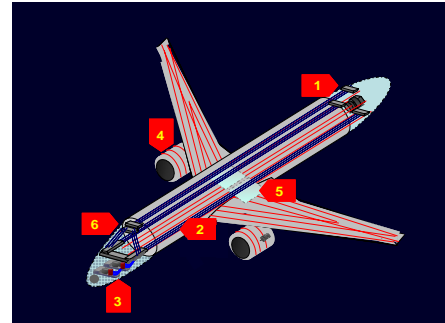
## Hazardous Temperature Locator / Evaluator System (HTLS)

**Unique Sensor and Powerful Real-Time Information System Provide Unprecedented Functionality and Security**

### HTLS DETECTS, LOCATES and DISPLAYS

abnormal temperature events between -40 and 1490 degrees F

- Highest Temperature Location and Value
- Highest Temperature Value
- Temperature Rate-of-Change
- Duration of Specific Event



### HTLS ALERTS, ALARMS, INITIATES PREDETERMINED ACTION TO AVERT DAMAGE AND LOSSES

| Log # | Date     | Time / S | System    | Location | Temp    | Priority | Rate/Min | Alarm | Action | Archive | Element / System |
|-------|----------|----------|-----------|----------|---------|----------|----------|-------|--------|---------|------------------|
| 0030  | 04.19.06 | 23:46:07 | Sec Power | V.331.45 | 112.3 F | 3.09     | 5.16     | 0     | 0      | BB.765  | 1 1              |
| 0029  | 04.19.06 | 23:46:57 | Sec Power | V.331.45 | 111.6 F | 3.09     | 9.38     | 0     | 0      | BB.765  | 1 1              |
| 0028  | 04.19.06 | 23:46:47 | Sec Power | V.331.45 | 110.1 F | 3.09     | 18.54    | 0     | 0      | BB.765  | 1 1              |
| 0027  | 04.19.06 | 23:46:37 | Sec Power | V.331.45 | 106.5 F | 3.09     | 16.98    | 0     | 0      | BB.765  | 1 1              |
| 0026  | 04.19.06 | 23:46:27 | Sec Power | V.331.45 | 103.8 F | 3.09     | 14.65    | 0     | 0      | BB.765  | 1 1              |
| 0025  | 04.19.06 | 23:46:17 | Sec Power | V.331.45 | 100.4 F | 3.09     | 9.31     | 0     | 0      | BB.765  | 1 1              |
| 0024  | 04.19.06 | 23:46:07 | Sec Power | V.331.45 | 98.9 F  | 3.09     | 6.92     | 0     | 0      | BB.765  | 1 1              |
| 0023  | 04.19.06 | 23:46:57 | Sec Power | V.331.45 | 97.9 F  | 3.09     | 5.40     | 0     | 0      | BB.765  | 1 1              |
| 0022  | 04.19.06 | 23:46:37 | Sec Power | V.331.45 | 96.1 F  | 3.09     | 2.39     | 0     | 0      | BB.765  | 1 1              |
| 0021  | 04.19.06 | 23:46:07 | Sec Power | V.331.45 | 94.5 F  | 3.09     | 0        | 0     | 0      | BB.765  | 1 1              |
| 0020  | 04.19.06 | 23:46:07 | Sec Power | V.331.45 | 94.5 F  | 3.09     | 0        | 0     | 0      | BB.765  | 1 1              |
| 0019  | 04.19.06 | 23:46:07 | Sec Power | V.331.45 | 94.5 F  | 3.09     | 0        | 0     | 0      | BB.765  | 1 1              |
| 0018  | 04.19.06 | 23:46:07 | Sec Power | V.331.45 | 94.5 F  | 3.09     | 0        | 0     | 0      | BB.765  | 1 1              |
| 0017  | 04.19.06 | 23:46:07 | Sec Power | V.331.45 | 94.5 F  | 3.09     | 0        | 0     | 0      | BB.765  | 1 1              |

Log Series Sector 3    04.19.06    23:46:16:09    Operator Code: 124

### HTLS CONTINUOUSLY ARCHIVES ALL INFORMATION FOR:

- Total Temperature Information Management
- Root Cause Analysis

| Log # | Date     | Time / S     | System    | Location | Temp    | Priority | Rate/Min | Alarm | Action | Archive | Element / System |
|-------|----------|--------------|-----------|----------|---------|----------|----------|-------|--------|---------|------------------|
| 0030  | 04.19.06 | 23:46:23 :07 | Sec Power | V.331.45 | 112.3 F | 3.09     | 5.16     | 0     | 0      | BB.765  | 1 1              |
| 0029  | 04.19.06 | 23:46:22 :57 | Sec Power | V.331.45 | 111.6 F | 3.09     | 9.38     | 0     | 0      | BB.765  | 1 1              |
| 0028  | 04.19.06 | 23:46:22 :47 | Sec Power | V.331.45 | 110.1 F | 3.09     | 18.54    | 0     | 0      | BB.765  | 1 1              |
| 0027  | 04.19.06 | 23:46:22 :37 | Sec Power | V.331.45 | 106.5 F | 3.09     | 16.98    | 0     | 0      | BB.765  | 1 1              |
| 0026  | 04.19.06 | 23:46:22 :27 | Sec Power | V.331.45 | 103.8 F | 3.09     | 14.65    | 0     | 0      | BB.765  | 1 1              |
| 0025  | 04.19.06 | 23:46:22 :17 | Sec Power | V.331.45 | 100.4 F | 3.09     | 9.31     | 0     | 0      | BB.765  | 1 1              |
| 0024  | 04.19.06 | 23:46:22 :07 | Sec Power | V.331.45 | 98.9 F  | 3.09     | 6.92     | 0     | 0      | BB.765  | 1 1              |
| 0023  | 04.19.06 | 23:46:21 :57 | Sec Power | V.331.45 | 97.9 F  | 3.09     | 5.40     | 0     | 0      | BB.765  | 1 1              |
| 0022  | 04.19.06 | 23:46:21 :37 | Sec Power | V.331.45 | 96.1 F  | 3.09     | 2.39     | 0     | 0      | BB.765  | 1 1              |
| 0021  | 04.19.06 | 23:46:21 :07 | Sec Power | V.331.45 | 94.5 F  | 3.09     | 0        | 0     | 0      | BB.765  | 1 1              |
| 0020  | 04.19.06 | 23:46:20 :07 | Sec Power | V.331.45 | 94.5 F  | 3.09     | 0        | 0     | 0      | BB.765  | 1 1              |
| 0019  | 04.19.06 | 23:46:19 :07 | Sec Power | V.331.45 | 94.5 F  | 3.09     | 0        | 0     | 0      | BB.765  | 1 1              |
| 0018  | 04.19.06 | 23:46:18 :07 | Sec Power | V.331.45 | 94.5 F  | 3.09     | 0        | 0     | 0      | BB.765  | 1 1              |
| 0017  | 04.19.06 | 23:46:17 :07 | Sec Power | V.331.45 | 94.5 F  | 3.09     | 0        | 0     | 0      | BB.765  | 1 1              |

Log Series Sector 3    04.19.06    23:46:16:09    Operator Code: 124

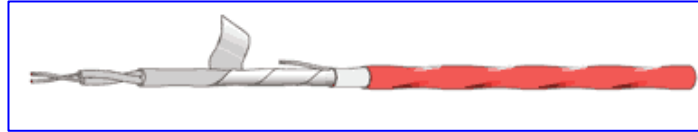
## Hazardous Temperature Locator / Valuator System - Aircraft Applications

Two Types of Sensor Element for Every Application from from – 40 to 1490 degrees F

### Teflon<sup>®</sup> Jacketed

-40 to 350°F (-40 to 150°C)

Element weight: 1.63 lb per 100 feet



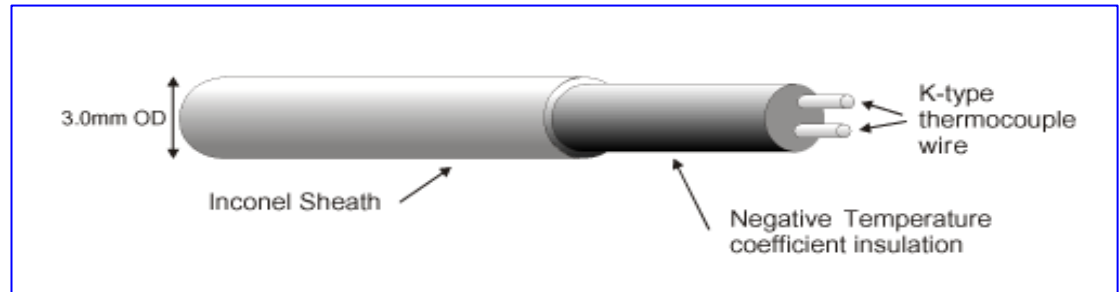
*Teflon Jacket, Flexible Type K Element. Up to 2000 ft maximum length.*

### High Temperature, Hostile, Rugged Environments

### Inconel<sup>®</sup> Sheathed

-40 to 1490°F (-40 to 810°C)

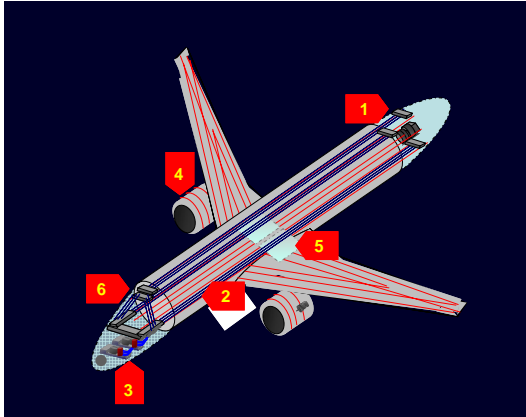
Element weight: 2.56 lb per 100 feet



*Bendable Inconel<sup>®</sup> Sheathed Type K Element. Up to 140 ft maximum length.*

## Hazardous Temperature Locator / Valuator System - Aircraft Applications Wide Variety of Intelligent Display Possibilities

Sequence of Events / Priority Location  
Graphic Display



Abnormal Temperature Event  
Location/Value/Trend/Log Display

**Abnormal Temperature Event**  
121° F  
Zone V.331.45  
Rate of Rise 5.2 ° F/minute  
Event Duration: 8 minutes  
System Status: Capable/Active

| Location | Date     | Time     | T <sub>M</sub> | T <sub>C</sub> | Alert Level Codes |
|----------|----------|----------|----------------|----------------|-------------------|
| 12.23.06 | 11.03.06 | 13:06:12 | 90.7           | 167            | 0 0 1             |
| 12.23.06 | 11.03.06 | 13:06:57 | 94.2           | 167            | 0 0 1             |
| 12.23.06 | 11.03.06 | 13:07:45 | 99.1           | 167            | 0 1 1             |
| 12.23.06 | 11.03.06 | 13:08:33 | 109.6          | 167            | 0 1 1             |
| 12.23.06 | 11.03.06 | 13:09:16 | 119.3          | 167            | 1 1 1             |

Abnormal Temperature Event Quick Alert

**Abnormal Temperature Event**

121° F  
Zone D6

Rate of Rise 5.2 ° F/minute  
Event Duration: 8 minutes  
System Status: Capable/Active

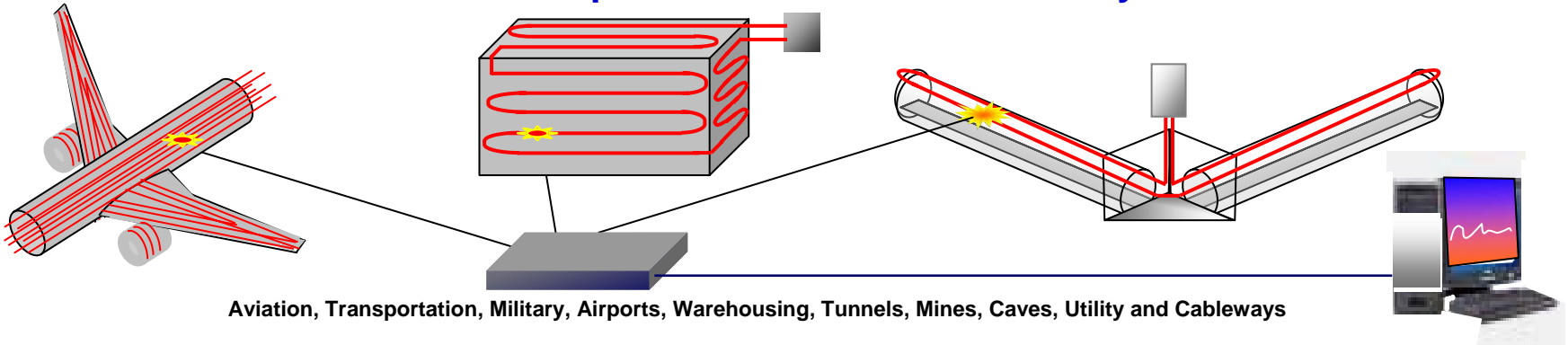
Real-Time Event  
Alarm/ Action Log

| Log #   | Date     | Time / S  | System    | Location | Temp    | Priority | Rate/Min | Alarm | Action | Archive | Element / System |
|---|----------|-----------|-----------|----------|---------|----------|----------|-------|--------|---------|------------------|
| 0030  | 04.19.06 | 23:46 :07 | Sec Power | V.331.45 | 112.3 F | 3.09     | 5.16     | 0     | 0      | BB.765  | 1 1              |
| 0029  | 04.19.06 | 23:46 :57 | Sec Power | V.331.45 | 111.6 F | 3.09     | 9.38     | 0     | 0      | BB.765  | 1 1              |
| 0028  | 04.19.06 | 23:46 :47 | Sec Power | V.331.45 | 110.1 F | 3.09     | 18.54    | 0     | 0      | BB.765  | 1 1              |
| 0027  | 04.19.06 | 23:46 :37 | Sec Power | V.331.45 | 106.5 F | 3.09     | 16.98    | 0     | 0      | BB.765  | 1 1              |
| 0026  | 04.19.06 | 23:46 :27 | Sec Power | V.331.45 | 103.8 F | 3.09     | 14.65    | 0     | 0      | BB.765  | 1 1              |
| 0025  | 04.19.06 | 23:46 :17 | Sec Power | V.331.45 | 100.4 F | 3.09     | 9.31     | 0     | 0      | BB.765  | 1 1              |
| 0024  | 04.19.06 | 23:46 :07 | Sec Power | V.331.45 | 98.9 F  | 3.09     | 6.92     | 0     | 0      | BB.765  | 1 1              |
| 0023  | 04.19.06 | 23:46 :57 | Sec Power | V.331.45 | 97.9 F  | 3.09     | 5.40     | 0     | 0      | BB.765  | 1 1              |
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| 0021  | 04.19.06 | 23:46 :27 | Sec Power | V.331.45 | 94.5 F  | 3.09     | 0        | 0     | 0      | BB.765  | 1 1              |
| 0020  | 04.19.06 | 23:46 :17 | Sec Power | V.331.45 | 94.5 F  | 3.09     | 0        | 0     | 0      | BB.765  | 1 1              |
| 0019  | 04.19.06 | 23:46 :07 | Sec Power | V.331.45 | 94.5 F  | 3.09     | 0        | 0     | 0      | BB.765  | 1 1              |
| 0018  | 04.19.06 | 23:46 :07 | Sec Power | V.331.45 | 94.5 F  | 3.09     | 0        | 0     | 0      | BB.765  | 1 1              |
| 0017  | 04.19.06 | 23:46 :07 | Sec Power | V.331.45 | 94.5 F  | 3.09     | 0        | 0     | 0      | BB.765  | 1 1              |
| Log Series Sector 3 04.19.06 23:46:16:09 Operator Code: 124 |          |           |           |          |         |          |          |       |        |         |                  |

Archival Event Log

| Log #   | Date     | Time / S  | System    | Location | Temp    | Priority | Rate/Min | Alarm | Action | Archive | Element / System |
|---|----------|-----------|-----------|----------|---------|----------|----------|-------|--------|---------|------------------|
| 0030  | 04.19.06 | 23:46 :07 | Sec Power | V.331.45 | 112.3 F | 3.09     | 5.16     | 0     | 0      | BB.765  | 1 1              |
| 0029  | 04.19.06 | 23:46 :57 | Sec Power | V.331.45 | 111.6 F | 3.09     | 9.38     | 0     | 0      | BB.765  | 1 1              |
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| 0027  | 04.19.06 | 23:46 :37 | Sec Power | V.331.45 | 106.5 F | 3.09     | 16.98    | 0     | 0      | BB.765  | 1 1              |
| 0026  | 04.19.06 | 23:46 :27 | Sec Power | V.331.45 | 103.8 F | 3.09     | 14.65    | 0     | 0      | BB.765  | 1 1              |
| 0025  | 04.19.06 | 23:46 :17 | Sec Power | V.331.45 | 100.4 F | 3.09     | 9.31     | 0     | 0      | BB.765  | 1 1              |
| 0024  | 04.19.06 | 23:46 :07 | Sec Power | V.331.45 | 98.9 F  | 3.09     | 6.92     | 0     | 0      | BB.765  | 1 1              |
| 0023  | 04.19.06 | 23:46 :57 | Sec Power | V.331.45 | 97.9 F  | 3.09     | 5.40     | 0     | 0      | BB.765  | 1 1              |
| 0022  | 04.19.06 | 23:46 :37 | Sec Power | V.331.45 | 96.1 F  | 3.09     | 2.39     | 0     | 0      | BB.765  | 1 1              |
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| 0020  | 04.19.06 | 23:46 :17 | Sec Power | V.331.45 | 94.5 F  | 3.09     | 0        | 0     | 0      | BB.765  | 1 1              |
| 0019  | 04.19.06 | 23:46 :07 | Sec Power | V.331.45 | 94.5 F  | 3.09     | 0        | 0     | 0      | BB.765  | 1 1              |
| 0018  | 04.19.06 | 23:46 :07 | Sec Power | V.331.45 | 94.5 F  | 3.09     | 0        | 0     | 0      | BB.765  | 1 1              |
| 0017  | 04.19.06 | 23:46 :07 | Sec Power | V.331.45 | 94.5 F  | 3.09     | 0        | 0     | 0      | BB.765  | 1 1              |
| Log Series Sector 3 04.19.06 23:46:16:09 Operator Code: 124 |          |           |           |          |         |          |          |       |        |         |                  |

## Hazardous Temperature Locator / Valuator System



- **Unique Lightweight\* Sensor and Advanced Electronics System Provide Unparalleled Use of Continuous Real-Time Information**

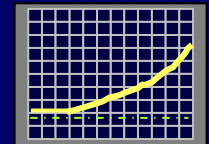
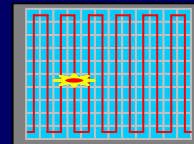
**Detects the Location and Highest Temperature Value Sensed anywhere along its length and provides the following Real-Time Information:**

- **Precise Location of Highest Temperature**
- **Value of Highest Temperature and Instantaneous Rate-of-Change**
- **Archive and Sequence-of-Events Analysis**
- **Sensor and System Condition / Status**

### Abnormal Temperature Event

121° F  
Zone D6

Rate of Rise 5.2 ° F/minute  
Event Duration: 8 minutes  
System Status: Capable/Active



**Detects – Locates – Indicates – Alerts – Archives- Analyzes**

## **-Unique Sensor and Powerful Real-Time Information System Provide Unprecedented Functionality and Security**

Unlike fixed-point fire sensor systems, HTLS continuously monitors and archives the highest temperature during NORMAL operation in the range of -40 and 350 degrees F (Teflon) or -40 and 1490 degrees F (Inconel). (HTLS is always working, always ready).

- **HTLS DETECTS and DISPLAYS** any abnormal temperature event.
  - Improperly functioning or overheating equipment, power overloads
  - Breached containment, leaks
  - Deteriorated insulation and seals
- **HTLS PRECISELY LOCATES** any abnormal temperature event.
- **HTLS ALERTS, ALARMS, TAKES PREDETERMINED ACTION.** System can be configured to suggest corrective action to operator. HTLS can combine abnormal temperature information with other real-time information about aircraft operation to facilitate on-line real-time operations analysis.
- **HTLS CONTINUOUSLY ARCHIVES ALL INFORMATION** for later investigation:
  - Normal Operations Analysis – the aircraft operates the same correct way each time during normal operation – temperatures within their normal predictable range.
  - Root-Cause Analysis – finding specific underlying causes for variability in temperatures during normal operation, or abnormal temperature events that without intervention, could lead to fire or explosion with ensuing losses and damage.