

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.
2. 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.

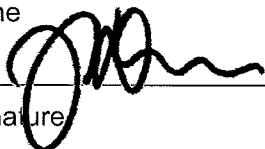
If results are acceptable affix label indicating the initials of the person performing the calibration, the date of calibration, and the due date for the next calibration (12 months).

Procedure Approval

Approved by:

John G. Diehl

Name


Signature

President

Title

April 6, 2006

Date

Client Approval (if required):

Name

Title

Signature

Date



Seismic Recorder/Logger Calibration Procedure
Revision 1.30 Page 2



Calibration Report



METROLOGY
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edisonmetrology.com

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

Manufacturer: Oyo Corporation
Model Number: 3331-A
Description: Logger, Suspension,
Asset Number: 19029
Serial Number: 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	910	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	Mary J	04-21-06
Name	Title	Phone	Name	Date

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SEISMOGRAPH CALIBRATION DATA SHEET REV 4/6/06

INSTRUMENT DATA

SYSTEM MFR:	OYO	MODEL NO.:	3331A
SERIAL NO.:	19029	CALIBRATION DATE:	4/21/2006
BY:	ROBERT STELLER	DUE DATE:	4/21/2007
COUNTER MFR:	HEWLETT PACKARD	MODEL NO.:	5335A
SERIAL NO.:	2626A09881	CALIBRATION DATE:	12/9/2005
BY:	SCE #S1-01252	DUE DATE:	6/9/2006
FCTN GEN MFR:	HEWLETT PACKARD	MODEL NO.:	3325B
SERIAL NO.:	2847A14447	CALIBRATION DATE:	11/3/2005
BY:	SCE #S1-03355	DUE DATE:	11/3/2006

SYSTEM SETTINGS:

GAIN:	10
FILTER:	20 KHZ
RANGE:	100 MILLISEC
DELAY:	0
STACK: 1 (STD)	1
PULSE:	1.6
DISPLAY:	NA
SYSTEM: DATE = CORRECT DATE & TIME	4/21/2006, 10:30AM

PROCEDURE:

SET FREQUENCY TO 100.0HZ SQUAREWAVE WITH AMPLITUDE APPROXIMATELY 0.25 VOLT PEAK. RECORD BOTH ON DISK AND PAPER TAPE, IF AVAILABLE. ANALYZE AND PRINT WAVEFORMS FROM ANALYSIS UTILITY. ATTACH PAPER COPIES OF PRINTOUT AND PAPER TAPES, IF AVAILABLE, TO THIS FORM. AVERAGE FREQUENCY MUST BE BETWEEN 99.0 AND 101.0 HZ.

AS FOUND 100.0

AS LEFT 100.0

WAVEFORM	FILE NO	FREQUENCY	TIME FOR 9 CYCLES Hn	TIME FOR 9 CYCLES Hr	TIME FOR 9 CYCLES V	AVERAGE FREQ.
SQUARE	201	100.0	90.0	90.0	90.0	100.0
SQUARE	202	100.0	90.0	90.0	90.0	100.0
SINE	203	100.0	89.9	89.9	89.9	100.1
SINE	204	100.0	90.0	90.0	89.9	100.0

CALIBRATED BY:

ROBERT STELLER
NAME

4/21/2006

DATE

SIGNATURE

Robert Steller

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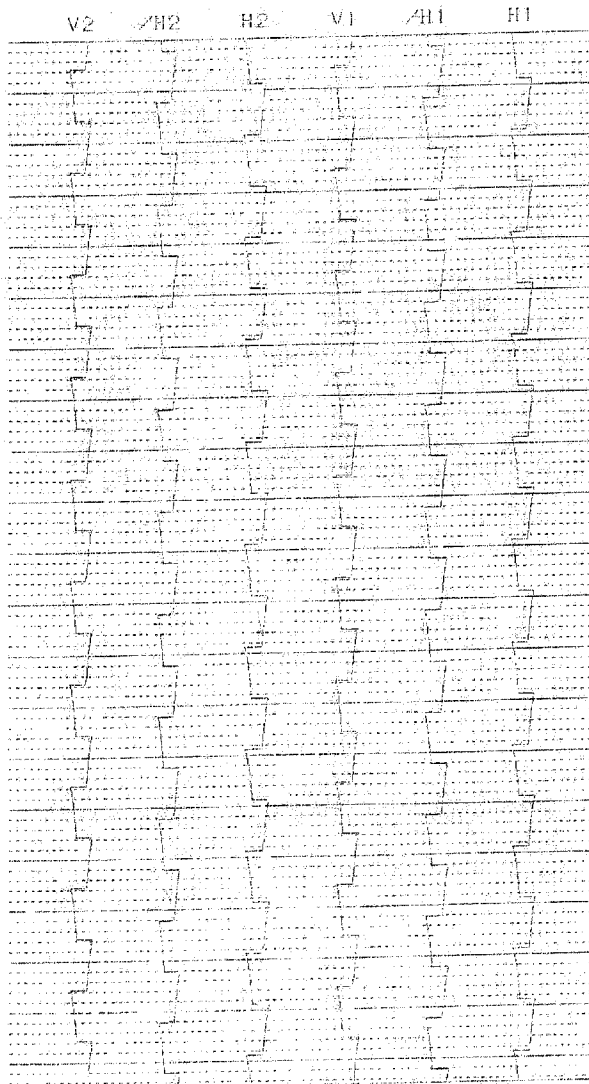
OYO S/N 1902a

Suspension 170 4.25

ID_NO. : 201
HOLE NO. : 0
DEPTH : 0.0 [m]
DATE : 21/04/06 10:41:05 AM
H-SAMPLE RATE: 100 [μSEC]
V-SAMPLE RATE: 100 [μSEC]
PULSE WIDTH : 1.6 [mSEC]
DELAY TIME : 3 [mSEC]

	H1	/H1	V1	H2	/H2	V2
GAIN	X 10	X 10	X 10	X 10	X 10	X 10
LCF [Hz]	5	5	5	5	5	5
HCF [Hz]	20K	20K	20K	20K	20K	20K
STACK	1	1	1	1	1	1

TRACE SIZE : 1
H-TIME SCALE: 1.00 [mSEC/LINE]
V-TIME SCALE: 1.00 [mSEC/LINE]



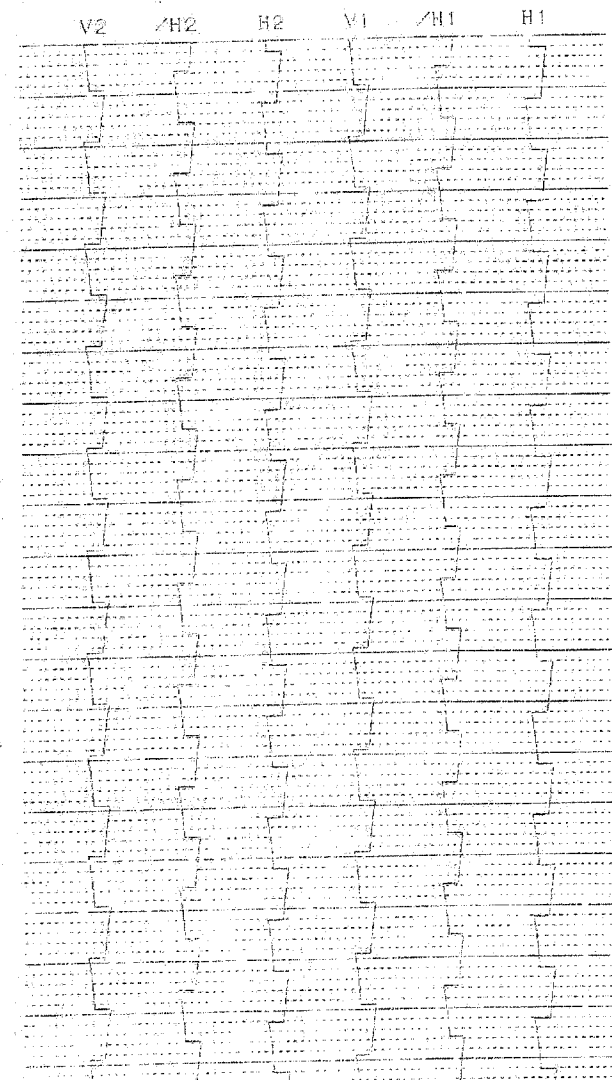
OYO S/N 1902a

Suspension 170 4.25

ID_NO. : 202
HOLE NO. : 0
DEPTH : 0.0 [m]
DATE : 21/04/06 10:45:05 AM
H-SAMPLE RATE: 100 [μSEC]
V-SAMPLE RATE: 100 [μSEC]
PULSE WIDTH : 1.6 [mSEC]
DELAY TIME : 3 [mSEC]

	H1	/H1	V1	H2	/H2	V2
GAIN	X 10	X 10	X 10	X 10	X 10	X 10
LCF [Hz]	5	5	5	5	5	5
HCF [Hz]	20K	20K	20K	20K	20K	20K
STACK	1	1	1	1	1	1

TRACE SIZE : 1
H-TIME SCALE: 1.00 [mSEC/LINE]
V-TIME SCALE: 1.00 [mSEC/LINE]



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OYO

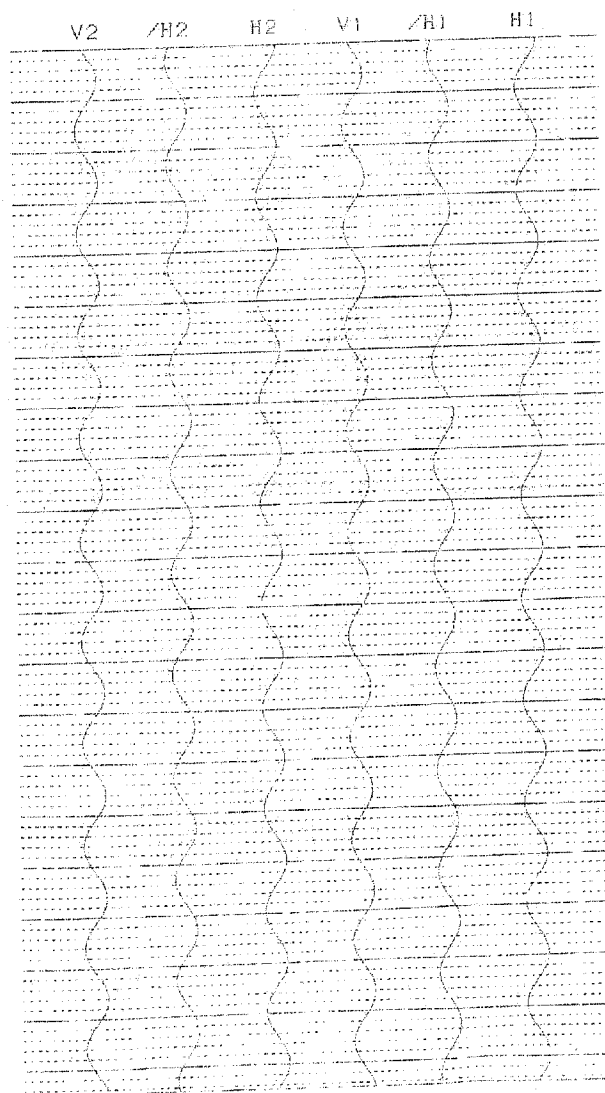
S/N 19029

Suspension 170 4.25

ID_NO. : 203
HOLE NO. : 0
DEPTH : 0.0 [m]
DATE : 21/04/06 10:46:15 AM
H-SAMPLE RATE: 100 [μSEC]
V-SAMPLE RATE: 100 [μSEC]
PULSE WIDTH : 1.6 [mSEC]
DELAY TIME : 3 [mSEC]

	H1	/H1	V1	H2	/H2	V2
GAIN	X 10	X 10	X 10	X 10	X 10	X 10
LCF [Hz]	5	5	5	5	5	5
HCF [Hz]	20K	20K	20K	20K	20K	20K
STACK	1	1	1	1	1	1

TRACE SIZE : 1
H-TIME SCALE: 1.00 [mSEC/LINE]
V-TIME SCALE: 1.00 [mSEC/LINE]



OYO

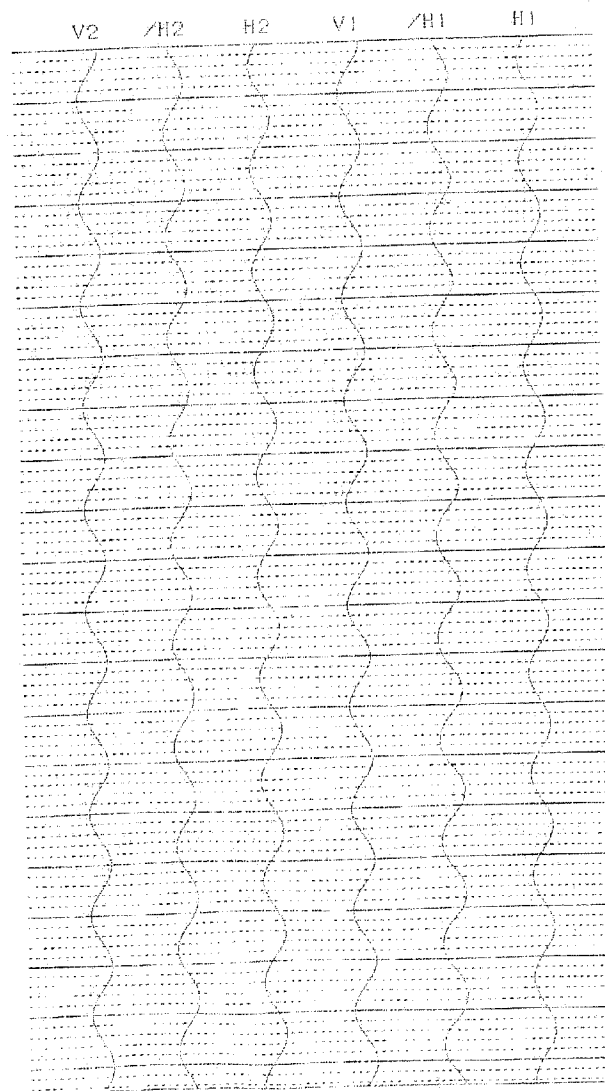
S/N 19029

Suspension 170 4.25

ID_NO. : 204
HOLE NO. : 0
DEPTH : 0.0 [m]
DATE : 21/04/06 10:47:47 AM
H-SAMPLE RATE: 100 [μSEC]
V-SAMPLE RATE: 100 [μSEC]
PULSE WIDTH : 1.6 [mSEC]
DELAY TIME : 3 [mSEC]

	H1	/H1	V1	H2	/H2	V2
GAIN	X 10	X 10	X 10	X 10	X 10	X 10
LCF [Hz]	5	5	5	5	5	5
HCF [Hz]	20K	20K	20K	20K	20K	20K
STACK	1	1	1	1	1	1

TRACE SIZE : 1
H-TIME SCALE: 1.00 [mSEC/LINE]
V-TIME SCALE: 1.00 [mSEC/LINE]





METROLOGY

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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:			Quality Reviewer:	
Branson, Craig A	Metrologist	714-895-0714		04-21-06
Name	Title	Phone	Name	Date

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m.w.
4-21-06



SEISMOGRAPH CALIBRATION DATA SHEET REV 4/6/06

INSTRUMENT DATA

SYSTEM MFR: OYO	MODEL NO.: 3403
SERIAL NO.: 160023	CALIBRATION DATE: 4/21/2006
BY: ROBERT STELLER	DUE DATE: 4/21/2007
COUNTER MFR: HEWLETT PACKARD	MODEL NO.: 5335A
SERIAL NO.: 2626A09881	CALIBRATION DATE: 12/9/2005
BY: SCE #S1-01252	DUE DATE: 6/9/2006
FCTN GEN MFR: HEWLETT PACKARD	MODEL NO.: 3325B
SERIAL NO.: 2847A14447	CALIBRATION DATE: 11/3/2005
BY: SCE #S1-03355	DUE DATE: 11/3/2006

SYSTEM SETTINGS:

GAIN:	2
FILTER:	10 KHZ
RANGE:	100 MILLISEC, 100 MICROSECOND SAMPLE RATE
DELAY:	0
STACK: 1 (STD)	1
PULSE:	1.6
DISPLAY:	NA
SYSTEM: DATE = CORRECT DATE & TIME	4/21/2006, 11:07AM

PROCEDURE:

SET FREQUENCY TO 100.0HZ SQUAREWAVE WITH AMPLITUDE APPROXIMATELY 0.25 VOLT PEAK. RECORD BOTH ON DISK AND PAPER TAPE, IF AVAILABLE. ANALYZE AND PRINT WAVEFORMS FROM ANALYSIS UTILITY. ATTACH PAPER COPIES OF PRINTOUT AND PAPER TAPES, IF AVAILABLE, TO THIS FORM. AVERAGE FREQUENCY MUST BE BETWEEN 99.0 AND 101.0 HZ.

AS FOUND 100.0 AS LEFT 100.0

WAVEFORM	FILE NO	FREQUENCY	TIME FOR 9 CYCLES Hn	TIME FOR 9 CYCLES Hr	TIME FOR 9 CYCLES V	AVERAGE FREQ.
SQUARE	305	100.0	90.0	90.0	90.0	100.0
SQUARE	306	100.0	90.0	90.0	90.0	100.0
SINE	307	100.0	90.0	90.0	90.0	100.0
SINE	308	100.0	90.1	90.0	90.0	100.0

CALIBRATED BY:	ROBERT STELLER	4/21/2006	<i>Rob Steller</i>
	NAME	DATE	SIGNATURE



Calibration Report



METROLOGY

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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: 160024
Serial Number: 160024

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.: 501204

Calibration Performed By:			Quality Reviewer:	
Branson, Craig A	Metrologist	714-895-0714		04-21-06
Name	Title	Phone	Name	Date

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MD
4-21-06



SEISMOGRAPH CALIBRATION DATA SHEET REV 4/6/06

INSTRUMENT DATA

SYSTEM MFR: OYO	MODEL NO.: 3403
SERIAL NO.: 160024	CALIBRATION DATE: 4/21/2006
BY: ROBERT STELLER	DUE DATE: 4/21/2007
COUNTER MFR: HEWLETT PACKARD	MODEL NO.: 5335A
SERIAL NO.: 2626A09881	CALIBRATION DATE: 12/9/2005
BY: SCE #S1-01252	DUE DATE: 6/9/2006
FCN GEN MFR: HEWLETT PACKARD	MODEL NO.: 3325B
SERIAL NO.: 2847A14447	CALIBRATION DATE: 11/3/2005
BY: SCE #S1-03355	DUE DATE: 11/3/2006

SYSTEM SETTINGS:

GAIN:	2
FILTER:	10 KHZ
RANGE:	100 MILLISEC, 100 MICROSECOND SAMPLE RATE
DELAY:	0
STACK: 1 (STD)	1
PULSE:	1.6
DISPLAY:	NA
SYSTEM: DATE = CORRECT DATE & TIME	4/21/2006, 11:30AM

PROCEDURE:

SET FREQUENCY TO 100.0HZ SQUAREWAVE WITH AMPLITUDE APPROXIMATELY 0.25 VOLT PEAK. RECORD BOTH ON DISK AND PAPER TAPE, IF AVAILABLE. ANALYZE AND PRINT WAVEFORMS FROM ANALYSIS UTILITY. ATTACH PAPER COPIES OF PRINTOUT AND PAPER TAPES, IF AVAILABLE, TO THIS FORM. AVERAGE FREQUENCY MUST BE BETWEEN 99.0 AND 101.0 HZ.

AS FOUND 100.0 AS LEFT 100.0

WAVEFORM	FILE NO	FREQUENCY	TIME FOR 9 CYCLES Hn	TIME FOR 9 CYCLES Hr	TIME FOR 9 CYCLES V	AVERAGE FREQ.
SQUARE	401	100.0	90.0	90.0	90.0	100.0
SQUARE	402	100.0	90.0	90.0	90.0	100.0
SINE	403	100.0	89.9	90.0	90.1	100.0
SINE	404	100.0	90.0	90.1	90.1	99.9

CALIBRATED BY:	ROBERT STELLER	4/21/2006	<i>Rob Steller</i>
NAME		DATE	SIGNATURE



Calibration Report

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

Manufacturer: Geometrics
Model Number: STRATAVIEW
Description: Siesmograph,
Asset Number: 75299
Serial Number: 75299

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

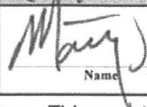
Remarks:

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.: 501205

Calibration Performed By:			Quality Reviewer:	
Branson, Craig A	Metrologist	714-895-0714		04-21-06
Name	Title	Phone	Name	Date

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SEISMOGRAPH CALIBRATION DATA SHEET REV 4/6/06

INSTRUMENT DATA

SYSTEM MFR: GEOMETRICS	MODEL NO.:	STRATAVIEW
SERIAL NO.: 75299	CALIBRATION DATE:	4/21/2006
BY: ROBERT STELLER	DUE DATE:	4/21/2007
COUNTER MFR: HEWLETT PACKARD	MODEL NO.:	5335A
SERIAL NO.: 2626A09881	CALIBRATION DATE:	12/9/2005
BY: SCE #S1-01252	DUE DATE:	6/9/2006
FCTN GEN MFR: HEWLETT PACKARD	MODEL NO.:	3325B
SERIAL NO.: 2847A14447	CALIBRATION DATE:	11/3/2005
BY: SCE #S1-03355	DUE DATE:	11/3/2006

SYSTEM SETTINGS:

GAIN:	15 DB
FILTER:	NONE
RANGE:	256 MILLISEC, 31 MICROSECOND SAMPLE RATE
DELAY:	0
STACK: 1 (STD)	1
PULSE:	NA
DISPLAY:	NA
SYSTEM: DATE = CORRECT DATE & TIME	4/21/2006, 12:09PM

PROCEDURE:

SET FREQUENCY TO 100.0HZ SQUAREWAVE WITH AMPLITUDE APPROXIMATELY 0.25 VOLT PEAK. RECORD BOTH ON DISK AND PAPER TAPE, IF AVAILABLE. ANALYZE AND PRINT WAVEFORMS FROM ANALYSIS UTILITY. ATTACH PAPER COPIES OF PRINTOUT AND PAPER TAPES, IF AVAILABLE, TO THIS FORM. AVERAGE FREQUENCY MUST BE BETWEEN 99.0 AND 101.0 HZ.

AS FOUND 100.0 AS LEFT 100.0

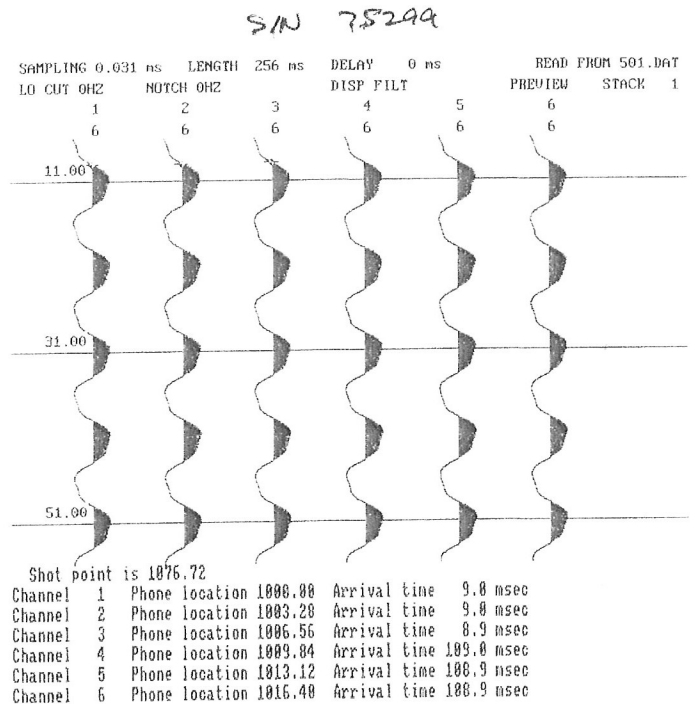
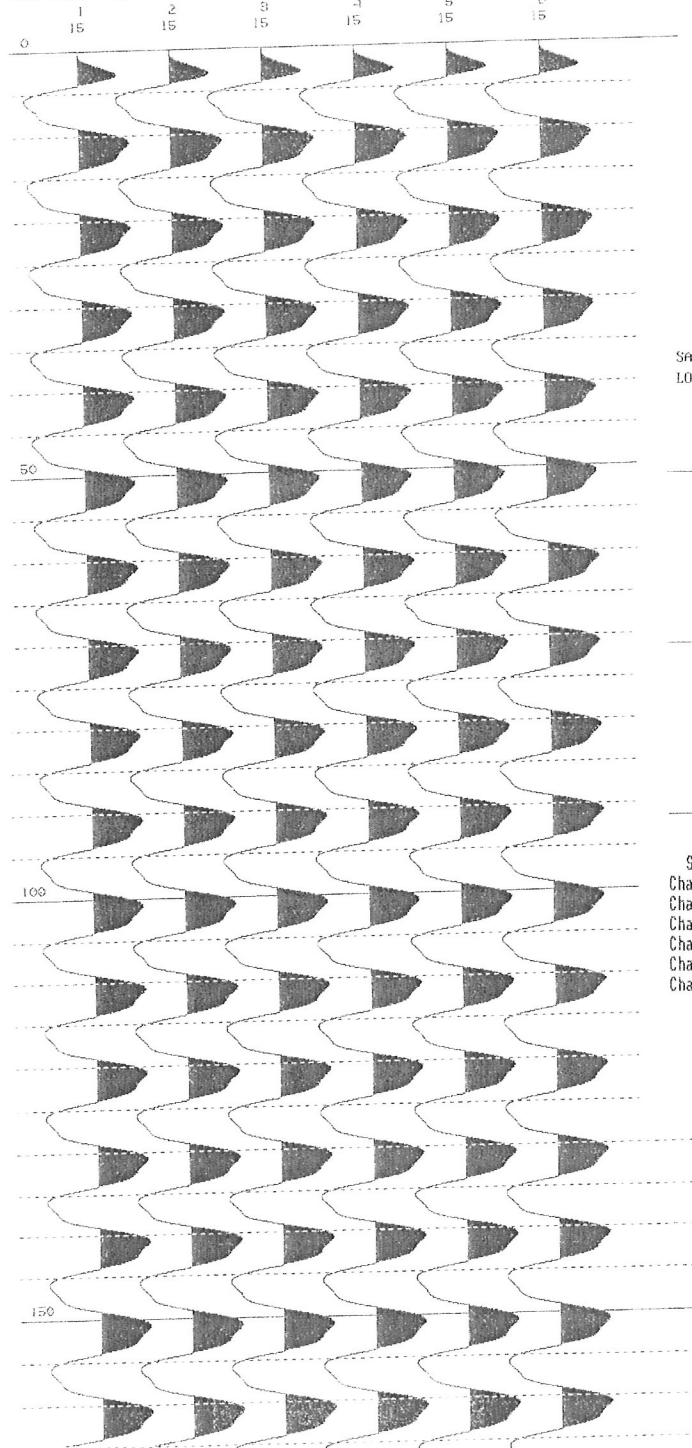
WAVEFORM	FILE NO	FREQUENCY	TIME FOR 9 CYCLES Hn	TIME FOR 9 CYCLES Hr	TIME FOR 9 CYCLES V	AVERAGE FREQ.
SQUARE	501	100.0	90.0	90.0	90.0	100.0
SQUARE	502	100.0	90.0	90.0	90.0	100.0
SINE	503	100.0	90.0	90.0	90.0	100.0
SINE	504	100.0	90.0	90.0	90.0	100.0

CALIBRATED BY:	ROBERT STELLER	4/21/2006	<i>Rob Steller</i>
	NAME	DATE	SIGNATURE

Seismic recorder/Logger Calibration Data Sheet Rev 1.30 4-6-06

page 3 of 6

EOMETRICS S/N 75299 StrataView
15:14:03 21/APR/2006
READ FROM 501.DAT
LINE NUMBER 00-00
SHOT LOC 1076.72 GROUP INTERVAL 3.28
SAMPLE INTERVAL 031 uS PHONE 1 LOC 1000.00 PHONE 6 LOC 1016.40
ACQ FILT LO CUT 0HZ RECORD LEN 256 MS DELAY 0 MS
DISP FILT HI CUT 250HZ NOTCH 0HZ STACKS 1
OUT FIXED GAIN



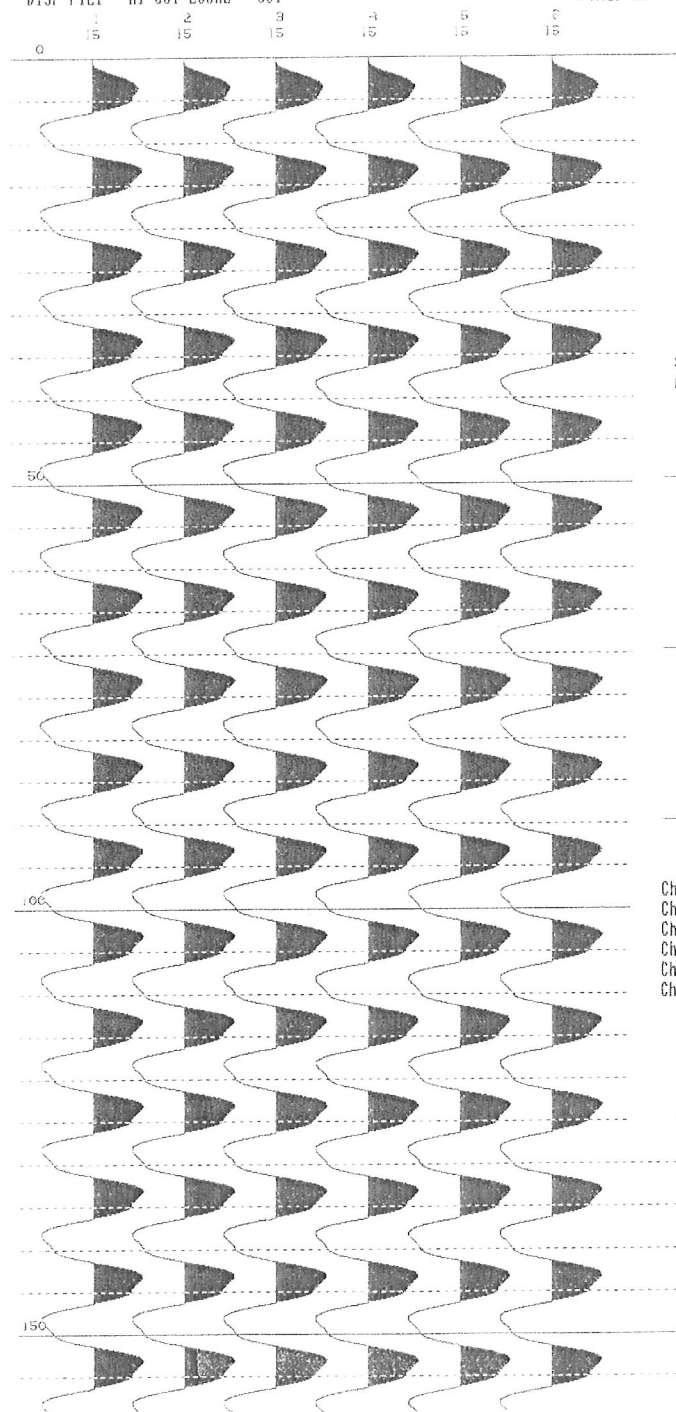
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GEOMETRICS

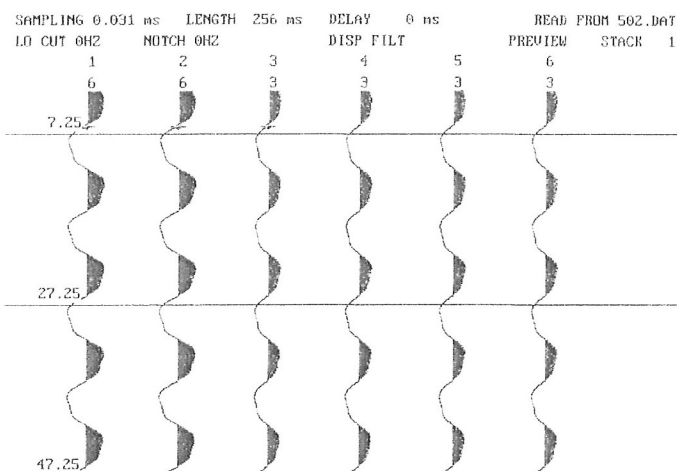
StrataView

READ FROM 502.DAT
LINE NUMBER 00-00
SHOT LOC 1076.72
SAMPLE INTERVAL 0.31 uS
ACQ FILT LO CUT 0HZ
DISP FILT HI CUT 250HZ
GROUP INTERVAL 3.28
PHONE 1 LOC 1000.00
RECORD LEN 256 MS
NOTCH 0HZ
OUT
PHONE 6 LOC 1016.40
DELAY 0 MS
STACKS 1
FIXED GAIN

15:15:49 21/APR/2006



S/N 75249



Shot point is 1076.72

Channel	Phone location	Arrival time
1	1000.00	6.4 msec
2	1003.28	6.4 msec
3	1006.56	6.4 msec
4	1009.84	96.4 nsec
5	1013.12	96.4 nsec
6	1016.40	96.4 nsec

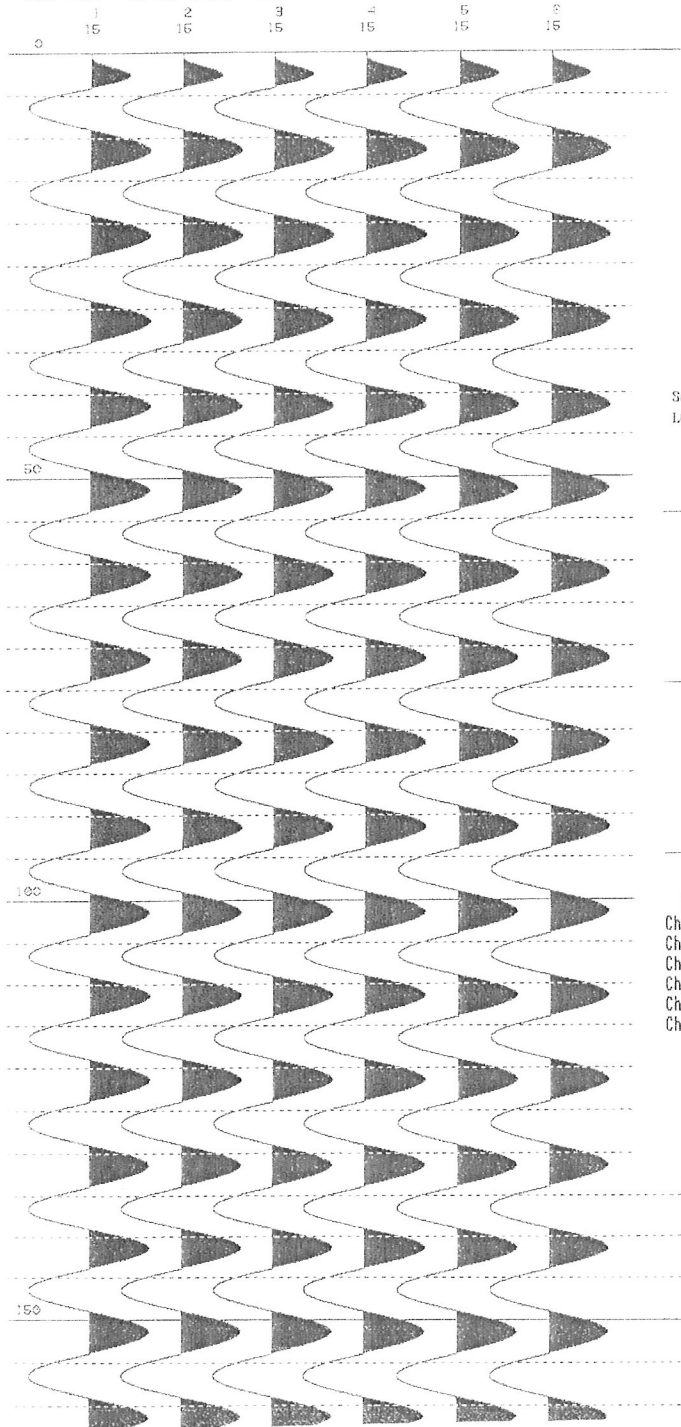
GEOMETRICS

S/N 75299

StrataView

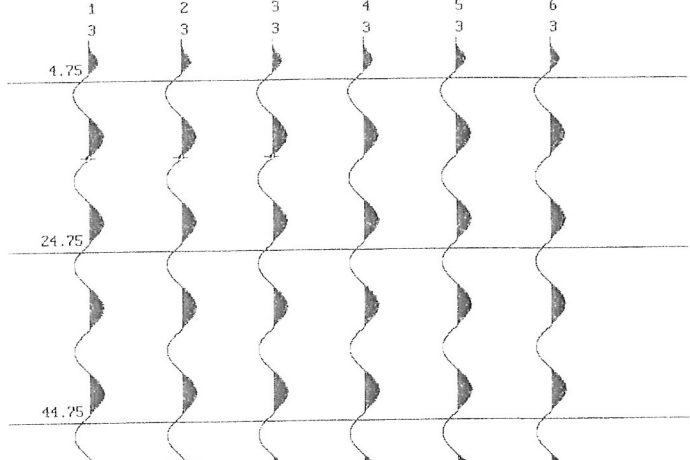
page 5 of 6

READ FROM 503.DAT
LINE NUMBER 00-00
SHOT LOC 1876.72
SAMPLE INTERVAL 0.31 uS
ACQ FILT LO CUT 0HZ
DISP FILT HI CUT 250HZ
GROUP INTERVAL 3.28
PHONE 1 LOC 1000.00
RECORD LEN 256 MS
NOTCH 0HZ
OUT
PHONE 6 LOC 1016.40
DELAY 0 MS
STACKS 1
FIXED GAIN



S/N 75299

SAMPLING 0.031 ms LENGTH 256 ms DELAY 0 ms
LO CUT 0HZ NOTCH 0HZ DISP FILT
READ FROM 503.DAT
PREVIEW STACK 1



Shot point is 1876.72
Channel 1 Phone location 1000.00 Arrival time 13.0 nsec
Channel 2 Phone location 1003.28 Arrival time 13.0 nsec
Channel 3 Phone location 1006.56 Arrival time 13.0 nsec
Channel 4 Phone location 1009.84 Arrival time 13.0 nsec
Channel 5 Phone location 1013.12 Arrival time 13.0 nsec
Channel 6 Phone location 1016.40 Arrival time 13.0 nsec

GEOMETRICS

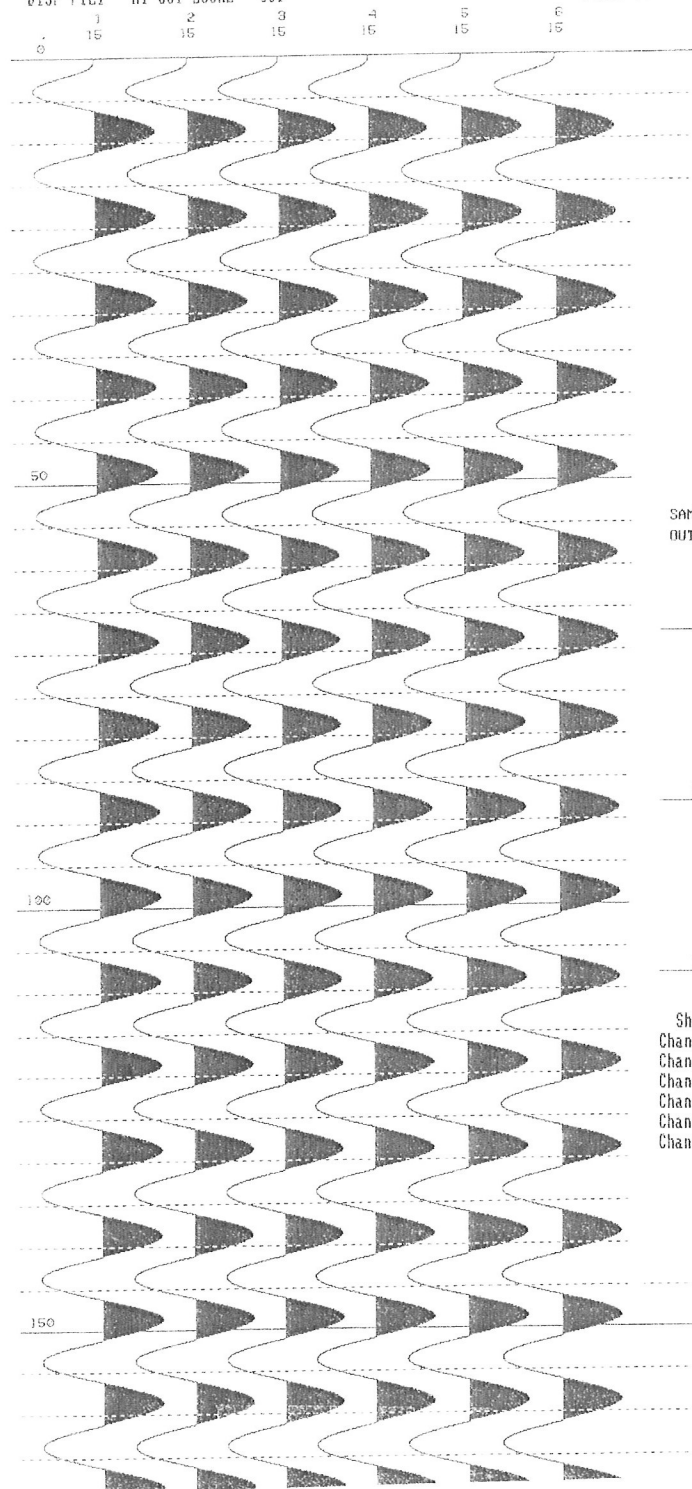
S/N 75299

StrataView

15:19:34 21/APR/2006

page 6 of 6

READ FROM 504.DAT
LINE NUMBER 00-00
SHOT LOC 1076.72
SAMPLE INTERVAL 0.031 us
ACO FILT LO CUT 0HZ
DISP FILT HI CUT 250HZ
GROUP INTERVAL 3.28
PHONE 1 LOC 1000.00
RECORD LEN 256 MS
NOTCH 0HZ
PHONE 6 LOC 1016.40
DELAY 0 MS
STACKS 1
FIXED GAIN



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



A handwritten signature in cursive script, reading "C. D. Faison".

For the National Institute of Standards and Technology



National Voluntary Laboratory Accreditation Program



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 ($\pm$) 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 Uncertainty ($\pm$) 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 Uncertainty ($\pm$) in μ in ^{note 1}

Remarks

0.040 to 0.825	6	Comparison to gage blocks
> 0.825 to 1.510	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

Best Uncertainty ($\pm$) in ppm ^{note 1}

Frequency in Hz

Range	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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CALIBRATION LABORATORIES

NVLAP LAB CODE 105014-0

200 mA	270	199	127	116			
300 mA	270	199	127	116			
500 mA	270	208	141	130			
	<i>10</i>	<i>20</i>	<i>40</i>	<i>400 to 5 k</i>	<i>10 k</i>		
1A	270	199	127	116	130		
	<i>10</i>	<i>20</i>	<i>40</i>	<i>400 to 10 k</i>			
2A	271	200	129	118			
3A	271	200	129	118			
	<i>10</i>	<i>20</i>	<i>40</i>	<i>400 to 5 k</i>	<i>10 k</i>		
5A	286	209	142	132	148		
	<i>10</i>	<i>20</i>	<i>40</i>	<i>400</i>	<i>1 k</i>	<i>5 k</i>	<i>10 k</i>
10A	273	233	132	121	121	143	143
							<i>400 to 10 k</i>
20A							144

NVLAP Code: 20/E05
DC Current

Range

Best Uncertainty ($\pm$) in ppm^{note 1}

10 nA	2.9
100 nA	2.3
1 μ A	2.0
10 μ A	2.0
100 μ A	2.0
1 mA	1.9
10 mA	1.9
100 mA	1.9
1 A	10.4
10 A	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

<i>Nominal Value in Ω</i>	<i>Best Uncertainty ($\pm$) in ppm ^{note 1}</i>	<i>Remarks</i>
100 μ	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

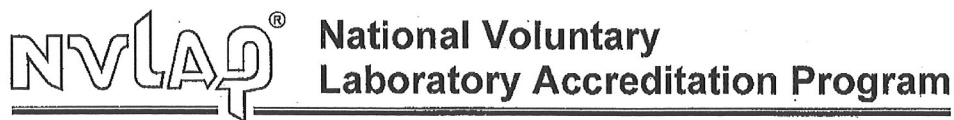
DC Voltage

<i>Range</i>	<i>Best Uncertainty ($\pm$) in ppm ^{notes 1,2}</i>	<i>Remarks</i>
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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Effective dates

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

NVLAP Code: 20/E09
LF AC Voltage

Best Uncertainty ($\pm$) 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 ($\pm$) ^{note 1}	Remarks
10 MHz	1.2×10^{-12}	GPS Receiver

MECHANICAL

NVLAP Code: 20/M05
Flow Rate

Nominal Flow Rate	Best Uncertainty ($\pm$) 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 ($\pm$) ^{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 lb	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 ($\pm$) 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	0.0005	Echelon I
1 mg	0.0005	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

1. Represents an expanded uncertainty using a coverage factor, $k = 2$, at an approximate level of confidence of 95 %.
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: $\text{uncert.} = (A + B/mVDC^2)^{0.5}$ (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.
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

C. D. Faison

For the National Institute of Standards and Technology

Calibration Report



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

Customer: **GEOVISION**
Corona CA 92882
Account#: **15214**
Cust. PO#:
Page 1 of 2

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

Instrument: **Caliper Calibration Plate**

Mfg: **Robertson Geo Logging**
Model: **N/A**
Size:
Res.:

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:

MPC#	Instrument	Due Date	Traceability
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**

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



Form Cert 04-25-05

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 S/N 101 500 pulse/revolution Circumference = 983mm (3225.07 millifeet)	100.1 feet (30.51 m)	99.95 feet (30.46 m)	100.05 feet (30.50 m)
Depth wheel S/N 102 500 pulse/revolution Circumference = 994mm (3261.15 millifeet)	100.00 feet (30.48) m	100.05 feet (30.50 m)	100.00 feet (30.48) m
Aries winch 200 pulse/revolution Circumference = 305.9mm (1003.51 millifeet)	100.05 feet (30.50) m	100.05 feet (30.50 m)	100.00 feet (30.48) m
Depth wheel S/N 103 500 pulse/revolution Circumference = 1000mm (3.281 feet)			
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 +/- 0.1 foot or +/- 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 30086	40.2in 1.02m	40.0in 1.02m	76.0in 1.93m
Receiver S/N 20042	39.8in 1.01m	39.6in 1.01m	75.7in 1.92m
Receiver S/N 12008	40.2in 1.02m	40.0in 1.02m	76.0in 1.93m

All measurements taken with a Lufkin 3.7m flexible steel tape model number HV1034DM, marked in mm and 100th 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 hysteresis in rubber section approximately +/- 0.01’ or +/- 0.003m.

