Executive Briefing

The 5 Most Dangerous Trends Facing Pipeline Companies Today

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Briefing Objectives

- ✓ **Five most dangerous trends** facing pipeline companies today.
- ✓ Expose a **hidden threat** .
- ✓ Simple strategic decision that reduces the negative effects of these trends.

Sources Listed Here

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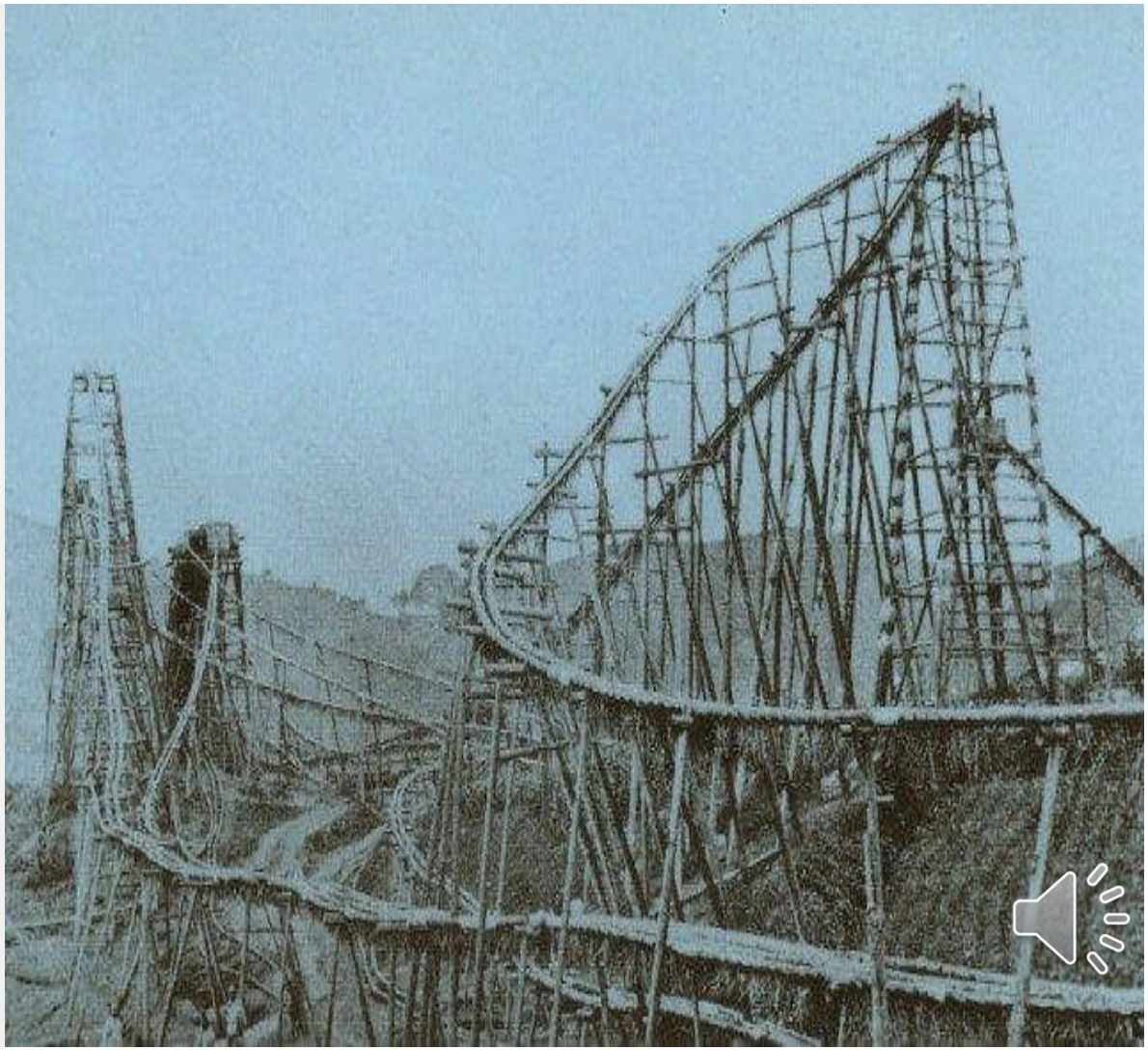
When Was the First Pipeline Created?

- 900 BC in China
- Hollow bamboo and wax pipe
- Transported natural gas and water



www.EarthFacts.com

When and Where Was the First US Pipeline?

- 1865 in Pennsylvania. From Pithole Creek to the Allegheny River.
- 6-mile, 6” gravity pipeline.
- Moved 7,000 barrels of crude oil daily.

http://www.petroleumhistory.org/OilHistory/pages/Pipelines/BigYear.html

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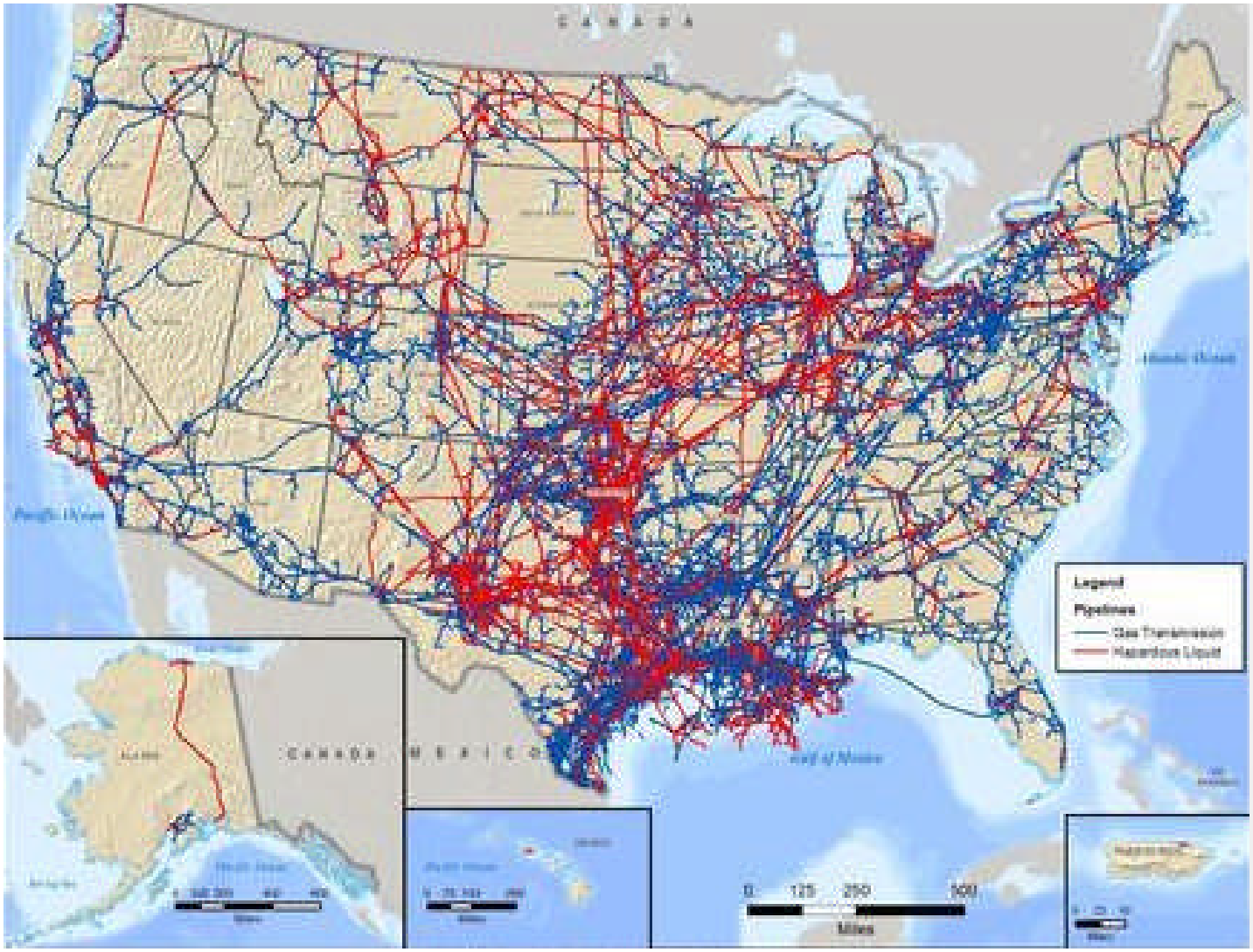

How Many Miles of US Pipeline Today?

2,620,642

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2.6 Million Miles of US Pipeline

Pipeline	Mileage	Operators
Hazardous Liquid Pipeline	182,166	350
Gas Transmission Pipeline	324,832	1,034
Gas Distribution Lines	2,113,643	1,285

Question: How many different products do pipelines move in the US?

- Pipelines move **38 different products** across our country.

http://opsweb.phmsa.dot.gov/pipelineforum/facts-and-stats

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Trend 1: Aging Infrastructure

Period	Hazardous Liquid	Transmission & Gathering	Distribution Main Line	Distribution Service Miles
Pre 1950s	15%	13%	15%	12%
1950-1970	37%	45%	25%	17%
Total	**52%**	**58%**	40%	29%

- 52% of Hazardous Liquid pipelines were installed prior to regulation in 1970.
- 58% of gas transmission and gathering pipelines are pre 1970.
- **The majority of "pipe in the ground" has been there over 40 years.**

http://opsweb.phmsa.dot.gov/pipelineforum/facts-and-stats

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Maintaining a Pipeline Isn't Cheap

$ 15,500

x 506,998

$ 7,858,469,000

PG&E Annual Report; Colonial Pipeline Annual Report

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1990

- 1,695,000 miles of pipeline
- 60,000 employees
- 28.25 miles of pipeline per employee

2010

- 2,620,642 miles of pipeline
- 42,000 employees
- 62.4 miles of pipeline per employee

- Today there are **30% fewer employees** and **55% more pipeline**.
- Your team's readiness and pipeline's operational efficiency is more critical now than ever before.

US Census Bureau

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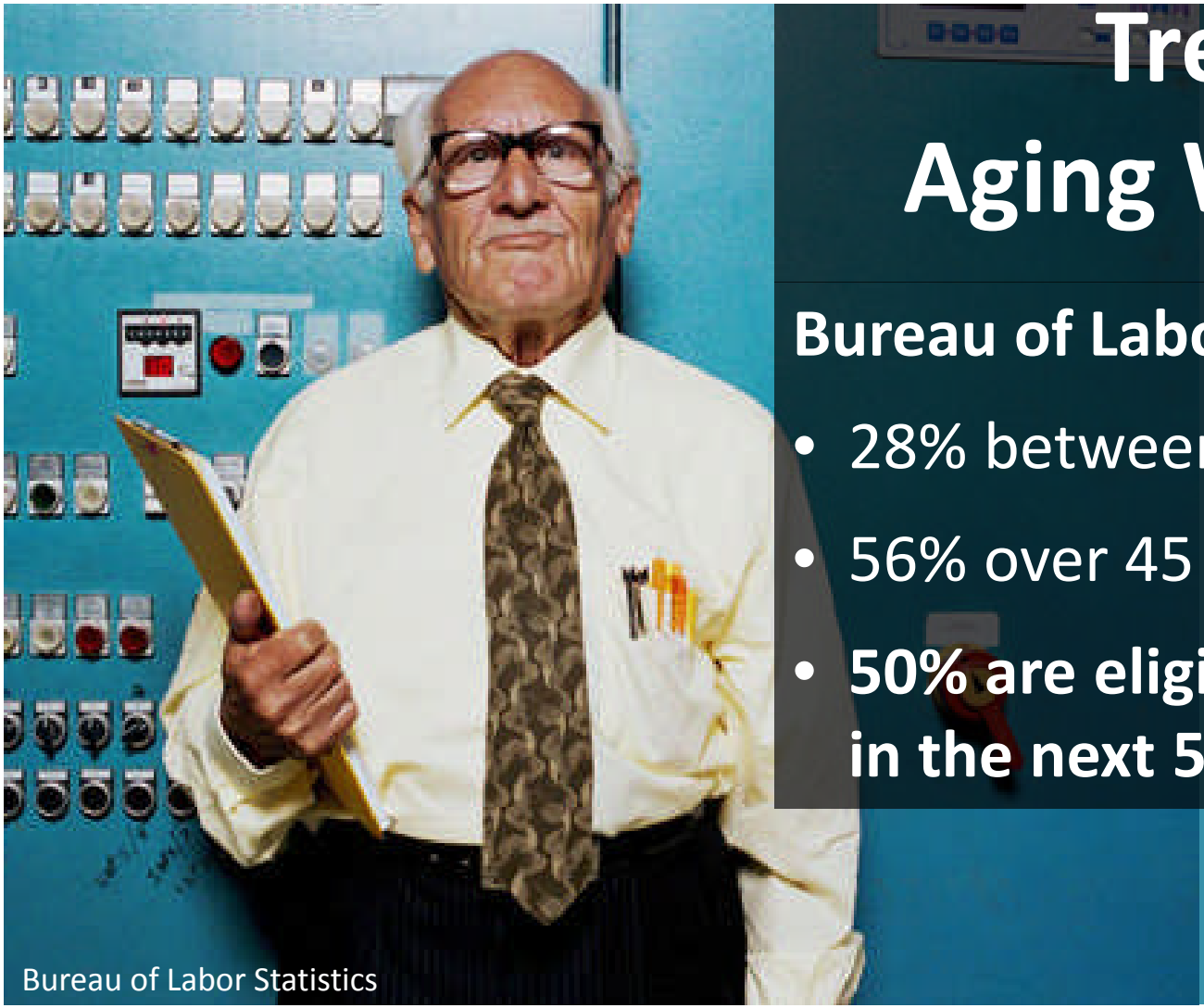

Trend 2: Aging Workforce

Bureau of Labor Statistics:

- 28% between 55-64
- 56% over 45
- **50% are eligible for retirement in the next 5-10 years**

Bureau of Labor Statistics

Filling the Skill Gap is Expensive

- New employees take 3-5 years to achieve proficiency.
- Investment of $250,000 or more in salary & benefits.
- More responsibilities and use more advanced technologies than 20 years ago.
- **Aging Infrastructure + Aging Workforce = programs to train and develop technicians on maintenance and testing are more important than ever.**

US Department of Labor Statistics

Confidential & Pr

Trend 3: Significant Incidents

Question: **Since 2000, how many pipeline "significant incidents" have occurred in the US?**

Answer: 3,630 (279 annually)

- 201 fatalities, 777 injuries, and over $3B property damage.
- Causes: corrosion, equipment failure, damage from excavations, incorrect operation, and natural forces.
- **Accurate, reliable, and proper use of test equipment can identify and/or prevent 3 of these 5 causes of incidents.**

Year	Incidents
2000	290
2001	233
2002	258
2003	298
2004	311
2005	383
2006	257
2007	268
2008	279
2009	271
2010	257
2011	281
2012	244
Total:	**3,630**

US Department of Transportation, PHMSA Filtered Incident Files

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Kalamazoo River Spill

July 26, 2010 – Township, MI

- 23,000+ barrels of crude spilled into Talmadge Creek and the Kalamazoo River, costing…
- $765,000,000 - The most expensive pipeline spill since the US began keeping records in 1968.

Bloomberg.com; EPA

San Bruno Explosion

September 9, 2010 – San Bruno, CA

- 8 killed
- 58 injured
- 38 homes destroyed

"Cost could exceed $1 billion"

-- Tony Early, CEO of PG&E

www.ntsb.gov/doclib/reports/2011/PAR1101.pdf; CBS San Francisco

Yellowstone River Spill

July 1, 2011 – Billings, MT

- 1,509 barrels of crude released
- Cleanup costs: $135,000,000
- Pipeline shut down in only 30 minutes
- **Could have been much worse**

http://www.nytimes.com/2011/07/03/us/03oilspill.html

Bellingham, WA Rupture & Explosion

June 10, 1999

- 237,000 gallons of gasoline
- Explosion killed 3 (2 children)
- $21,000,000 in federal criminal fines
- $15,000,000 in civil penalties

www.ntsb.gov/doclib/reports/2002/PAR0202.pdf

Profound Industry Impact

- Upper management became **criminally liable**.
- Upgrade inspection, repair, maintenance, and training programs…
- **Costing the industry billions.**

www.ntsb.gov/doclib/reports/2002/PAR0202.pdf

Trend 4: Increased Regulation

- Serious incidents result in increased legislation and regulation.
- Considering recent history, environmental issues, and the changing political climate, increased regulation is likely.
- **API Spec Q2 currently being implemented in oil and gas industries.**
- **Audit preparedness is becoming more important, difficult and costly.**

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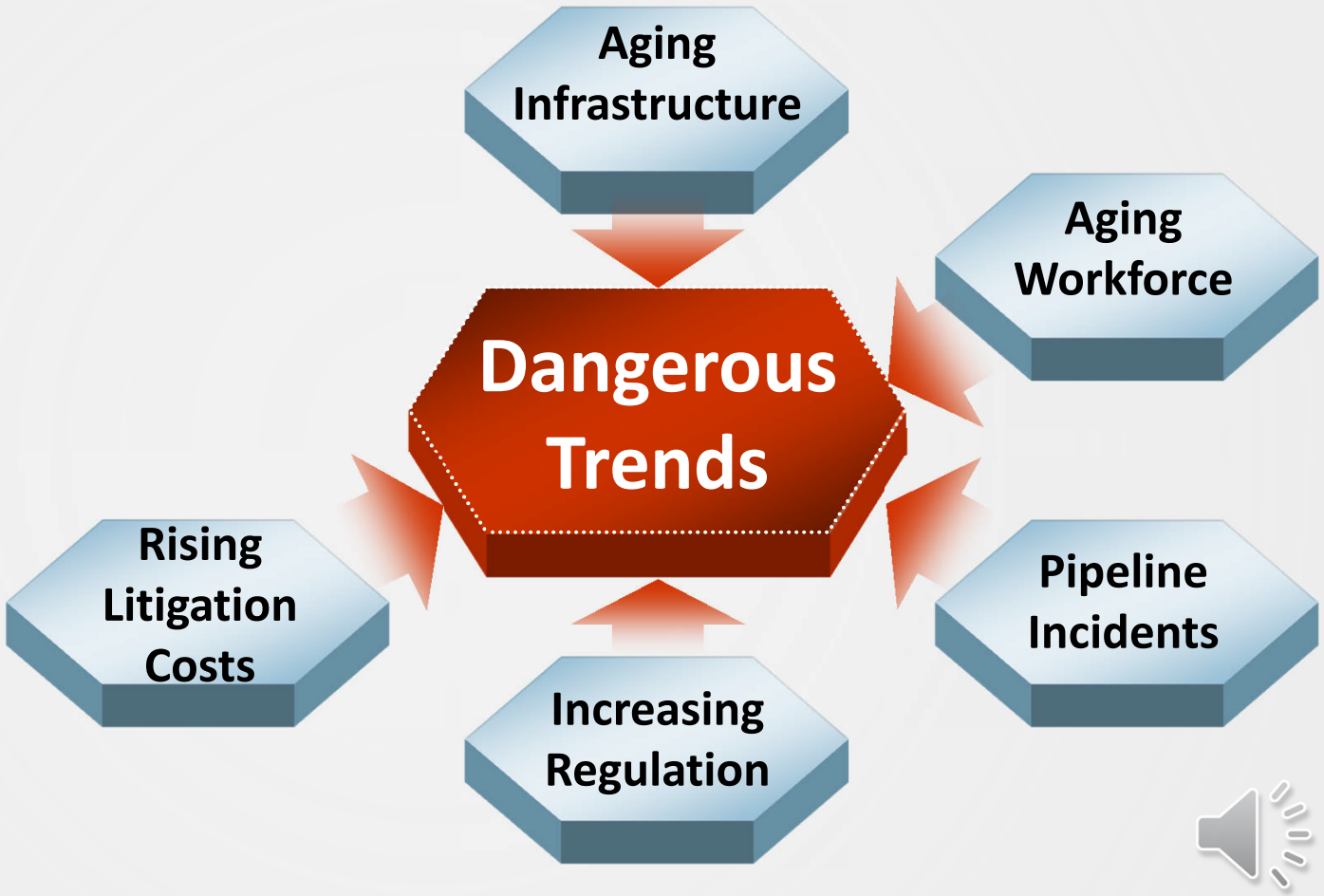
Trend 5: Rising Litigation Costs

- Business defendants lose at trial 65% of the time (US Chamber of Commerce)
- Average litigation costs (Insurance Journal)
  - 2010: $1 million
  - **2011 = $1.4 million**
- **A properly managed test equipment program greatly reduces your exposure to expensive litigation.**

www.insurancejournal.com; US Chamber of Commerce; Fulbright Survey

Summary of Trends Facing Pipeline Companies



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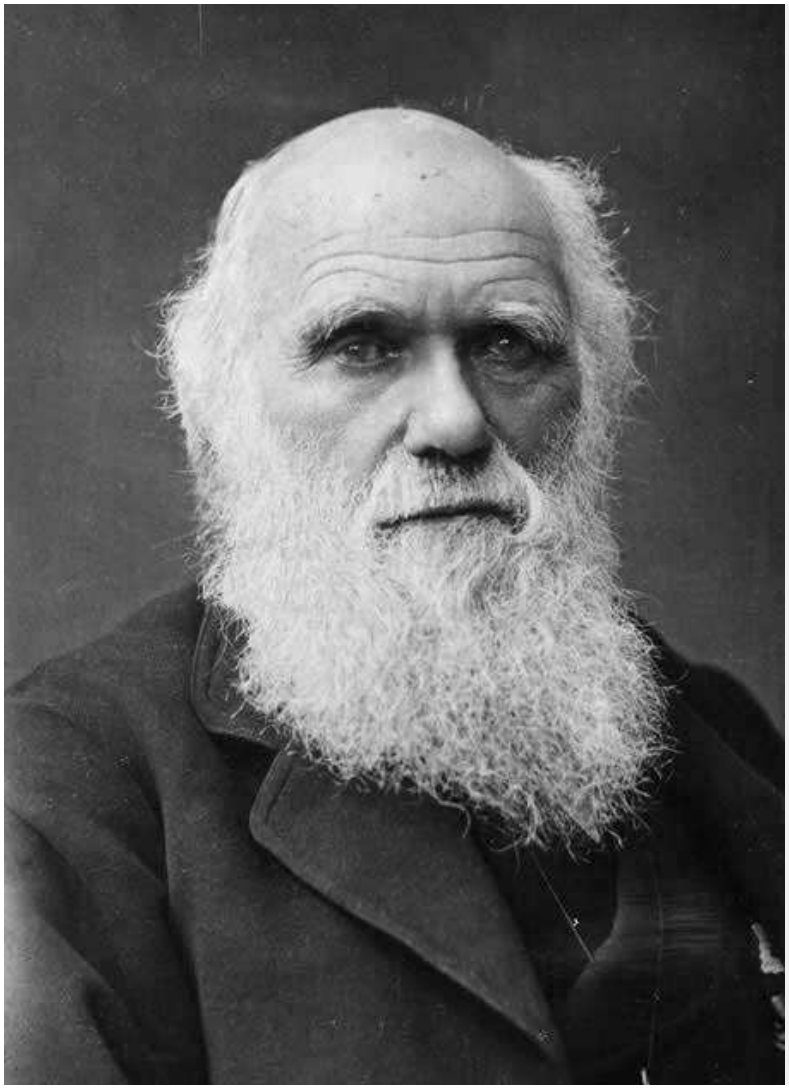

The Real Threat:
Change

"It's not the strongest that survives, nor the most intelligent. It's the one that is most adaptable to change."

Charles Darwin

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What is NIST ?

NIST

National Institute of Standards and Technology

Technology Administration, U.S. Department of Commerce

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NIST

- Why is NIST important?
- What does it mean to you?
- How do you comply?
- What is NIST Traceability?

NIST
National Institute of Standards and Technology
U.S. Department of Commerce

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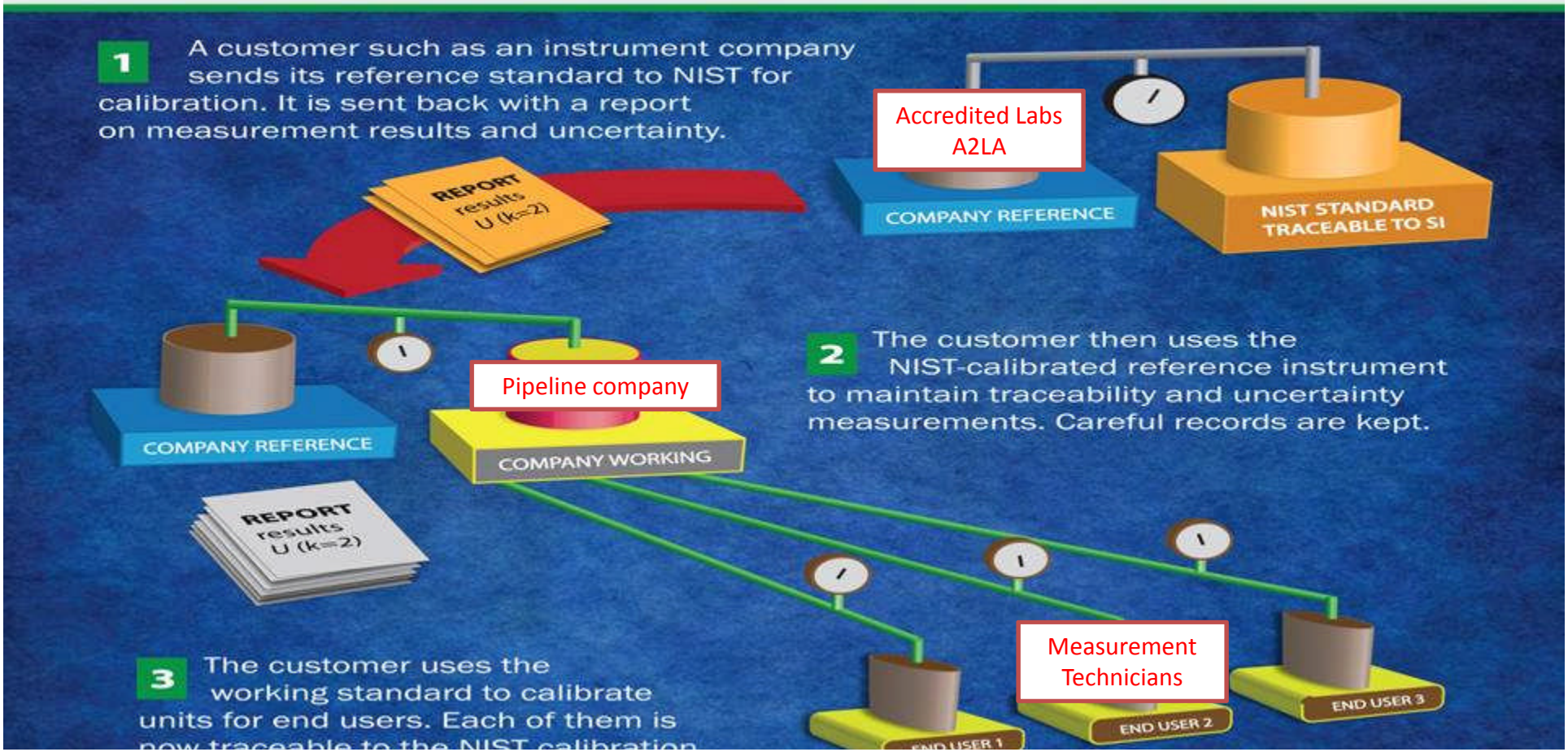
Metrological Traceability Through Calibration



Temperature Certification

- Methods used to Certify
- Dry Block Calibrators
- Liquid Baths
- Resistance Reference

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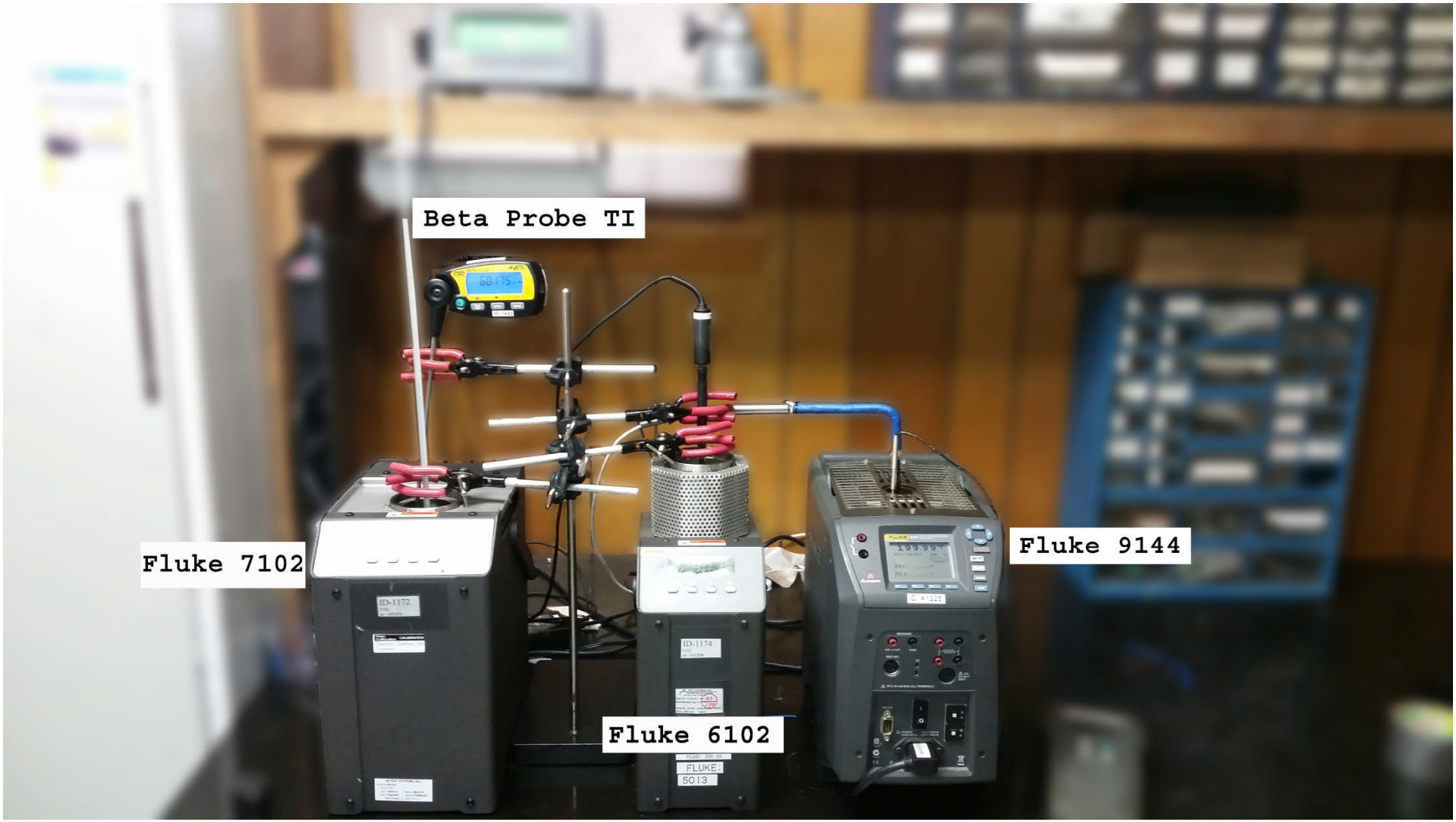
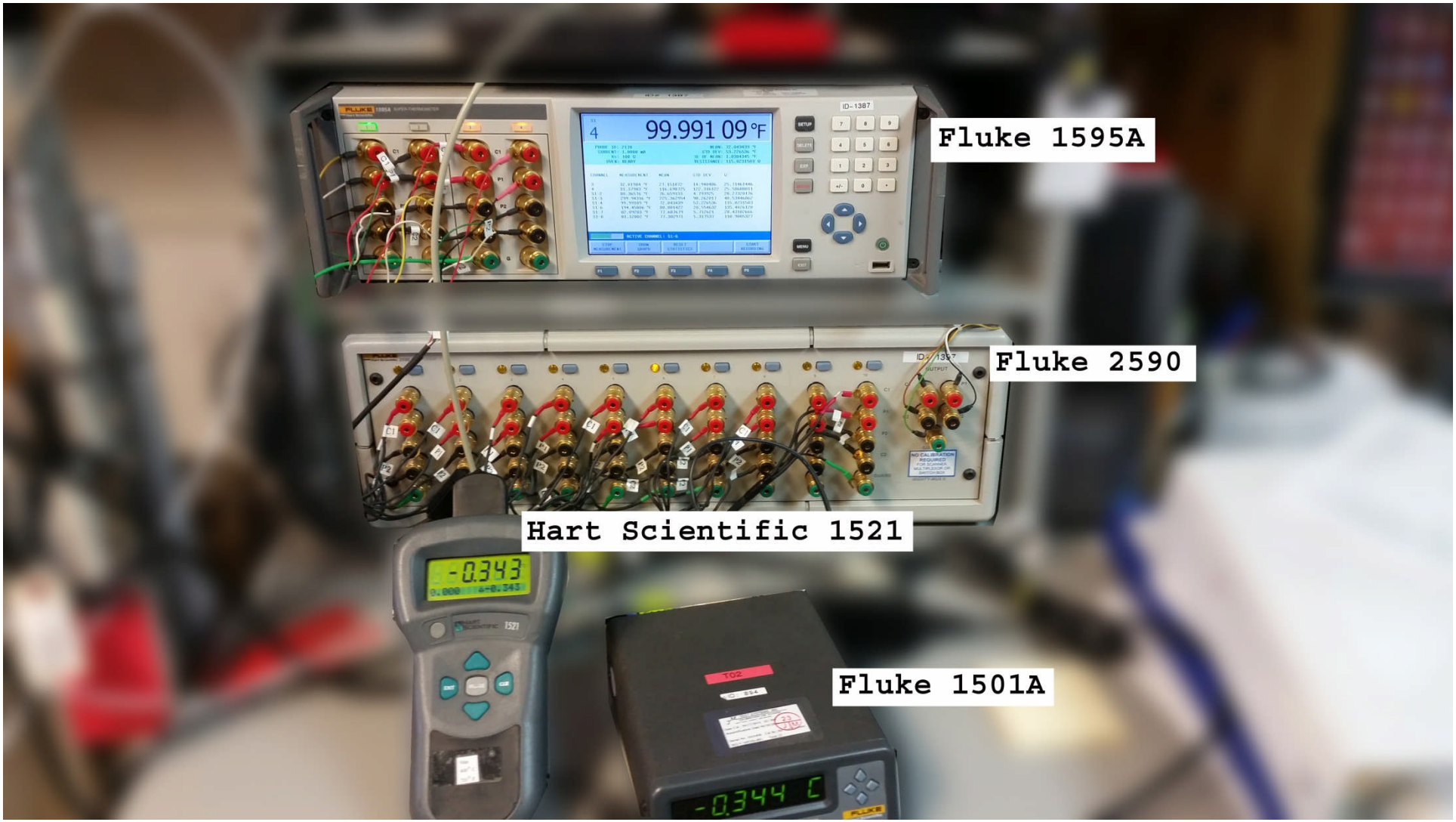

Beta Probe TI
Fluke 7102
Fluke 6102
Fluke 9144

Fluke 1552A
Thermoprobe
TL1-W
HART 6331

Fluke 1502A
Hart Scientific 7341

Decade boxes


Fluke 1595A
99.991 09 °F
Fluke 2590
Hart Scientific 1521
-0.343
Fluke 1501A
-0.344 C

Fluke 4181

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CERTIFICATE OF CALIBRATION

Manuf. **THERMOPROBE** PO# **AM4510244471**
Model **TP-8** Submitted By

Mfg Serial **8-1863**
Cust ID# **N/A**
Cust Serial **N/A**
Desc. **DIGITAL THERMOMETER**

JM TEST SYSTEMS certifies this instrument has been repaired, if necessary, and calibrated to published manufacturer specifications using standards traceable to NIST, to consensus standards, to ratio methods, or to accepted values of natural physical constants. This certificate applies only to the item listed above. JM TEST SYSTEMS' quality control system meets the requirements of ANSI/NCSL Z540-1, ISO 9001, ISO 10012 and ISO 17025.

Condition In: **In Tolerance**
Condition Out: **No Adjustments**
Action: **Cleaned, calibrated and certified.**
Procedure: **Manufacturer's**

The following standards were used in the calibration:

Manufacturer	Model Number	Std #	Date Due
HART SCIENTIFIC	**5628-12**	**761**	**10/31/2015**
HART SCIENTIFIC	**1595A**	**1387**	**11/07/2015**

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Certificate/traceability number: **0164-0387.17-185486-003** WO#: **185486-003**

Calibration Date: **03/27/2015**
Due Recalibration Date: **04/29/2015**
Lab Environment: TEMP: **23°C**
HUMIDITY: **41%RH**

Technician

JM Test Systems, Inc. **Calibration Data Sheet** work order#: 185486003

Manufacturer: THERMOPROBE/AVTEMP Model: TP-8/9/AT-1 SERIES

Parameter		Out	Measured value		Acceptance limits	
Range	Mode	*	Before	After	Low	High
I/A/W MFG. PROCEDURE:					±.2°F	
DIGITAL THERMOMETER						
SET STANDARD TO:			STANDARD	READING:		
	≈32°F		31.9	N/A	RECORD	ONLY
	≈75°F		75.1	N/A	RECORD	ONLY
	≈190°F		189.7	N/A	RECORD	ONLY
					DEVIATION	FROM ABOVE
TEST INSTRUMENT:			TI DISPLAY	READING:	STANDARD	READING:
0/220°F	32°F		31.9	N/A	-0.2°F	+0.2°F
	75°F		75.0	N/A	-0.2°F	+0.2°F
	190°F		189.8	N/A	-0.2°F	+0.2°F
OPERATIONAL CHECK ONLY:						
	BACKLIGHT		PASS	N/A	PASS/	FAIL

Pressure Certification

- Methods used to certify
  - Electronic method
  - Pneumatic pressure source
  - Deadweight – hydraulics/pneumatic

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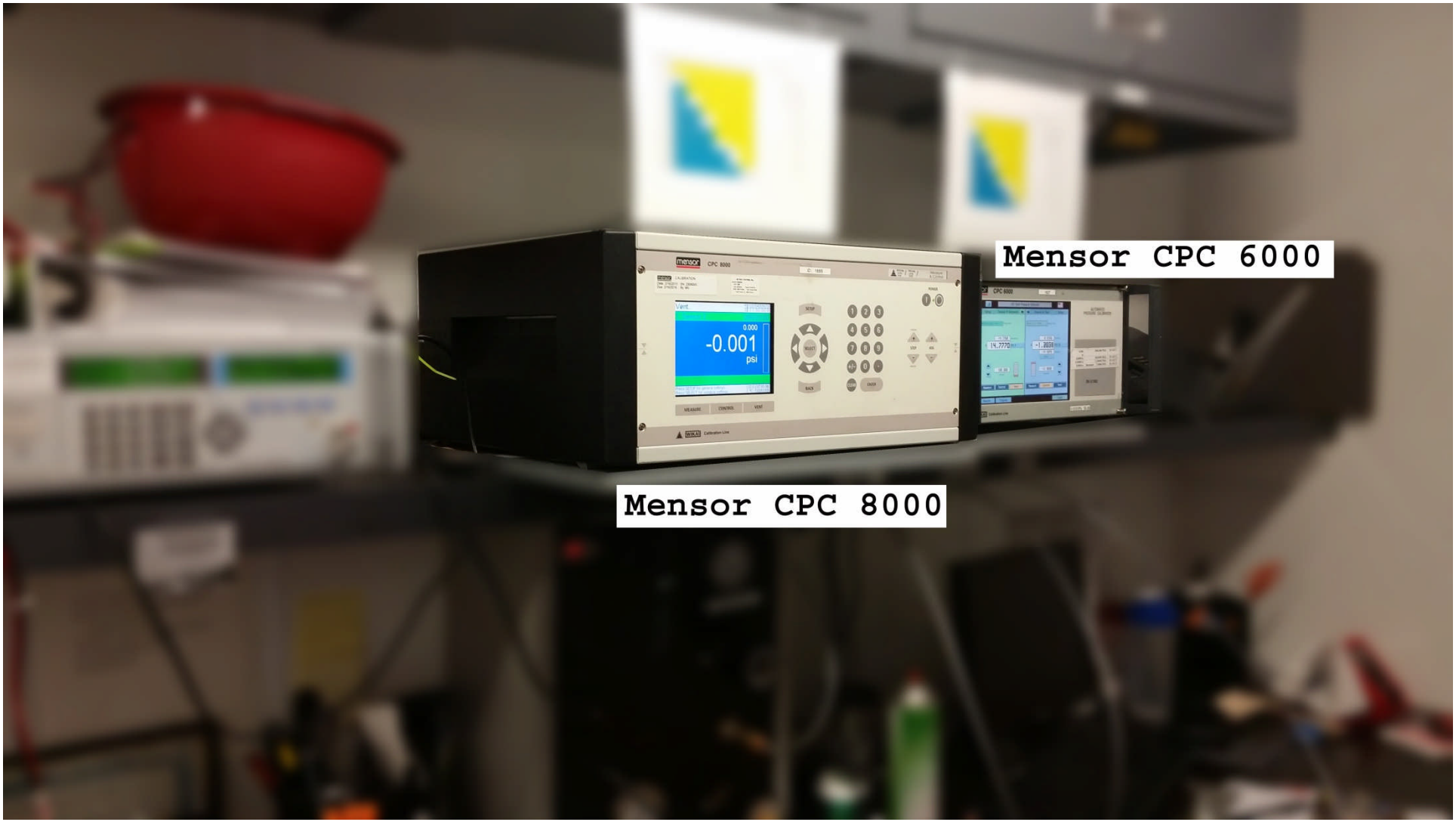
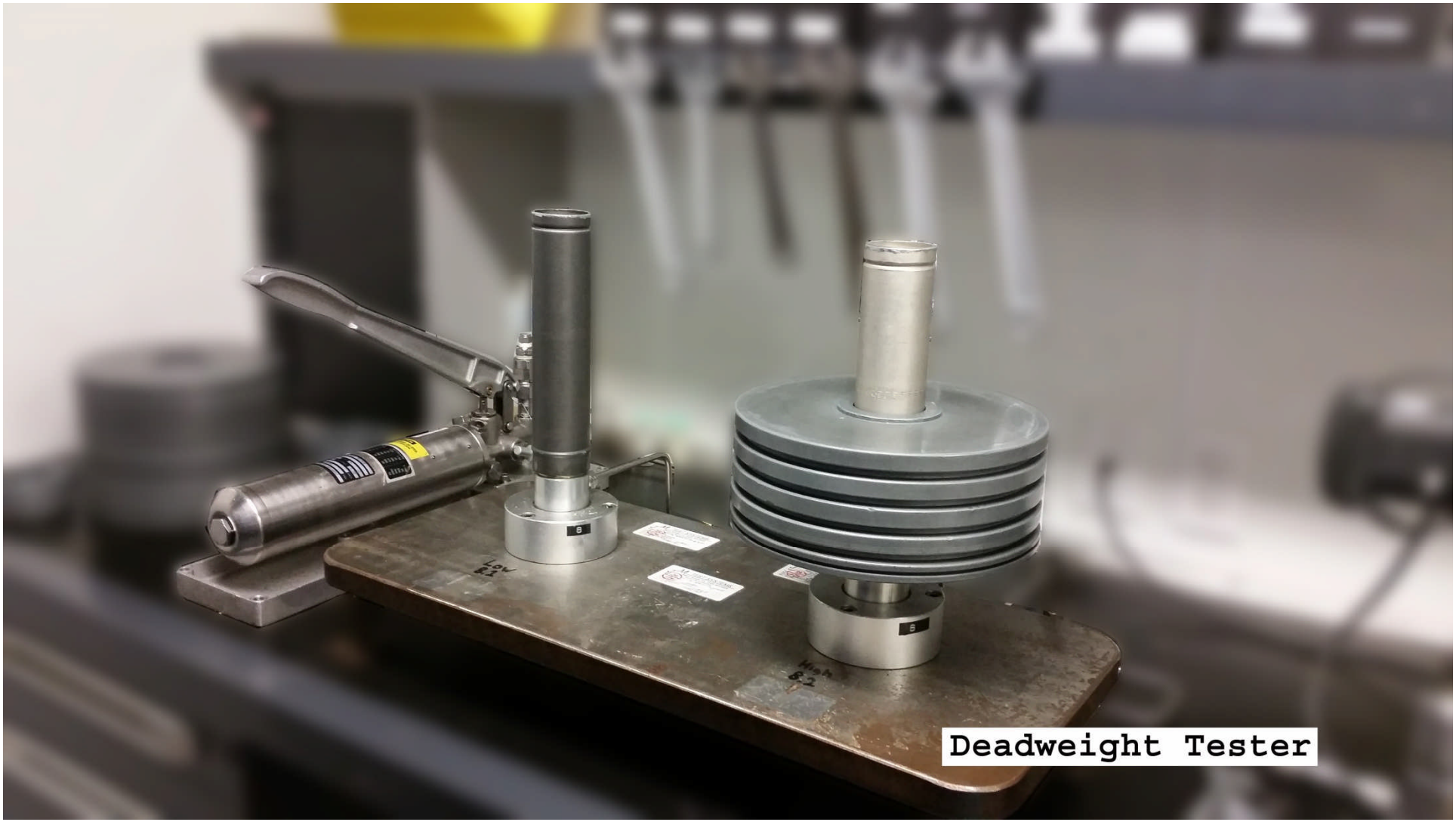
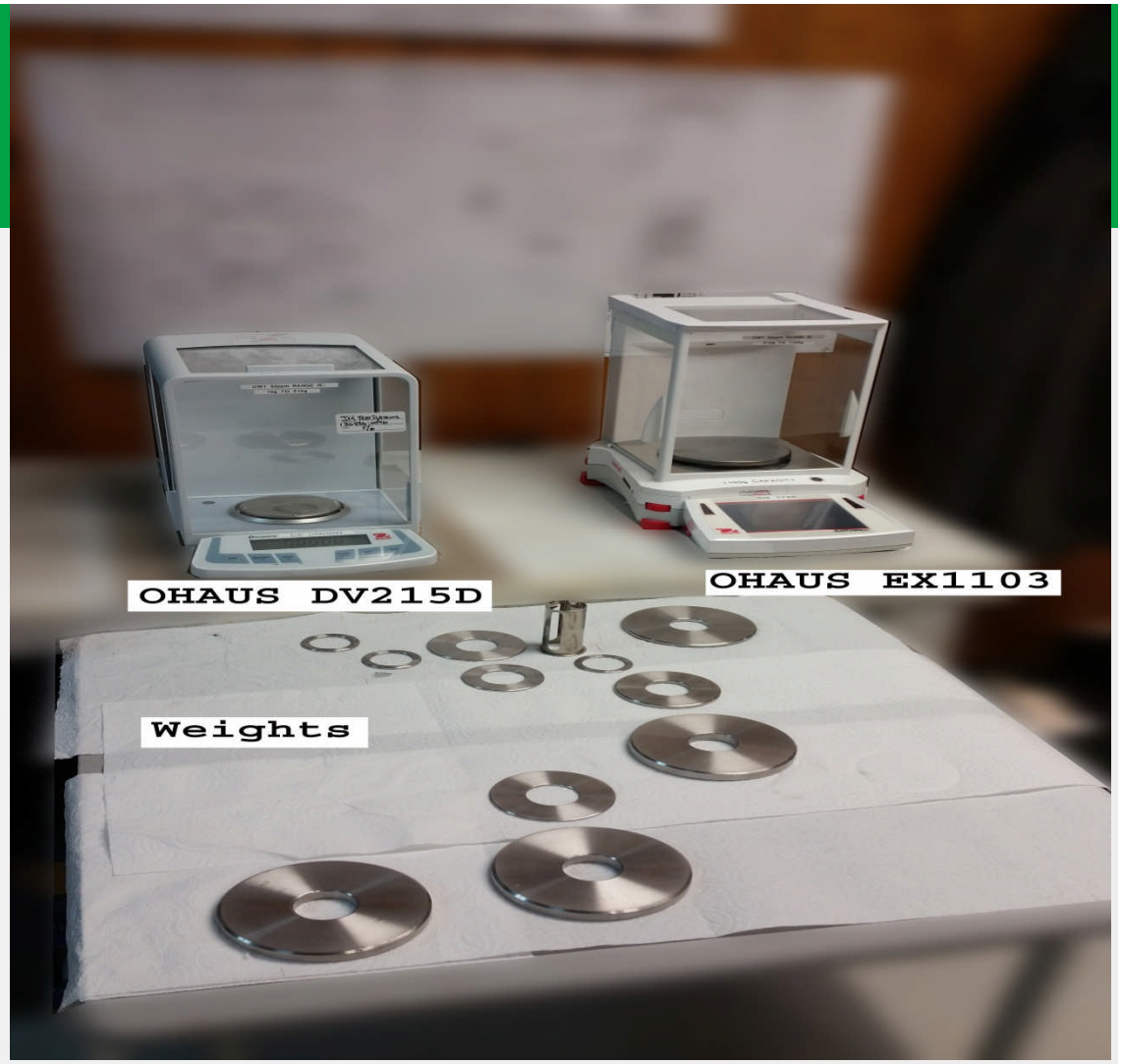

Mensor CPC 6000
Mensor CPC 8000


Deadweight Tester

Weighing the Weights for PK Tester



CERTIFICATE OF CALIBRATION

Manuf. **CRYSTAL ENGINEER.** PO# **W/OPO**
Model **IS33** Submitted By

Mfg Serial **2262-941965**
Cust ID# **N/A**
Cust Serial
Desc. **PRESSURE CALIBRATOR**

JM TEST SYSTEMS certifies this instrument has been repaired, if necessary, and calibrated to published manufacturer specifications using standards traceable to NIST, to consensus standards, to ratio methods, or to accepted values of natural physical constants. This certificate applies only to the item listed above. JM TEST SYSTEMS' quality control system meets the requirements of ANSI/NCSL Z540-1, ISO 9001, ISO 10012 and ISO 17025.

Condition In: **In Tolerance**
Condition Out: **No Adjustments**
Action: **BATTERY > 8.75V. CLEANED, CALIBRATED AND CERTIFIED.**
Procedure: **MANUFACTURER**

The following standards were used in the calibration:

Manufacturer	Model Number	Std #	Date Due
AMETEK	**10-10525**	**067255**	**02/28/2013**
AMETEK	**RK1100/300PSI**	**445**	**07/31/2012**
FLUKE	**5500A**	**531**	**02/28/2013**
KING NUTRONICS	**3682**	**902868**	**06/30/2014**

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Certificate/traceability number: **0001-0300.00-130006-001** WO#: **130006-001**

Calibration Date: **07/06/2012**
Due Recalibration Date: **07/06/2013**
Lab Environment: TEMP: **22°C**
HUMIDITY: **38%RH**

Technician

B.R. (800) 353-3411 • Alex. (318) 443-5589 • Odessa (866) 631-9091 • Clute (800) 762-1998
www.JMTestSystems.com

JM Test Systems, Inc. **Calibration Data Sheet** work order#: 186952020

Manufacturer: CRYSTAL/TRANS. Model: IS/33/31/92/91

Parameter Range	Mode	Out *	Measured value Before	After	Acceptance limits Low	High
	I/A/W MFG. PROCEDURE:					
	PRESSURE CALIBRATOR					
	DC CURRENT INPUT:				±.025%of RDG	+.001 mA
50 mA	4 mA		3.999	N/A	3.998 mA	4.002 mA
	10 mA		10.000	N/A	9.996 mA	10.004 mA
	20 mA		20.000	N/A	19.994 mA	20.006 mA
	30 mA		29.999	N/A	29.991 mA	30.009 mA
	40 mA		39.999	N/A	39.989 mA	40.011 mA
	50 mA		49.998	N/A	49.985 mA	50.014 mA
	-14.7/36 PSIG RANGE:					
NOMINAL	ACTUAL				±.25% of RDG	+0.004 PSI
-12 PSIG	-12.0000 PSIG		-12.006	N/A	-12.034 PSIG	-11.966 PSIG
-6 PSIG	-6.0000 PSIG		-6.009	N/A	-6.019 PSIG	-5.981 PSIG
					±.05% of RDG	+.005% of FS
0 PSIG	0.0000 PSIG		0.000	N/A	-0.002 PSIG	0.002 PSIG
8 PSIG	7.9892 PSIG		7.985	N/A	7.983 PSIG	7.995 PSIG
16 PSIG	15.9784 PSIG		15.975	N/A	15.969 PSIG	15.988 PSIG
22 PSIG	21.9703 PSIG		21.969	N/A	21.958 PSIG	21.983 PSIG
29 PSIG	28.9609 PSIG		28.962	N/A	28.944 PSIG	28.978 PSIG
36 PSIG	35.9515 PSIG		35.969	N/A	35.932 PSIG	35.971 PSIG
	0/3000 PSIG RANGE:					
NOMINAL	ACTUAL				±.05% of RDG	+.005% of FS
0 PSIG	0.00 PSIG		0.0	N/A	-0.2 PSIG	0.2 PSIG
750 PSIG	748.99 PSIG		748.8	N/A	748.5 PSIG	749.5 PSIG
1500 PSIG	1497.98 PSIG		1497.7	N/A	1497.1 PSIG	1498.9 PSIG
2250 PSIG	2246.97 PSIG		2246.3	N/A	2245.7 PSIG	2248.2 PSIG
3000 PSIG	2995.96 PSIG		2995.8	N/A	2994.4 PSIG	2997.6 PSIG
	OPERATIONAL CHECK ONLY:					
	CONTRAST		PASS	N/A	PASS	/FAIL
	UNITS KEY		PASS	N/A	PASS	/FAIL
	ZERO KEY		PASS	N/A	PASS	/FAIL
	mA/% KEY		PASS	N/A	PASS	/FAIL
	SPAN MULTIPLIERS:		AS FOUND	AS LEFT		
	LP		0.99889	0.99889	RECORD	ONLY
	HP		1.00000	1.00000	RECORD	ONLY
	mA		1.00000	1.00000	RECORD	ONLY
	"H2O REFERENCE		4°C	4°C	RECORD	ONLY

JMT#: 4096

PK/RK Deadweight Testers

- Methods to Certify
  - Clean weights
  - Weigh weight
  - Internal Inspection

- Local Gravity and how important It is To Accurate Measurement

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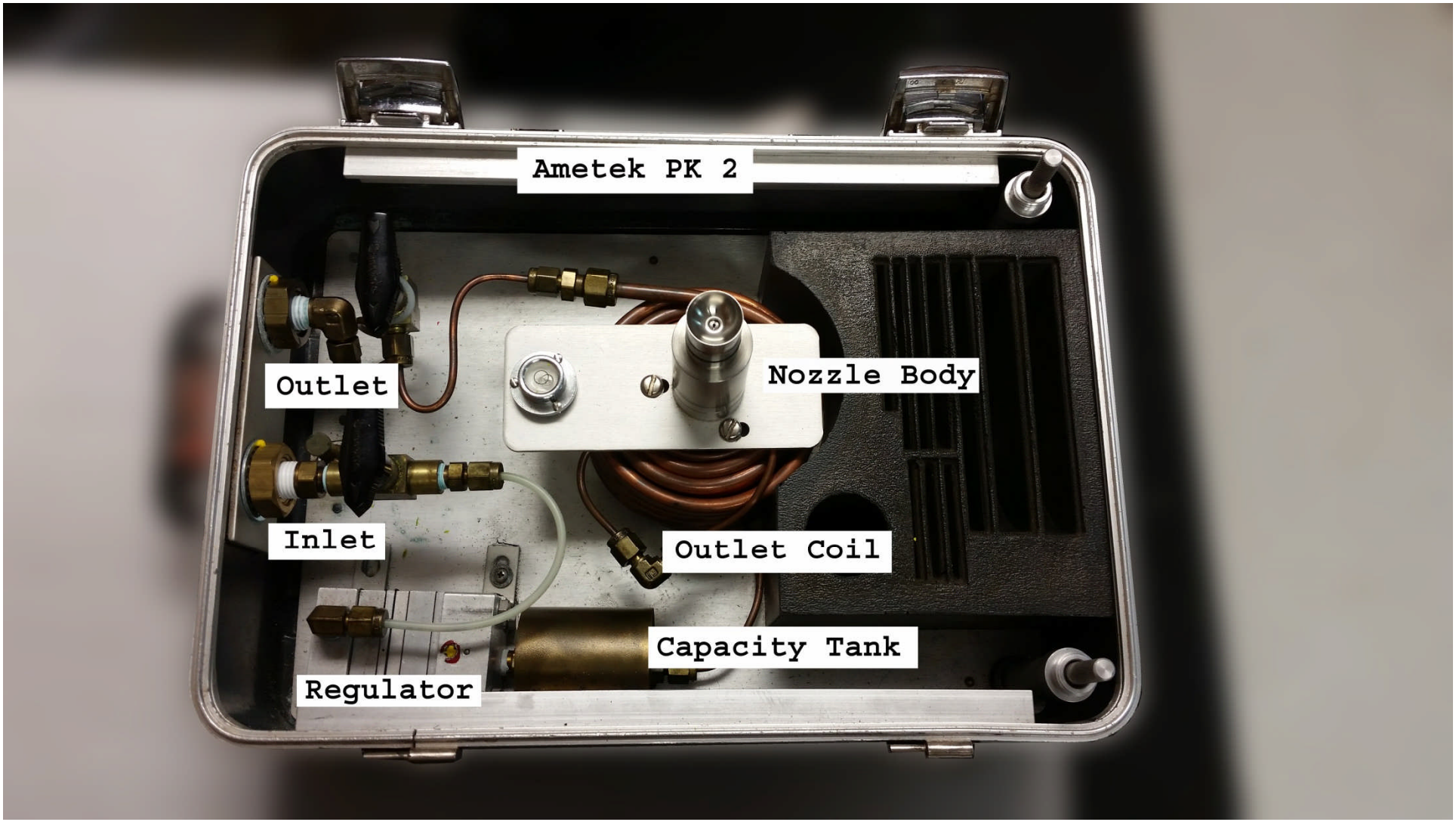
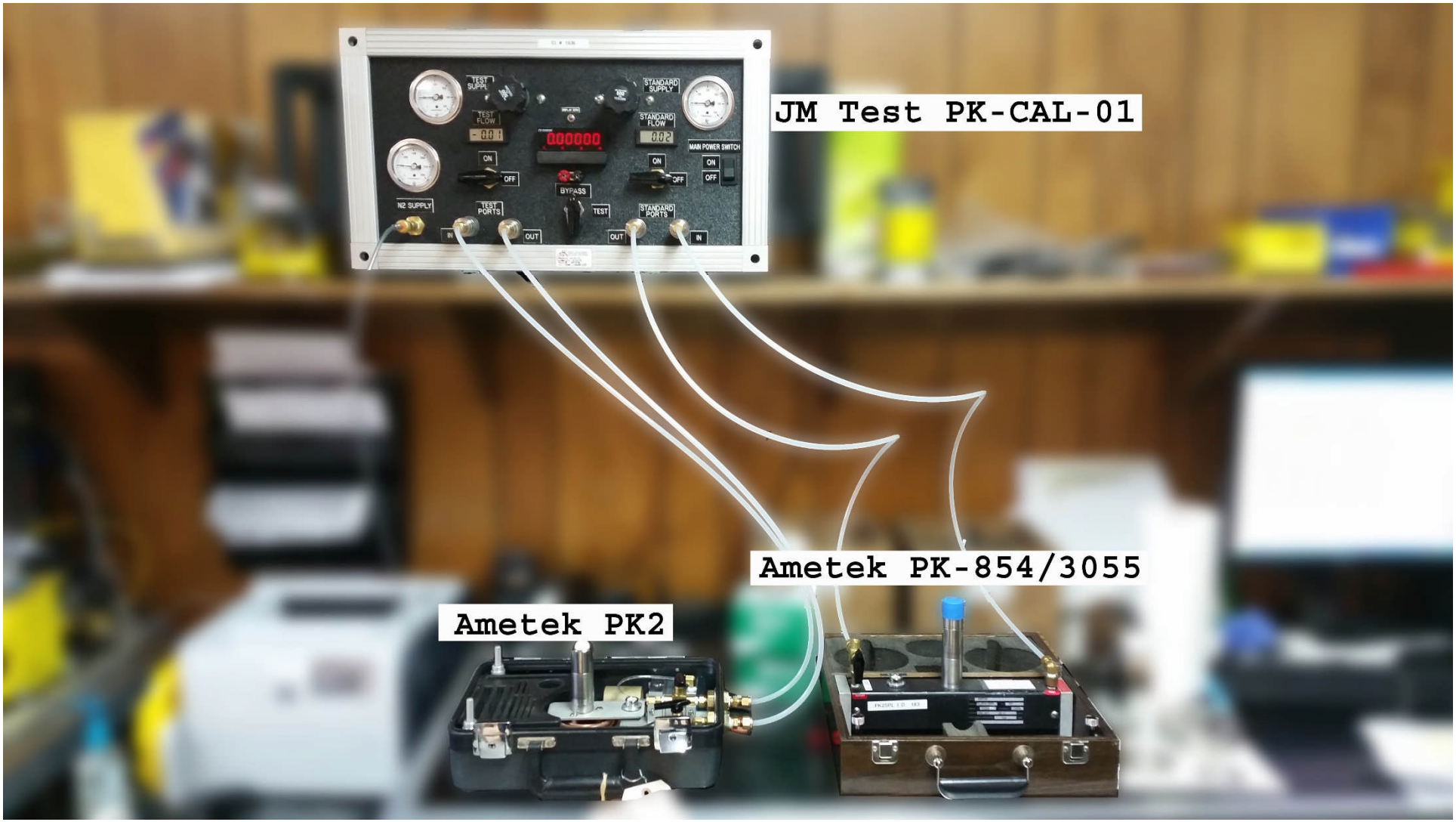

Ametek PK 2
Outlet
Nozzle Body
Inlet
Outlet Coil
Capacity Tank
Regulator


JM Test PK-CAL-01
Ametek PK-854/3055
Ametek PK2

Voltage/Current Certification

- Voltmeters
- Process Calibrators
- Multifunction Calibrators
- Pressure w/ Current Capabilities

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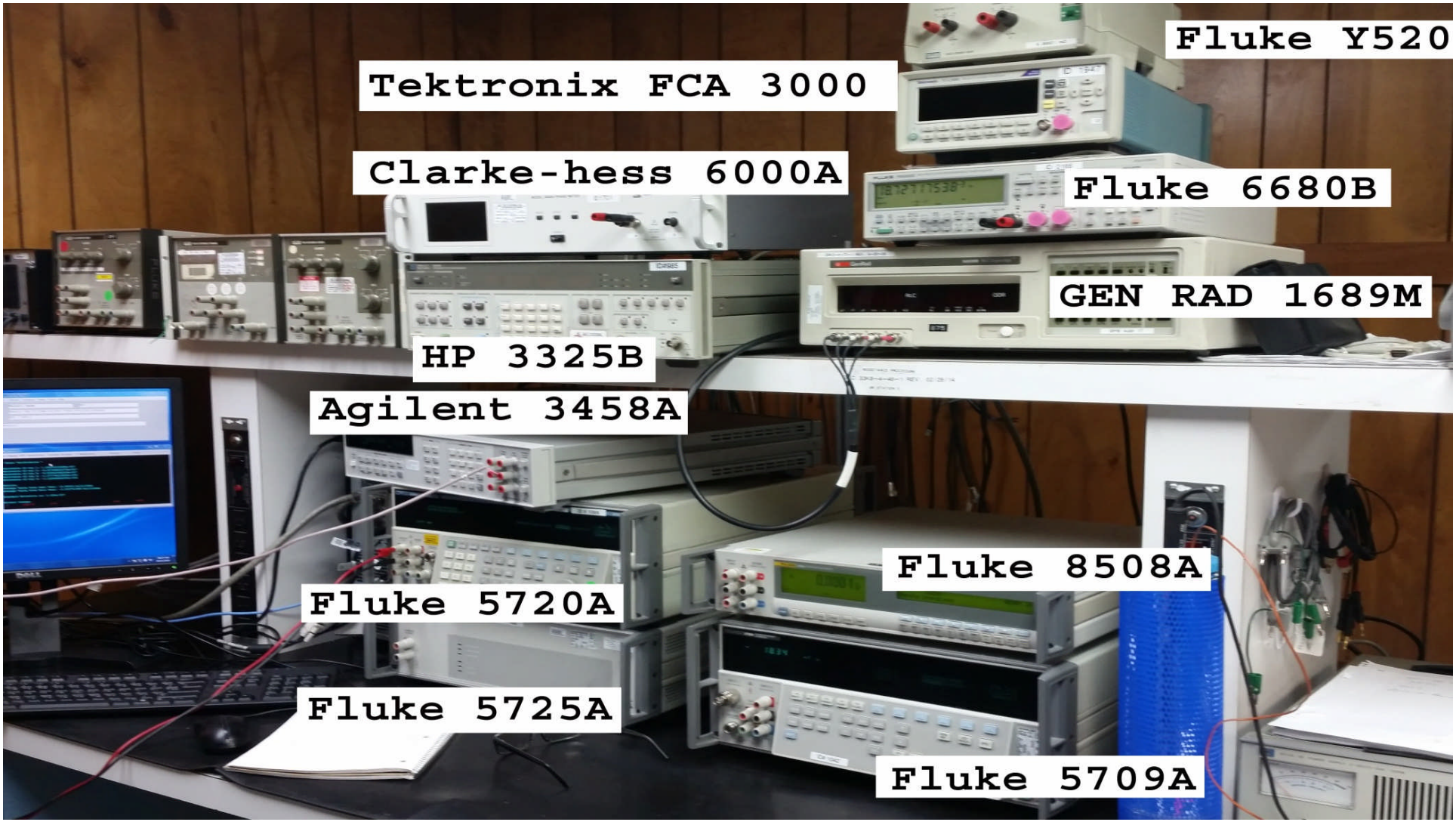
Devices in Electronics Lab


Fluke Y520
Tektronix FCA 3000
Clarke-hess 6000A
Fluke 6680B
GEN RAD 1689M
HP 3325B
Agilent 3458A
Fluke 8508A
Fluke 5720A
Fluke 5725A
Fluke 5709A

CERTIFICATE OF CALIBRATION

Manuf. **FLUKE** PO# **W/OPO**
Model **789** Submitted By

Mfg Serial **98200069**
Cust ID# **ANALYZER-DEVILLIER**
Cust Serial **N/A**
Desc. **PROCESSMETER**

JM TEST SYSTEMS certifies this instrument has been repaired, if necessary, and calibrated to published manufacturer specifications using standards traceable to NIST, to consensus standards, to ratio methods, or to accepted values of natural physical constants. This certificate applies only to the item listed above. JM TEST SYSTEMS' quality control system meets the requirements of ANSI/NCSL Z540-1, ISO 9001, ISO 10012 and ISO 17025.

Condition In: **In Tolerance**
Condition Out: **No Adjustments**
Action: **Cleaned, calibrated and certified.**
Procedure: **Manufacturer's**

The following standards were used in the calibration:

Manufacturer	Model Number	Std #	Date Due
FLUKE	**5500A**	**530**	**01/31/2016**
HEWLETT PACKARD	**34401A**	**294**	**05/31/2015**

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Certificate/traceability number: **0845-0677.02-184684-030** WO#: **184684-030**

Calibration Date: **03/11/2015**
Due Recalibration Date: **03/11/2016**
Lab Environment: TEMP: **21°C**
HUMIDITY: **48%RH**

Technician

JM Test Systems, Inc. **Calibration Data Sheet** work order#: 184684-030

Manufacturer: FLUKE Model: 789

Parameter Range	Mode	Out *	Measured value Before	After	Acceptance limits Low	High
I/A/W MFR PROCEDURE						
PROCESSMETER						
	AC VOLTS @ 60 Hz:				±.7% of RDG	+4D
400 mV	100 mV		99.7	N/A	98.9 mV	101.1 mV
	300 mV		299.6	N/A	297.5 mV	302.5 mV
					±.7% of RDG	+2D
4 V	1 V		0.998	N/A	0.991 V	1.009 V
	2 V		1.996	N/A	1.984 V	2.016 V
	3 V		2.996	N/A	2.977 V	3.023 V
40 V	10 V		9.98	N/A	9.91 V	10.09 V
	30 V		29.96	N/A	29.77 V	30.23 V
400 V	100 V		99.8	N/A	99.1 V	100.9 V
	300 V		299.5	N/A	297.7 V	302.3 V
1000 V	100 V		100	N/A	97 V	103 V
	800 V		800	N/A	792 V	808 V
	FREQUENCY/PEAK:				±.005% of	RDG +1D
199.99 Hz 5 V	@ 100 Hz		100.00	N/A	99.98 Hz	100.02 Hz
1999.9 Hz	@ 1 kHz		1000.0	N/A	999.8 Hz	1000.2 Hz
19.999 kHz	@ 10 kHz		10.000	N/A	9.998 kHz	10.002 kHz
	AC CURRENT:				±1% of RDG	+2D
1 A	0.1 A @ 60Hz		0.100	N/A	0.097 A	0.103 A
	0.4 A @ 60Hz		0.401	N/A	0.394 A	0.406 A
	DC CURRENT:				±.05% of RDG	+2D
30 mA	4 mA		4.000	N/A	3.996 mA	4.004 mA
	12 mA		11.998	N/A	11.992 mA	12.008 mA
	20 mA		19.997	N/A	19.988 mA	20.012 mA
					±.2% of RDG	+2D
1 A	0.1 A		0.100	N/A	0.098 A	0.102 A
	0.4 A		0.400	N/A	0.397 A	0.403 A
	DC VOLTS:				±.1% of RDG	+1D
4 V	1 V		0.999	N/A	0.998 V	1.002 V
	3 V		2.996	N/A	2.996 V	3.004 V
40 V	10 V		9.99	N/A	9.98 V	10.02 V
	30 V		29.98	N/A	29.96 V	30.04 V
400 V	100 V		99.9	N/A	99.8 V	100.2 V
	300 V		299.8	N/A	299.6 V	300.4 V
1000 V	100 V		100	N/A	99 V	101 V
	800 V		800	N/A	798 V	802 V
					±.1% of RDG	+1D
400 mV	100 mV		99.9	N/A	99.7 mV	100.3 mV
	300 mV		299.7	N/A	299.5 mV	300.5 mV
	RESISTANCE:				±.2% of RDG	+2D
400 Ω	120 Ω		119.7	N/A	119.6 Ω	120.4 Ω
	300 Ω		299.7	N/A	299.2 Ω	300.8 Ω
4000 Ω	1.2 kΩ		1.199	N/A	1.197 kΩ	1.203 kΩ

JMT# 10250

Gas Volume* X

Differential Pressure:	48.000	inH2O	Volume:	6048.838	Mcf
Static Pressure:	740.000	psi	Energy:	6048.838	DTH
Temperature:	80.000	°F	C Prime:	31.781	Daily
Flow Duration:	24.0	h	Extension:	190.330	

Meter Type: Orifice | Calc. Method: AGA-3 1992 | FPV Method: AGA-8 Gross 2

Characteristics | Factors

Pressure Base:	14.650	psi	Relative Density:	0.6000	
Temperature Base:	60	°F	Heating Value:	1000.0000	Btu/scf
Static Press. Type:	Gauge		CO2:		%
Atmos. Pressure:	14.700	psi	N2:		%
Viscosity:	0.0000069	lb/(ft·s)	Sp. Heat Ratio:	1.3	

Meter Specific

Plate Diameter:	2.1500	in	Tube Diameter:	4.0000	in
Plate Ref. Temp:	68	°F	Tube Ref. Temp:	68	°F
Plate Material:	Stainless Steel		Tube Material:	Carbon Steel	
Tap Type:	Flange		Tap Location:	Upstream	
Beta Ratio (ß):	0.538				

BAD

Gas Volume* X

Differential Pressure:	50.000	inH2O	Volume:	6173.233	Mcf
Static Pressure:	740.000	psi	Energy:	6173.233	DTH
Temperature:	80.000	°F	C Prime:	31.779	Daily
Flow Duration:	24.0	h	Extension:	194.255	

Day Rate:
-124.395 MCF

Monthly:
-3731.85 MCF

Meter Type: Orifice | Calc. Method: AGA-3 1992 | FPV Method: AGA-8 Gross 2

Characteristics | Factors

Pressure Base:	14.650	psi	Relative Density:	0.6000	
Temperature Base:	60	°F	Heating Value:	1000.0000	Btu/scf
Static Press. Type:	Gauge		CO2:		%
Atmos. Pressure:	14.700	psi	N2:		%
Viscosity:	0.0000069	lb/(ft·s)	Sp. Heat Ratio:	1.3	

Meter Specific

Plate Diameter:	2.1500	in	Tube Diameter:	4.0000	in
Plate Ref. Temp:	68	°F	Tube Ref. Temp:	68	°F
Plate Material:	Stainless Steel		Tube Material:	Carbon Steel	
Tap Type:	Flange		Tap Location:	Upstream	
Beta Ratio (ß):	0.538				

GOOD

Gas Volume* X

Differential Pressure:	48.000	inH2O	Volume:	6065.042	Mcf
Static Pressure:	740.000	psi	Energy:	6065.042	DTH
Temperature:	78.00	°F	C Prime:	31.866	Daily
Flow Duration:	24.0	h	Extension:	190.330	

Meter Type: Orifice | Calc. Method: AGA-3 1992 | FPV Method: AGA-8 Gross 2

Characteristics | Factors

Pressure Base:	14.650	psi	Relative Density:	0.6000	
Temperature Base:	60	°F	Heating Value:	1000.0000	Btu/scf
Static Press. Type:	Gauge		CO2:		%
Atmos. Pressure:	14.700	psi	N2:		%
Viscosity:	0.0000069	lb/(ft·s)	Sp. Heat Ratio:	1.3	

Meter Specific

Plate Diameter:	2.1500	in	Tube Diameter:	4.0000	in
Plate Ref. Temp:	68	°F	Tube Ref. Temp:	68	°F
Plate Material:	Stainless Steel		Tube Material:	Carbon Steel	
Tap Type:	Flange		Tap Location:	Upstream	
Beta Ratio (β):	0.538				

BAD

Gas Volume* X

Differential Pressure:	48.000	inH2O	Volume:	6048.838	Mcf
Static Pressure:	740.000	psi	Energy:	6048.838	DTH
Temperature:	80.000	°F	C Prime:	31.781	Daily
Flow Duration:	24.0	h	Extension:	190.330	

Daily Rate:
-16.21 MCF

Monthly:
-486.3 MCF

Meter Type: Orifice | Calc. Method: AGA-3 1992 | FPV Method: AGA-8 Gross 2

Characteristics | Factors

Pressure Base:	14.650	psi	Relative Density:	0.6000	
Temperature Base:	60	°F	Heating Value:	1000.0000	Btu/scf
Static Press. Type:	Gauge		CO2:		%
Atmos. Pressure:	14.700	psi	N2:		%
Viscosity:	0.0000069	lb/(ft·s)	Sp. Heat Ratio:	1.3	

Meter Specific

Plate Diameter:	2.1500	in	Tube Diameter:	4.0000	in
Plate Ref. Temp:	68	°F	Tube Ref. Temp:	68	°F
Plate Material:	Stainless Steel		Tube Material:	Carbon Steel	
Tap Type:	Flange		Tap Location:	Upstream	
Beta Ratio (β):	0.538				

GOOD

Overview

- If at all possible try and use an accredited lab.
- Audit your cal lab at least every two years.
- Questions?

American Association for Laboratory Accreditation

Accredited Laboratory

A2LA has accredited

CAL LAB'S NAME

Baton Rouge, LA

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of ANSI/NCSL Z540-1-1994 and any additional program requirements in the field of calibration. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 22nd day of December 2014.

President & CEO
For the Accreditation Council
Certificate Number 1995.01
Valid to November 30, 2016

For the calibrations to which this accreditation applies, please refer to the laboratory's Calibration Scope of Accreditation.

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