

THEASO KLEIN I  
P R O T O C O L S -  
F A C T S A N D  
M I S C O N C E P T I O N S

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Find it on the Web at:

<http://psc.state.wi.us/electric/newsinfo/strayvol.htm>

# Acknowledgements

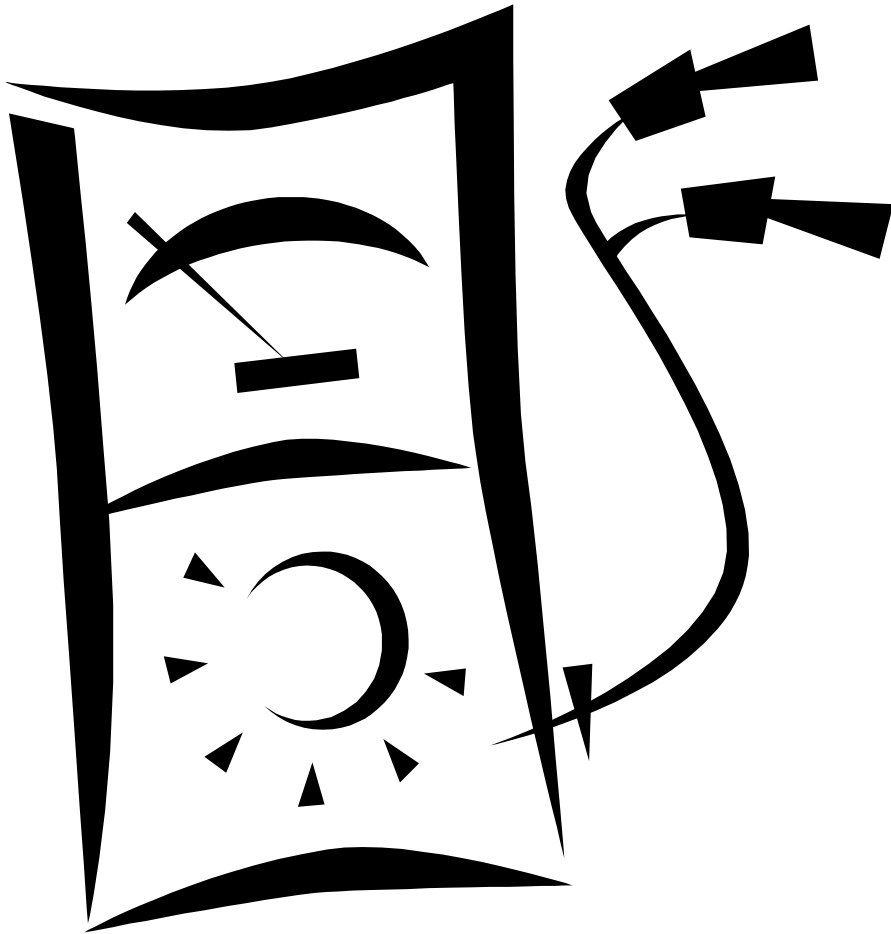
- ▶ **Fluke Corp.: “*The ABC’s of DMMs*” ©1984**
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- ▶ **Keithley Corp.: “*Low Level Measurements*” ©1998**
- ▶ **Carl Sagan: “*The Demon-Haunted World – Science as a Candle in the Dark*” ©1996**  
Ballantine Books
- ▶ **John Brignall: “*Sorry, Wrong Number! The Abuse of Measurement*” © 2000** European Science and Environment Forum

# **Premise: Dire consequences exist when acquired data is error plagued, unreliable and just plain wrong:**

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- **Adverse consequences of decisions based solely on bad data.**
- **Bad data fosters bad theories about how the world works.**
- **The mis-interpretation of bad data creates an air of animosity, distrust and confusion.**

# What is needed to make and assure good measurements?



- Understand the measurement process
  - Theory
  - Practice and protocols
- Understand specifications:
  - ADC's
  - Instrument parameters
  - Noise and interferences
  - Physical error sources
  - Human error sources

A world full of

**NOISE!**

What do  
we do?

# WHAT IS NOISE?

- DISAGREEABLE SOUNDS?
- UNINTELLIGIBLE MUTTERINGS?
- VISUAL DISTORTION?

■ ANYTHING THAT IS AN INTEGRAL PART OF A SIGNAL AND INTERFERES WITH THE PROPER INTERPRETATION OF THAT SIGNAL!

There are five methods by which noise and interferences may be coupled into a data acquisition system:

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- ❖ Capacitive (electric field).
- ❖ Inductive (magnetic field).
- ❖ Resistive (Conductive/leakage).
- ❖ EM-Electro-magnetic (RF).
- ❖ Ground loop (common mode).

# What about distortions to measurements?

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- **'Harmonics' are distortions of the basic 60 Hz sine-wave.**
  - **They occur when current is drawn by non-linear loads.**
  - **They are a mathematical artifice used to explain the shape of the distortions.**
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**Harmonics are integer multiples of the frequency of interest that, when added to the fundamental frequency, distorts its pure wave shape.**

# SUMMATION

Because noise and interference are of a fundamental nature, it must be realized that complete freedom from noise and interference can **never** be achieved in real world measurements.