

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

WORK ORDER

CERTIFICATE # 29975 ASSET # 006322 DATE 02 June 98

ITEM DATA:
Manufacturer Omega Model PR302-015070
Description Pressure Transducer Serial # 97112
Accessories _____

ACTION REQUESTED repair into system, cal

CUSTODIAN DUJO, Reg. Person

Turned in by: Melissa Hill Phone 9012

CHARGE # 70-01 Date Required _____

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

COPY OF CALIBRATION CERTIFICATE (Yes) (No)

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

By Melissa Hill Date 06/05/98

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

CONDITION RECEIVED: _____ (F) Out of tolerance, repaired to specifications
_____ (G) In tolerance, minor adjustments/repairs made
_____ (J) In tolerance, no adjustments/repairs
_____ (K) Out of tolerance, adjusted to specifications
 (S) Received into system, introduced or reactivated

ACTION TAKEN: (Calibration/Repair/Parts) (New Inst) 5 Point Cal

CAL ENVIRONMENT:
Temperature 72°F Humidity 68 %RH

CALIBRATED/REPAIRED: AMW
By _____ Cal Procedure CCCP-PI-001
Date 6-5-98 Accuracy ±0.25%FS (L, H & R only)
Cal Interval 6mo Reliability Code: _____
Next Cal due 12-5-98 Cal Time 2.5 hr Repair Time _____
Standards used (Asset#) 1554 4259

DATE COMPLETED 6-5-98
DATE PICKED UP 6/7/98 PICKED UP BY Melissa Hill

29975

15

PRESSURE CALIBRATION CHECK FORM

Date 6-5-98 Work Order 29975 Technician AM Wood
 Inst Cust. Ron Green Ext _____ Charge # 20-0751-006 time 2.5

A) Unit Under Test Omega Press Trans
 Model PX302-0156V Serial No. 971112 Asset No. 6322
 Range 0-15 PSI Uncertainty _____ Tol ± 0.25% FS (L, H & R only)

B) Calibration Standard (1) Ametek DWT
 Model RK300 Serial No. 82167 Asset No. 1554
 Uncertainty ± 0.05% RD Std Unc _____

C) Calibration Standard (2) Phillips DVM
 Model PM2535 Serial No. DM638003 Asset No. 4259
 Uncertainty ± 0.019% RD Std Unc _____

Comb Unc (rss A,B&C) 0.053% FS

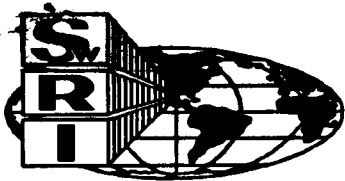
Env: Room Temp. 72°F Humidity 68% Baro Press. 28.91" Hg
 Conversion Factor(s) N/A

STANDARD	INCREASING	DECREASING	UNCERTAINTY: ± 0.053% RD
UNITS: PSI	UNITS: mV	UNITS: mV	UNITS: PSI
AS FOUND			
0	- 0.680	- 0.716	± 0.008 PSI Max
3	19.428	19.411	↓
6	39.524	39.514	
9	59.578	59.572	
12	79.568	79.565	
15	99.476	↗	
AS DELIVERED	Power Supply	Sensitivity	@ 15 PSI
	<i>E_{exc}</i>	<i>Out out</i>	
	9.80 V	97.377 mV	
	9.90 v	98.434 mV	
	10.00 v	99.484 mV	
	10.10 v	100.400 mV	
	10.20 v	101.346 mV	

NOTES: Above Calibration Performed at $E_{exc} = 10.0003V$ Page 1 of 1

$$LSQ: mV = 6.683(P) - 0.634$$

error $\leq \pm 0.15\% FS$



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



Certificate of Calibration

5 June 1998

Issued to: RON GREEN DIV20 B57
 Manufacturer/Model: OMEGA PX302-015GV
 Description: PRESSURE TRANSDUCER
 Serial Number: 971112
 Asset Number: 006322

Environmental Conditions

Temperature: 72 Deg. F Humidity: 68 % RH

Calibration Information

Calibration was in accordance with requirements of MIL-STD-45662A and ANSI/NCSL 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.

No allowance has been made for the instability of the test device due to use, time, etc.; such allowances would be made by the customer as needed.

Calibration Date: 5 Jun 98 Calibration Procedure: CLCP-PI-001
 Interval: 6 months
 Next Calibration Due: 5 Dec 98 Received: (1)

Remarks:

Results

(1) see attached data sheet

Signed: *John Wood*
 Title: Caltech

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

WORK ORDER

CERTIFICATE # 30493 ASSET # M0301 DATE 12/14/98

ITEM DATA:

Manufacturer Lincoln Model 1250
Description Pressure Transducer Serial # 1250
Accessories _____

ACTION REQUESTED Calibration

CUSTODIAN _____

Turned in by: Melissa Hill Phone X 2 2

CHARGE # _____ Date Required _____

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

COPY OF CALIBRATION CERTIFICATE (Yes) (No)

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

By MA Date 12/14/98

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

CONDITION RECEIVED: _____ (F) Out of tolerance, repaired to specifications
_____ (G) In tolerance, minor adjustments/repairs made
_____ (J) In tolerance, no adjustments/repairs
_____ (K) Out of tolerance, adjusted to specifications
_____ (S) Received into system, introduced or reactivated

ACTION TAKEN: (Calibration/Repair/Parts) 6 Point Cal
No Tolerance Conformance Performed

SWRI CALIBRATION LAB
(210) 522-5215
CAL 6-5-98 BY AMW
DUE 12-5-98 ID 6322
S/N 97112

CAL ENVIRONMENT:
Temperature 68 °F Humidity 41 %RH

CALIBRATED/REPAIRED: OM Wood
By _____ Cal Procedure CCCP-P1-001
Date 12-14-98 Accuracy Unknown
Cal Interval 6 mo Reliability Code: _____
Next Cal due 6-14-99 Cal Time 2h Repair Time _____
Standards used (Asset#) 5259, 4259

DATE COMPLETED 12-14-98
DATE PICKED UP 12/14/98 PICKED UP BY Melissa Hill

30493

PRESSURE CALIBRATION CHECK FORM

Date 12-14-98 Work Order 32493 Technician AMW
 Inst Cust. M Hill Ext 2012 Charge # 20-0751-006 time 2hr

A) Unit Under Test Omega Press Trans
 Model PX302-0156V Serial No. 911112 Asset No. 6322
 Range 15 PSI Uncertainty _____ Tol ±0.25% FS (L, H, & R)

B) Calibration Standard (1) Mensor
 Model 5014 Serial No. 340119B Asset No. 5259
 Uncertainty ±0.003 psi (±0.01% FS) Std Unc _____

C) Calibration Standard (2) Phillips DUM
 Model PM2535 Serial No. DM638003 Asset No. 4259
 Uncertainty ±0.019% RD Std Unc _____

Comb Unc (rss A,B&C) ±0.021% FS

Env: Room Temp. 68°F Humidity 41% Baro Press. 29.48" Hg
 Conversion Factor(s) N/A

STANDARD	INCREASING	DECREASING	UNCERTAINTY: ± 0.021	
UNITS: PSI	UNITS: mV	UNITS: mV	UNITS: % FS	
AS FOUND				
0	-0.986	-0.992	± 0.021%	FS
3	19.179	19.169	↓	
6	39.314	39.309		
9	59.402	59.397		
12	79.420	79.424		
15	99.352	↑		
	$C_0 = 6.694(P) - 0.917$			
AS DELIVERED				

NOTES: $E_s = 10.0017$ volts



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

14 December 1998

Issued to: RON GREEN DIV20 B57
Manufacturer/Model: OMEGA PX302-015GV
Description: PRESSURE TRANSDUCER
Serial Number: 971112
Asset Number: 006322

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: 68. Degrees Fahrenheit Humidity: 41 % RH

Calibration Date: 14 Dec 98 **Calibration Procedure:** CLCP-PI-001 1997

Condition as Received: SEE REMARKS

Condition as Released: SEE CAL DATA

Remarks: TOLERANCE CONFORMANCE TEST NOT PERFORMED

Comments: ATTACHED DATA SHEET GIVES MEASURED VALUES PLUS MEASUREMENT UNCERTAIN


Mack Wood / Technician

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

WORK ORDER

WORK ORDER # 36480 ASSET # 006322 DATE 20 OCT 99

ITEM DATA:

Manufacturer Omega Model PY302-015GV
Description pressure transducer Serial # 99112
Accessories box, spec sheet

ACTION REQUESTED cal

CUSTODIAN Divide from Green

Turned in by: Jim Prikey Phone _____

CHARGE # 20. 01402, 661 Date Required _____

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

COPY OF CALIBRATION CERTIFICATE (Yes) (No)

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

By mm Date 10-20-99

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

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

ACTION TAKEN: (Calibration/Repair/Parts) cal
12-14-98

SWRI CALIBRATION LAB
CAL 12-14-98 BY Chap
DATE 12-14-98 ID 6282
SN 99112

CAL ENVIRONMENT:
Temperature 60 °F Humidity 41 %RH

CALIBRATED/REPAIRED:
By Jim Prikey Cal Procedure CLCP-PI-001 Jun 99
Date 10-27-99 Accuracy ± 0.25% BFSL
Cal Interval 6 mo Reliability Code _____
Next Cal Due 4-27-00 Cal Time 2.5h Repair Time _____
Standards used (Asset #) 5259, 4259

DATE COMPLETED 10-27-99

DATE PICKED UP 11/3/99 PICKED UP BY Jan D. PJO

36480

PRESSURE CALIBRATION DATA SHEET

Date 10-27-99 Work Order 36480 Technician AMW
 Inst Cust. Ron Green Ext Charge # 20-01402-661 time 2.5 hr

A) Unit Under Test Omega Press Transducer
 Model Px302-0156V Serial No. 971112 Asset No. 6322
 Range 15 psi Uncertainty ±0.25% FS (L,H,R) Std Unc

B) Calibration Standard (1) Mensor
 Model 5014 Serial No. 34019B Asset No. 5257
 Uncertainty ±0.003 psi (±0.01%) Std Unc

C) Calibration Standard (2) Phillips DMM
 Model PM2535 Serial No. DML78003 Asset No. 4259
 Uncertainty ±0.019% Rd Std Unc
 Comb Unc (rss B&C) 0.021% FS TUR (A Unc/Comb Unc) (12/1)

If less than 4:1, Total combined calibration Unc (kXrss)
 k= Explanation
 Env: Room Temp. 68°F Humidity 41% Baro Press. 29.31" Hg
 Conversion Factor(s) N/A

STANDARD	INCREASING	DECREASING	TOLERANCE: ±0.25% FS (L,H,R)	
UNITS: <u>PSI</u>	UNITS: <u>mV</u>	UNITS: <u>mV</u>	UNITS: * See notes	
AS FOUND			MIN	MAX
0	- 1.504	- 1.522		
3	18.647	18.634		
6	38.786	38.774		
9	58.877	58.867		
12	78.904	78.900		
15	98.839	↗		
AS DELIVERED				
	BFSL $e_0 = 6.69509(P) - 1.44816$			

NOTES: #1) Above Data within ± 0.14% of BFSL
 2) Measurement Uncertainty ± 0.02% FS
 3) Excitation 10.0015 v
 4) Previous BFSL gives FS error of 0.7% with this data set

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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

27 October 1999

Issued to: RON GREEN DIV20 B57
Manufacturer/Model: OMEGA PX302-015GV
Description: PRESSURE TRANSDUCER
Serial Number: 971112
Asset Number: 006322

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: 68.0 Degrees Fahrenheit Humidity: 41 % RH


Calibration Date: 27 Oct 99 **Calibration Procedure** CLCP-PI-001 JUN99

Condition as Received: IN TOLERANCE

Condition as Released: IN TOLERANCE

Remarks:

Approved by:



Jim Patterson, Supervisor or Walt Hill, Metrologist

Certificate # 36480

m:\a2la.rpt Rev date 10 Mar 99

Measurements performed by:



Mack Wood, Technician

Page 1 of 1

SOUTHWEST RESEARCH INSTITUTE

Calibration Laboratory

WORK ORDER

Processed by WHILL at 10:04:22AM on 6/12/01



Work Order 444044001

Arrived 6/12/01

Asset No. 006322 Manufacturer OMEGA

Model PX302-015GV

Instrument Type/Class PRESSURE TRANSDUCER

Serial No. 971112

Accessory No. Calibration Procedure CLCP-PI-001, 6/99

Location B57

Div/Client DIV20

Custodian RON GREEN

Mail Stop B57

Tel. 5305

Charge/Project No. 00751.006 1.20

Delivered By / Telephone JIM PRIKRYL/

IN4CAL

Special Instructions _____

WORK NOTES

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

Cal-Lab By: mw
10/27/99 DUE: 04/27/00
006322 SN: 971112

REPAIR PARTS

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

WORK SUMMARY

Failure Description _____

Repair Action _____

Calibration Procedure _____ Temp 68 F Hum. 40 %

Tech CHILL Totals Cal Hours 2.5 Repair Hours _____ Parts Cost _____

Standards Used 5259, 4259

Date Picked Up 9/19/01

Picked Up By Jim P. P.

444001

**Southwest Research Institute
Calibration Laboratory
Calibration Data Sheet**

Work Order 444044001		Mfr. Omega		Technician C.M.Wood	
Asset No. 6322		Model PX302		Procedure CLCP-PI-001	
Serial No. 971112		Type		Cal Date Jun. 15, 01	
Remarks:					
Parameter	Applied Value	Found/Left	Instrument Error	Test Uncertainty	Result
Pressure	PSI	mV	N/A	+/-mV	
	0	-0.448		0.026	
	3.75	24.755		0.026	
	7.50	49.909		0.027	
	11.25	74.969		0.028	
	15.00	99.899		0.029	
	11.25	74.967		0.028	
	7.50	49.906		0.027	
	3.75	24.753		0.026	
	0	-0.446		0.026	

PRESSURE TRANSDUCER CALIBRATION DATA SHEET *

WORK ORDER #: 444044001 DATE: 6/15/01 TECH. *[Signature]*

UUT Omega pressure transducer

ASN: 6322

R SPAN: 15	LRP: 0	URP: 15	UNITS: 1	psi
EP SPAN: 100	LEP: 0	UEP: 100	UNITS: 3	mV

TOLERANCE +/--% : 0.25 m = 6.694579 UUT resolution: 0.001
 b = -0.37897 UUT repeatability 0.004

CALIBRATION STANDARD 1 Setability: 0.0005
 ASSET #: 5259 MFR: mensor

CALIBRATION STANDARD 2
 ASSET #: 4259 MFR: Phillips

UNCERTAINTY BUDGET @ F.S.			
description	value	divisor	std unc
UUT resolution	0.0005	1.73205	0.000289
UUT repeatability	0.004	1	0.004
Calibration standard 1	0.020084	1.73205	0.011595
Setability	0.003347	1.73205	0.001933
Calibration standard 2	0.0121	1.73205	0.006986
combined uncertainty			1.4E-02
expanded uncertainty	k = 2		2.9E-02

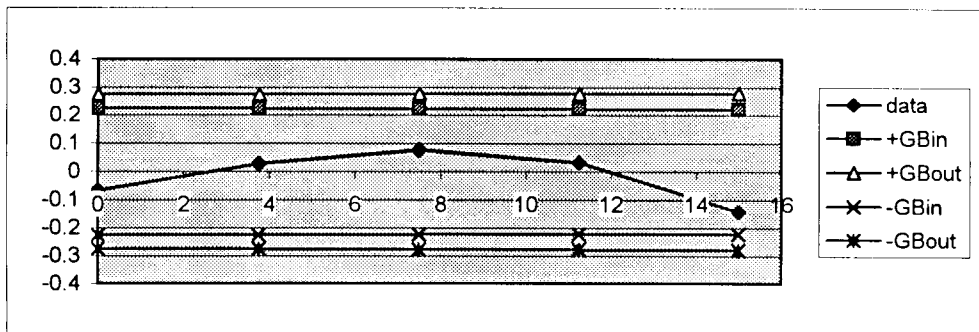
TAR= 10.7

TUR= 8.8

DATA

tolerance 0.25

INPUT	IDEALout	READING	ERROR	UNCERT	GBin	GBout	PASS	FAIL
0	-0.37897	-0.448	-0.06903	0.025523	0.224477	0.275523	P	
3.75	24.7257	24.755	0.029299	0.026063	0.223937	0.276063	P	
7.5	49.83037	49.909	0.078628	0.026747	0.223253	0.276747	P	
11.25	74.93504	74.969	0.033956	0.027564	0.222436	0.277564	P	
15	100.0397	99.899	-0.14072	0.028502	0.221498	0.278502	P	
11.25	74.93504	74.967	0.031956	0.027564	0.222436	0.277564	P	
7.5	49.83037	49.906	0.075628	0.026747	0.223253	0.276747	P	
3.75	24.7257	24.753	0.027299	0.026063	0.223937	0.276063	P	
0	-0.37897	-0.446	-0.06703	0.025523	0.224477	0.275523	P	



*Instructions on Sheet 3

LSQ Max Error (% Span): 0.140714

PRESSURE CALIBRATION WORK SHEET

INPUT LRP 0 URP 15 R Span 15

OUTPUT LEP 0 UEP 100 EP Span 100

ANSI grade? n/a Or Tol (% FS) 1

Zero? y (y or n)

Tol in Engr units 1

9.9999

10.0004

10.0002

INPUT	OUTPUT	Tolerance			P/F
		Min Value	Ideal Out	Max value	
0	-0.448	-1	0	1	
3.75	24.755	24	25	26	
7.5	49.909	49	50	51	
11.25	74.969	74	75	76	
15	99.899	99	100	101	
11.25	74.967	74	75	76	
7.5	49.906	49	50	51	
3.75	24.753	24	25	26	
0	-0.446	-1	0	1	

Asset number C322

Calibration Standard 5259

Serial number 971112

Calibration Standard 4259

Date 6-15-01

Setability of Std 0.0005


Work Order # 44001

Resolution 0.001

Notes:

Past EP SPAN 100.343
 Current EPS 100.346
 History

0.003%

See 
 Work Order
 444044001
 for Repeatability
 and power supply

m= 6.666667
 b= 0

LSA m= 6.694579 Sensitivity data

b = -0.37897

1 1

result:

Rep = $\sigma = 0.004$
 mV



Southwest Research Institute
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Department of Quality Assurance
Calibration Laboratory



Certificate #
0972-01

Certificate of Calibration

15 June 2001

Issued to: RON GREEN DIV20 B57
Manufacturer/Model: OMEGA PX302-015GV
Description: PRESSURE TRANSDUCER
Serial Number: 971112
Asset Number: 006322
Work Order Number: 444044001

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

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

Ambient Conditions: Temperature: 68.0 Degrees Fahrenheit Humidity: 40 % RH

Calibration Date: 15 Jun 01 **Calibration Procedure:** CLCP-PI-001, 6/99

Condition as Received: SEE ATTACHED DATA

Condition as Released: SEE ATTACHED DATA

Remarks: CALIBRATION DATA ATTACHED

Approved by:



Walt Hill, Supervisor
Institute Calibration Laboratory

Measurements performed by:



Mack Wood, Technician