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.

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
Signature	April 6, 2006
	Date

Client Approval (if required):

Name	Title
Signature	Date

EDISON ESI
A SOUTHERN CALIFORNIA EDISON Company

Metrology
7300 Fenwick Lane
Westminster, CA 92683
Phone: 866-723-2257

Calibration Report

NVLAP Accredited
Calibration

GEOVision Geophysical Services
1151 Pomona Road, Unit P
Corona, CA 92882

TEST NUMBER
550393

NVLAP
Lab Code:105014-0

Manufacturer:	Oyo	**Condition As Found:**	In Tolerance
Model Number:	3403	**Condition As Left:**	In Tolerance
Description:	Unit, Suspension Telemetry,	**Calibration Date:**	01/25/2008
Asset Number:	160023	**Calibration Due Date:**	01/25/2009
Serial Number:	160023	**Calibration Interval:**	12 Months
PO Number:	8200-080122-01		

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. Measurement uncertainity is 0.2 x E-12 Hz. 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,	12/28/2007	06/28/2008
S1-01347	Hewlett Packard	3325A	Generator, Function, Synthesizer	10/09/2007	04/09/2008
S1-03686	Fluke	910	Standard, Frequency, Controlled, Gps	01/22/2008	01/22/2009

Procedure: Customer
Temperature: 23° C
Humidity: 37% RH
Test No.: 550393

Calibration Performed By:			Quality Reviewer:	
Branson, Craig A	Metrologist	714-895-0714	Clarence Stevenson	1/25/08
Name	Title	Phone	Name	Date

GEOVision
geophysical services

SEISMOGRAPH CALIBRATION DATA SHEET REV 4/6/06

INSTRUMENT DATA

SYSTEM MFR:	OYO	MODEL NO.:	3403
SERIAL NO.:	160023	CALIBRATION DATE:	01/25/2008
BY:	ROBERT STELLER	DUE DATE:	01/25/2009
COUNTER MFR:	HEWLETT PACKARD	MODEL NO.:	5335A
SERIAL NO.:	2626A09881	CALIBRATION DATE:	12/28/2007
BY:	SCE #S1-01252	DUE DATE:	6/28/2008
FCTN GEN MFR:	HEWLETT PACKARD	MODEL NO.:	3325A
SERIAL NO.:	2652A25647	CALIBRATION DATE:	10/9/2007
BY:	SCE #S1-01347	DUE DATE:	4/9/2008

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	01/25/2008, 12:20PM

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	301	100.0	90.0	90.0	90.0	100.0
SQUARE	302	100.0	90.0	90.0	90.0	100.0
SINE	303	100.0	90.0	90.0	90.0	100.0
SINE	304	100.0	90.0	90.0	90.0	100.0

CALIBRATED BY: ROBERT STELLER 1/25/2008 Robt Steller
NAME DATE SIGNATURE

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

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