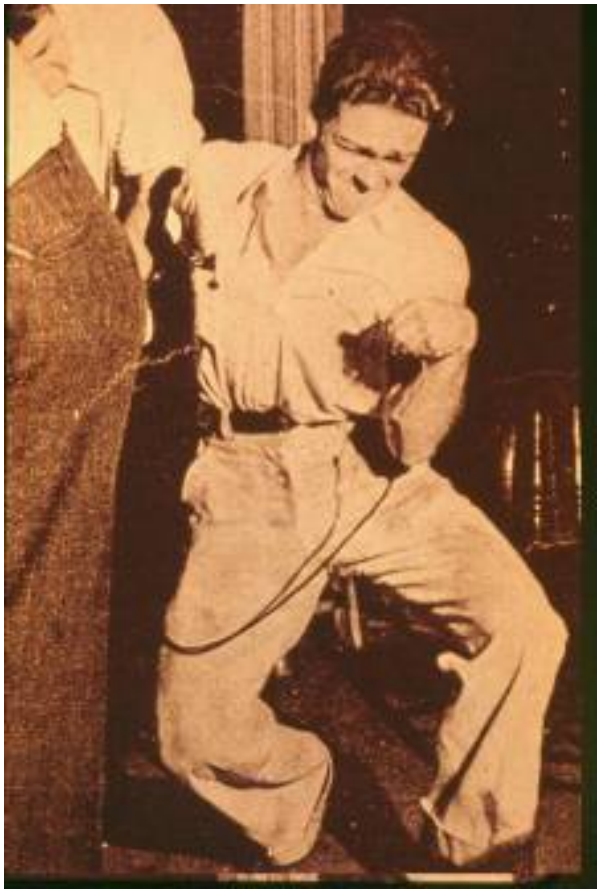
Why Test Switches Still Matter

By Glenn Goldfarb April 6, 2016

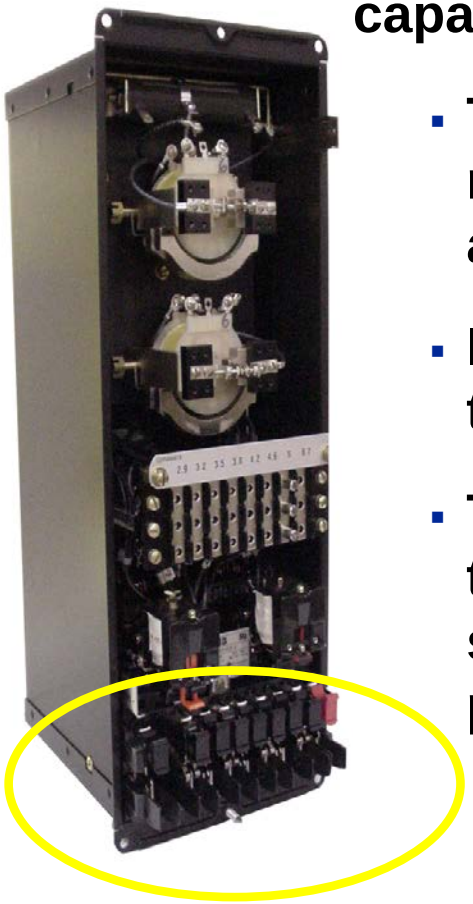
Test Switch Product Evolution

- Effects of Current on the human body

mA	**Affect on Person**
0.5 - 3	Tingling sensation
3+	May be painful
10+	Muscle contractions and pain
30+	Respiratory paralysis
75+	Ventricular fibrillation
4+ Amps	Heart Paralysis
5+ Amps	Tissue and Organs start to burn



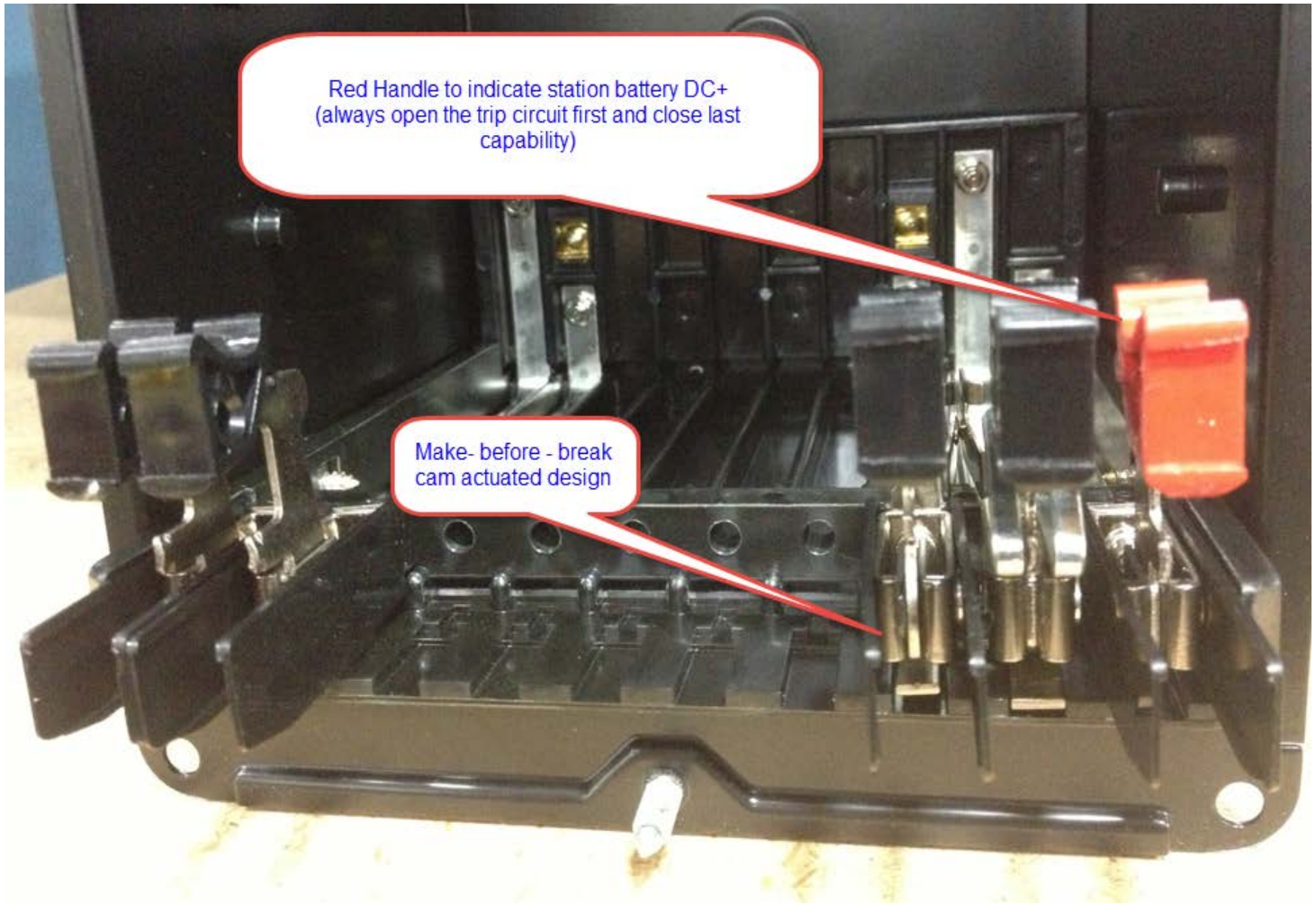
Test Switch Product Evolution



The electromechanical relay case was developed over 60 years ago to provide safe, reliable, in-case test capability.

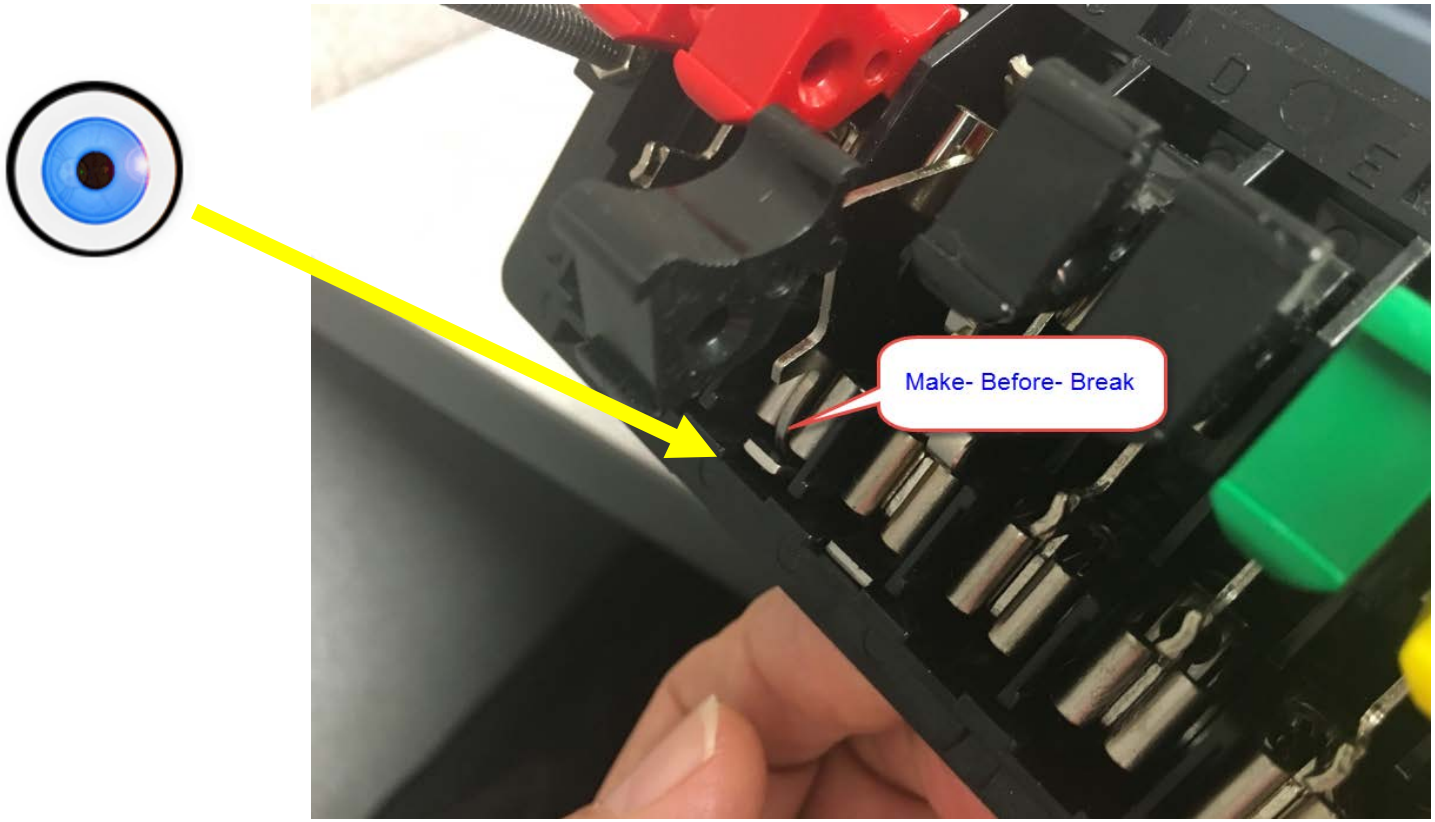
- **Test switch assemblies in the case provide a reliable means to insert or remove the internal relay assembly, providing secure circuit isolation**
- **Individual blades may be opened to securely isolate trip circuits and safely short CT circuits**
- **The relay may be removed from the case for bench testing, or remain in the case for testing with separate source, in service or current probe test plugs**

Test Switch Product Evolution



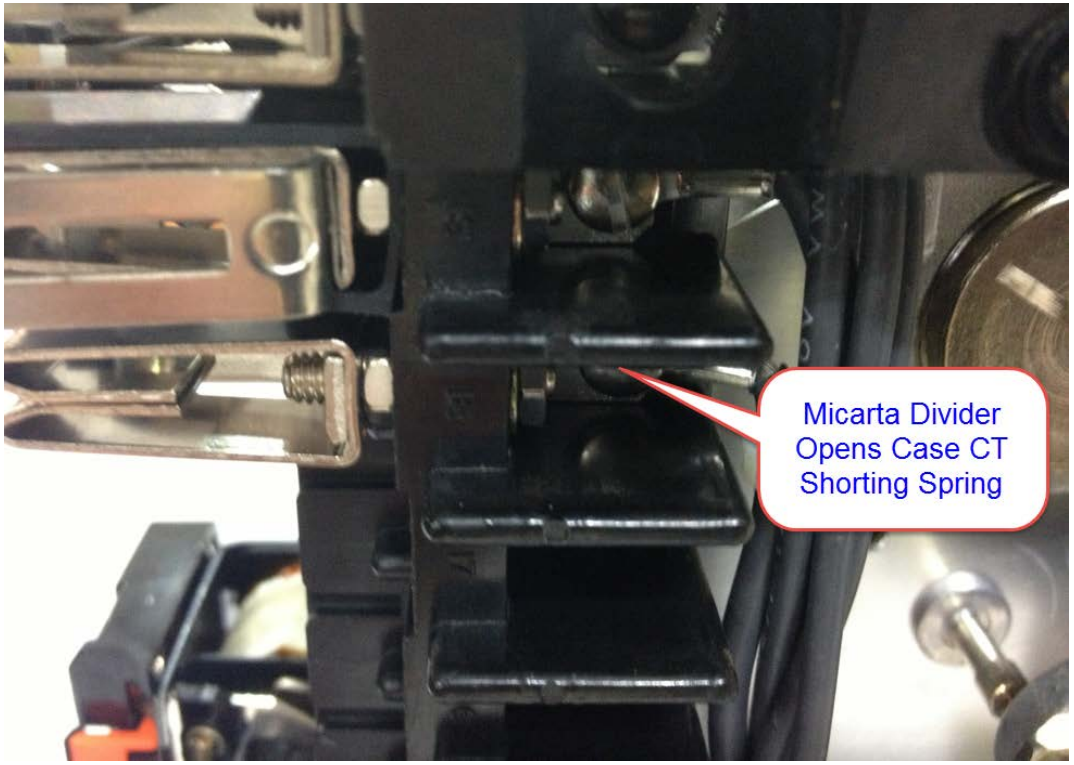
Test Switch Features and Advantages

- CT Shorting – Visual Pole Disconnect



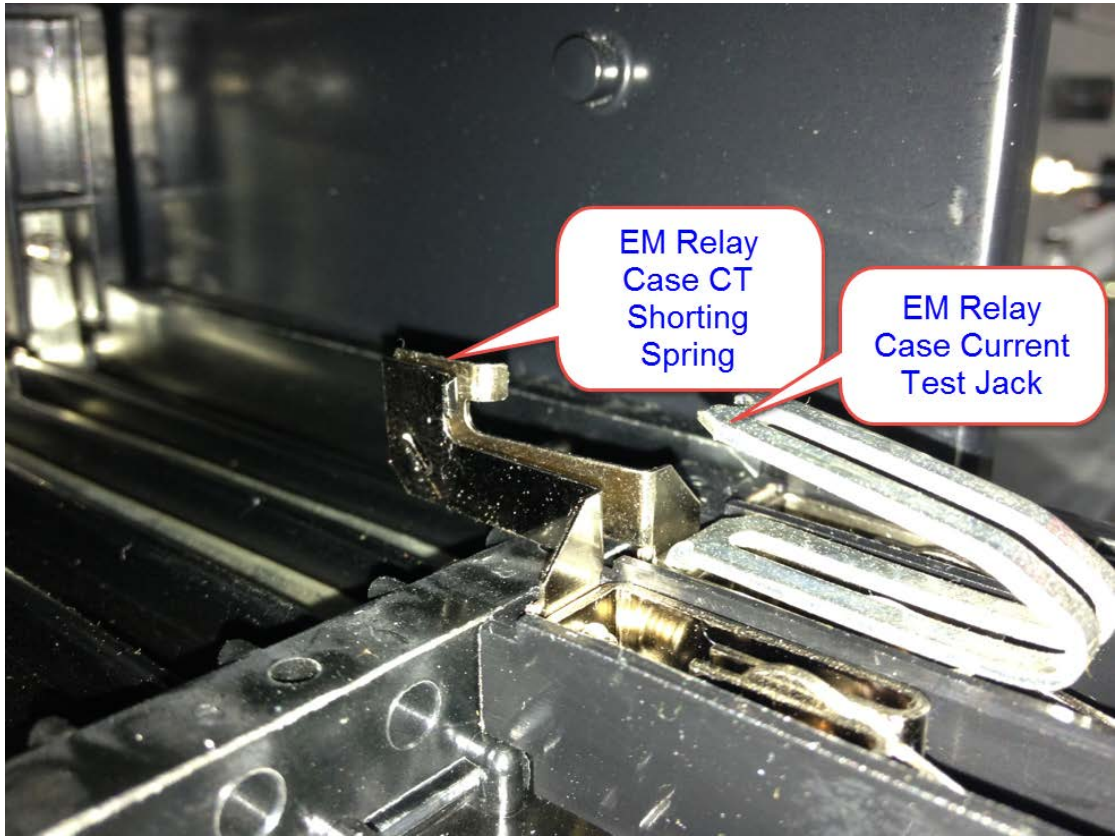
Test Switch Features and Advantages

- CT Shorting – EM Relay CT Connect/ Disconnect Feature

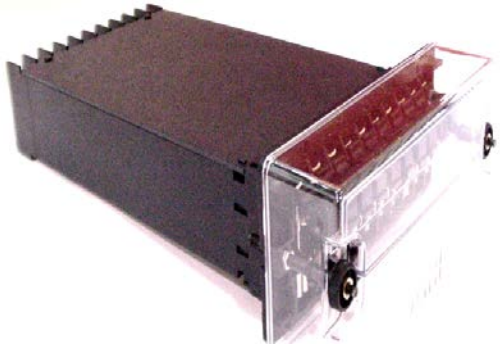


Test Switch Product Evolution

- CT Shorting – EM Relay Case CT Shorting Springs

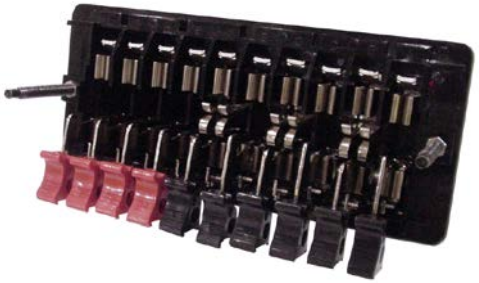


Test Switch Product Variations



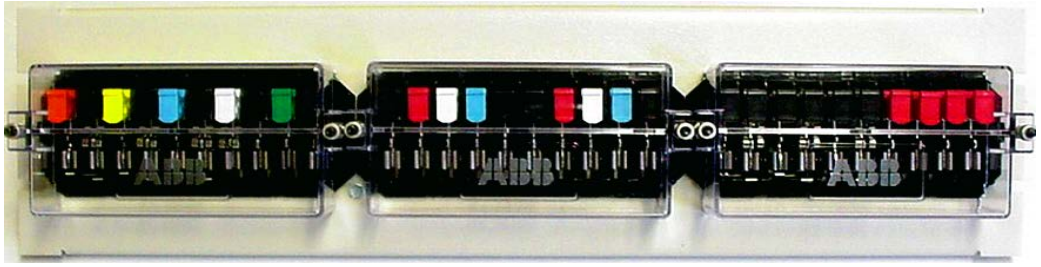
10 pole Extended Switch

10 pole Front Connected Switch



10 pole Switch

14 pole Switch

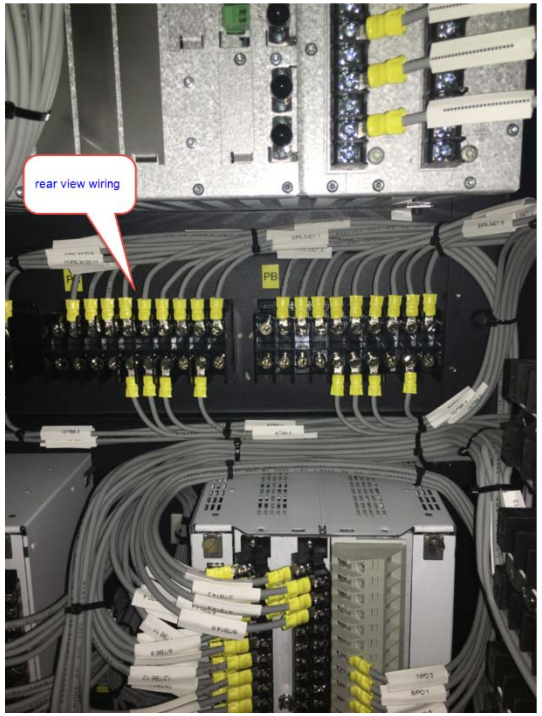


30 Pole Option

Clear Cover and Colored Handles

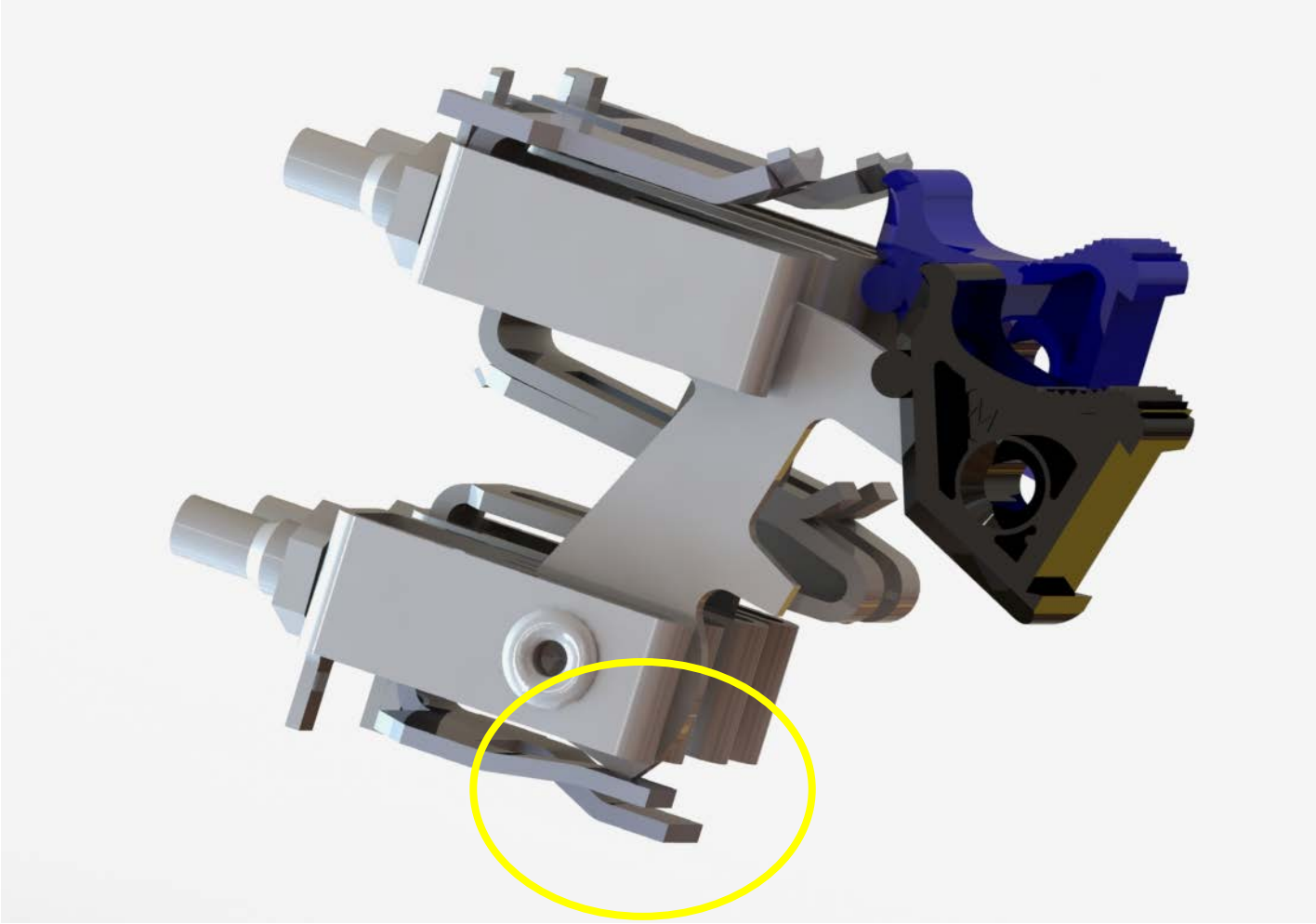
Test Switches with Microprocessor Based Relays

- 30 Poles in a 19” Rack can be used for PT, CT, Station Battery and Programmable I/O Connections



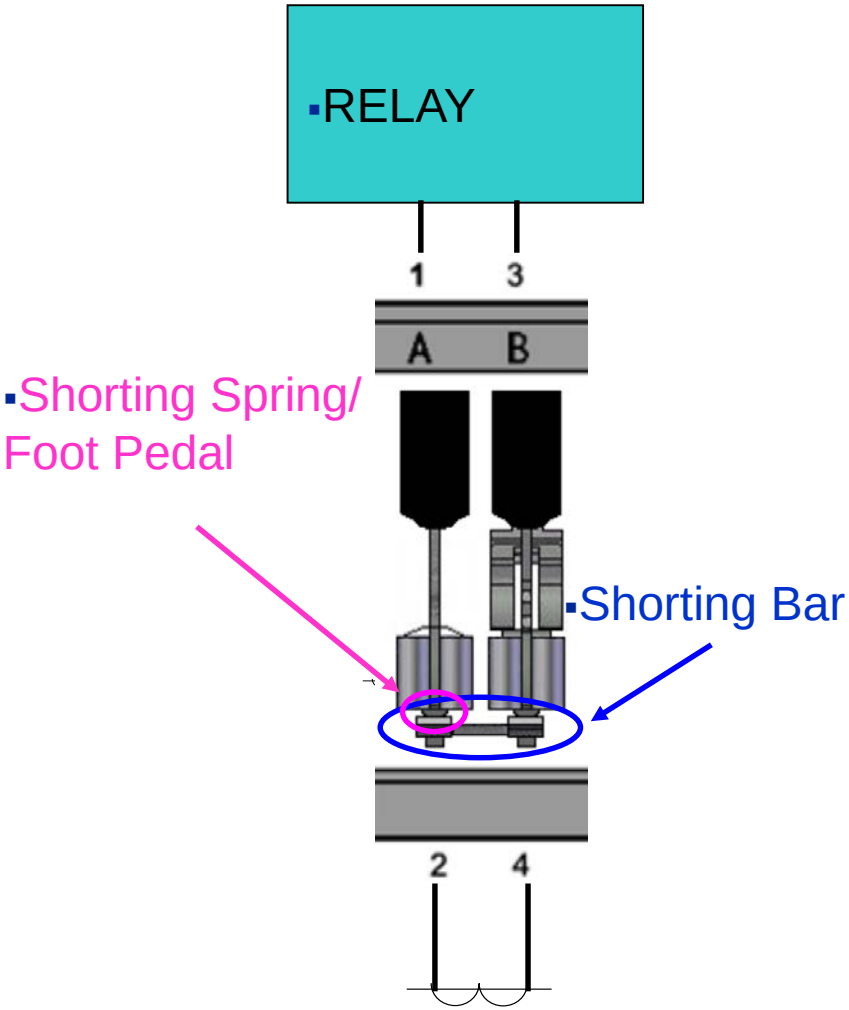
Test Switch Features and Advantages

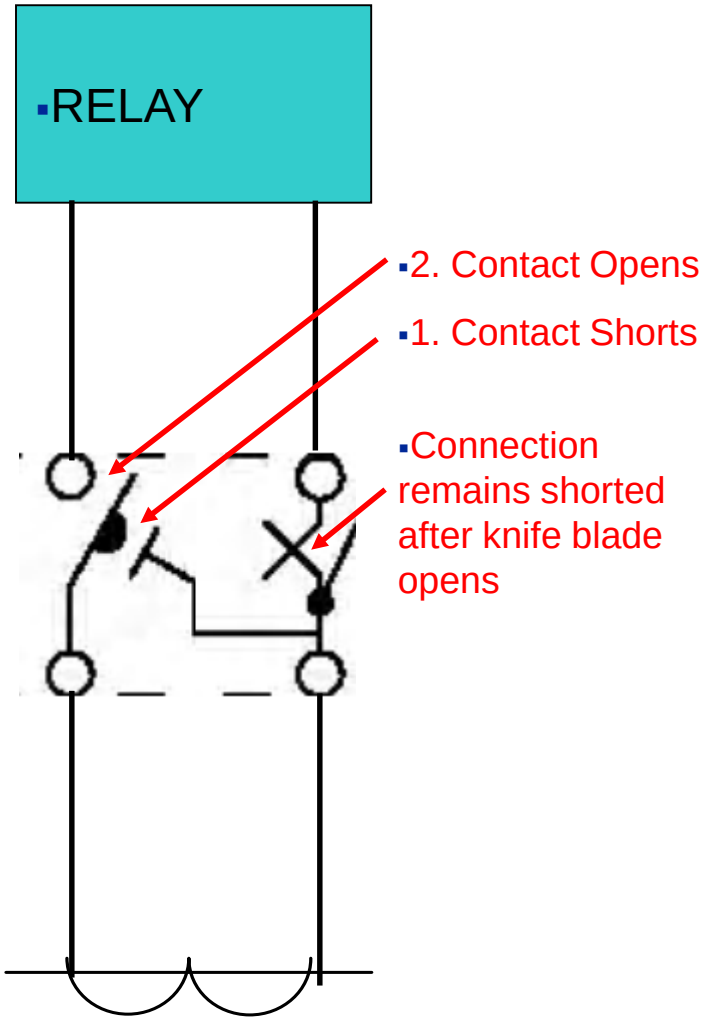
- CT Shorting



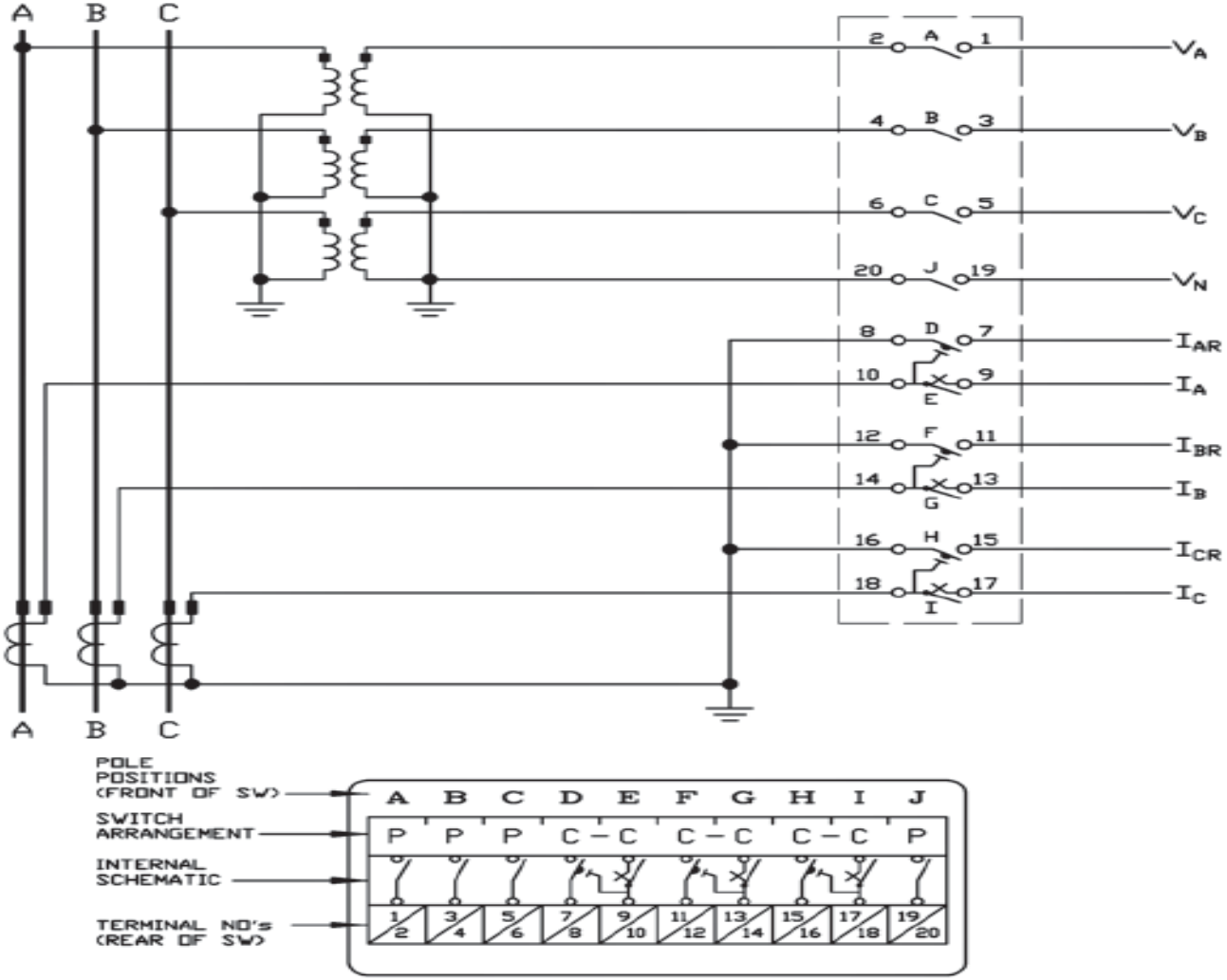
Test Switch Features and Advantages

- CT Shorting Sequence



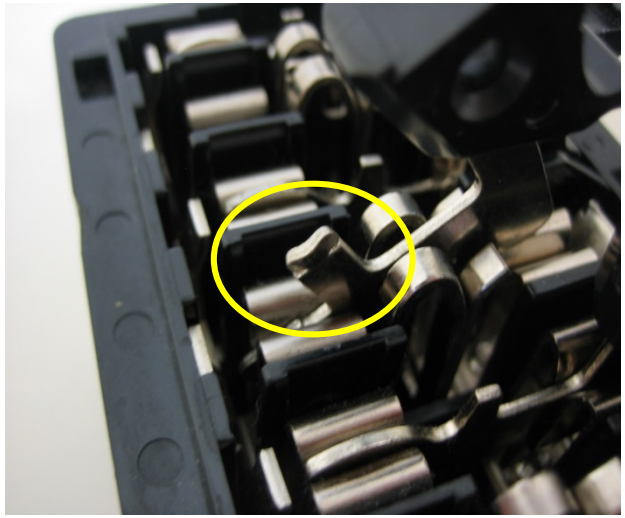


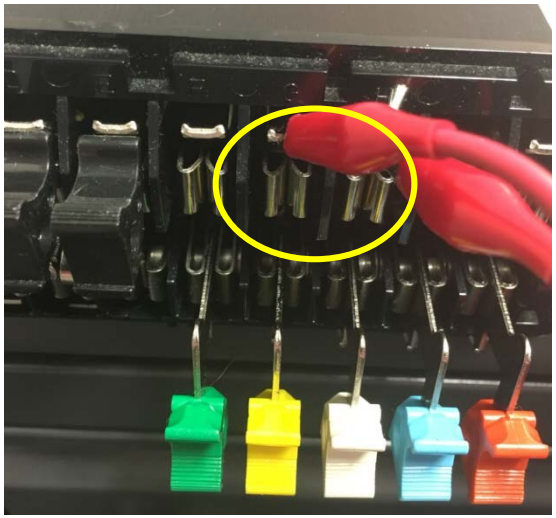
Test Switch Applications



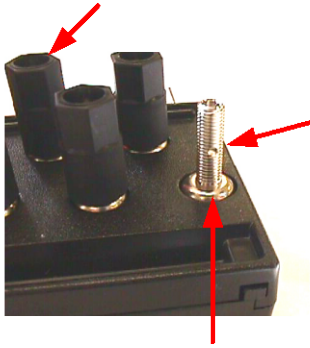
Test Benefits

- Knife Blade and Switchjaw terminals allow easy connection of test leads



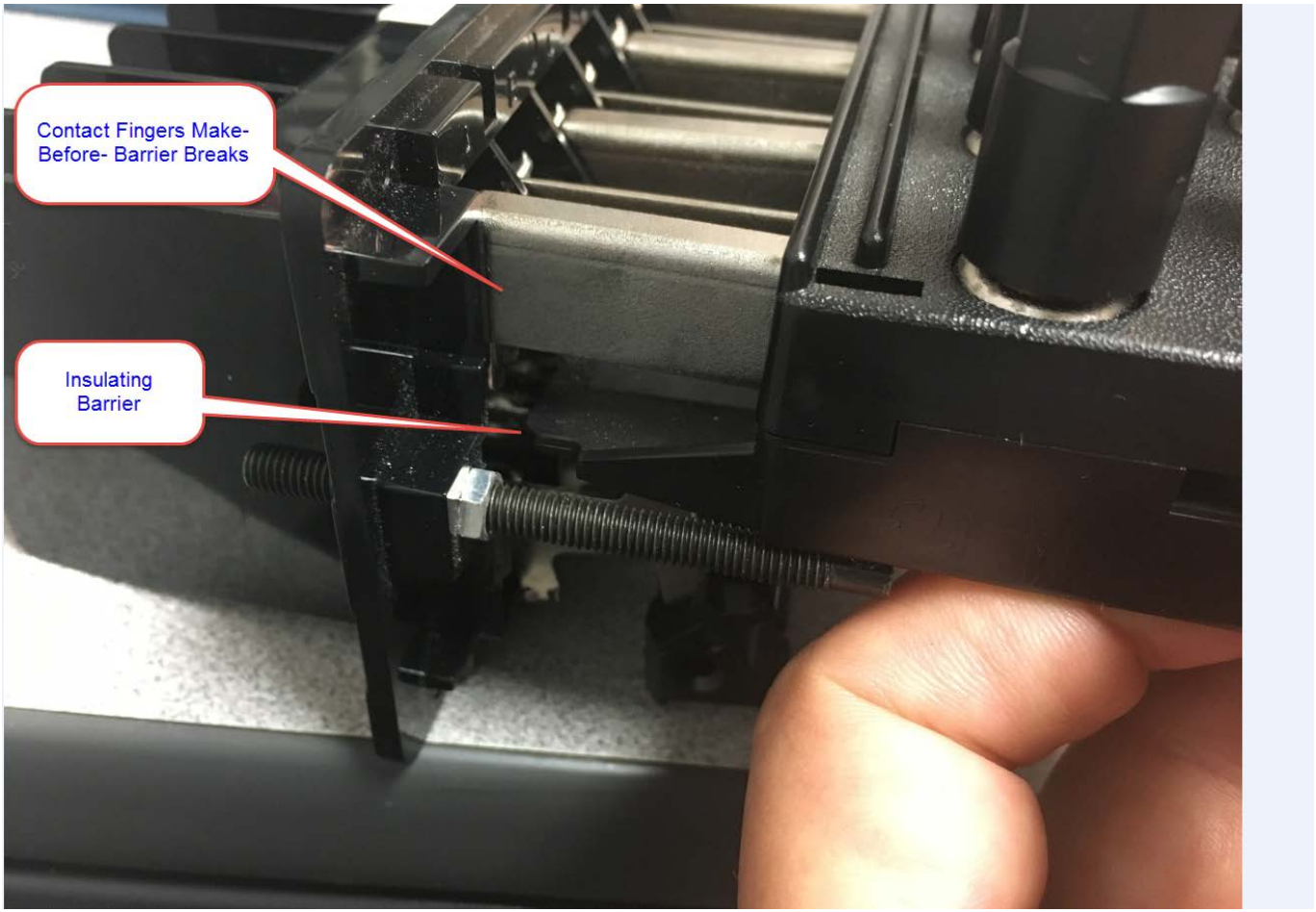


Test Switch Separate Source Test Plug



Separate Source Test Plug

Warning: If the Insulating Barrier is cracked or broken do not use and discard test plug



In-Service Test Plug

- An in-service test plug is used for testing 10 pole Test switches
  - **Typically used to connect devices measuring currents and voltages being supplied to relays, meters and instruments, without shorting the circuit**
- The individual current circuit test plug is an ammeter type device used to measure currents only
  - **Leads from an ammeter are connected to the 2 terminal strips in the test plug and the plug is inserted in the current test jack of the test switch**

What Can Go Wrong – Does Go Wrong

- Accidental Opening of current transformer due to:

  Blown Fuse

  Disconnected leads

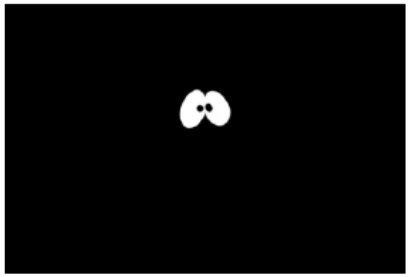
  Defective leads

  Defective equipment

  Incorrect Connections

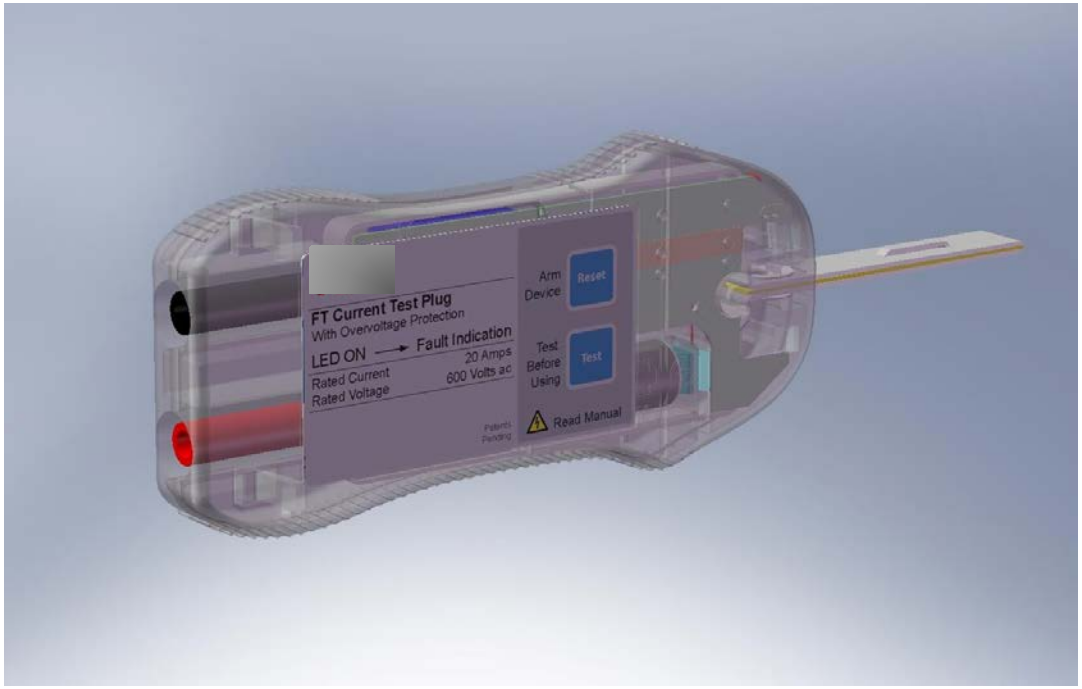
  Incorrect meter mode selected

What Can Go Wrong – Does Go Wrong



- High voltage and shock hazard
- Signal discontinuity to relay and controls could lead to incorrect operations and outages.
- Potential magnetization of the CT leads to incorrect secondary output. This can cause error in readings, revenue metering calculations, incorrect operations <u>long after the open CT condition is restored.</u>

Solution to Existing Problems



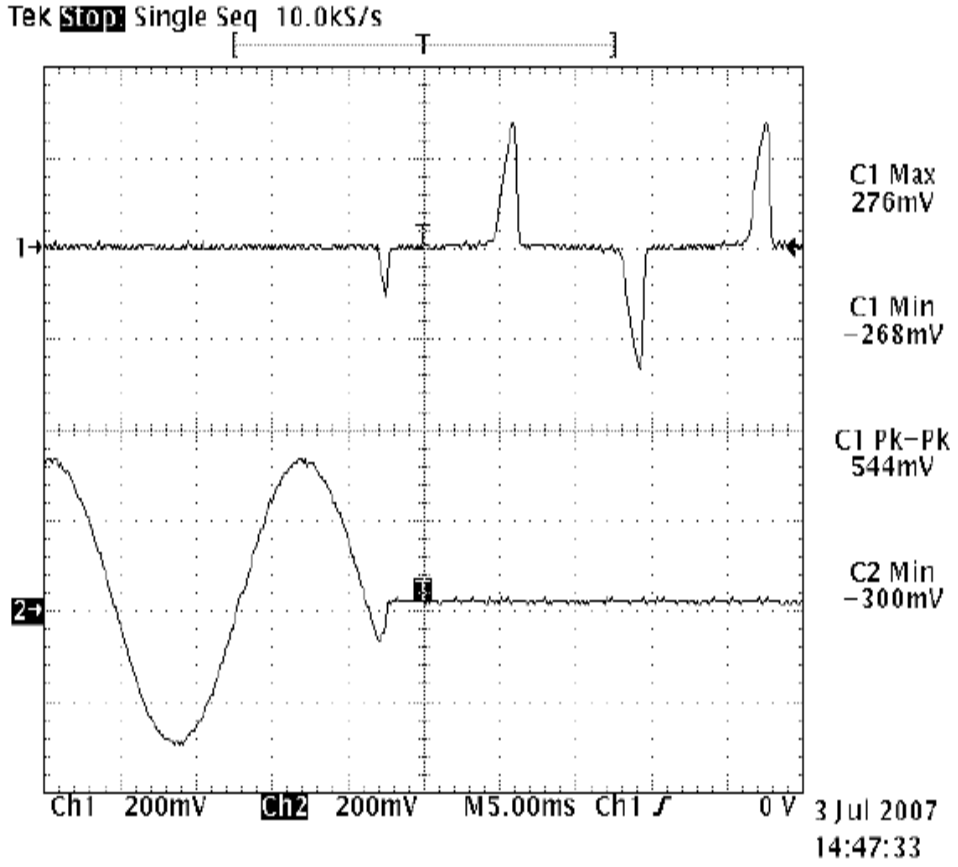
- **Prevents Shock Hazards** [Created by human error, and other causes]

- **Prevent Blackouts** [Created by human error, and other causes]

- **Prevents CT erroneous reading** (Avoid Magnetization)

- Smart Test Plug with Open CT Protection
- 1 pole Smart Individual Current Circuit Test Plug w/open CT protection

Open CT Condition



- Current goes to zero until condition is restored
- Every half cycle high voltage spikes occur

Questions