

SOUTHWEST RESEARCH INSTITUTE  
Department of Quality Assurance  
Calibration Laboratory • 522-5215

WORK ORDER

WORK ORDER # 36431 ASSET # 007617 DATE 15 Oct. 99

ITEM DATA:

Manufacturer Koff Model ASTM 910  
Description Thermometer Serial # 1709  
Accessories \_\_\_\_\_

ACTION REQUESTED cal

CUSTODIAN DU. 20, Melissa Nugent

Turned in by: \_\_\_\_\_ Phone 6565

CHARGE # 20.01402.871 Date Required \_\_\_\_\_

INSTRUMENT USED ON:  (DOD/NASA)  (NUCLEAR)  (GLP)  (SPPE)  (ISO)  
 OTHER \_\_\_\_\_

COPY OF CALIBRATION CERTIFICATE  (Yes)  (No)

NEW WORK  Yes  No If yes, an evaluation shall be made to verify capabilities.

By MAD Date 10/15/99

Work involves proprietary/confidential information or equipment  (Yes)  (No)

CONDITION RECEIVED: \_\_\_\_\_ Out of tolerance  
\_\_\_\_\_  In tolerance  
\_\_\_\_\_ Damaged (Contact customer)  
\_\_\_\_\_ Contact \_\_\_\_\_ Date \_\_\_\_\_  
\_\_\_\_\_  Received into system, introduced or reactivated

ACTION TAKEN: (Calibration/Repair/Parts) cal over

CAL ENVIRONMENT:  
Temperature \_\_\_\_\_ °F Humidity 42 %RH

CALIBRATED/REPAIRED:  
By [Signature] Cal Procedure OL9 MM 99  
Date 19 Oct 99 Accuracy ±1°  
Cal Interval 6 Reliability Code 1  
Next Cal Due 5 PR 00 Cal Time 15 Repair Time \_\_\_\_\_  
Standards used (Asset #) 5243 5174

DATE COMPLETED 15 Oct 99

DATE PICKED UP 10/21/99 PICKED UP BY [Signature]

Melissa Nugent

36431  
150  
[Signature]





Southwest Research Institute  
6220 Culebra Road  
San Antonio, TX 78238  
(210) 522-5215  
Department of Quality Assurance  
Calibration Laboratory

## Certificate of Calibration

20 October 1999

**Issued to:** MELISSA NUGENT DIV20 B57  
**Manufacturer/Model:** ERTCO ASTM 91 C  
**Description:** THERMOMETER  
**Serial Number:** 1709  
**Asset Number:** 007617

This certifies the above item was calibrated in compliance with MIL-STD-45662A and ANSI/NCSL Z540-1-1994. Standards used in this calibration, described in the referenced calibration procedure with associated uncertainties or tolerances, are traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and is available for examination upon request. This certificate is not to be reproduced, except in full, without the written approval of the Southwest Research Institute Department of Quality Assurance Calibration Laboratory.

The uncertainty of the calibration was sufficient to determine that the item met the manufacturer's published specifications unless stated otherwise below.

**Ambient Conditions:** Temperature: 76.0 Degrees Fahrenheit Humidity: 42 % RH


**Calibration Date:** 19 Oct 99 **Calibration Procedure:** CL-9 MAY 99

**Condition as Received:** IN TOLERANCE

**Condition as Released:** IN TOLERANCE

**Remarks:**

**Approved by:**

  
\_\_\_\_\_  
Jim Patterson, Supervisor or Walt Hill, Metrologist

**Certificate # 36431**

m:\nona2la.rpt Rev date 13 Apr 99

**Measurements performed by:**

  
\_\_\_\_\_  
Jerry White, Technician

Page 1 of 1

# WORK ORDER 38920

Date Received 5/1/00

Asset No. 007617 Manufacturer ERTCO Model ASTM 91 C  
Description THERMOMETER Serial Number 1709  
Accessory Received/Required CASE  
Div/CC ID NONE Accessory to Asset No. N/A  
Div/CC DIV20 Location B57 Custodian MELISSA NUGENT Tel. 6565  
Charge/Project No. 20.00751.006 Proprietary/Confidential N Date Required ROUTINE  
Work Requested CALIBRATION  
Receiving Inspection O.K.  
Delivered By MELISSA NUGENT Tel. 6565

### WORK HISTORY

Date	Start Time	Stop Time	Notes

### PARTS

Part Name	Part Number	Cost	Failure Description

### WORK SUMMARY

Failure Description \_\_\_\_\_

Repair Action \_\_\_\_\_

Cal Procedure CL-9, 5/99 Temp 75 F Hum 44 %

Tech 8216 Cal Hrs. 2.5 Repair Hrs. \_\_\_\_\_ Part Cost \_\_\_\_\_

Action Taken Calibrated per Procedure

Standards Used 219, 5174

Date Cal 2 May 00 Int. 6 Mo. Date Due 2 Nov 00 Reliability Code 2

Date Picked Up 6/7/2000 Picked Up By Melissa Nugent

38920

# SOUTHWEST RESEARCH INSTITUTE

CALIBRATION LABORATORY

6220 CULEBRA ROAD POST OFFICE DRAWER 28510 SAN ANTONIO, TEXAS 78228-0510 TEL (210) 522-5215 FAX (210) 522-3692

Receipt for Work Order 38920 Date Received 5/1/00

Asset No. 007617 Manufacturer ERTCO Model ASTM 91 C

Description THERMOMETER Serial Number 1709

Accessory Received/Required CASE

Div/CC ID NONE Accessory to Asset No. N/A Accuracy +/- .1DEG C

Div/CC DIV20 Location B57 Custodian MELISSA NUGENT Tel. 6565

Charge/Project No. 20.00751.006 Proprietary/Confidential N Date Required ROUTINE

Work Requested CALIBRATION

Receiving Inspection O.K.

Delivered By MELISSA NUGENT Tel. 6565

## CUSTOMER COMMENTS REQUESTED

The Calibration Laboratory staff is committed to good laboratory practice and providing our customers quality calibration services. Please rate how well we are meeting our goal and provide us with your recommendations for improvement.

Quality of service provided	_____	Rating Scale
Turn-around time	_____	4 = Excellent
Certificates	_____	3 = Good
Calibration labels	_____	2 = Acceptable
Recall notification	_____	1 = Needs improvement
Condition of returned equipment	_____	
Overall service	_____	

Please check all that apply: Equipment user  Delivery person  Custodian

**IF WE PLEASE YOU, TELL OTHERS; IF NOT, TELL US.**

COMMENTS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Name \_\_\_\_\_ Tel. \_\_\_\_\_





Southwest Research Institute  
6220 Culebra Road  
San Antonio, TX 78238  
(210) 522-5215  
Department of Quality Assurance  
Calibration Laboratory

Accredited



Certificate #  
0972-01

## Certificate of Calibration

2 May 2000

**Issued to:** MELISSA NUGENT DIV20 B57  
**Manufacturer/Model:** ERTCO ASTM 91 C  
**Description:** THERMOMETER  
**Serial Number:** 1709  
**Asset Number:** 007617

This certifies the above item was calibrated in compliance with MIL-STD-45662A and ANSI/NC SL Z540-1-1994. The results of this calibration relate only to the individual item as described above. Standards used in this calibration, described in the referenced calibration procedure with associated uncertainties or tolerances, are traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and available for examination upon request. This certificate is not to be reproduced, except in full, without the written approval of the Southwest Research Institute Department of Quality Assurance Calibration Laboratory.

This laboratory is accredited by the American Association for Laboratory Accreditation (A2LA) and the results of this calibration certificate were determined in accordance with the terms of accreditation unless stated otherwise below.

The uncertainty of the calibration was sufficient to determine that the item met the manufacturer's published specifications unless stated otherwise below.

**Ambient Conditions:** Temperature: 75.0 Degrees Fahrenheit Humidity: 44 % RH


**Calibration Date:** 2 May 00 **Calibration Procedure:** CL-9, 5/99

**Condition as Received:** IN TOLERANCE

**Condition as Released:** IN TOLERANCE

**Remarks:**

**Approved by:**

  
\_\_\_\_\_  
Jim Patterson, Supervisor, or Walt Hill, Metrologist

**Certificate # 38920**

m:\a2la.rpt Rev date 14 Dec 99

**Measurements performed by:**

  
\_\_\_\_\_  
Ken Harp, Technician

Page 1 of 1

# SOUTHWEST RESEARCH INSTITUTE

## Calibration Laboratory

### WORK ORDER

Processed by RCRUZ at 3:07:03PM on 4/4/01



**Work Order 444043026**

Arrived 4/4/01

Asset No. 007617 Manufacturer ERTCO

Model ASTM 91 C

Instrument Type/Class THERMOMETER

Serial No. 1709

Accessory No. Calibration Procedure CL-9, 5/99

Location B57

Div/Client DIV20

Custodian MELISSA NUGENT

Mail Stop B57

Tel. 6565

Charge/Project No. 20.00751.006

Delivered By / Telephone BRADLEY X 6565

**IN4CAL**

Special Instructions \_\_\_\_\_

### WORK NOTES

Date	Hours	Remarks/Notes
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

### REPAIR PARTS

Date	Hours	Part Name	Part Number	Failure Description	Cost
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

SwRI-Cal-Lab TECH: kwh  
CAL: 06/02/00 DUE: 11/02/00  
AN:007617 SN:1709

### WORK SUMMARY

Failure Description \_\_\_\_\_

Repair Action \_\_\_\_\_

Calibration Procedure \_\_\_\_\_ Temp 76F Hum. 50 %

Tech [Signature] Totals Cal Hours 2.5 Repair Hours \_\_\_\_\_ Parts Cost \_\_\_\_\_

Standards Used 5174

Date Picked Up 4/16/2001

Picked Up By Bradley Wenling

43026



7617

Nom	Tm	Act (Std)	ETm
20	20.37	20.319	0.051
30	30.20	30.181	0.019
40	40.15	40.150	0
50	49.71	49.618	0.092

Ave Stem Temp must be 77°F (25°C)

Max Scale Error  $\pm 0.1^\circ\text{C}$

UMC is  $\pm 5^\circ\text{F}$

Stem Cur is ?

Type A is what?

73054





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6220 Culebra Road  
San Antonio, TX 78238  
(210) 522-5215  
Department of Quality Assurance  
Calibration Laboratory



Certificate #  
0972-01

## Certificate of Calibration

6 April 2001

**Issued to:** MELISSA NUGENT DIV20 B57  
**Manufacturer/Model:** ERTCO ASTM 91 C  
**Description:** THERMOMETER  
**Serial Number:** 1709  
**Asset Number:** 007617  
**Work Order Number:** 444043026

This certifies the above item was calibrated in compliance with MIL-STD-45662A and ANSI/NCSL Z540-1-1994. The results of this calibration relate only to the individual item as described above. Standards used in this calibration, described in the referenced calibration procedure with associated uncertainties or tolerances, are traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and available for examination upon request. This certificate is not to be reproduced, except in full, without the written approval of the Southwest Research Institute Department of Quality Assurance Calibration Laboratory.

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The uncertainty of the calibration was sufficient to determine that the item met the manufacturer's published specifications unless stated otherwise below.

**Ambient Conditions:** Temperature: 76.0 Degrees Fahrenheit Humidity: 50 % RH

**Calibration Date:** 6 Apr 01 **Calibration Procedure:** CL-9, 5/99

**Condition as Received:** SEE ATTACHED DATA

**Condition as Released:** SEE ATTACHED DATA

**Remarks:** CALIBRATION DATA ATTACHED

**Approved by:**

Walt Hill, Supervisor  
Institute Calibration Laboratory

**Measurements performed by:**

Mack Wood, Technician

# SOUTHWEST RESEARCH INSTITUTE

## Calibration Laboratory

### WORK ORDER

Received by RCRUZ, 10/9/01 2:36:26PM

1 10011 0001 0001 1001 0001 1001 1001

Arrived 10/9/01

Work Order **444045533**

Asset No. 007617 Manufacturer ERTCO

Model ASTM 91 C

Instrument Type/Class THERMOMETER

Serial No. 1709

Accessory No.

Calibration Procedure CL-9, 5/99

Location B57

Div/Client DIV20

Custodian BRADLEY WERLING

Mail Stop B57

Tel. 6565

**IN4CAL**

Special Instructions \_\_\_\_\_

Notify before making adjustments or repairs. (  Provide measurement readings (  )

Charge/Project No. 00751.006 1.20

Requested By / Telephone

The above is correct for the work requested.

Bradley Werling 6565

### WORK NOTES

Date	Hours	Remarks/Notes
<u>10/10</u>	<u>1.0</u>	<u>Cal</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Date	Hours	Part Name	Part Number	Failure Description	Cost
<u>n/a</u>	<u>→</u>	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

### WORK SUMMARY

Failure Description n/a

Repair Action n/a

Calibration Procedure CL-9, 5/99

Temp 71F

Hum. 50 %

Tech R Dykstra

Totals Cal Hours 1.0

Repair Hours \_\_\_\_\_

Parts Cost \_\_\_\_\_

Standards Used 5243, 5174

Date Picked Up 10/16/01

Picked Up By Bradley Werling

45533

Southwest Research Institute  
Calibration Laboratory  
Calibration Data Sheet

Workorder 444045533

Mfr. ERTCO

Technician Roger Dykstra

Asset #. 007617

Model ASTM 91 C

Procedure CL-9, 5/99

Serial #. 1709

Type Thermometer

Cal Date 10/10/01

**Measurement uncertainty Budget for Temperature at any point.**

Source of uncertainty	Value +/- Deg C	Distribution	Divisor	Standard Unc. Deg C
Standard	0.06	Normal	2	0.03
Instrument Resolution	0.02	Rectangular	Sqrt 3	0.01
Combined Uncertainty			RSS	0.03
Expanded Uncertainty			K=2	0.06

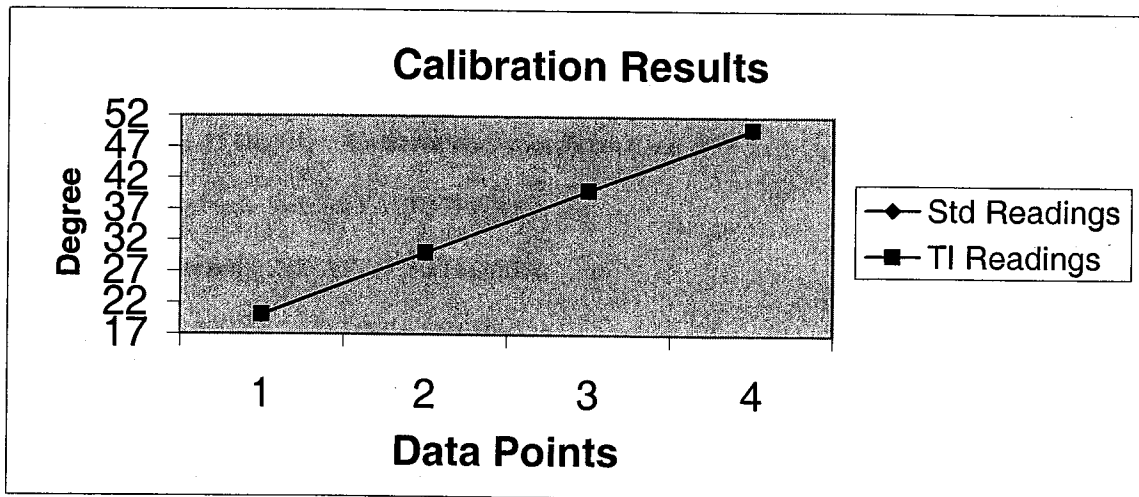
Tolerance 0.1 Degree C

Range 20 to 50 Degree C

Instrument error = TI reading - Standard reading

Results can be the following: Pass, Fail, or if blank undeterminable.

Standard Reading Degree C	As Found Value Deg C	Instrument Error	Instrument Tolerance	Results
20.024	20.08	0.056	0.1	
30.048	30.08	0.032	0.1	Pass
40.083	40.1	0.017	0.1	Pass
49.942	50.02	0.078	0.1	

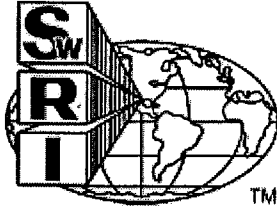


**Results:**

This report uncertainty is based upon a standard uncertainty multiplied by a coverage of k=2, which provides a level of confidence of approximately 95%.

For 20 & 50 C it is not possible to state a in tolerance based on a 95% level of confidence, however the results indicate that in tolerance is more probable than an out of tolerance.

The tolerance is from ASTM -91C specifications.



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Department of Quality Assurance  
Calibration Laboratory



Certificate #  
0972-01

## Certificate of Calibration

11 October 2001

**Issued to:** BRADLEY WERLING DIV20 B57  
**Manufacturer/Model:** ERTCO ASTM 91 C  
**Description:** THERMOMETER  
**Serial Number:** 1709  
**Asset Number:** 007617  
**Work Order Number:** 444045533

This certifies the above item was calibrated in compliance with MIL-STD-45662A and ANSI/NCSL Z540-1-1994. The results of this calibration relate only to the individual item as described above. Standards used in this calibration, described in the referenced calibration procedure with associated uncertainties or tolerances, are traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and available for examination upon request. This certificate is not to be reproduced, except in full, without the written approval of the Southwest Research Institute Department of Quality Assurance Calibration Laboratory.

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The uncertainty of the calibration was sufficient to determine that the item met the manufacturer's published specifications unless stated otherwise below.

**Ambient Conditions:** Temperature: 74.0 Degrees Fahrenheit Humidity: 58 % RH

**Calibration Date:** 11 Oct 01 **Calibration Procedure:** CL-9, 5/99

**Condition as Received:** SEE ATTACHED DATA

**Condition as Released:** SEE ATTACHED DATA

**Remarks:** SEE ATTACHED DATA SHEET.

**Approved by:**

  
\_\_\_\_\_

Walt Hill, Supervisor  
Institute Calibration Laboratory

**Measurements performed by:**

  
\_\_\_\_\_

Roger Dykstra, Technician

# SOUTHWEST RESEARCH INSTITUTE

## Calibration Laboratory

### WORK ORDER

Received by RCRUZ,3/20/02 1:19:18PM

||||| ||||| ||||| ||||| ||||| ||||| ||||| |||||

Arrived 3/20/02

Work Order **444047765**

Asset No. 007617 Manufacturer ERTCO

Model ASTM 91 C

Equipment Type THERMOMETER

Serial No. 1709

Accessory No.

Interval 6 M

Calibration Procedure CL-9, 5/99

Location B57

Div/Client DIV20

Custodian BRADLEY WERLING

Mail Stop B57

Tel 6565

**IN LINE**

Special Instructions \_\_\_\_\_

Notify before adjustments or repairs. ( ) Provide data with certificate ( ) Certificate Type \_\_\_\_\_

Charge/Project No. 00751.006 1.20

Requester / Telephone

This information is correct for the work requested.

*Bradley Werling*

### WORK NOTES

Date	Hours	Remarks/Notes
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Date	Hours	Part Name	Part Number	Failure Description	Cost
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

47765

### WORK SUMMARY

Failure Description \_\_\_\_\_

Repair Action \_\_\_\_\_

Tech 8216 Cal Hrs. 1 Repair Hrs \_\_\_\_\_ Parts Cost \_\_\_\_\_ Temp 77 F Hum. 31 %

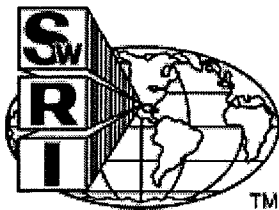
Standards Used 5242, 5174

Date Picked Up \_\_\_\_\_

Picked Up By *Bradley Werling*







Southwest Research Institute  
6220 Culebra Road  
San Antonio, TX 78238  
(210) 522-5215  
Department of Quality Assurance  
Calibration Laboratory

## Certificate of Calibration

21 March 2002

**Issued to:** BRADLEY WERLING DIV20 B57  
**Manufacturer/Model:** ERTCO ASTM 91 C  
**Description:** THERMOMETER  
**Serial Number:** 1709  
**Asset Number:** 007617  
**Work Order Number:** 444047765

This certifies the above item was calibrated in compliance with MIL-STD-45662A and ANSI/NCSL Z540-1-1994. Standards used in this calibration, described in the referenced calibration procedure with associated uncertainties or tolerances, are traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and is available for examination upon request. This certificate is not to be reproduced, except in full, without the written approval of the Southwest Research Institute Department of Quality Assurance Calibration Laboratory.

The uncertainty of the calibration was sufficient to determine that the item met the manufacturer's published specifications unless stated otherwise below.

**Ambient Conditions:** Temperature: 77.0 Degrees Fahrenheit Humidity: 31 % RH

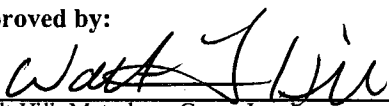
**Calibration Date:** 21 Mar 02 **Calibration Procedure:** CL-9, 5/99

**Condition as Received:** SEE ATTACHED DATA

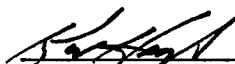
**Condition as Returned:** SEE ATTACHED DATA

**Remarks:** SEE ATTACHED AS FOUND CALIBRATION DATA SHEET.

Approved by:

  
\_\_\_\_\_  
Walt Hill, Metrology Group Leader  
Institute Calibration Laboratory

Measurements performed by:

  
\_\_\_\_\_  
Ken Harp, Technician