

Certificate of Calibration

Certificate Number: 122932

Document Number: 87300

Customer Details:

Customer Name: DOD ARMY APG US ARMY RESEARCH LAB

Instrument Details:

| | | | |
|-------------------|-------------------------------|-------------------|-----------------|
| Manufacturer: | EXTECH INSTRUMENTS | Calibration Date: | January 8, 2015 |
| Description: | 12 CHANNEL THERMOCOUPLE DATAL | Calibration Due: | January 8, 2016 |
| Model Number: | TM500 | Cal. Interval: | 12 MONTHS |
| Serial Number: | Z325771 | As Received: | NEW |
| Equip. ID Number: | 30JZ54 | | |

Environmental Details:

Temperature: 21 Deg. +/- 5 C

Relative Humidity: 40 % +/- 15 %

Procedures Used:

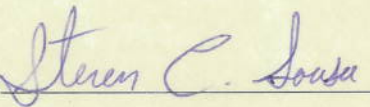
Calibration Procedure: EICMTM500-CP

Certification

Extech Instruments certifies that the instrument listed above meets the specifications of the manufacturer at the completion of its calibration. Standards used are traceable to the National Institute of Standards and Technology (NIST), or have been derived from accepted values, natural physical constants, or through the use of the ratio method of self-calibration techniques. Methods used are in accordance with ISO 10012-1 and ANSI/NCSL Z540-1-1994. This certificate is not to be reproduced other than in full, except with prior written approval of Extech Instruments Corporation. All the calibration standards used have an accuracy ratio of 4:1 or better, unless otherwise stated.

Technicians Notes:

Technician: DOLORES CHAPLIN

Approved By: 

Certificate of Calibration

Certificate Number: 122932

Document Number: 87300

Model Number: TM500

S/N: Z325771

As Received

Calibration Data

| Standard | UUT | Accuracy | High Limit | Low Limit | Error | Status |
|-----------------------|-------|---------------------------|------------|-----------|-------|--------|
| Function: Type K - T1 | | | | | | |
| -90.0Deg C | -90.2 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | -0.2 | PASS |
| 150.0Deg C | 149.8 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | -0.2 | PASS |
| 500.0Deg C | 499.9 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | -0.1 | PASS |
| 850.0Deg C | 849.7 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | -0.3 | PASS |
| 1200Deg C | 1200 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | 0 | PASS |

Function: Type K - T2

| | | | | | | |
|------------|-------|---------------------------|-------|-------|------|------|
| -90.0Deg C | -90.2 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | -0.2 | PASS |
| 150.0Deg C | 149.9 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | -0.1 | PASS |
| 500.0Deg C | 499.9 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | -0.1 | PASS |
| 850.0Deg C | 849.7 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | -0.3 | PASS |
| 1200Deg C | 1200 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | 0 | PASS |

Function: Type K - T3

| | | | | | | |
|------------|-------|---------------------------|-------|-------|------|------|
| -90.0Deg C | -90.2 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | -0.2 | PASS |
| 150.0Deg C | 149.8 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | -0.2 | PASS |
| 500.0Deg C | 499.9 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | -0.1 | PASS |
| 850.0Deg C | 849.8 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | -0.2 | PASS |
| 1200Deg C | 1200 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | 0 | PASS |

Function: Type K - T4

| | | | | | | |
|------------|-------|---------------------------|-------|-------|------|------|
| -90.0Deg C | -90.2 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | -0.2 | PASS |
| 150.0Deg C | 149.9 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | -0.1 | PASS |
| 500.0Deg C | 500.0 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | 0.0 | PASS |
| 850.0Deg C | 849.8 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | -0.2 | PASS |
| 1200Deg C | 1200 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | 0 | PASS |

Function: Type K - T5

| | | | | | | |
|------------|-------|---------------------------|-------|-------|-----|------|
| -90.0Deg C | -89.9 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | 0.1 | PASS |
| 150.0Deg C | 150.1 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | 0.1 | PASS |
| 500.0Deg C | 500.1 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | 0.1 | PASS |
| 850.0Deg C | 850.0 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | 0.0 | PASS |
| 1200Deg C | 1200 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | 0 | PASS |

Function: Type K - T6

| | | | | | | |
|------------|-------|---------------------------|-------|-------|------|------|
| -90.0Deg C | -90.1 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | -0.1 | PASS |
| 150.0Deg C | 150.0 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | 0.0 | PASS |
| 500.0Deg C | 500.0 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | 0.0 | PASS |
| 850.0Deg C | 849.8 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | -0.2 | PASS |
| 1200Deg C | 1200 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | 0 | PASS |

Certificate of Calibration

Certificate Number: 122932

Document Number: 87300

Model Number: TM500

S/N: Z325771

As Received

Calibration Data

| Standard | UUT | Accuracy | High Limit | Low Limit | Error | Status |
|-----------------------|-------|---------------------------|------------|-----------|-------|--------|
| Function: Type K - T7 | | | | | | |
| -90.0Deg C | -90.1 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | -0.1 | PASS |
| 150.0Deg C | 149.9 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | -0.1 | PASS |
| 500.0Deg C | 499.9 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | -0.1 | PASS |
| 850.0Deg C | 849.7 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | -0.3 | PASS |
| 1200Deg C | 1200 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | 0 | PASS |

Function: Type K - T8

| | | | | | | |
|------------|-------|---------------------------|-------|-------|------|------|
| -90.0Deg C | -90.0 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | 0.0 | PASS |
| 150.0Deg C | 149.9 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | -0.1 | PASS |
| 500.0Deg C | 500.0 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | 0.0 | PASS |
| 850.0Deg C | 849.9 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | -0.1 | PASS |
| 1200Deg C | 1200 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | 0 | PASS |

Function: Type K - T9

| | | | | | | |
|------------|-------|---------------------------|-------|-------|------|------|
| -90.0Deg C | -90.2 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | -0.2 | PASS |
| 150.0Deg C | 149.8 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | -0.2 | PASS |
| 500.0Deg C | 499.8 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | -0.2 | PASS |
| 850.0Deg C | 849.7 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | -0.3 | PASS |
| 1200Deg C | 1200 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | 0 | PASS |

Function: Type K - T10

| | | | | | | |
|------------|-------|---------------------------|-------|-------|------|------|
| -90.0Deg C | -90.2 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | -0.2 | PASS |
| 150.0Deg C | 149.9 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | -0.1 | PASS |
| 500.0Deg C | 499.9 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | -0.1 | PASS |
| 850.0Deg C | 849.8 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | -0.2 | PASS |
| 1200Deg C | 1199 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | -1 | PASS |

Function: Type K - T11

| | | | | | | |
|------------|-------|---------------------------|-------|-------|------|------|
| -90.0Deg C | -90.1 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | -0.1 | PASS |
| 150.0Deg C | 149.9 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | -0.1 | PASS |
| 500.0Deg C | 499.9 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | -0.1 | PASS |
| 850.0Deg C | 849.7 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | -0.3 | PASS |
| 1200Deg C | 1200 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | 0 | PASS |

Function: Type K - T12

| | | | | | | |
|------------|-------|---------------------------|-------|-------|------|------|
| -90.0Deg C | -90.0 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | 0.0 | PASS |
| 150.0Deg C | 150.0 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | 0.0 | PASS |
| 500.0Deg C | 500.0 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | 0.0 | PASS |
| 850.0Deg C | 849.7 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | -0.3 | PASS |
| 1200Deg C | 1199 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | -1 | PASS |

Certificate of Calibration

Certificate Number: 122932

Document Number: 87300

Final Reading

Calibration Data

| Standard | UUT | Accuracy | High Limit | Low Limit | Error | Status |
|----------|-----|----------|------------|-----------|-------|--------|
|----------|-----|----------|------------|-----------|-------|--------|

Function: Type K - T1

| | | | | | | |
|-------------|-------|---------------------------|-------|-------|------|------|
| -90.0 Deg C | -90.2 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | -0.2 | PASS |
| 150.0 Deg C | 149.8 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | -0.2 | PASS |
| 500.0 Deg C | 499.9 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | -0.1 | PASS |
| 850.0 Deg C | 849.7 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | -0.3 | PASS |
| 1200 Deg C | 1200 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | 0 | PASS |

Function: Type K - T2

| | | | | | | |
|-------------|-------|---------------------------|-------|-------|------|------|
| -90.0 Deg C | -90.2 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | -0.2 | PASS |
| 150.0 Deg C | 149.9 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | -0.1 | PASS |
| 500.0 Deg C | 499.9 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | -0.1 | PASS |
| 850.0 Deg C | 849.7 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | -0.3 | PASS |
| 1200 Deg C | 1200 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | 0 | PASS |

Function: Type K - T3

| | | | | | | |
|-------------|-------|---------------------------|-------|-------|------|------|
| -90.0 Deg C | -90.2 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | -0.2 | PASS |
| 150.0 Deg C | 149.8 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | -0.2 | PASS |
| 500.0 Deg C | 499.9 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | -0.1 | PASS |
| 850.0 Deg C | 849.8 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | -0.2 | PASS |
| 1200 Deg C | 1200 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | 0 | PASS |

Function: Type K - T4

| | | | | | | |
|-------------|-------|---------------------------|-------|-------|------|------|
| -90.0 Deg C | -90.2 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | -0.2 | PASS |
| 150.0 Deg C | 149.9 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | -0.1 | PASS |
| 500.0 Deg C | 500.0 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | 0.0 | PASS |
| 850.0 Deg C | 849.8 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | -0.2 | PASS |
| 1200 Deg C | 1200 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | 0 | PASS |

Function: Type K - T5

| | | | | | | |
|-------------|-------|---------------------------|-------|-------|-----|------|
| -90.0 Deg C | -89.9 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | 0.1 | PASS |
| 150.0 Deg C | 150.1 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | 0.1 | PASS |
| 500.0 Deg C | 500.1 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | 0.1 | PASS |
| 850.0 Deg C | 850.0 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | 0.0 | PASS |
| 1200 Deg C | 1200 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | 0 | PASS |

Function: Type K - T6

| | | | | | | |
|-------------|-------|---------------------------|-------|-------|------|------|
| -90.0 Deg C | -90.1 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | -0.1 | PASS |
| 150.0 Deg C | 150.0 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | 0.0 | PASS |
| 500.0 Deg C | 500.0 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | 0.0 | PASS |
| 850.0 Deg C | 849.8 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | -0.2 | PASS |
| 1200 Deg C | 1200 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | 0 | PASS |

Certificate of Calibration

Certificate Number: 122932

Document Number: 87300

Final Reading

Calibration Data

| Standard | UUT | Accuracy | High Limit | Low Limit | Error | Status |
|------------------------------|-------|---------------------------|------------|-----------|-------|--------|
| Function: Type K - T7 | | | | | | |
| -90.0 Deg C | -90.1 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | -0.1 | PASS |
| 150.0 Deg C | 149.9 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | -0.1 | PASS |
| 500.0 Deg C | 499.9 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | -0.1 | PASS |
| 850.0 Deg C | 849.7 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | -0.3 | PASS |
| 1200 Deg C | 1200 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | 0 | PASS |

Function: Type K - T8

| | | | | | | |
|-------------|-------|---------------------------|-------|-------|------|------|
| -90.0 Deg C | -90.0 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | 0.0 | PASS |
| 150.0 Deg C | 149.9 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | -0.1 | PASS |
| 500.0 Deg C | 500.0 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | 0.0 | PASS |
| 850.0 Deg C | 849.9 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | -0.1 | PASS |
| 1200 Deg C | 1200 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | 0 | PASS |

Function: Type K - T9

| | | | | | | |
|-------------|-------|---------------------------|-------|-------|------|------|
| -90.0 Deg C | -90.2 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | -0.2 | PASS |
| 150.0 Deg C | 149.8 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | -0.2 | PASS |
| 500.0 Deg C | 499.8 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | -0.2 | PASS |
| 850.0 Deg C | 849.7 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | -0.3 | PASS |
| 1200 Deg C | 1200 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | 0 | PASS |

Function: Type K - T10

| | | | | | | |
|-------------|-------|---------------------------|-------|-------|------|------|
| -90.0 Deg C | -90.2 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | -0.2 | PASS |
| 150.0 Deg C | 149.9 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | -0.1 | PASS |
| 500.0 Deg C | 499.9 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | -0.1 | PASS |
| 850.0 Deg C | 849.8 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | -0.2 | PASS |
| 1200 Deg C | 1199 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | -1 | PASS |

Function: Type K - T11

| | | | | | | |
|-------------|-------|---------------------------|-------|-------|------|------|
| -90.0 Deg C | -90.1 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | -0.1 | PASS |
| 150.0 Deg C | 149.9 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | -0.1 | PASS |
| 500.0 Deg C | 499.9 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | -0.1 | PASS |
| 850.0 Deg C | 849.7 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | -0.3 | PASS |
| 1200 Deg C | 1200 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | 0 | PASS |

Function: Type K - T12

| | | | | | | |
|-------------|-------|---------------------------|-------|-------|------|------|
| -90.0 Deg C | -90.0 | +/- (0.4%rdg + 1 Deg C) | -88.6 | -91.4 | 0.0 | PASS |
| 150.0 Deg C | 150.0 | +/- (0.4%rdg + 0.5 Deg C) | 150.7 | 149.3 | 0.0 | PASS |
| 500.0 Deg C | 500.0 | +/- (0.4%rdg + 0.5 Deg C) | 502.1 | 497.9 | 0.0 | PASS |
| 850.0 Deg C | 849.7 | +/- (0.4%rdg + 0.5 Deg C) | 853.5 | 846.5 | -0.3 | PASS |
| 1200 Deg C | 1199 | +/- (0.4%rdg + 1 Deg C) | 1206 | 1194 | -1 | PASS |

UUT-Unit Under Test

Certificate of Calibration

Certificate Number: 122932

Document Number: 87300

Standards Used

| Manufacturer | Model # | Serial # | Description | Cal. Due Date |
|--------------|---------|----------|--------------------------|---------------|
| FLUKE | 525A | 8974212 | TEMP/PRESSURE CALIBRATOR | March 6, 2015 |