



United Calibration Corporation

Established 1964

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Certificate of Calibration

CERTIFICATE NO. 12345-20

ZYX Corporation
111 Main Street
Huntington Beach, CA 92649

Calibrate Load Cell in Accordance with ASTM E 74-02

Location Work Performed: UCC Huntington Beach CA	Date Performed: 3/31/2002
Device Under Test: United Load Cell	Calibration Due Date: 3/31/2003
Device S/N: 12345	Loading Range: Class A
Calibration Range: 0 to 30000 Lbf	Temp (Deg F): 74
Capacity: 30000 Lbf	Rel Humidity (%): 55
Indicator or Recorder: Resolution = 1 Lbf	

This document certifies that the equipment identified above has been calibrated in accordance with the requirements of ASTM E 74- and UCC Procedure 105 using standards which are traceable to standards maintained by NIST.

Standards Used:

ID# 0402: United 5K Deadweight Tester, 5,000 Lbf, S/N 001, Calibrated 2/25/2002 by UCC, Calibration Due Date: 2/25/2004.

ID# 0507: Tovey Engineering Load Cell, 100,000 Lbf, S/N 101116A, Calibrated 7/2/2002 by N.I.S.T., Calibration Due Date: 7/2/2003 Class AA Lower Limit in Tension: 5891 Lbf Class AA Lower Limit in Compression: 6284 Lbf.

Note: Weights have been corrected to local gravity according to ASTM E 74, Local gravity correction = 0.9989

UNITED CALIBRATION CORPORATION maintains a quality system which meets the requirements of ISO/IEC Guide 17025, ANSI/NCSL Z540-1 and ISO-9002.

Accredited by NVLAP for the specific scope of accreditation under lab code 200521. Calibration results relate only to items tested and calibrated. Uncertainty calculations are performed in accordance with ASTM E 74 and UCC Procedure UP-01.

Performed By:

William Warner
Calibration Technician

Approved Signatory:

Jere H. Watson
Technical Director
UNITED CALIBRATION CORPORATION

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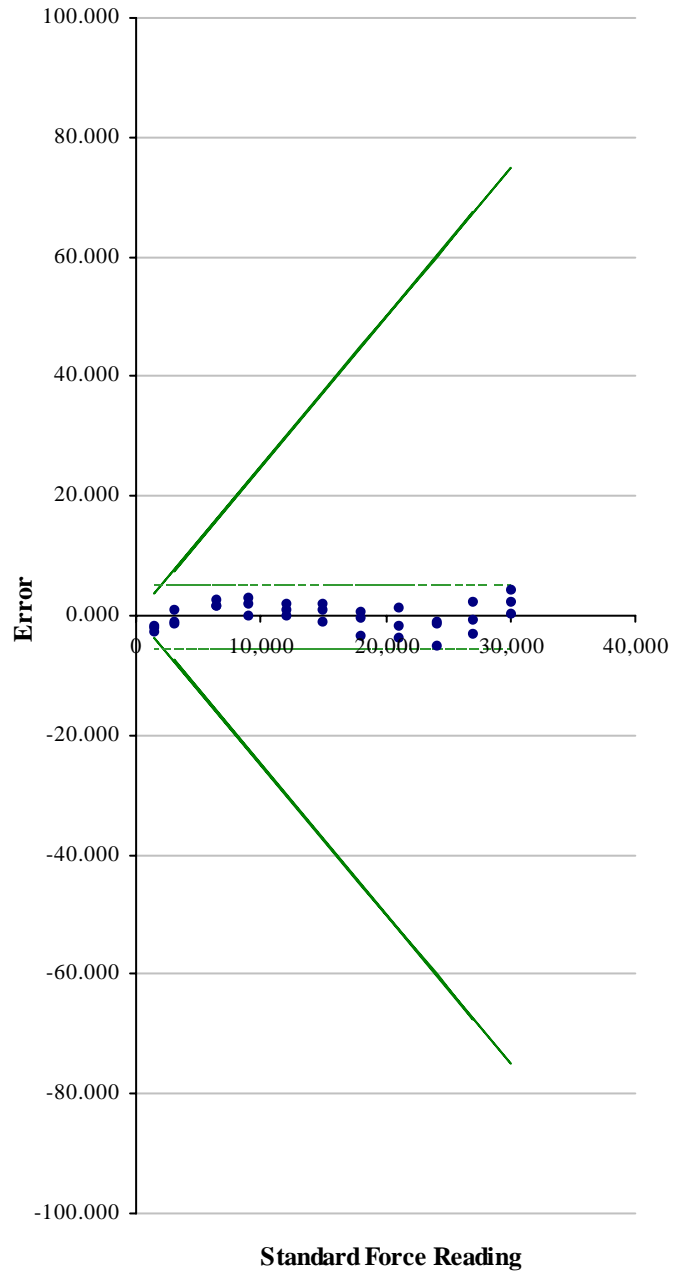


Direction: Tension

Data Point	Std Reading (Lbf)	UUT Reading (Lbf)	As Found		As Left	
			UUT Reading (Lbf)	Error (%)	Predicted Reading* (Lbf)	Error (%)
1	0.00	0.00			-3.68	
2	0.00	0.00			-3.68	
3	1,498.60	1,496.30	1,496.30	-0.15	1,497.06	-0.10
4	2,996.30	2,992.60	2,992.60	-0.12	2,997.27	0.03
5	6,430.00	6,420.00	6,420.00	-0.16	6,431.63	0.03
6	9,000.00	8,985.00	8,985.00	-0.17	9,000.04	0.00
7	12,010.00	11,993.00	11,993.00	-0.14	12,010.06	0.00
8	15,010.00	14,992.00	14,992.00	-0.12	15,008.94	-0.01
9	18,030.00	18,012.00	18,012.00	-0.10	18,026.69	-0.02
10	21,030.00	21,016.00	21,016.00	-0.07	21,026.32	-0.02
11	24,020.00	24,011.00	24,011.00	-0.04	24,014.84	-0.02
12	27,050.00	27,052.00	27,052.00	0.01	27,047.11	-0.01
13	30,000.00	30,016.00	30,016.00	0.05	30,000.49	0.00
14	0.00	0.00			-3.68	
15	0.00	0.00			-3.68	
16	1,498.60	1,495.20	1,495.20	-0.23	1,495.96	-0.18
17	2,996.30	2,990.40	2,990.40	-0.20	2,995.06	-0.04
18	6,420.00	6,411.00	6,411.00	-0.14	6,422.62	0.04
19	9,020.00	9,008.00	9,008.00	-0.13	9,023.06	0.03
20	12,030.00	12,014.00	12,014.00	-0.13	12,031.06	0.01
21	15,015.00	15,000.00	15,000.00	-0.10	15,016.94	0.01
22	18,030.00	18,016.00	18,016.00	-0.08	18,030.69	0.00
23	21,050.00	21,041.00	21,041.00	-0.04	21,051.27	0.01
24	24,030.00	24,025.00	24,025.00	-0.02	24,028.81	0.00
25	27,020.00	27,024.00	27,024.00	0.01	27,019.20	0.00
26	30,020.00	30,038.00	30,038.00	0.06	30,022.41	0.01
27	0.00	0.00			-3.68	
28	0.00	0.00			-3.68	
29	1,498.60	1,495.70	1,495.70	-0.19	1,496.46	-0.14
30	2,996.30	2,990.80	2,990.80	-0.18	2,995.46	-0.03
31	6,420.00	6,410.00	6,410.00	-0.16	6,421.62	0.03
32	9,025.00	9,012.00	9,012.00	-0.14	9,027.07	0.02
33	12,085.00	12,070.00	12,070.00	-0.12	12,087.08	0.02
34	15,010.00	14,994.00	14,994.00	-0.11	15,010.94	0.01
35	18,060.00	18,045.00	18,045.00	-0.08	18,059.65	0.00
36	21,010.00	20,998.00	20,998.00	-0.06	21,008.35	-0.01
37	24,020.00	24,015.00	24,015.00	-0.02	24,018.83	0.00
38	27,010.00	27,017.00	27,017.00	0.03	27,012.22	0.01
39	30,000.00	30,020.00	30,020.00	0.07	30,004.48	0.01

*Predicted values based upon second order least squares fit.

Load Cell Measurement Error: Predicted Minus Standard (Lbf) in Tension



- Data Point
- Uncertainty of Calibration = 5.248 Lbf
- ± 0.25% of Applied Force

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ASTM E74 Calibration Summary (Tension)

Class A Lower Limit* (Lbf) 2,099.15

ASTM E74 Uncertainty (Lbf) : ± 5.248

*The Class A Lower Limit is the largest of the following: (i) the minimum force applied to the UUT during the calibration procedure (ii) four hundred times the calculated ASTM E74 uncertainty

Direct 2nd Order Least Squares Fit Expression in Tension

$$Y = A + Bx + Cx^2$$

where:

Y =	X =	A =	B =	C =
True (Lbf)	UUT (Lbf)	-3.678043	1.003141	-1.17784E-07

Interpolation Table for Estimating True (Lbf) from UUT (Lbf)

UUT (Lbf)	0	200	400	600	800
0	-3.7	196.9	397.6	598.2	798.8
1,000	999.3	1,199.9	1,400.5	1,601.0	1,801.6
2,000	2,002.1	2,202.7	2,403.2	2,603.7	2,804.2
3,000	3,004.7	3,205.2	3,405.6	3,606.1	3,806.6
4,000	4,007.0	4,207.4	4,407.9	4,608.3	4,808.7
5,000	5,009.1	5,209.5	5,409.9	5,610.2	5,810.6
6,000	6,010.9	6,211.3	6,411.6	6,611.9	6,812.2
7,000	7,012.5	7,212.8	7,413.1	7,613.4	7,813.7
8,000	8,013.9	8,214.2	8,414.4	8,614.6	8,814.8
9,000	9,015.1	9,215.3	9,415.4	9,615.6	9,815.8
10,000	10,016.0	10,216.1	10,416.3	10,616.4	10,816.5
11,000	11,016.6	11,216.7	11,416.8	11,616.9	11,817.0
12,000	12,017.1	12,217.1	12,417.2	12,617.2	12,817.2
13,000	13,017.3	13,217.3	13,417.3	13,617.3	13,817.2
14,000	14,017.2	14,217.2	14,417.1	14,617.1	14,817.0
15,000	15,016.9	15,216.9	15,416.8	15,616.7	15,816.6
16,000	16,016.4	16,216.3	16,416.2	16,616.0	16,815.9
17,000	17,015.7	17,215.5	17,415.3	17,615.1	17,814.9
18,000	18,014.7	18,214.5	18,414.2	18,614.0	18,813.8
19,000	19,013.5	19,213.2	19,412.9	19,612.6	19,812.3
20,000	20,012.0	20,211.7	20,411.4	20,611.1	20,810.7
21,000	21,010.3	21,210.0	21,409.6	21,609.2	21,808.8
22,000	22,008.4	22,208.0	22,407.6	22,607.2	22,806.7
23,000	23,006.3	23,205.8	23,405.3	23,604.9	23,804.4
24,000	24,003.9	24,203.4	24,402.8	24,602.3	24,801.8
25,000	25,001.2	25,200.7	25,400.1	25,599.6	25,799.0
26,000	25,998.4	26,197.8	26,397.2	26,596.5	26,795.9
27,000	26,995.3	27,194.6	27,394.0	27,593.3	27,792.6
28,000	27,991.9	28,191.2	28,390.5	28,589.8	28,789.1
29,000	28,988.4	29,187.6	29,386.9	29,586.1	29,785.3
30,000	29,984.6				

Inverse 2nd Order Least Squares Fit Expression in Tension

$$Y = A + Bx + Cx^2$$

where:

Y =	X =	A =	B =	C =
UUT (Lbf)	True (Lbf)	3.708005	0.996853	1.179698E-07

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**Interpolation Table for Estimating UUT (Lbf)
from True (Lbf)**

True (Lbf)	0	200	400	600	800
0	3.7	203.1	402.5	601.9	801.3
1,000	1,000.7	1,200.1	1,399.5	1,599.0	1,798.4
2,000	1,997.9	2,197.4	2,396.8	2,596.3	2,795.8
3,000	2,995.3	3,194.8	3,394.4	3,593.9	3,793.5
4,000	3,993.0	4,192.6	4,392.1	4,591.7	4,791.3
5,000	4,990.9	5,190.5	5,390.2	5,589.8	5,789.4
6,000	5,989.1	6,188.7	6,388.4	6,588.1	6,787.8
7,000	6,987.5	7,187.2	7,386.9	7,586.6	7,786.3
8,000	7,986.1	8,185.8	8,385.6	8,585.4	8,785.2
9,000	8,984.9	9,184.7	9,384.6	9,584.4	9,784.2
10,000	9,984.0	10,183.9	10,383.7	10,583.6	10,783.5
11,000	10,983.4	11,183.3	11,383.2	11,583.1	11,783.0
12,000	11,982.9	12,182.9	12,382.8	12,582.8	12,782.8
13,000	12,982.7	13,182.7	13,382.7	13,582.7	13,782.7
14,000	13,982.8	14,182.8	14,382.9	14,582.9	14,783.0
15,000	14,983.0	15,183.1	15,383.2	15,583.3	15,783.4
16,000	15,983.6	16,183.7	16,383.8	16,584.0	16,784.1
17,000	16,984.3	17,184.5	17,384.7	17,584.9	17,785.1
18,000	17,985.3	18,185.5	18,385.7	18,586.0	18,786.2
19,000	18,986.5	19,186.8	19,387.1	19,587.4	19,787.7
20,000	19,988.0	20,188.3	20,388.6	20,588.9	20,789.3
21,000	20,989.7	21,190.0	21,390.4	21,590.8	21,791.2
22,000	21,991.6	22,192.0	22,392.4	22,592.8	22,793.3
23,000	22,993.7	23,194.2	23,394.7	23,595.1	23,795.6
24,000	23,996.1	24,196.6	24,397.2	24,597.7	24,798.2
25,000	24,998.8	25,199.3	25,399.9	25,600.5	25,801.0
26,000	26,001.6	26,202.2	26,402.9	26,603.5	26,804.1
27,000	27,004.7	27,205.4	27,406.1	27,606.7	27,807.4
28,000	28,008.1	28,208.8	28,409.5	28,610.2	28,810.9
29,000	29,011.7	29,212.4	29,413.2	29,613.9	29,814.7
30,000	30,015.5				

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