

What's Behind Your Test Kit Results?

Adolfo Wurts

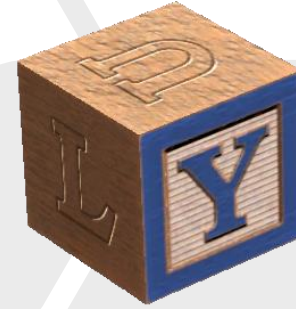
About Us – Our Background

- Developing field instrumentation for over 21 years
 - 20+ patents
 - 100+ products introduced for field technicians
 - Marines, Airforce, Navy, Army, NASA, Boeing, Dollywood and Cross Connection Control testers around the world.



About Us – And the Field Technician

- Labor shortage in trades
 - Increase the numbers of testers
 - Recruiting and formal training
 - Increased productivity of testers
 - Improving education and training
 - Better tools and equipment



What We'll Cover

- Measurement and Cross Connection Control
- A Look Inside Your Test Kit
- Types of Error and How to Avoiding Them



A decorative graphic on the right side of the slide consists of three hexagons. The largest is a solid light gray hexagon at the bottom right. A smaller, white-outlined hexagon is positioned above and to the left of it, overlapping the top edge of the larger one. A third, smaller solid light gray hexagon is located below and to the left of the white-outlined one.

Measurement and Cross Connection Control

How Does Measurement Apply to CCC?

- Why do you test? –
 - Protects the water supply, Its my Job, To pay the bills. ...
 - Check our Expectations against our Test Results
- How do you test? –
 - Following a test procedure, with a test kit ...
 - Combine Training, Experience, Problem solving skills, Test and Measurement Equipment



Importance of Measurements

- If you don't measure, you don't know.
- Worse than No information is Incorrect information
- Good Measurements allow you to learn and build up knowledge



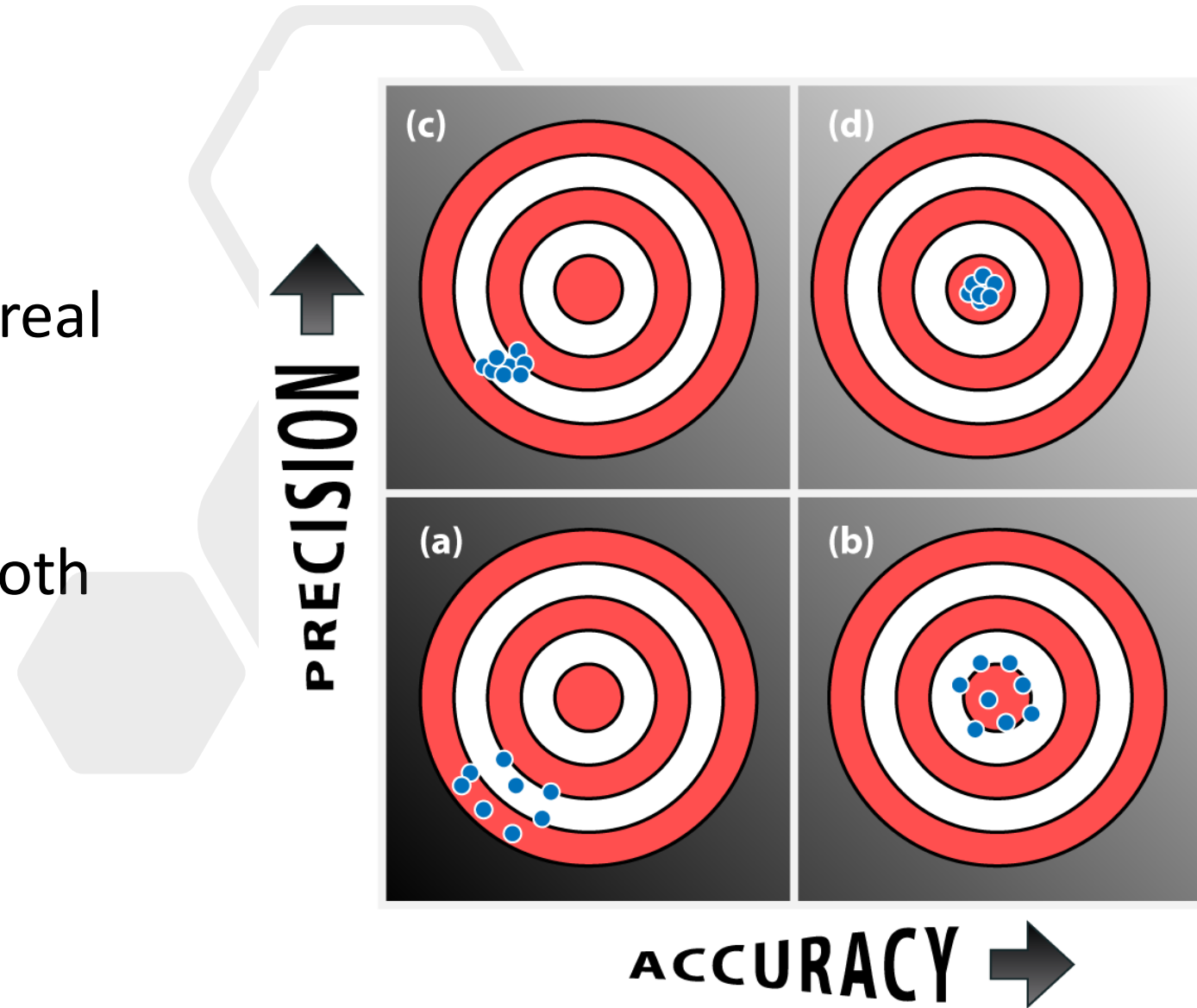
A Few Good Measurements

- We want the truth!
- How do we get there?
 - Maintaining Traceability
 - Avoid Error



What Makes a Good Measurement?

- Accuracy & Precision
 - Accuracy = centered around real quantity
 - Precision = more repeatable
- Good measurements must be both accurate and precise!



Keeping your Kit in Compliance

- **Certification**

- Meets applicable standard
 - 3rd party standard (UL, FCC, etc.)
 - USC FCCCHR Manual 10
 - Manufacturer's standard

- **Calibration**

- A comparison between a device under test and an established standard.

- **Adjustment**

- Changing a device under test to meet calibration



Traceability

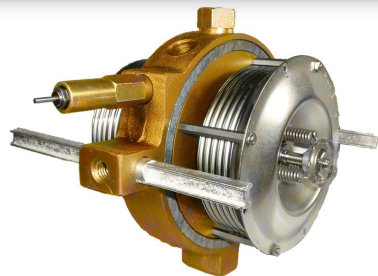


The background features several hexagonal shapes. A large, light gray hexagon is positioned on the right side, with its right edge pointing towards the right. Overlapping its top-left corner is a smaller, white-outlined hexagon. Below the large hexagon, to the left, is a smaller, solid light gray hexagon.

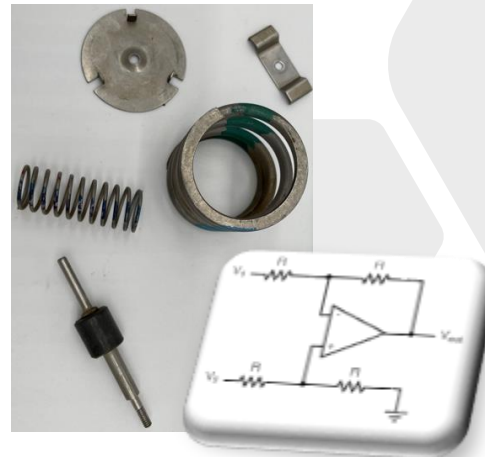
A Look Inside Your Test Kit

Your Test Kit – A General Measurement System

Sensor Stage



Signal
Conditioning
Stage(s)

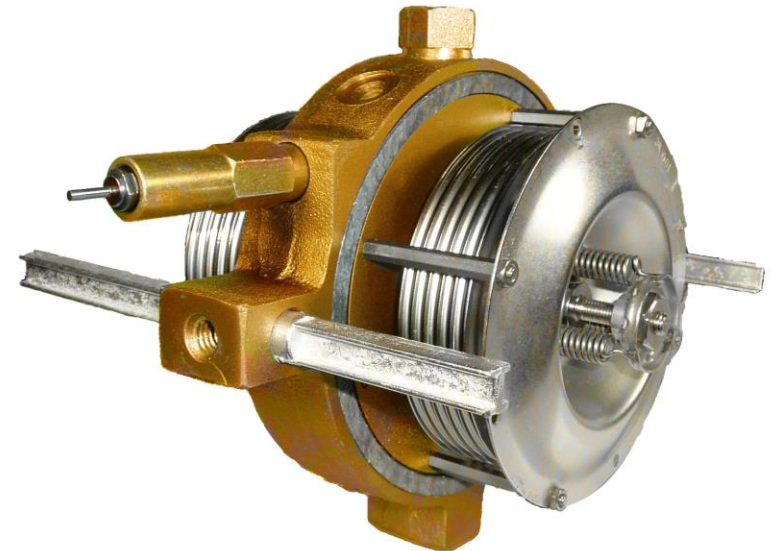


Readout
Stage



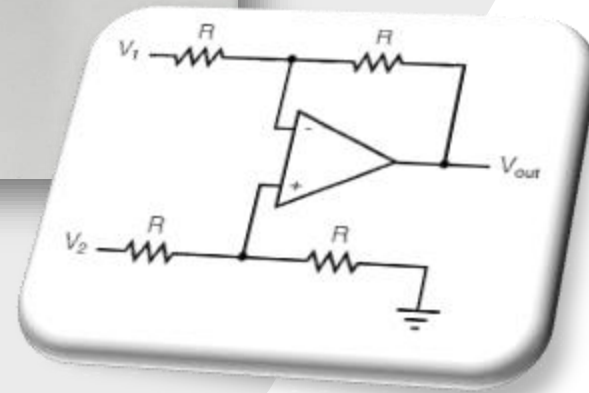
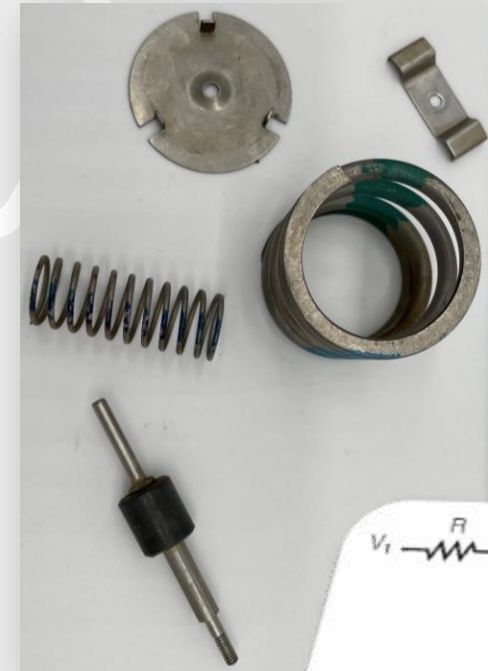
Sensor Stage

- Senses Desired Input
 - In contact with what's being measured
 - Excludes other inputs
 - Temperature compensation example



Signal Conditioning Stage in Your Test Kit

- Modifies sensor signal into form usable for readout stage
 - Analog test kit – From elastic element (bellow or diaphragm) displacement to dial
 - Digital test kit – Analog electrical signal to a digital display



Readout Stage

- Readout
 - Dial on a gauge
 - Digital readout of value
 - Rate of change graph



Recording Stage

- Recording

- Follower needle
- Chart recorder
- Notepad
- Capture button
- Output via Bluetooth for report creation



Backflow Assembly Test Report
Made By Mako Assist on: 02/02/2022 at 9:37 AM

SITE	ASSEMBLY
Water Authority: Springfield water authority	Type: DCCA-I
Contact Name: Waylon Smithers	Size: 4 INCH
Service Address: 100 Industrial Way 2nd Floor 2nd Floor Springfield, OR 97403 United States	Manufacturer: ames
	Model: 3000civ
	Serial Number: 9675309
	Geo Tag: 45.5855038786062 -122.60047627582794
	Meter Reading Before: 23467
	Meter Reading After: 23490

TEST GAUGE
Name: MAKO MKS
Serial Number: 2AC19060298
Calibration Date: 2021-02-04

TEST RESULTS
Test Procedure Followed: USC Manual 10/ABPA

Line Pressure (LP) (PSID):	74.0	BPCV 1 Held Tight?:	YES
Bypass Check Valve 1 (BPCV 1) (PSID):	1.9	BPCV 2 Held Tight?:	YES
Bypass Check Valve 2 (BPCV 2) (PSID):	1.7	CV 1 Held Tight?:	YES
Check Valve 1 (CV 1) (PSID):	2.1	CV 2 Held Tight?:	YES
Check Valve 2 (CV 2) (PSID):	1.6		

COMMENTS
Final test:
Repaired seal of check valve 2.
Assembly located by large palm tree in rear of property.

PASS
CERTIFIED BY:
Tom

Name: Tom Tester
Certificate #: 142B3C
Company: Arbitr
Phone: 5035551234
Email: appsupport@arbitertech.com

AMBITERBACKFLOW.COM

A decorative graphic consisting of several hexagons. A large, light gray hexagon is the central element. Overlapping its top-left corner is a smaller, white-outlined hexagon. Below the large hexagon, to the left, is a small, solid light gray hexagon. The text "Types of Error and How to Avoiding Them" is centered horizontally across the middle of the large hexagon.

Types of Error and How to Avoiding Them

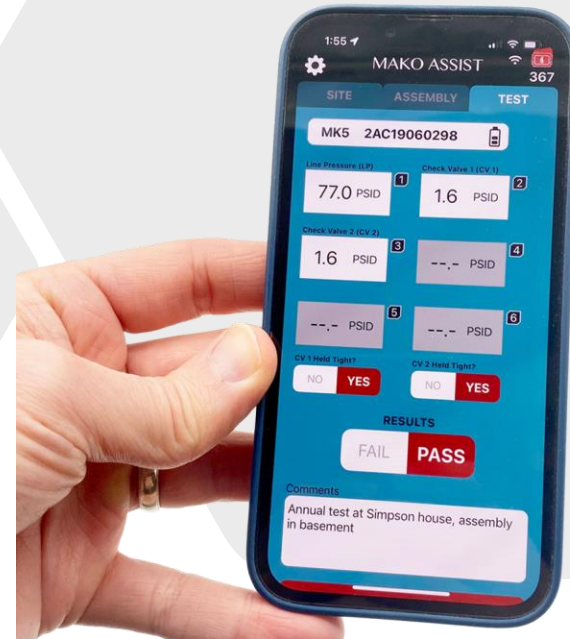
Types of Errors Outside Test Kit pt. 1

- **Testing error**
 - Incorrect/ incomplete test method used
 - Test method or fault of tester
 - Example, not raising test kit to proper elevation or orientation of test kit
 - Improper testing conditions for the method
 - NYC example



Types Errors Outside Test Kit pt. 2

- **Perception error**
 - Incorrectly reading display (eyesight, darkness, etc.)
 - Parallax
 - Position of needle in analog kits; mirrors
- **Transcription error**
 - Incorrect initial recoding
 - Incorrect data entry



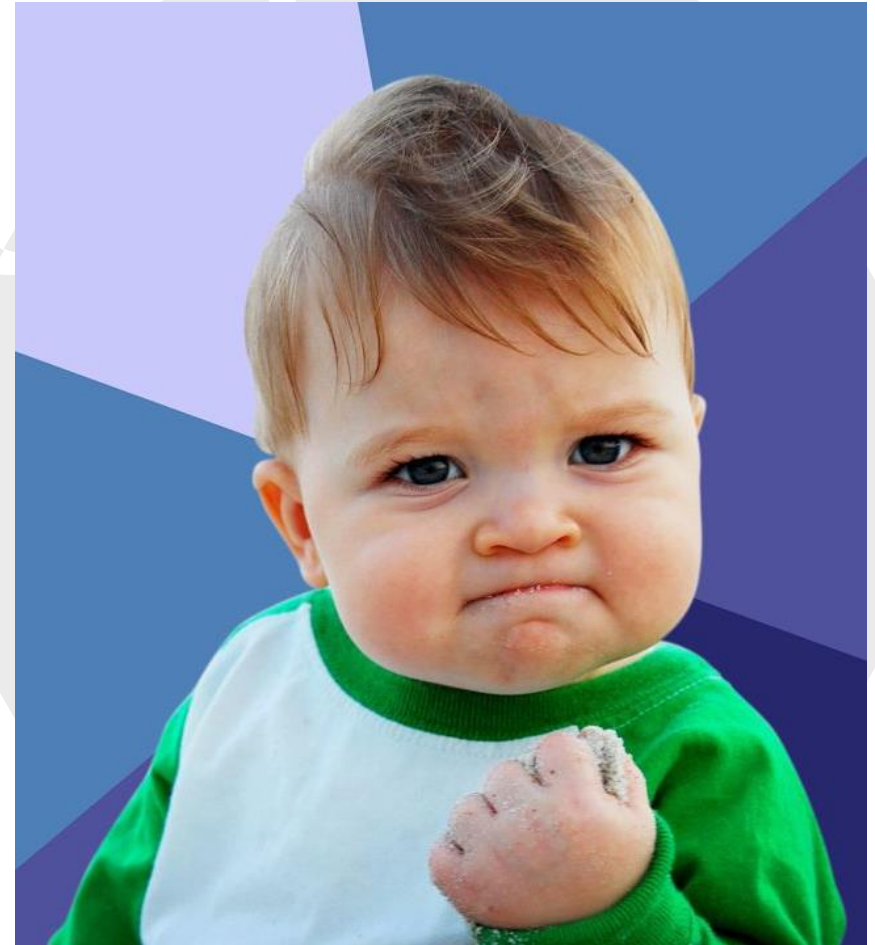
Types of Errors Inside Test Kit in CCC

- **Drift**
 - Deviation from expected calibration over time due to temp, vibration etc
 - USC checks accuracy after other tests
 - Gets worse with test kit age
- **Mechanical friction** - Corrosion and foreign object build up
- **Loading error**
 - Measuring device influences measurement



How You Can Reduce Error in Your Testing pt. 1

- Send in your test kit to a qualified lab for calibration, certification and adjustment for that kit
 - Ask them for their current certificate for their standard
 - At least 4x as accurate
 - Make sure they're on the manufacturer's current list or website



How You Can Reduce Error in Your Testing pt. 2

- **Protect your test equipment**
 - Drain it from water and keep it out of freezing environments
 - Undrained water is a water column which acts on the sensor(s)
 - Clean and replace filters to keep foreign objects out
 - Connect the hoses in the same orientation every time
 - Extreme temperatures tend to cause faster drift
 - Off the dash of vehicle in heat
 - Inside the house at night



How You Can Reduce Error in Your Testing pt. 3

- Protect your test equipment continued
 - Vibration and impact protection (particularly for analog test kits)
 - Open valves slowly
- Follow current and approved test procedures
 - Learn about the “why” behind the test procedures
 - If you’re thinking about a variation from procedure, ask the makers of the test procedures



How You Can Reduce Error in Your Testing pt. 4

- Use the best measurement equipment for the job
 - Is it designed for the application?
 - Is it accurate, precise, rugged enough?
 - Is the performance verified by a 3rd party?
- Keep improving your judgement
 - More experience testing
 - Continue education
 - Ask and share, we all drink the same water



Thank You For Your Time

- Have any questions about the content of this presentation e-mail:
support@arbiterbackflow.com
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