APPENDIX D

BORING GEOPHYSICAL LOGGING SYSTEMS - NIST TRACEABLE CALIBRATION PROCEDURES AND CALIBRATION RECORDS

CALIBRATION PROCEDURE FOR GEOVision SEISMIC RECORDER/LOGGER

Reviewed 4/6/06

Objective

The timing/sampling accuracy of seismic recorders or data loggers is required for several GEOVision field procedures including Seismic Refraction, Downhole Seismic Velocity Logging, and P-S Suspension Logging. This procedure describes the method for measuring the timing accuracy of a seismic data logger, such as the OYO Model 170, OYO/Robertson Model 3403, Geometrics Strataview or Geometrics Geode. The objective of this procedure is to verify that the timing accuracy of the recorder is accurate to within 1%.

Frequency of Calibration

The calibration of each GEOVision seismic data logger is twelve (12) months. In the case of rented seismic data loggers, calibration must be performed prior to use.

Test Equipment Required

The following equipment is required. Item #2 must have current NIST traceable calibration.

- 1. Function generator, Krohn Hite 5400B or equivalent
- 2. Frequency counter, HP 5315A or equivalent
- 3. Test cables, from item 1 to item 2, and from item 1 to subject data logger.

Procedure

This procedure is designed to be performed using the accompanying Seismograph Calibration Data Sheet with the same revision number. All data must be entered and the procedure signed by the technician performing the test.

- 1. Record all identification data on the form provided.
- Connect function generator to data logger (such as OYO Model 170) using test cable
- 3. Connect the function generator to the frequency counter using test cable.



Seismic Recorder/Logger Calibration Procedure Revision 1.30 Page 1

- 4. Set up generator to produce a 100.0 Hz, 0.25 volt (amplitude is approximate, modify as necessary to yield less than full scale waveforms on logger display) peak square wave or sine wave. Verify frequency using the counter and initial space on the data sheet.
- 5. Initialize data logger and record a data record of at least 0.1 second using a 100 microsecond or less sample period.
- 6. Measure the recorded square wave frequency by measuring the duration of 9 cycles of data. This measurement can be made using the data logger display device, or by printing out a paper tape. If a paper tape can be printed, the resulting printout must be attached to this procedure. Record the data in the space provided.
- 7. Repeat steps 5 and 6 three more times using separate files.

Criteria

The duration for 9 cycles in any file must be 90.0 milliseconds plus or minus 0.9 milliseconds, corresponding to an average frequency for the nine cycles of 100.0 Hz plus or minus 1 Hz (obtained by dividing 9 cycles by the duration in milliseconds).

If the results are outside this range, the data logger must be marked with a GEOVision REJECT tag until it can be repaired and retested.

If results are acceptable affix label indicating the initials of the person performing the calibration, the date of calibration, and the due date for the next calibration (12 months).

Procedure Approval Approved by: John G. Diehl President Name Title April 6, 2006 Signa Date Client Approval (if required): Name Title Signature Date Seismic Recorder/Logger Calibration Procedure GE Vision Revision 1.30 Page 2





Calibration Report

GEOVision Geophysical Services

1151 Pomona Road, Unit P Corona, CA 92882 P.O. No.: 6162-060414-01

METROLOGY

7300 Fenwick Lane Westminster, CA 92683 866-723-2257 edisonmetrology.com

Manufacturer:

Oyo Corporation

Model Number:

3331-A

Description:

Logger, Suspension,

Asset Number: Serial Number:

19029 19029

Calibration Date:

04/21/2006

Calibration Due Date: 04/21/2007 Calibration Interval:

12 Months

Condition As Found:

In Tolerance

Condition As Left:

In Tolerance

Remarks:

The UUT (unit under test) was calibrated using the customer's procedure. The UUT was operated by the customer's personnel and data collection was observed by SCE personnel. The UUT was found to be in tolerance to customer supplied specifications. The reference standards used are in compliance with ISO/IEC 17025:1999 and laboratory accreditation criteria established by NIST/NVLAP under the specific scope of accreditation for lab code 105014-0. Frequency is accredited. Please see attached data.

Standards Utilized

| I.D. No. | Mfg. | Model No. | Description | Cal. Date | Due Date |
|----------|-----------------|----------------------|--------------------------------------|------------|------------|
| S1-01252 | Hewlett Packard | 5335A OPT 010,203040 | Counter, Universal | 12/09/2005 | 06/09/2006 |
| S1-03355 | Hewlett Packard | 3325B OPT 001, 002 | Generator, Function, Synthesizer | 11/03/2005 | 11/03/2006 |
| S1-03686 | Fluke | 4.4 | Standard, Frequency, Controlled, Gps | 01/16/2006 | 01/16/2007 |

Procedure: Customer Temperature: 23° C **Humidity:** 40% RH Test No.: 501206

Calibration Performed By: Quality Reviewer: Branson, Craig A Metrologist 714-895-0714

This report may not be reproduced, except in full, without written permission of this laboratory. This report may not be used to claim product endorsement by NVLAP or any agency of the US Government. The results stated in this report relate only to the items tested or calibrated. Measurements reported herein are traceable to SI units via national standards maintained by NIST and were performed in compliance with MIL-STD-45662A, ANSI/NCSL Z540-1-1994, 10CFR50, Appendix B, and ISO 9002-94.

Page 1 of 4



SEISMOGRAPH CALIBRATION DATA SHEET REV 4/6/06

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Suspension 170 4.25

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A SOUTHERN CALIFORNIA EDISON® Company

METROLOGY 7500 Fenwick Lane Westminster, CA 92683 866-723-2257 edisonmetrology.com

Calibration Report

GEOVision Geophysical Services

1151 Pomona Road, Unit P Corona, CA 92882 P.O. No.: 6162-060414-01

Manufacturer: Oyo Model Number: 3403

Description: Unit, Suspension Telemetry,

Asset Number: 160023 Serial Number: 160023 Calibration Date: 04/21/2006 Calibration Due Date: 04/21/2007

Calibration Interval: 12 Months
Condition As Found: In Tolerance
Condition As Left: In Tolerance

Remarks:

The UUT (unit under test) was calibrated using the customer's procedure. The UUT was operated by the customer's personnel and data collection was observed by SCE personnel. The UUT was found to be in tolerance to customer supplied specifications. The reference standards used are in compliance with ISO/IEC 17025:1999 and laboratory accreditation criteria established by NIST/NVLAP under the specific scope of accreditation for lab code 105014-0. Frequency is accredited.

Please see attached data.

Standards Utilized

| I.D. No. | Mfg. | Model No. | Description | Cal. Date | Due Date |
|----------|-----------------|----------------------|--------------------------------------|------------|------------|
| S1-01252 | Hewlett Packard | 5335A OPT 010,203040 | Counter, Universal | 12/09/2005 | 06/09/2006 |
| S1-03355 | Hewlett Packard | 3325B OPT 001, 002 | Generator, Function, Synthesizer | 11/03/2005 | 11/03/2006 |
| S1-03686 | Fluke | 910 | Standard, Frequency, Controlled, Gps | 01/16/2006 | 01/16/2007 |

Procedure: Customer Temperature: 23° C Humidity: 40% RH Test No.: 501203 Calibration Performed By:

Branson, Craig A Metrologist 714-895-0714
Name Title Phone Name Of 21-66
Date

This report may not be reproduced, except in full, without written permission of this laboratory. This report may not be used to claim product endorsement by NVLAP or any agency of the US Government. The results stated in this report relate only to the items tested or calibrated. Measurements reported herein are traceable to SI units via national standards maintained by NIST and were performed in compliance with MIL-STD-45662A, ANSI/NCSL Z540-1-1994, 10CFR50, Appendix B, and ISO 9002-94.

Page 1 of 2

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SEISMOGRAPH CALIBRATION DATA SHEET REV 4/6/06

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| SERIAL NO.: | 2626A098 | 381 | CALIBRATIO | IN DATE: | 12/9/2005 | | | |
| BY: | SCE #S1- | 01252 | DUE DATE: | | 6/9/2006 | | | |
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Calibration Report

GEOVision Geophysical Services

1151 Pomona Road, Unit P Corona, CA 92882 P.O. No.: 6162-060414-01

METROLOGY 7300 Fenwick Lane Westminster, CA 92683 866-723-2257 edisonmetrology.com

Manufacturer: Model Number:

Description:

Asset Number: 160024 Serial Number: 160024

Oyo 3403

Unit, Suspension Telemetry,

Calibration Interval: Condition As Found: **Condition As Left:**

Calibration Date:

04/21/2006 Calibration Due Date: 04/21/2007 12 Months In Tolerance

In Tolerance

Remarks:

The UUT (unit under test) was calibrated using the customer's procedure. The UUT was operated by the customer's personnel and data collection was observed by SCE personnel. The UUT was found to be in tolerance to customer supplied specifications. The reference standards used are in compliance with ISO/IEC 17025:1999 and laboratory accreditation criteria established by NIST/NVLAP under the specific scope of accreditation for lab code 105014-0. Frequency is accredited. Please see attached data.

Standards Utilized

| I.D. No. | Mfg. | Model No. | Description | Cal. Date | Due Date |
|----------|-----------------|----------------------|--------------------------------------|------------|------------|
| S1-01252 | Hewlett Packard | 5335A OPT 010,203040 | Counter, Universal | 12/09/2005 | 06/09/2006 |
| S1-03355 | Hewlett Packard | 3325B OPT 001, 002 | Generator, Function, Synthesizer | 11/03/2005 | 11/03/2006 |
| S1-03686 | Fluke | 910 | Standard, Frequency, Controlled, Gps | 01/16/2006 | 01/16/2007 |

Procedure: Customer Temperature: 23° C **Humidity:** 40% RH Test No .: 501204

Calibration Performed By: Quality Reviewer: Branson, Craig A (Metrologist 714-895-0714 Phone

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Page 1 of 2

page 2 of 2



SEISMOGRAPH CALIBRATION DATA SHEET REV 4/6/06

| SYSTEM MFR: | | | MODEL NO.: | | 3403 | | | |
|---------------|-----------------------|---|--------------------|------------|--------------|-------------|---|--|
| | 160024 | | CALIBRATIO | | | | - | |
| A | | STELLER | DUE DATE: | | 4/21/2007 | | | |
| COUNTER MFF | HEWLE | TT PACKARD | MODEL NO.: | | 5335A | | | |
| | 2626A098 | | CALIBRATIC | | 12/9/2005 | | | |
| | SCE #S1- | | DUE DATE: | | 6/9/2006 | | | |
| FCTN GEN MFF | | | MODEL NO. | : | 3325B | | | |
| | 2847A144 | | CALIBRATIC | | 11/3/2005 | | | |
| | SCE #S1- | | DUE DATE: | | 11/3/2006 | | | |
| SYSTEM SETTI | | | | | | | NAME OF THE PARTY | |
| GAIN: | INGS. | | 2 | | | | | |
| FILTER: | | | 10 KHZ | | | | ··· | |
| RANGE: | | | | C. 100 MIC | ROSECOND | SAMPI | ERATE | |
| DELAY: | | | 0 | | ····· | | | |
| STACK: 1 (STD |) | | 1 | | | | | |
| PULSE: | , | | 1.6 | | | | | |
| DISPLAY: | | | NA | | | | | |
| SYSTEM: DATE | E = CORRI | ECT DATE & TIME | 4/21/2006, 11:30AM | | | | | |
| AND PRINT WA | AVEFORM APES, IF A | RD BOTH ON DISK S FROM ANALYSIS VAILABLE, TO THIS .0 HZ. | UTILITY. AT | TACH PAP | ER COPIES C | F PRI | NTOUT | |
| AS FOUND | ÷ . | 100.0 | _ | AS LEFT | 100.0 | | | |
| WAVEFORM | FILE NO | FREQUENCY | TIME FOR | TIME FOR | TIME FOR | 9 | AVERAGE | |
| | | | 9 CYCLES | 9 CYCLES | CYCLES | 3 | FREQ. | |
| | | | Hn | Hr | V | 1.2 | | |
| SQUARE | 401 | 100.0 | 90.0 | | | 90.0 | 100.0 | |
| SQUARE | 402 | 100.0 | 90.0 | | | 90.0 | 100.0 | |
| SINE | 403 | 100.0 | 89.9 | ļ | | 90.1 | 100.0 | |
| SINE | 404 | 100.0 | 90.0 | 90.1 | 1 | 90.1 | 99.9 | |
| CALIBRATED | | ROBERT STELLER | | 4/21/2006 | | | سنسل | |
| | | NAME | | DATE | SIGNATURE | | | |
| | Seismic | recorder/Logger Cali | bration Data | Sheet Rev | v 1.30 4-6-0 | | | |





Calibration Report

GEOVision Geophysical Services

1151 Pomona Road, Unit P Corona, CA 92882 P.O. No.: 6162-060414-01

METROLOGY 7300 Fenwick Lane

Westminster, CA 92685 866-723-2257

Manufacturer: Model Number: Geometrics **STRATAVIEW**

Description:

Siesmograph,

Asset Number: 75299 Serial Number:

75299

Calibration Date:

04/21/2006

Calibration Due Date: 04/21/2007

12 Months

Calibration Interval: Condition As Found:

In Tolerance

Condition As Left:

In Tolerance

The UUT (unit under test) was calibrated using the customer's procedure. The UUT was operated by the customer's personnel and data collection was observed by SCE personnel. The UUT was found to be in tolerance to customer supplied specifications. The reference standards used are in compliance with ISO/IEC 17025:1999 and laboratory accreditation criteria established by NIST/NVLAP under the specific scope of accreditation for lab code 105014-0. Frequency is accredited. Please see attached data.

Standards Utilized

| I.D. No. | Mfg. | Model No. | Description | Cal. Date | Due Date |
|----------|-----------------|----------------------|--------------------------------------|------------|------------|
| S1-01252 | Hewlett Packard | 5335A OPT 010,203040 | Counter, Universal | 12/09/2005 | 06/09/2006 |
| S1-03355 | Hewlett Packard | 3325B OPT 001, 002 | Generator, Function, Synthesizer | 11/03/2005 | 11/03/2006 |
| S1-03686 | Fluke | 910 | Standard, Frequency, Controlled, Gps | 01/16/2006 | 01/16/2007 |

Procedure: Customer Temperature: 23° C **Humidity:** 40% RH Test No .: 501205

Quality Reviewer: Calibration Performed By: Branson, Craig A Metrologist 714-895-0714

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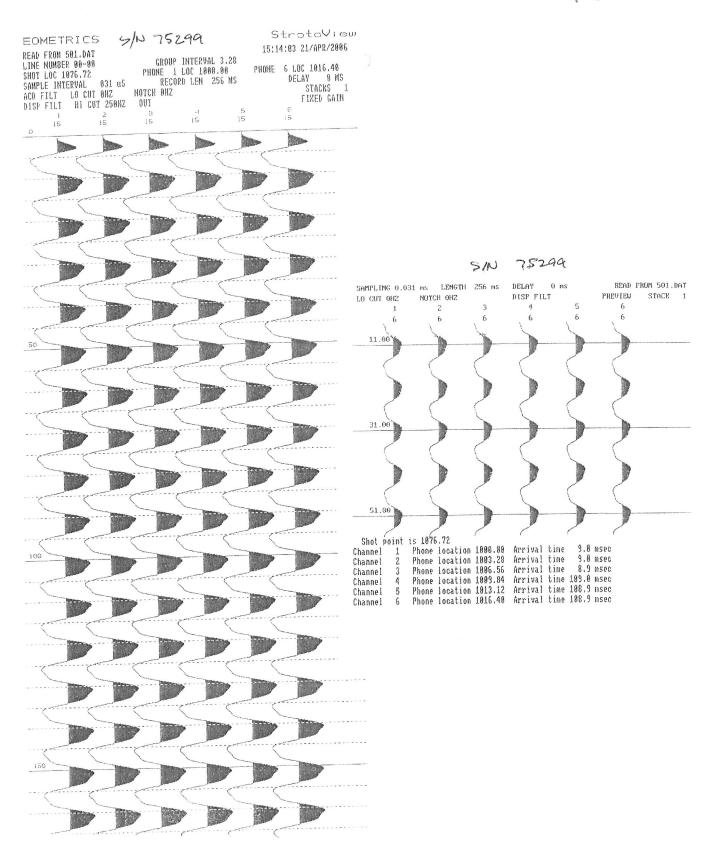
pge Zot 6

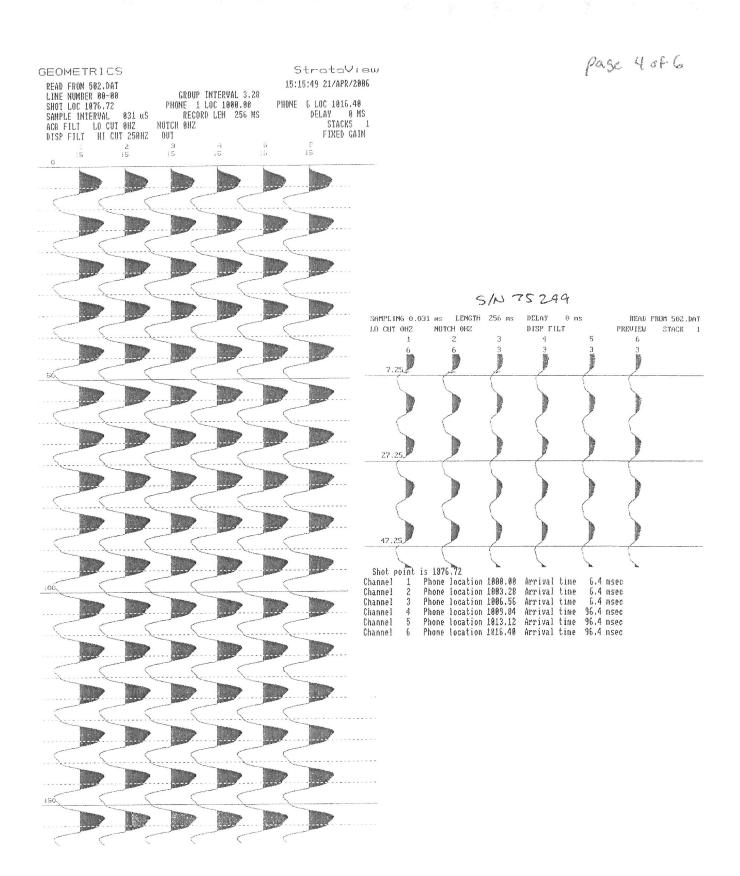


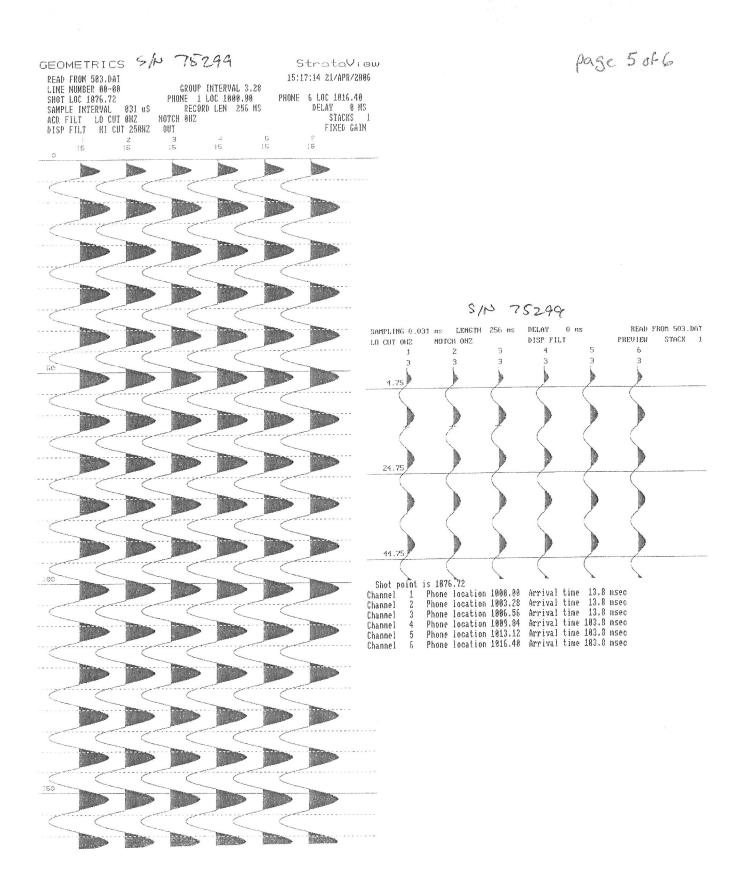
SEISMOGRAPH CALIBRATION DATA SHEET REV 4/6/06

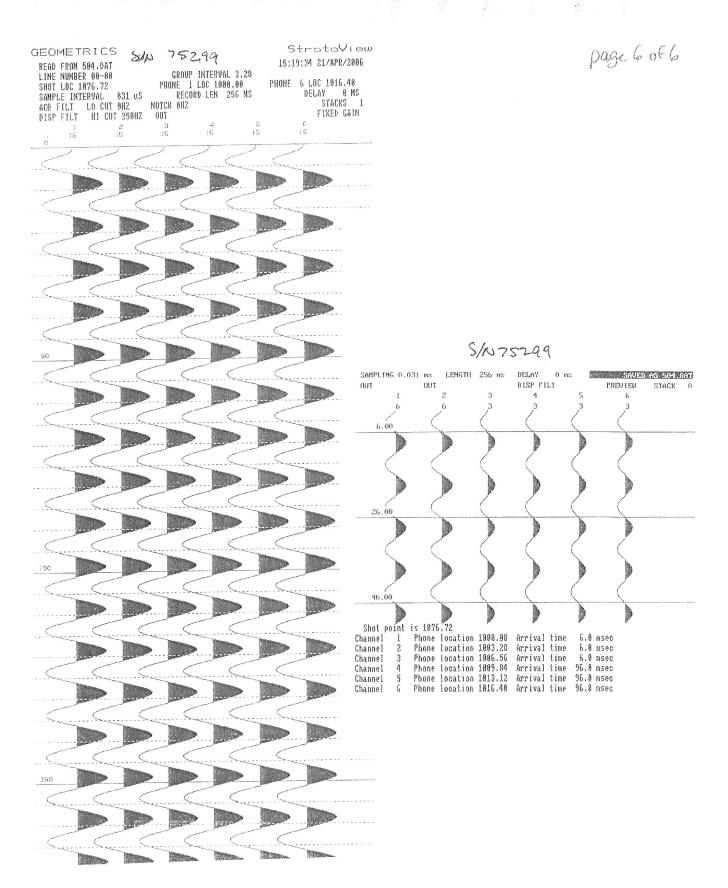
| INSTRUMENT I | ATA | | | | | | | |
|---------------------|-----------------------|--|----------------|------------|-------------|-------------|----------|-------|
| SYSTEM MFR: | | RICS | MODEL NO .: | | STRATAVIEW | | | |
| SERIAL NO.: | 75299 | | CALIBRATIO | N DATE: 4 | 1/21/2006 | | | |
| | ROBERT | STELLER | DUE DATE: | 7 | 1/21/2007 | | | |
| COUNTER MFF | - HEWLE | TT PACKARD | MODEL NO.: | . A | 5335A | | | |
| SERIAL NO.: | 2626A098 | | CALIBRATIO | | 12/9/2005 | | | |
| BY: | SCE #S1- | | DUE DATE: | | 5/9/2006 | | | |
| FCTN GEN MFI | R: HEWLE | TT PACKARD | MODEL NO.: | | 3325B | | | |
| | 2847A144 | | CALIBRATIC | N DATE: | 11/3/2005 | | | |
| | SCE #S1- | | DUE DATE: | | 11/3/2006 | | | |
| SYSTEM SETT | INGS: | | | | | | | |
| GAIN: | nijoo. | | 15 DB | | | | | |
| FILTER: | | | NONE | | | | | |
| RANGE: | | • | 256 MILLISE | C, 31 MICR | OSECOND SA | MPL | E RAT | E |
| DELAY: | | | 0 | | | | | |
| STACK: 1 (STE |) Ý | | 1 | | | | | |
| PULSE: | · V. | | NA | | | | | |
| DISPLAY: | | | NA | | | | | |
| | E = CORRI | ECT DATE & TIME | 4/21/2006, 1 | 2:09PM | | | | |
| AND PRINT W | AVEFORM APES, IF A | RD BOTH ON DISK S FROM ANALYSIS WAILABLE, TO THI .0 HZ. | SUTILITY, AT | TACH PAPI | ER COPIES O | FPRI | NTOU | T. |
| . A mai jum | | 400.0 | | AS LEFT | 100.0 | | | |
| AS FOUND | | 100.0 | | AO LEFT | 100.0 | | | |
| WAVEFORM | FILE NO | FREQUENCY | TIME FOR | TIME FOR | TIME FOR | 9 | AVER | AGE |
| 11, 11, 12, 13, 13, | | | 9 CYCLES | 9 CYCLES | CYCLES | | FRE | EQ. |
| | | | Hn | Hr | V | | | |
| SQUARE | 501 | 100.0 | 90.0 | 90.0 | | 90.0 | | 100.0 |
| SQUARE | 502 | 100.0 | 90.0 | 1 | | 90.0 | | 100.0 |
| SINE | 503 | 100.0 | 90.0 | | | 90.0 | | 100.0 |
| SINE | 504 | 100.0 | 90.0 | 90.0 | | 90.0 | | 100.0 |
| CALIBRATED | BY: | ROBERT STELLE | ર | 4/21/2006 | | Ste | مستدر | |
| | | NAME | | DATE | SIGNATURE | | | |
| | Saismie | recorder/Logger Ca | libration Data | Sheet Rev | 1.30 4-6-06 | 3 | <u> </u> | |

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United States Department of Commerce National Institute of Standards and Technology



Certificate of Accreditation to ISO/IEC 17025:1999

NVLAP LAB CODE: 105014-0

Southern California Edison Company

Westminster, CA

is recognized by the National Voluntary Laboratory Accreditation Program for conformance with criteria set forth in NIST Handbook 150:2001 and all requirements of ISO/IEC 17025:1999. Accreditation is granted for specific services, listed on the Scope of Accreditation, for.

CALIBRATION LABORATORIES

2006-04-01 through 2007-03-31

Effective dates



Project 6468-06-1472 January 17, 2007

MACTEC Engineering and Consulting, Inc. North Anna COL Geotechnical Report Attachment E





SCOPE OF ACCREDITATION TO ISO/IEC 17025:1999

Southern California Edison Company

7300 Fenwick Lane Westminster, CA 92683 Ms. Jennifer E. Smith

Phone: 714-895-0133 Fax: 714-895-0781 E-mail: Jennifer.Smith@sce.com URL: http://www.edisonmetrology.com

CALIBRATION LABORATORIES

NVLAP LAB CODE 105014-0

NVLAP Code: 20/A01

ANSI/NCSL Z540-1-1994; Part 1

Compliant

DIMENSIONAL

NVLAP Code: 20/D03

Gage Blocks

| Nominal Length in in | Best Uncertainty (±) in µin note 1 |
|----------------------|------------------------------------|
| 0.01 to < 0.05 | 1.9 |
| 0.05 to < 0.1 | 1.7 |
| 0.1 to < 1.0 | 1.2 |
| 1.0 | 1.4 |
| 2.0 | 1.8 |
| 3.0 | 2.2 |
| 4.0 | 2.9 |
| 5.0 | 5.4 |
| 6.0 | 5.6 |
| 7.0 | 5.8 |
| 8.0 | 6.0 |
| 10.0 | 6.8 |
| 12.0 | 7.2 |
| 16.0 | 8.1 |
| 20.0 | 9.4 |

2006-04-01 through 2007-03-31

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CALIBRATION LABORATORIES

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| Nominal Length in mm | | Best Unc | ertainty (±) in nm ^{note 1} |
|----------------------|--|----------|--------------------------------------|
| 0.5 to < 1.0 | | | 52 |
| 1.0 to < 2.5 | | | 44 |
| 2.5 to < 25.0 | | | 39 |
| 25.0 | | | 44 |
| 50.0 | | | 47 |
| 75.0 | | | 60 |
| 100.0 | | | 80 |

NVLAP Code: 20/D11

Spherical Diameter; Ring Gages

| Range in inches | Best | t Uncertainty (±) in μin ^{note 1} | Remarks |
|-------------------|------|--|---------------------------|
| 0.040 to 0.825 | | 6 | Comparison to gage blocks |
| > 0.825 to 1.510 | 7 | 7 | Comparison to gage blocks |
| > 1.510 to 2.510 | | 8 | Comparison to gage blocks |
| > 2.510 to 4.510 | | 12 | Comparison to gage blocks |
| > 4.510 to 6.510 | | 14 | Comparison to gage blocks |
| > 6.510 to 9.010 | | 16 | Comparison to gage blocks |
| > 9.010 to 12.010 | | 19 | Comparison to gage blocks |
| > 12.010 to 13.25 | | 31 | Comparison to gage blocks |

ELECTROMAGNETICS - DC/LOW FREQUENCY

NVLAP Code: 20/E02

AC Current

| Range | Best Uncertainty (±) in ppm ^{note 1} Frequency in Hz | | | | | | |
|--------|---|-----|-----|-------------|--|--|--|
| | 10 | 20 | 40 | 400 to 10 k | | | |
| 10 mA | 270 | 199 | 127 | 116 | | | |
| 20 mA | 270 | 199 | 127 | 116 | | | |
| 30 mA | 270 | 199 | 127 | 116 | | | |
| 50 mA | 286 | 208 | 141 | 130 | | | |
| 100 mA | 270 | 199 | 127 | 116 | | | |

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10 k

143

5 k

143

| CALIBRATION LABORATORIES | | | | | NVLAP LAE | 3 CODE 105014-0 | | |
|--------------------------|--------|--|-----|-----|-----------|-----------------|------|-----|
| | | | | | | | | |
| | 200 mA | | | 270 | | 199 | 127 | 116 |
| | 300 mA | | | 270 | | 199 | 127 | 116 |
| | 500 mA | | | 270 | | 208 | 141 | 130 |
| | | | 10 | 20 | 40 | 400 to 5 k | 10 k | |
| | 1A | | 270 | 199 | 127 | 116 | 130 | |
| | | | 10 | 20 | 40 | 400 to 10 k | | |
| | 2A | | 271 | 200 | 129 | 118 | | |
| | 3A | | 271 | 200 | 129 | 118 | | |
| | | | 10 | 20 | 40 | 400 to 5 k | 10 k | |
| | 5A | | 286 | 209 | 142 | 132 | 148 | |
| | | | | | | | | |

20A 144

400

121

1 k

121

40

132

NVLAP Code: 20/E05 DC Current

10A

10

273

20

233

| Range | | Best Uncertainty (±) in ppm note 1 |
|--------|----|------------------------------------|
| 10 nA | | 2.9 |
| 100 nA | | 2.3 |
| 1 μΑ | | 2.0 |
| 10 μΑ | | 2.0 |
| 100 μΑ | | 2.0 |
| 1 mA | | 1.9 |
| 10 mA | | 1.9 |
| 100 mA | | 1.9 |
| 1 A | | 10.4 |
| 10 A | ٠. | 10.4 |
| 30 A | | 20.6 |

2006-04-01 through 2007-03-31

Effective dates

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CALIBRATION LABORATORIES

NVLAP LAB CODE 105014-0

DC Resistance

| Nominal Value in Ω | Best Uncertainty (±) in ppm note 1 | Remarks |
|---------------------------|------------------------------------|--|
| 100μ | 8.20 | Automated DC Resistance Calibration System |
| 1 m | 5.50 | Automated DC Resistance Calibration System |
| 10 m | 3.70 | Automated DC Resistance Calibration System |
| 100 m | 2.10 | Automated DC Resistance Calibration System |
| 1 | 0.40 | Automated DC Resistance Calibration System |
| 10 | 0.40 | Automated DC Resistance Calibration System |
| 25 | 0.50 | Automated DC Resistance Calibration System |
| 100 | 0.50 | Automated DC Resistance Calibration System |
| 1 k | 0.50 | Automated DC Resistance Calibration System |
| 10 k | 0.50 | Automated DC Resistance Calibration System |
| 100 k | 1.50 | Automated DC Resistance Calibration System |
| 1 M | 2.30 | Automated DC Resistance Calibration System |
| 10 M | 3.30 | Automated DC Resistance Calibration System |
| 100 M | 4.00 | Automated DC Resistance Calibration System |

NVLAP Code: 20/E06

DC Voltage

| Range | Best Uncertainty (±) in ppm notes 1,2 | Remarks |
|----------------|---------------------------------------|---|
| 1.018 V | 0.80 | Automated DC Calibration System |
| 10.00 V | 0.20 | Automated DC Calibration System |
| 1.000 V | 0.80 | Automated DC Calibration System |
| 1 mV to 100 mV | 1.3 note 6 | Ratiometric Measurement Techniques performed by voltage transfer utilizing a high precision voltage |
| 100 mV | 0.7 | Ratiometric Measurement Techniques performed by voltage transfer utilizing a high precision voltage |
| 1.0 V | 0.3 | Ratiometric Measurement Techniques performed by voltage transfer utilizing a high precision voltage |

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CALIBRATION LABORATORIES

NVLAP LAB CODE 105014-0

| 10.0 V | 0.3 | Ratiometric Measurement Techniques performed by voltage transfer utilizing a high |
|----------|-----|---|
| 20.0 V | 0.5 | precision voltage Ratiometric Measurement Techniques performed by voltage transfer utilizing a high |
| 100.0 V | 0.3 | precision voltage Ratiometric Measurement Techniques performed by voltage transfer utilizing a high |
| 1000.0 V | 0.7 | precision voltage Ratiometric Measurement Techniques performed by voltage transfer utilizing a high precision voltage |

NVLAP Code: 20/E09 LF AC Voltage

Best Uncertainty (±) in ppm notes 1,3,4 Frequency in Hz

| Range | 10 | 20 | 40 | 100 | 1k | 10k | 20k | 50k | 100k | 300k | 500k | 800k | 1M |
|--------|-----|-----|-----|-----|-----|-----|------|-----|------|------|------|------|------|
| 2 mV | 448 | 912 | 889 | 969 | 379 | 865 | 1073 | 405 | 1131 | 1265 | 2116 | 2595 | 2938 |
| 10 mV | 119 | 230 | 102 | 177 | 245 | 169 | 180 | 220 | 343 | 243 | 676 | 425 | 488 |
| 20 mV | 83 | 70 | 67 | 67 | 66 | 76 | 76 | 165 | 261 | 361 | 521 | 372 | 442 |
| 30 mV | 134 | 111 | 80 | 78 | 62 | 63 | 71 | 133 | 219 | 345 | 535 | 688 | 791 |
| 100 mV | 36 | 72 | 23 | 42 | 34 | 35 | 34 | 43 | 77 | 169 | 220 | 287 | 225 |
| 190 mV | 36 | 31 | 22 | 20 | 21 | 26 | 21 | 42 | . 80 | 136 | 124 | 264 | 215 |
| 300 mV | 46 | 61 | 30 | 32 | 34 | 19 | 28 | 36 | 59 | 116 | 143 | 189 | 205 |
| 1 V | 120 | 36 | 18 | 10 | 13 | 12 | 11 | 25 | 14 | 87 | 102 | 104 | 98 |
| 1.9 V | 36 | 22 | 22 | 9 | 9 | 9 | 8 | 18 | 11 | 94 | 101 | 85 | 89 |
| 3 V | 26 | 34 | 25 | 17 | 14 | 14 | 13 | 27 | 14 | 100 | 108 | 95 | 97 |
| 10 V | 20 | 42 | 19 | 10 | 10 | 9 | 10 | 11 | 16 | 80 | 100 | 111 | 100 |
| 19 V | 26 | 23 | 20 | 11 | 9 | 9 | 10 | 11 | 16 | 98 | 109 | 82 | 82 |
| 30 V | 30 | 37 | 26 | 19 | 15 | 16 | 19 | 37 | 44 | 118 | | | |
| 100 V | 140 | 46 | 20 | 16 | 15 | 19 | 11 | 40 | 22 | | | | |
| 190 V | 47 | 27 | 20 | 20 | 13 | 13 | 13 | 41 | 26 | | | | |
| 300 V | | | 37 | 29 | 18 | 27 | 22 | 29 | 46 | | | | |
| 500 V | | | 33 | 25 | 17 | 20 | 19 | 38 | 52 | | | | |
| | | | | | | | | | | | | | |

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CALIBRATION LABORATORIES

NVLAP LAB CODE 105014-0

| 700 V | 29 | 23 | 18 | 17 | 19 | 44 | 54 |
|--------|----|----|----|----|----|----|----|
| 1000 V | 22 | 23 | 21 | 19 | 22 | | |

TIME AND FREQUENCY

NVLAP Code: 20/F01
Frequency Dissemination

| Range | Best Uncertainty (±) note 1 | Remarks |
|--------|-----------------------------|---------------------|
| 10 MHz | 1.2×10^{-12} | GPS Receiver |

MECHANICAL

NVLAP Code: 20/M05

Flow Rate

| Nominal Flow Rate | Best Uncertainty (±) in percent notes 1, 5 |
|------------------------|--|
| (0.8 to 30) L/s | 0.3 |
| (0.1 to 800) mL/s | 0.4 |
| (0.006 to 0.1) mL/s | 0.7 |
| | |

NVLAP Code: 20/M06

Force

| Nominal Force in lb | Best Uncertainty (±) note 1 | Remarks |
|---------------------|-----------------------------|---------------------|
| 2 to 200 | 0.025 % | Dead Weight |
| > 200 to 300 | 0.086 lb | Proving Ring |
| > 300 to 500 | 0.14 lb | Proving Ring |
| > 500 to 1000 | 0.28 lb | Proving Ring |
| > 1000 to 2000 | 0.55 lb | Proving Ring |
| > 2000 to 5000 | 0.84 16 | Proving Ring |
| > 5000 to 10 000 | 1.7 lb | Proving Ring |
| > 10 000 to 20 000 | 5.5 lb | Proving Ring |
| > 20 000 to 35 000 | 5.8 lb | Proving Ring |
| > 35 000 to 50 000 | 13 lb | Proving Ring |

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CALIBRATION LABORATORIES

NVLAP LAB CODE 105014-0

| > 50 000 to 60 000 | 16 lb | Proving Ring |
|----------------------|--------|---------------------|
| > 60 000 to 100 000 | 26 lb | Proving Ring |
| > 100 000 to 300 000 | 113 lb | Proving Ring |

NVLAP Code: 20/M08

Mass

| Range | Best Uncertainty (±) in mg notes 1,2 | Remarks |
|--------|--------------------------------------|-----------|
| 10 kg | 2.3 | Echelon I |
| 5 kg | 0.93 | Echelon I |
| 3 kg | 0.65 | Echelon I |
| 2 kg | 0.43 | Echelon I |
| 1 kg | 0.052 | Echelon I |
| 500 g | 0.043 | Echelon I |
| 300 g | 0.041 | Echelon I |
| 200 g | 0.034 | Echelon I |
| 100 g | 0.020 | Echelon I |
| 50 g | 0.013 | Echelon I |
| 30 g | 0.013 | Echelon I |
| 20 g | 0.0095 | Echelon I |
| 10 g | 0.0073 | Echelon I |
| 5 g | 0.0048 | Echelon I |
| 3 g | 0.0038 | Echelon I |
| 2 g | 0.0029 | Echelon I |
| 1 g | 0.0030 | Echelon I |
| 500 mg | 0.0017 | Echelon I |
| 300 mg | 0.0013 | Echelon I |
| 200 mg | 0.0010 | Echelon I |
| 100 mg | 0.0009 | Echelon I |
| 50 mg | 0.0007 | Echelon I |
| 30 mg | 0.0007 | Echelon I |
| 20 mg | 0.0005 | Echelon I |
| 10 mg | 0.0005 | Echelon I |
| 5 mg | 0.0006 | Echelon I |
| 3 mg | 0,0006 | Echelon I |

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CALIBRATION LABORATORIES

NVLAP LAB CODE 105014-0

| 2 mg 1 mg | 0.0005 0.0005 | Echelon I Echelon I |
|--------------|------------------|------------------------|
| 30 kg | 56 | Echelon II |
| 20 kg | 22 | Echelon II |

THERMODYNAMIC

NVLAP Code: 20/T05

Pressure

| Range | Best Uncertainty (\pm) in ppm $^{note\ 1}$ | Remarks |
|--------------------|--|---------|
| > 1.5 to 50 | 20 | Gas |
| > 50 to 1450 | 45 | Gas |
| > 1450 to 16 000 | 90 | Gas |
| > 1000 to 10 000 | 60 | Oil |
| > 10 000 to 30 000 | 110 | Oil |
| > 30 000 to 50 000 | 210 | Oil |

Represents an expanded uncertainty using a coverage factor, k = 2, at an approximate level of confidence of 95 %.

8. Avoirdupois mass calibration services are available by comparison to equivalent metric standards. Uncertainties may be appropriately larger.

2006-04-01 through 2007-03-31

Effective dates

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^{2.} Approximate value. Actual value determined by the test statistics.

^{3.} All ACV measurements performed via AC/DC transfer system.

^{4.} Uncertainties listed are representative of the laboratory's accredited capabilities within the stated ranges. Accreditation is not limited to only those fixed values shown.

^{5.} Dependent upon principle of operation of device being calibrated and its performance relative to standards at the time of the test.

^{6.} The equation: uncert. = $(A + B/mVDC^2)^{0.5}$ (where A = 0.16 and B = 0.013333) is provided in order for potential customers to calculate approximate uncertainties for values down to 1 mV. Example: uncertainty at 1 mVDC would calculate to approximately ±115.47 ppm.

^{7.} The laboratory maintains Echelon II capability for ranges 20 kg to 1 mg and separate Echelon III for all ranges.

Calibration Report

Customer: GEOVISION

Corona CA 92882

Account#: 15214

Cust.PO#: Page 1 of 2

Instrument: Caliper Calibration Plate

Mfg: Robertson Geo Logging

Model: N/A

Size: Res.: RO PRECISION LIBRATION INC.
12686 Honver Street, Garden Grove, CA 92841

12686 Hoover Street, Garden Grove, CA 92841 Ph. (714) 901-5659 Fax (714) 901-5649

MPC Ctrl#: AM6766 Report#: 199974 Print Date: 041006 MPC Job#: L25384

Serial#: 201
Cust Ctrl#:
Location:
Department:

Work Performed: Inspected, cleaned, and calibrated.

Parts Replaced: None

Calibration Condition as Received: In tolerance Calibration Condition as Returned: In tolerance

Functions/Parameters Tested

Actual Values (inch) As Measured 1.969 1.965 3.937 3.939 8.000 7.995 12.00 11.9965

Unless noted otherwise, Pass/Fail criteria is based on published manufacturer specifications and, unless noted otherwise, this instrument meets these specifications.

Services provided comply with ISO 17025:1999, ISO 9001:2000, MPC QM rev.3, MPC CSD rev.2 and customer purchase order requirements as required.

Calibration standards used for performance testing:01

MPC# Instrument
K3263 Pratt & Whitney C Super Micrometer 060706 192068
I2111 Mitutoyo 516-126 Gage Block Set 082406 397060

Environmental: 69 Deg / 40% Rh

Accuracy Ratio: 4:1 Cal Procedure: 33K6-4-552-1

Technician: CHRIS SPANGLER
Form Cert 04-25-05

Cal Int.: 12
Cal Date: 040606
Due Date: 040607
Quality Approval:



All standards used are either traceable to the National Institute of Standards and Technology or have intrinsic accuracy. All services performed have used proper manufacturer and industrial service techniques and are warranted for no less than (30) days. This report may not be reproduced in part without written permission of Micro Precision's Quality Assurance Manager.

GEOVision Borehole Geophysics depth wheel verification

Performed by Robert Steller on September 23, 2006

| | Depth reading in #1 | Depth reading out | Depth reading in #2 |
|-------------------------|---------------------|-------------------|---------------------|
| Depth wheel | 100.1 feet | 99.95 feet | 100.05 feet |
| S/N 101 | (30.51 m) | (30.46 m) | (30.50 m) |
| 500 pulse/revolution | | | |
| Circumference = 983mm | | | |
| (3225.07 millifeet) | | | |
| | | | |
| Depth wheel | 100.00 feet | 100.05 feet | 100.00 feet |
| S/N 102 | (30.48) m | (30.50 m) | (30.48) m |
| 500 pulse/revolution | | | |
| Circumference = 994mm | | | |
| (3261.15 millifeet) | | | |
| | 100.07.0 | | |
| Aries winch | 100.05 feet | 100.05 feet | 100.00 feet |
| 200 pulse/revolution | (30.50) m | (30.50 m) | (30.48) m |
| Circumference = 305.9mm | | | |
| (1003.51 millifeet) | | | |
| Depth wheel | | | |
| S/N 103 | | | |
| 500 pulse/revolution | | | |
| Circumference = 1000mm | | | |
| (3.281 feet) | | | |
| (3.201 1001) | | | |
| Comprobe winch | | | |
| 500 pulse/revolution | | | |
| Circumference = 1000mm | | | |
| (3.281 feet) | | | |

All measurements taken with a Stanley 100ft flexible stainless steel tape model number 34-130, and a Keeson 300 foot fiberglass tape, both marked in feet, inches and 1/8ths of inches. Enough cable was spooled off of the winch to allow the cable and tape measures to be laid flat on the parking lot surface side-by-side. A permanent marker was used to mark a 100.0 foot interval on the cable, and the marks were also tagged with electrical tape for visibility. The cable was then spooled back onto the winch. When the first mark was at the top of the measuring wheel, a matching permanent mark was placed, and the recording system (Robertson Micrologger) was set to 0.0 feet depth. The cable was spooled in to the second mark, and the distance was recorded. The recording system was set to 0.0 feet again, and the cable spooled out to the first mark again, and the distance was recorded. The process was repeated one more time to spool the cable back onto the winch, and the distance was recorded.

Estimated accuracy is of these measurements is \pm 0.1 foot or \pm 0.03m.

GEOVision Suspension PS probe Receiver 1–Receiver 2 (R1-R2) spacing verification

Performed by Robert Steller on September 23, 2006

| | R2 center to R1 center hanging dry | R2 center to R1 center hanging submerged | R1 bottom to source center hanging submerged with 1m isolation tube S/N 280068 |
|--------------|------------------------------------|--|--|
| Receiver S/N | 40.2in | 40.0in | 76.0in |
| 30086 | 1.02m | 1.02m | 1.93m |
| | | | |
| Receiver S/N | 39.8in | 39.6in | 75.7in |
| 20042 | 1.01m | 1.01m | 1.92m |
| | | | 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 |
| Receiver S/N | 40.2in | 40.0in | 76.0in |
| 12008 | 1.02m | 1.02m | 1.93m |
| | | | |
| | | | |
| | | | |

All measurements taken with a Lufkin 3.7m flexible steel tape model number HV1034DM, marked in mm and 100^{th} of feet. Probe suspended in 3-inch diameter clear PVC pipe, using chain clamp placed between bottom and center of Receiver 2 hard section (See Figure). Probe "bounced" to establish unrestricted hanging length before measurement. Probe allowed to relax for 5 minutes prior to each measurement. Water level set to submerge bottom of Receiver 2 hard section.. Estimated accuracy due to hysterisis in rubber section approximately ± -0.01 or ± -0.003 m.

