

CowContacttm

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If you use FLUKE[®] ScopeMeters and FlukeView logging software.....see CowContact Volume 2G.

If you use the Fluke 199C read this...

FLUKE[®] ScopeMeters and FlukeView logging software provide a powerful means of recording electrical events.

The newer Fluke 199C recording scope meters are GREAT instruments... if used properly.

I discovered that the FLUKE[®] ScopeMeter and FlukeView logging software can, under certain settings, report electrical events that did not exist at the measurement points. The engineers at FLUKE were very helpful and confirmed that this situation could exist. See CowContact Volume 2G.

The Fluke 199C has internal logging features that are great features. **I have not found any concerns with the Fluke 199C**, but this unit when used for measuring transients or impulses must be used properly.

Evaluating the Fluke 199C Scope Meter for impulse recording on a Dairy Farm

Recorder Button Options:

1. Trend Plot – plots a graph of selected Scope measurements over time.
2. Scope Record - records scope waveforms in deep memory
3. Meter Trend Plot – plots a graph of selected Meter measurements over time.

Using Trend Plot – plots a graph of selected Scope measurements over time. – Test #1

Channel A setup: (Push button with “A”)

Input A = ON-OFF set to ON if desired

Coupling = DC-AC set to DC for most situations.

Probe A = Voltage/Current/Temp set to Voltage for most situations.

Attenuation = 1:1 if scope probe is not used or 10:1 if scope 10:1 probe is used.

Input A Options = Polarity set to Normal for most situations.

Input A Options = Bandwidth set to Full for most situations.

Recorder Setup: (Push button with “RECORDER”)

Recorder = Run-Stop set on Stop.

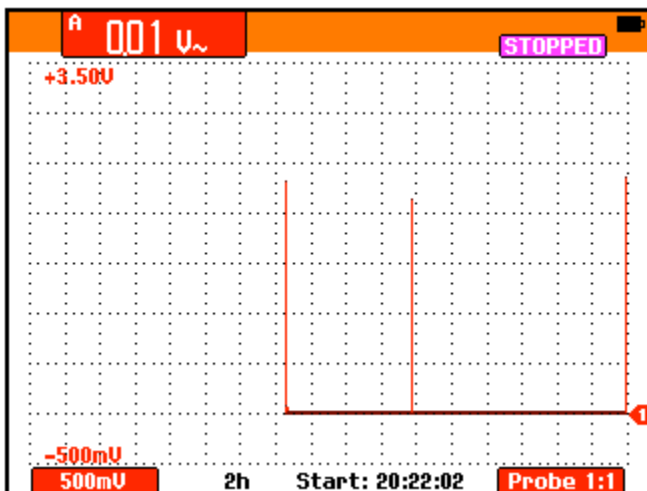
Options = Select Time of Day or From Start

Set View All or Normal as desired.

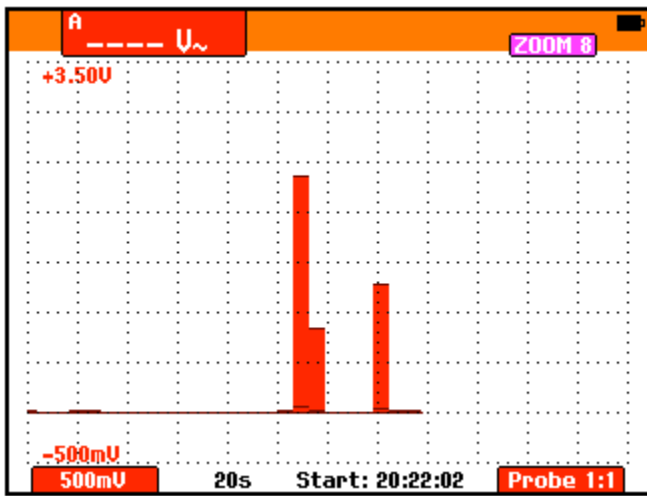
Recorder = Run-Stop set on Run to begin recording.

Do not Exit Recorder until you are finished.

Here is a sample that recorded for about 20 hours. Note that the entire recording period is shown and voltages were recorded, but you cannot tell how long each impulse lasted.



If you select the “ZOOM” button you can expand the chart recording as shown below:



The best you can expand the recording is to 20 second per division resolution. The impulses recorded would appear to have lasted about 5 seconds, but in reality they only lasted about 10 milliseconds. The scope has a limited amount of internal memory that must be shared over the entire recording period. The longer the period is the less resolution is available to determine the impulse duration. The TREND PLOT mode is acceptable to record the magnitude of voltage impulses, but it is not adequate to determine the duration of the impulse.

Using Scope Record - records successive scope waveform sweeps in deep memory – Test #2

Channel A setup: (Push button with “A”)

Input A = ON-OFF set to ON if desired

Coupling = DC-AC set to DC for most situations.

Probe A = Voltage/Current/Temp set to Voltage for most situations.

Attenuation = 1:1 if scope probe is not used or 10:1 if scope 10:1 probe is used.

Input A Options = Polarity set to Normal for most situations.

Input A Options = Bandwidth set to Full for most situations.

Range = set volts per division to the expected range you hope to record. This may be a trial and error process for cow contact impulses.

Recorder Setup: (Push button with “RECORDER”)

Recorder = Run-Stop set on Stop.

Options = Select Time of Day or From Start

Display Glitches = Set Glitch On to view all short duration impulses. Set 10 kHz to filter out short duration impulses.

Mode = Set Single Sweep if you want to record from the time you push the RUN setting until the memory is full.

Mode = Set Continuous if you want to continuously fill memory, keeping the last data recorded when you STOP.

Mode = Set Ext... is probably not a mode you will use.

Set View All or Normal as desired. View All lets you see what is being recorded.

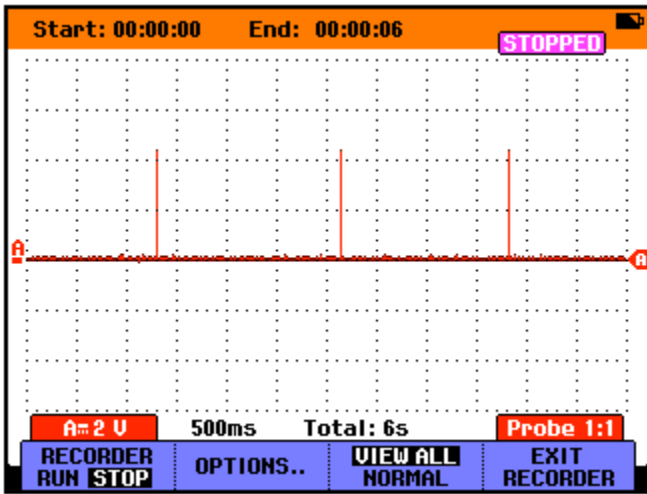
Horizontal Sweep Time setup:

Push TIME rocker switch to “S” or “ns” to select the desired sweep time from a slow sweep of 4 hours per division giving a total record time of 48 hours to a fast sweep of 500 milliseconds per division giving a total record time of 6 seconds.

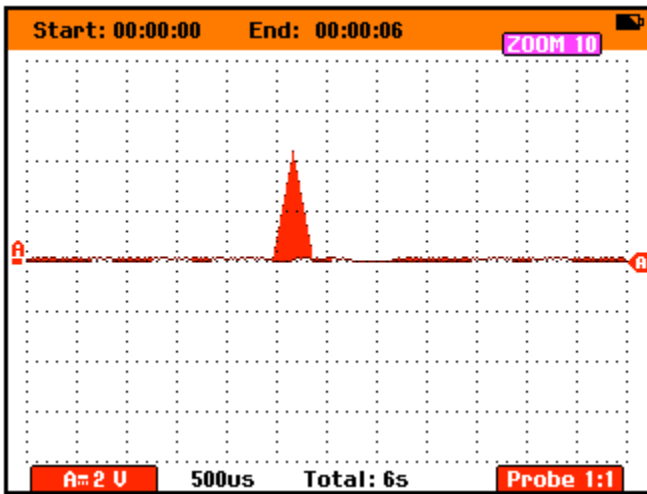
Recorder = Run-Stop set on Run to begin recording.

Do not Exit Recorder until you are finished.

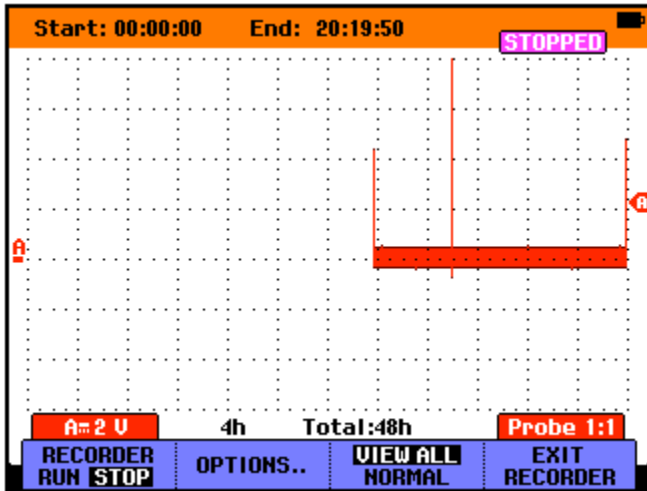
Below I am showing a test with the horizontal time sweep at 500 microseconds per division providing a total record time of 6 seconds. Three impulses have been recorded.



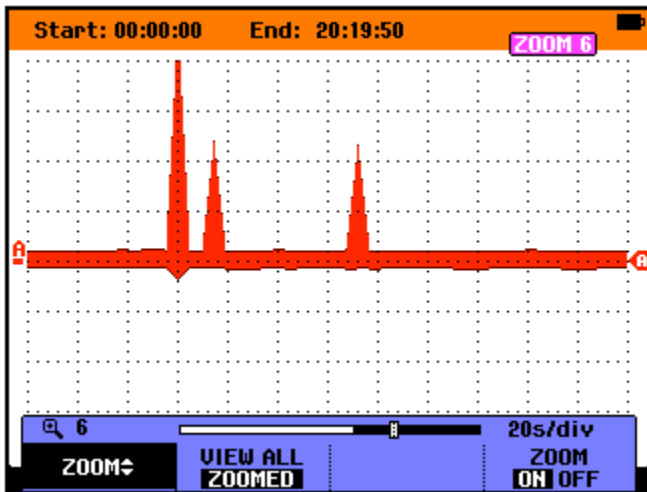
Using the ZOOM control one of the impulses has been expanded to show duration of 300 microseconds. But, the impulse sent to the scope was only 2 microseconds long. Even at the fast sweep speed the scope will not be able to tell the duration of the voltage event. The problem is that at a cow contact point and any other point on the farm there are numerous extremely short duration and high magnitude voltage impulses that will trick the scope meter into believing there is a cow contact concern, when the impulses being recorded would never affect a dairy cow.



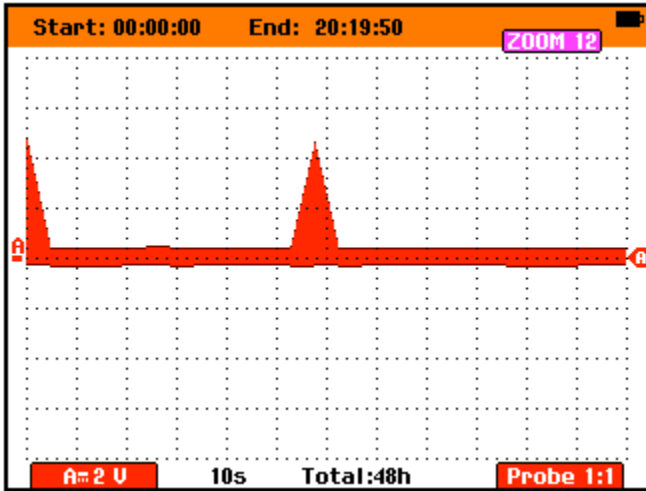
Below I am showing a test with the horizontal time sweep at 4 hours per division providing a total record time of 48 hours. Three impulses have been recorded. The recording was stopped after 20 hours and 19 minutes. The large impulse in the center is actually three impulses.



Here I have zoomed in on the large impulse and it is really three impulses. The first impulse is created when the Mr. Pulsar test set was first connected to the scope input, the next two test pulses are individual pulses of 2 microsecond duration each.



Zooming in on a 2 microsecond pulse as far as possible shows the following screen:



It would appear to some reading the scope screen that the pulse duration was about 10 seconds but it was only 2 microseconds. **So be careful, in this test the impulse appears to be 5,000,000 times greater in duration than it really is!**

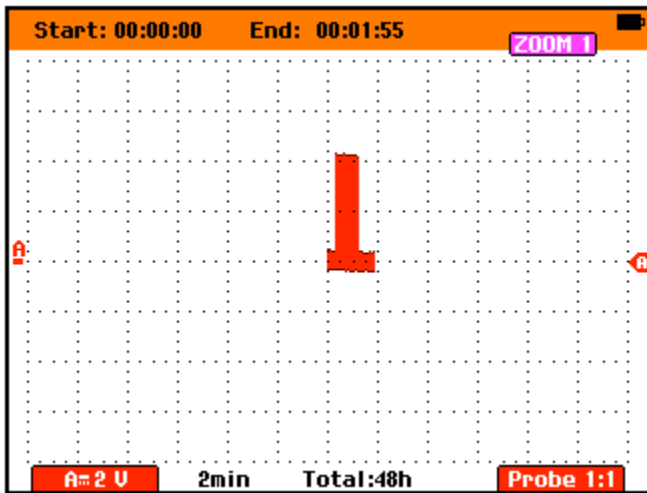
Does this mean the Fluke Scope recorded in error? **NO**. When the recording mode was set for a horizontal sweep of 4 hours per division the scope had a maximum record time of 48 hours ($48 \times 60 \times 60 = 172,800$ seconds). The deep memory in the scope has 27,000 memory points so the recording interval per memory point is ($172,800 / 27000 = 6.4$ seconds). The oscilloscope can detect impulses as short as 50 nanoseconds so it had no problem detecting and recording a 2 microsecond long impulse. The above scope screen shows that in the 6.4 second time period an impulse did occur, but it cannot tell you exactly how long the impulse lasted. **This is very important in stray voltage work.**

Another problem that can occur is if a 2 microsecond impulse occurs every 7 seconds, the scope chart may falsely show a continuous voltage for an even longer period of time.

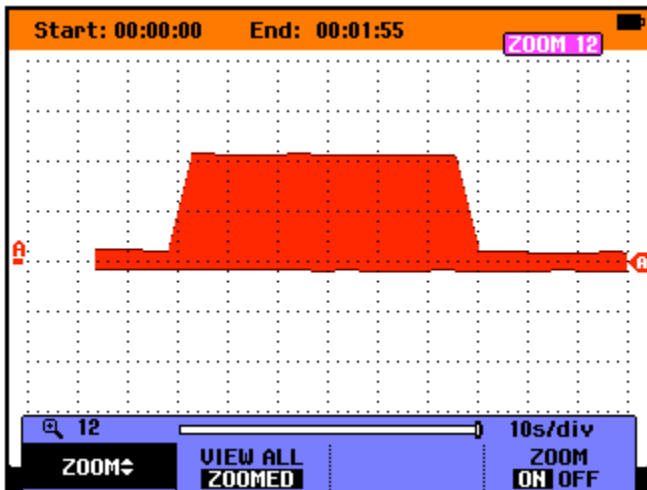
Using Scope Record - records successive scope waveform sweeps in deep memory – Test #3

This test has the same scope settings as Test #2.

Below is a test where the scope is recording at 4 hours per division for a total record time of 48 hours. For a 60 second period I applied one 2 microsecond pulse every five seconds. The first screen seems to indicate an impulse of 60 seconds duration:



Next I zoomed in to maximum resolution and the scope still indicates an impulse of 60 second duration:



The test the impulse is reported to be 30,000,000 times greater in duration than it really is!

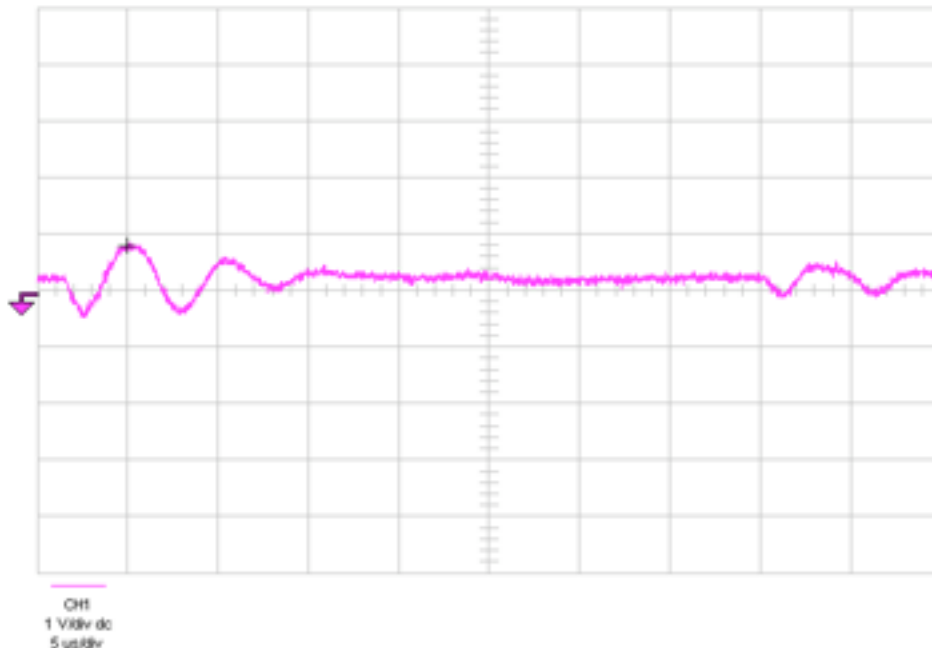
Why is the false reporting of short duration impulses so important?

On the farm there are numerous sources of extremely short duration impulses. These impulses come from on-farm equipment that is turning on and turning off. I have found that equipment turning off creates greater impulses than equipment turning on.

When a light is switched or a vacuum pump motor stops, there is a high magnitude impulse of very short duration that is created on the farm electrical system. This impulse can be observed at cow contact points and usually has a magnitude from 1 volt peak to as high as 70 volts peak. Of course the voltage does not last long enough for a cow to feel the voltage, but modern high-speed instruments such as the Fluke 199C can detect and record the events. It is extremely important when measuring voltages at cow contact points to measure both the magnitude of the voltage and the duration of the voltage.

Fortunately the Fluke 199C and other scopes of its class provide the ability to do a perfect job of recording data if the unit is used properly.

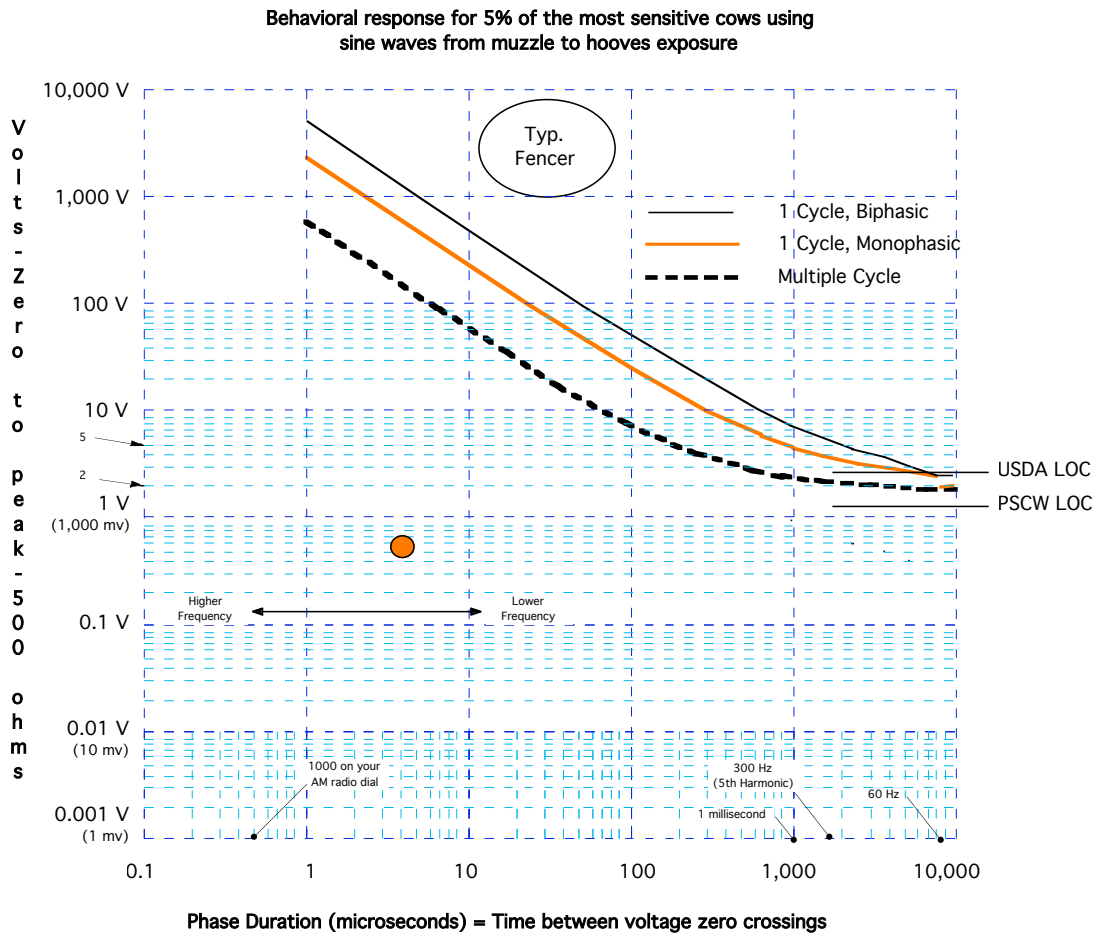
Below is a screen of a Fluke 199C properly recording a voltage impulse at a cow contact point.



The vertical voltage scale is 1 volt per division and the horizontal sweep speed is 5 microseconds per division. The impulse has a peak voltage of approximately 0.6 volts and duration of approximately 4 microseconds. As you can see even the 5% most sensitive cows would not detect the impulse.

To determine if the cow felt the impulse I refer to a cow sensitivity chart that I have prepared using data and assistance from the University of Wisconsin.

This chart is the summation of many different experiments and field measurements by many different researchers.



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C. Forster 7/5/00, 6/2003

Used properly, the ScopeMeter and FlukeView logging software can be a powerful survey tool for stray voltage. It is important that the system be used properly.

Please see the liability disclaimer at the end of Volume 2001 Issue B.

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Fluke products can be viewed at www.fluke.com

Mr. Pulsar can be viewed at www.phasorlabs.com