



Southwest Research Institute
6220 Culebra Road
San Antonio, TX 78238
Department of Quality Assurance
Calibration Laboratory

Certificate of Calibration

17 April 1997

Issued to: DARRELL DUNN DIV20 B57
Manufacturer/Model: ERTCO 15-166A
Description: THERMOMETER
Serial Number: C96-783
Asset Number: 005434

Environmental Conditions

Temperature: 77.0 Deg. F Humidity: 27%

Calibration Information

Calibration was in accordance with requirements of MIL-STD-45662A and ANSI/NC SL Z540-1-1994. Measurements are traceable to the National Institute of Standards and Technology (NIST). This report may not be reproduced except in full without written approval of the originator. Inspection and test data are on file and available for inspection.

Calibration Date: 15 Apr 97 Calibration Procedure: WI-9-30-TH03
Interval: 6 months Accuracy: +/-1 DEG.C
Next Calibration Due: 15 Oct 97 Received: In Tolerance

Remarks:

Standards Used

Asset	MFR	Model	Description	Serial No.	Due Cal
000106	FLUKE	8506A	THERMAL RMS DIGITAL M	4180021	31 Jan 98
005174	AZONIX	A12001	PRECISION RTD TEMPERA	438295	11 Nov 97

Certificate # 25039

Signed: 

LAST PAGE OF REPORT
Total Pages Printed: 1



Southwest Research Institute
6220 Culebra Road
San Antonio, TX 78238
Department of Quality Assurance
Calibration Laboratory

Certificate of Calibration

30 October 1997

Issued to: DARRELL DUNN DIV20 B57
Manufacturer/Model: FISHERBRAND/ERTCO 15-166A
Description: THERMOMETER
Serial Number: C96-783
Asset Number: 005434

Environmental Conditions

Temperature: 78.00 Deg. F

Humidity: 41 % RH

Calibration Information

Calibration was in accordance with requirements of MIL-STD-45662A and ANSI/NC SL Z540-1-1994. Measurements are traceable to the National Institute of Standards and Technology (NIST). This report may not be reproduced except in full without written approval of the originator. Inspection and test data are on file and available for inspection.

The uncertainty of the calibration was sufficient to determine that the instrument met the manufacturer's specifications.

Calibration Date: 29 Oct 97

Calibration Procedure: ASTM E77-92

Interval: 6 months

Next Calibration Due: 29 Apr 98

Received: In Tolerance

Remarks:

Standards Used

Asset	MFR	Model	Description	Serial No.	Due Cal
000219	AZONIX	A1011	RTD THERMOMETER	T1587-2078	24 Mar 98
000328	AZONIX	A12001	RTD TEMPERATURE PROBE	351477	3 Apr 98

Signed: 

Title: 

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Certificate # 27264



Southwest Research Institute
 6220 Culebra Road
 San Antonio, TX 78238
 Department of Quality Assurance
 Calibration Laboratory



Certificate of Calibration

11 May 1998

Issued to: DARRELL DUNN DIV20 B57
 Manufacturer/Model: FISHERBRAND/ERTCO 15-166A
 Description: THERMOMETER
 Serial Number: C96-783
 Asset Number: 005434

Environmental Conditions

Temperature: 80.00 Deg. F

Humidity: 32 % RH

Calibration Information

Calibration was in accordance with requirements of MIL-STD-45662A and ANSI/NC SL Z540-1-1994. Measurements are traceable to the National Institute of Standards and Technology (NIST). This report may not be reproduced except in full without written approval of the originator. Inspection and test data are on file and available for inspection.

The uncertainty of the calibration was sufficient to determine that the instrument met the manufacturer's specifications.

Calibration Date: 11 May 98

Calibration Procedure: ASTM E77-89

Interval: 6 months

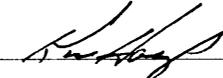
Next Calibration Due: 11 Nov 98

Received: In Tolerance

Remarks:

Standards Used

Asset	MFR	Model	Description	Serial No.	Due Cal
000219	AZONIX	A1011	RTD THERMOMETER	T1587-2078	16 Apr 99
000328	AZONIX	A12001	RTD TEMPERATURE PROBE	351477	27 Apr 99

Signed: 

Title: 

LAST PAGE OF REPORT
 Total Pages Printed: 1

Certificate # 29652



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



Certificate #
0972-01

Certificate of Calibration

19 January 1999

Issued to: DARRELL DUNN DIV20 B57
Manufacturer/Model: FISHERBRAND 15-166A
Description: THERMOMETER
Serial Number: C96-783
Asset Number: 005434

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.

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.

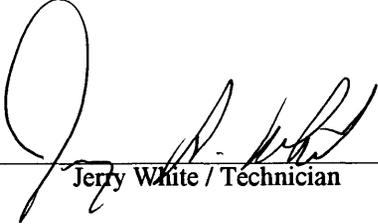
Ambient Conditions: Temperature: 73. Degrees Fahrenheit Humidity: 48 % RH

Calibration Date: 19 Jan 99 **Calibration Procedure:** ASTM E77-89

Condition as Received: IN TOLERANCE

Condition as Released: IN TOLERANCE

Remarks:



Jerry White / Technician



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



Certificate #
0972-01

Certificate of Calibration

18 August 1999

Issued to: DARRELL DUNN DIV20 B57
Manufacturer/Model: FISHER SCIENTIFIC 15-166A
Description: THERMOMETER
Serial Number: C96-783
Asset Number: 005434

This certifies the above item was calibrated in compliance with MIL-STD-45662A and ANSI/NC SL 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.

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: 76.0 Degrees Fahrenheit Humidity: 44 % RH

Calibration Date: 18 Aug 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 # 35664

m:\a2la.rpt Rev date 10 Mar 99

Measurements performed by:

Jerry White, Technician

Page 1 of 1



SOUTHWEST RESEARCH INSTITUTE™

6220 Culebra Road, P.O. Drawer 28510
Institute Quality Systems
Institute Calibration Laboratory
Phone: 210-522-5215 Fax 210-522-3692

Certificate of Calibration

Submitted By: DIV20

Address: B57

Contact: DARRELL DUNN

Manufacturer Model: FISHER SCIENTIFIC 15-166A

Description: THERMOMETER

Serial No: C96-783

Asset No: 005434

Procedure: CL-9, 5/99

Work Order: 444050659

Date Issued: Oct 21, 2002

Calibration Date: Oct 18, 2002

****Calibration Due:** Apr 18, 2003

Calibration Location: N/A

Environment: Temp. 75.0°F Hum. 56 %RH

***As Found:** IN TOLERANCE

***As Left:** IN TOLERANCE

This certificate documents traceability to the National Institute of Standards and Technology (NIST) and the International System of Units (SI). The Laboratory quality system conforms to ISO/IEC 17025, 1999 and ANSI/NCSL Z540-1-1994 which are equivalent to relevant requirements of the ISO 9000-1994 series of standards. This certificate may not be reproduced, except in full, without the written approval of the Southwest Research Institute Calibration Laboratory. The results of this calibration relate only to the individual instrument described above. This certificate shall not be used to claim product endorsement by the American Association for Laboratory Accreditation (A2LA) or any agency of the U. S. Government.

Uncertainty evaluation includes the item under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor of k=2 to approximate a 95% confidence level. The calibration process provides a Test Uncertainty Ratio (TUR) of less than or equal to 25% (4:1) of the test limit unless otherwise stated in remarks or an attachment.

*The client has sole responsibility for determination of in/out of tolerance or compliance/noncompliance. An in/out of tolerance opinion is provided for your convenience based only on the Test Instrument (TI) reading(s) and limits as reported. The reported uncertainty relates only to the results at the time of calibration and does not imply any short or long term stability of the TI.

**Calibration interval is determined by the client and does not assure the instrument will remain within tolerance until this date. Any number of factors may cause the instrument to be out of tolerance before the next calibration date.

Remarks: None

Standards Used

Asset	Manufacturer	Model	Description	Cal Due
009137	HART SCIENTIFIC, INC	1575	THERMOMETER	Dec 10, 02
008920	HART SCIENTIFIC, INC	17660-A-120-6-W	PLATINUM RTD	Dec 07, 02

Approved by: Walt Hill
Metrology Group Leader
m:\Non21a1.rpt Rev date 15, August 02

Measurements by: Vince Morales
Metrology Technician

Southwest Research Institute
 Calibration laboratory
 Calibration Sheet.

Work Order:	444050659	Mfr.	Fisher Scientific	Technician	V Morales
Asset No.	005434	Model	15-166A	Procedure	CL-9 5/99
Serial No.	C96-783	Type.	THERMOMETER	Cal Date.	18-Oct-02
Remarks:					

Function/Range	Standard	TI Reading	Difference	Test Limits+/-	Uncertainty	Found/Left
	Deg C	Deg C	Deg C	Deg C	Deg C	Results
-15	-14.8	-15.0	-0.2	0.5	0.3	Pass
0	0.1	0.0	-0.1	0.5	0.3	Pass
50	50.0	50.0	0.0	0.5	0.3	Pass
100	100.0	100.0	0.0	0.5	0.3	Pass
145	145.0	145.0	0.0	0.5	0.3	Pass



SOUTHWEST RESEARCH INSTITUTE™

6220 Culebra Road, P.O. Drawer 28510
Institute Quality Systems
Institute Calibration Laboratory
Phone: 210-522-5215 Fax 210-522-3692

Certificate of Calibration

Submitted By: DIV20

Address: B57

Contact: DARRELL DUNN

Manufacturer Model: FISHER SCIENTIFIC 15-166A

Description: THERMOMETER

Serial No: C96-783

Asset No: 005434

Procedure: THERMOMETERS, JAN/03

Work Order: 444053498

Date Issued: Apr 29, 2003

Calibration Date: Apr 29, 2003

****Calibration Due:** Oct 29, 2003

Calibration Location: Bldg. 64

Environment: Temp. 78.0°F Hum. 47 %RH

***As Found:** IN TOLERANCE

***As Left:** IN TOLERANCE

This certificate documents traceability to the National Institute of Standards and Technology (NIST) and the International System of Units (SI). The Laboratory quality system conforms to ISO/IEC 17025, 1999 and ANSI/NCSL Z540-1-1994 which are equivalent to relevant requirements of the ISO 9000-1994 series of standards. This certificate may not be reproduced, except in full, without the written approval of the Southwest Research Institute Calibration Laboratory. The results of this calibration relate only to the individual instrument described above. This certificate shall not be used to claim product endorsement by the American Association for Laboratory Accreditation (A2LA) or any agency of the U. S. Government.

Uncertainty evaluation includes the item under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor of k=2 to approximate a 95% confidence level. The calibration process provides a Test Uncertainty Ratio (TUR) of less than or equal to 25% (4:1) of the test limit unless otherwise stated in remarks or an attachment.

*The client has sole responsibility for determination of in/out of tolerance or compliance/noncompliance. An in/out of tolerance opinion is provided for your convenience based only on the Test Instrument (TI) reading(s) and limits as reported. The reported uncertainty relates only to the results at the time of calibration and does not imply any short or long term stability of the TI.

**Calibration interval is determined by the client and does not assure the instrument will remain within tolerance until this date. Any number of factors may cause the instrument to be out of tolerance before the next calibration date.

Remarks: None

Standards Used

Asset	Manufacturer	Model	Description	Cal Due
008920	HART SCIENTIFIC, INC	17660-A-120-6-W	PLATINUM RTD	Jul 06, 03
009137	HART SCIENTIFIC, INC	1575	THERMOMETER	Jul 06, 03

Approved by: Walt Hill
Metrology Group Leader

m:\Nona21a1.rpt Rev date 15, August 02

Measurements by: Mark Romero
Metrology Technician

Southwest Research Institute
Calibration laboratory
Measurement Record

Work Order:	444053498	Mfr.	Fisher Scientific	Technician	Mark Romero
Asset No.	005434	Model	15-166A		
Serial No.	C96-783	Type.	THERMOMETER	Cal Date.	29-Apr-03
Remarks:					

Function/Range	Test Point	TI Reading	Difference	+/-Limits	+/-Uncertainty	Found/Left
Temperature	Deg C	Deg C	Deg C	Deg C	Deg C	Results
-20	-19.9	-20.2	-0.3	0.5	0.6	Pass
0	0.1	0.0	-0.1	0.5	0.6	Pass
50	50.0	50.0	0.0	0.5	0.6	Pass
100	100.0	99.8	-0.2	0.5	0.6	Pass
150	149.9	150.0	0.1	0.5	0.6	Pass
END OF REPORT						



SOUTHWEST RESEARCH INSTITUTE™

6220 Culebra Road, P.O. Drawer 28510
Institute Quality Systems
Institute Calibration Laboratory
Phone: 210-522-5215 Fax 210-522-3692



Certificate of Calibration

Submitted By: DIV20

Address: B57

Contact: DARRELL DUNN

Manufacturer Model: FISHER SCIENTIFIC 15-166A

Description: THERMOMETER

Serial No: C96-783

Asset No: 005434

Procedure: TEMPERATURE, MAY/03

Work Order: 444056080

Date Issued: Oct 30, 2003

Calibration Date: Oct 30, 2003

****Calibration Due:** Apr 30, 2004

Calibration Location: Bldg. 64

Environment: Temp. 74.0°F Hum. 49 %RH

***As Found:** IN TOLERANCE

***As Left:** IN TOLERANCE

This certificate documents traceability to the National Institute of Standards and Technology (NIST) and the International System of Units (SI). The Laboratory quality system conforms to ISO/IEC 17025, 1999 and ANSI/NCCL Z540-1-1994 which are equivalent to relevant requirements of the ISO 9000-1994 series of standards. This certificate may not be reproduced, except in full, without the written approval of the Southwest Research Institute Calibration Laboratory. The results of this calibration relate only to the individual instrument described above. This certificate shall not be used to claim product endorsement by the American Association for Laboratory Accreditation (A2LA) or any agency of the U. S. Government.

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**Calibration interval is determined by the client and does not assure the instrument will remain within tolerance until this date. Any number of factors may cause the instrument to be out of tolerance before the next calibration date.

Remarks: None

Standards Used

Asset	Manufacturer	Model	Description	Cal Due
008920	HART SCIENTIFIC, INC	17660-A-120-6-W	PLATINUM RTD	Feb 07, 04
009137	HART SCIENTIFIC, INC	1575	THERMOMETER	Feb 05, 04

Approved by: Walt Hill

Metrology Group Leader

m:\a2la1.rpt Rev date 15, August 02

Measurements by: Vince Morales

Metrology Technician

Southwest Research Institute
 Calibration laboratory
 Calibration Report

Work Order:	444056080	Mfr.	Fisher Scientific	Technician	Vmorales
Asset No.	5434	Model	15-166A		
Serial No.	C96-783	Type.	THERMOMETER	Cal Date.	30-Oct-03
Remarks:					

Function/Range	Test Point	TI Reading	Difference	+/-Limit	+/-Uncertainty	Found/Left
Temperature	Deg C	Deg C	Deg C	Deg C	Deg C	Result
-20	-19.90	-20.20	-0.30	0.50	0.01	Pass
0	0.09	0.00	-0.09	0.50	0.01	Pass
50	49.90	50.00	0.10	0.50	0.01	Pass
100	99.99	99.90	-0.09	0.50	0.01	Pass
150	149.90	150.00	0.10	0.50	0.01	Pass
END OF REPORT						



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6220 Culebra Road, P.O. Drawer 28510
Institute Quality Systems
Institute Calibration Laboratory
Phone: 210-522-5215 Fax 210-522-3692



Certificate of Calibration

Submitted By: DIV20

Address: B57

Contact: DARRELL DUNN

Manufacturer Model: FISHER SCIENTIFIC 15-166A

Description: THERMOMETER

Serial No: C96-783

Asset No: 005434

Procedure: TEMPERATURE, JAN/04

Work Order: 444058755

Date Issued: Apr 30, 2004

Calibration Date: Apr 30, 2004

****Calibration Due:** Oct 30, 2004

Calibration Location: Bldg. 64

Environment: Temp. 75.0°F Hum. 50 %RH

***As Found:** IN TOLERANCE

***As Left:** IN TOLERANCE

This certificate documents traceability to the National Institute of Standards and Technology (NIST) and the International System of Units (SI). The Laboratory quality system conforms to ISO/IEC 17025, 1999 and ANSI/NC SL Z540-1-1994 which are equivalent to relevant requirements of the ISO 9000-1994 series of standards. This certificate may not be reproduced, except in full, without the written approval of the Southwest Research Institute Calibration Laboratory. The results of this calibration relate only to the individual instrument described above. This certificate shall not be used to claim product endorsement by the American Association for Laboratory Accreditation (A2LA) or any agency of the U. S. Government.

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**Calibration interval is determined by the client and does not assure the instrument will remain within tolerance until this date. Any number of factors may cause the instrument to be out of tolerance before the next calibration date.

Remarks: None

Standards Used

Asset	Manufacturer	Model	Description	Cal Due
009137	HART SCIENTIFIC	1575	THERMOMETER	Sep 05, 04
008920	HART SCIENTIFIC	5614-17660-A-12	PLATINUM RTD	Sep 09, 04

Approved by: Walt Hill
Metrology Group Leader
m:\a2la1.rpt Rev date 15, August 02

Measurements by: Scott Kester
Metrology Technician

Southwest Research Institute
Calibration laboratory
Caibration Report

Work Order:	444058755	Mfr.	Fisher-Scientific	Technician	SRK
Asset No.	005434	Model	15-166A		
Serial No.	C96-783	Type.	THERMOMETER	Cal Date.	30-Apr-04
Remarks:					

Function/Range	Test Point	TI Reading	Difference	+/-Limit	+/-Uncertainty	Found/Left
Temperature	Deg C	Deg C	Deg C	Deg C	Deg C	Result
-20	-19.8	-19.5	0.3	0.5	0.58	Pass
0	0.1	0.0	-0.1	0.5	0.58	Pass
50	50.0	50.0	0.0	0.5	0.58	Pass
100	100.0	100.0	0.0	0.5	0.58	Pass
150	150.1	150.0	-0.1	0.5	0.58	Pass
END OF REPORT						



SOUTHWEST RESEARCH INSTITUTE™

6220 Culebra Road, P.O. Drawer 28510
Institute Quality Systems
Institute Calibration Laboratory
Phone: 210-522-5215 Fax 210-522-3692



Certificate of Calibration

Certificate #

0972-01

Submitted By: DIV20

Address: B57

Contact: DARRELL DUNN

Manufacturer Model: FISHER SCIENTIFIC 15-166A

Description: THERMOMETER

Serial No: C96-783

Asset No: 005434

Procedure: TEMPERATURE, JAN/04

Work Order: 444061747

Date Issued: Nov 29, 2004

Calibration Date: Nov 29, 2004

****Calibration Due:** May 29, 2005

Calibration Location: Bldg. 64

Environment: Temp. 73.0°F Hum. 40 %RH

***As Found:** IN TOLERANCE

***As Left:** IN TOLERANCE

This certificate documents traceability to the National Institute of Standards and Technology (NIST) and the International System of Units (SI). The Laboratory quality system conforms to ISO/IEC 17025, 1999 and ANSI/NCCL Z540-1-1994 which are equivalent to relevant requirements of the ISO 9000-1994 series of standards. This certificate may not be reproduced, except in full, without the written approval of the Southwest Research Institute Calibration Laboratory. The results of this calibration relate only to the individual instrument described above. This certificate shall not be used to claim product endorsement by the American Association for Laboratory Accreditation (A2LA) or any agency of the U. S. Government

Uncertainty evaluation includes the item under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor of k=2 to approximate a 95% confidence level. See Remarks or attached Calibration Report with the same Work Order number for calibration data.

*The client has sole responsibility for determination of in/out of tolerance or compliance/noncompliance. An in/out of tolerance opinion is provided for your convenience based only on the Test Instrument (TI) reading(s) and limits as reported. The reported uncertainty relates only to the results at the time of calibration and does not imply any short or long term stability of the TI.

**Calibration interval is determined by the client and does not assure the instrument will remain within tolerance until this date. Any number of factors may cause the instrument to be out of tolerance before the next calibration date.

Remarks: None

Standards Used

Asset	Manufacturer	Model	Description	Cal Due
009414	HART SCIENTIFIC	1502A	TEMPERATURE READOUT	Mar 30, 05
010692	HART SCIENTIFIC	5618	PLATINUM RTD	Feb 16, 05

Approved by: Walt Hill
Metrology Group Leader
m:\a2la1.rpt Rev date 11, May 04

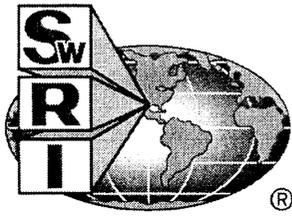
Measurements by: Bob Trollinger
Metrology Technician

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	444061747	Mfr.	Fisher-Scientific	Technician	blt
Asset No.	005434	Model	15-166A (ASTM 1C)		
Serial No.	C96-783	Type.	THERMOMETER	Cal Date.	29-Nov-04
Remarks:	Accuracy Reference ANSI Z236.1-1983				

Function/Range	Test Point	TI Reading	Difference	+/-Limit	+/-Uncertainty	Found/Left
Temperature	°C	°C	°C	°C	°C	Result
	-19.9	-19.5	0.4	0.5	0.12	Pass
	0.0	0.0	0.0	0.5	0.12	Pass
	49.9	50.0	0.1	0.5	0.12	Pass
	100.0	99.5	-0.5	0.5	0.12	Pass
	149.9	150.0	0.1	0.5	0.12	Pass

END OF REPORT



CNWRA *A center of excellence in earth
sciences and engineering*

6220 Culebra Road · San Antonio · Texas, U.S.A. 78228-5166

MEMORANDUM

To: SwRI Calibration Lab
From: Darrell S. Dunn 
Date: March 25, 2005
Subject: Thermometers

The following thermometers were either broken in service or were found to be out of tolerance during a normally scheduled calibration and should be removed from the calibration recall list. A copy of this memorandum will be placed in the Division 20 calibration records.

Kessler	ASTM 1C	Serial Number: 115749	Asset Number: 003247
Fisher Scientific	15-166A	Serial Number: C96-783	Asset Number: 005434
Fisher Scientific	15-166A	Serial Number: H98-149	Asset Number: 007298
Fisher Scientific	15-166A	Serial Number: C96-649	Asset Number: 004989
Fisher Scientific	15-166A	Serial Number: A2000-130	Asset Number: 008109

Please contact me at extension 6090 if you have any questions.