

Making Voltage and Current Measurements with a Peak-Reading Multimeter

The following document was put together by Raul Urgelles of the U.S. National Park Service (modified slightly by NCTC). The multimeter* used in this document, the Fluke 87-V, can be set to read peak voltage. Many thanks to Raul for this contribution.

The following protocol covers the measurement of direct current (DC) or pulsed direct current (PDC). The set-up for alternating current (AC) is similar, except that the dial would be set to measure AC volts (~). AC volts are RMS and we still recommend recording peak voltage for AC. Note that multimeters often pick up spikes that may not be meaningful to fish, so we recommend the use of a scopemeter, at least initially, to determine 1) the PDC waveform shape and 2) where the multimeter is taking the peak voltage reading on the waveform.

Peak Voltage Measurements

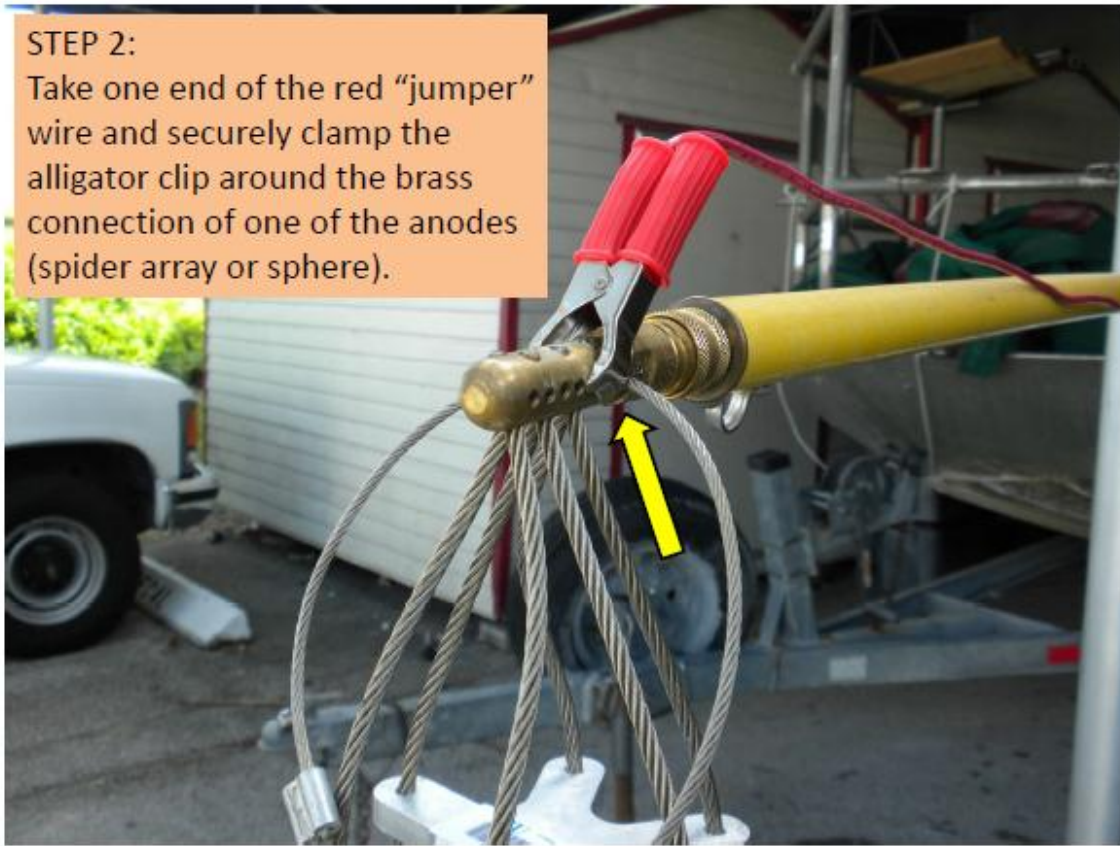


STEP 1:

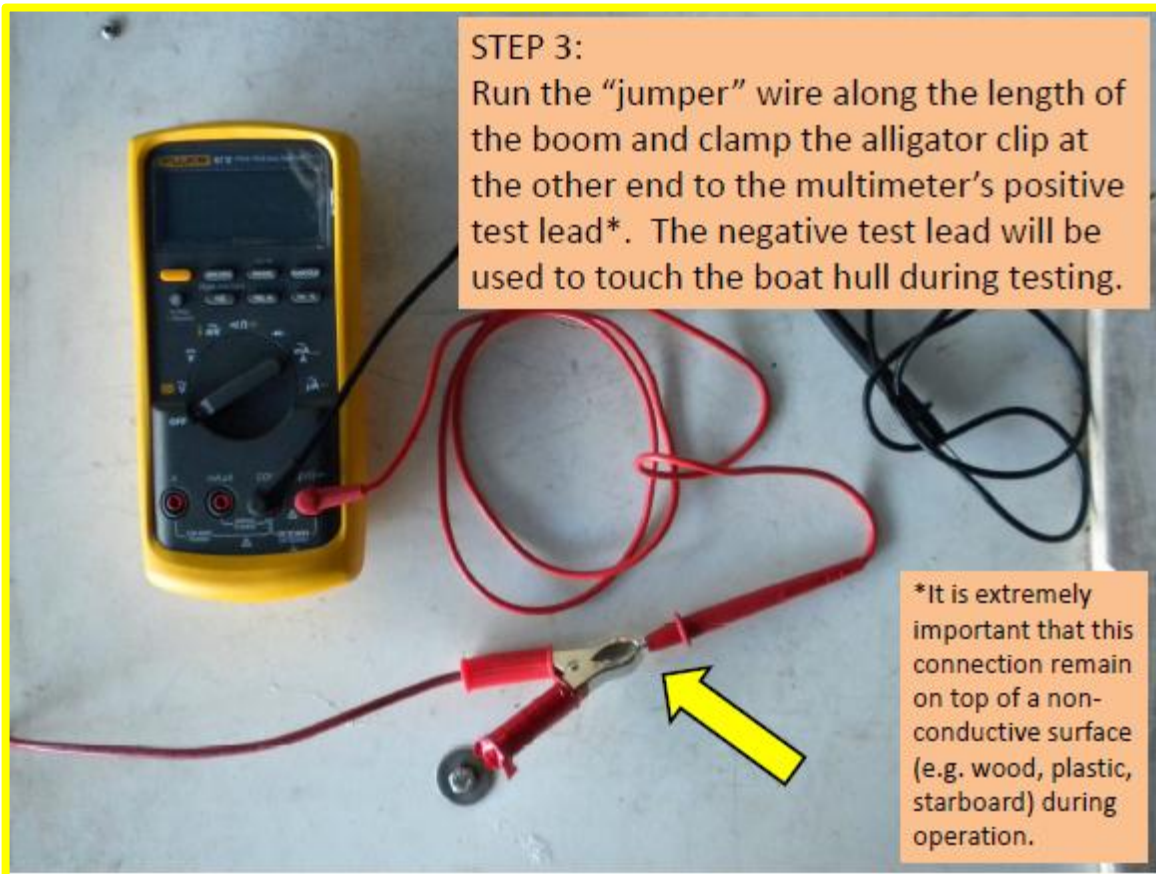
Make sure that the negative and positive test leads are properly connected to the Fluke 87V multimeter.

*The use of the particular multimeter and current clamp models do not imply endorsement by the Department of Interior, National Park Service, or U.S. Fish & Wildlife Service.

STEP 2:
Take one end of the red "jumper" wire and securely clamp the alligator clip around the brass connection of one of the anodes (spider array or sphere).



The connection to the boom electrodes can be made anyway on the metal end, as on one dropper. The important thing is to make a good, secure electrical connection.



As noted, this connection constitutes a potential hazard. The safest and recommended approach is to have an unbroken test lead long enough to reach from the multimeter to the boom.



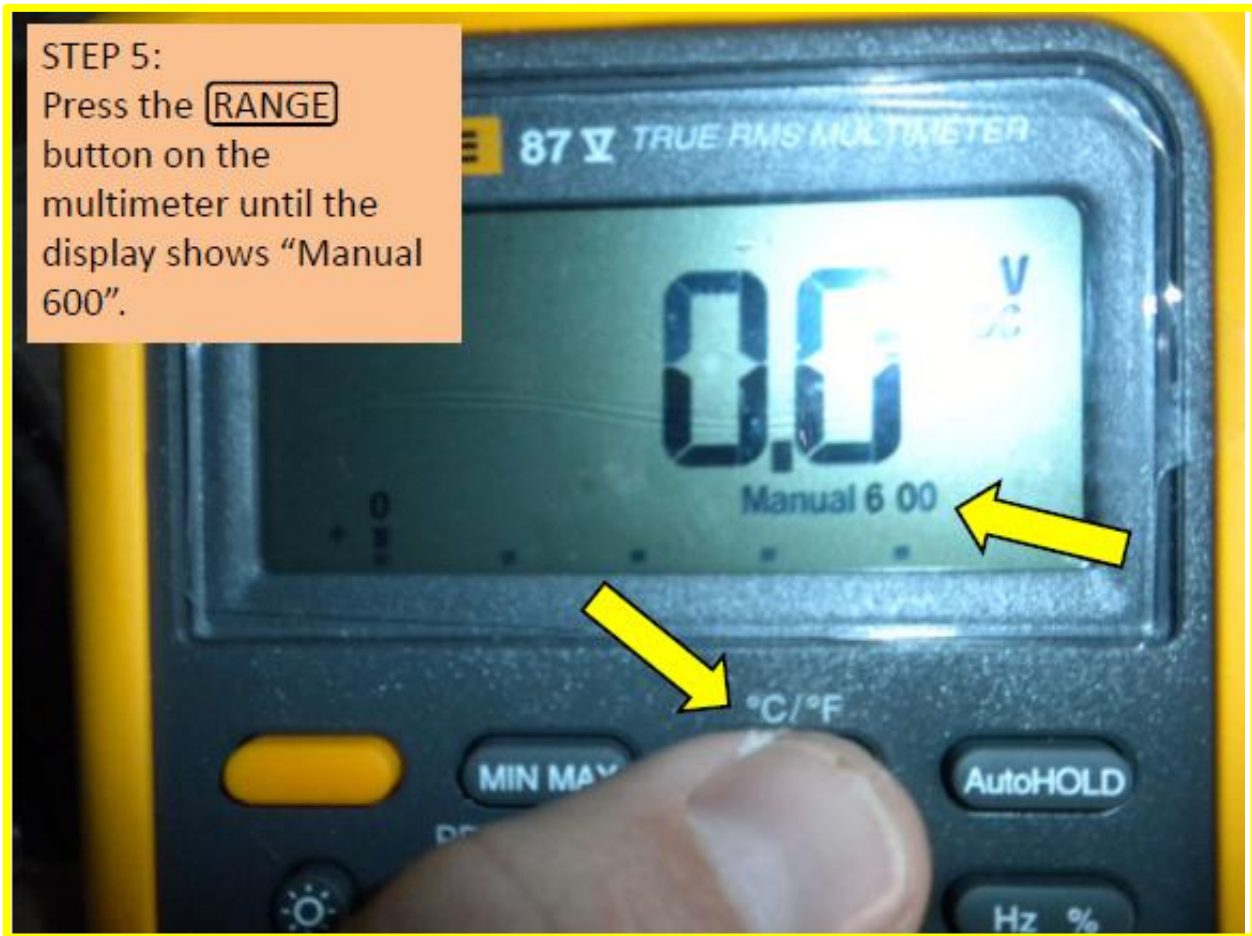
STEP 4:

Turn the multimeter's dial to the "Volts DC" setting:



This setting is for measuring DC or PDC. For measuring AC, the dial would need to be set to $V\sim$.

STEP 5:
Press the **RANGE**
button on the
multimeter until the
display shows "Manual
600".



This model has an auto-range voltage scaling capability; however, it is better to set the meter in manual mode to the 600 V range since higher voltages are used. Another safety note is that the "do not exceed" rating (CAT II or CAT III) of this particular meter is 600 Vrms.



STEP 6:

Press the **MIN MAX** button on the multimeter once to display the words "MIN MAX".



STEP 7:

Press the **MIN MAX** button on the multimeter a second time to display the word “MAX” next to “MIN MAX”.



STEP 8:

Press the **PEAK** button on the multimeter once to display the word “PEAK” before “MIN MAX” and “MAX”.

You are now ready to take peak voltage measurements. When the pedal is depressed at the desired GPP settings, touch the boat hull with the metal tip of the negative test lead.

Peak Current Measurements

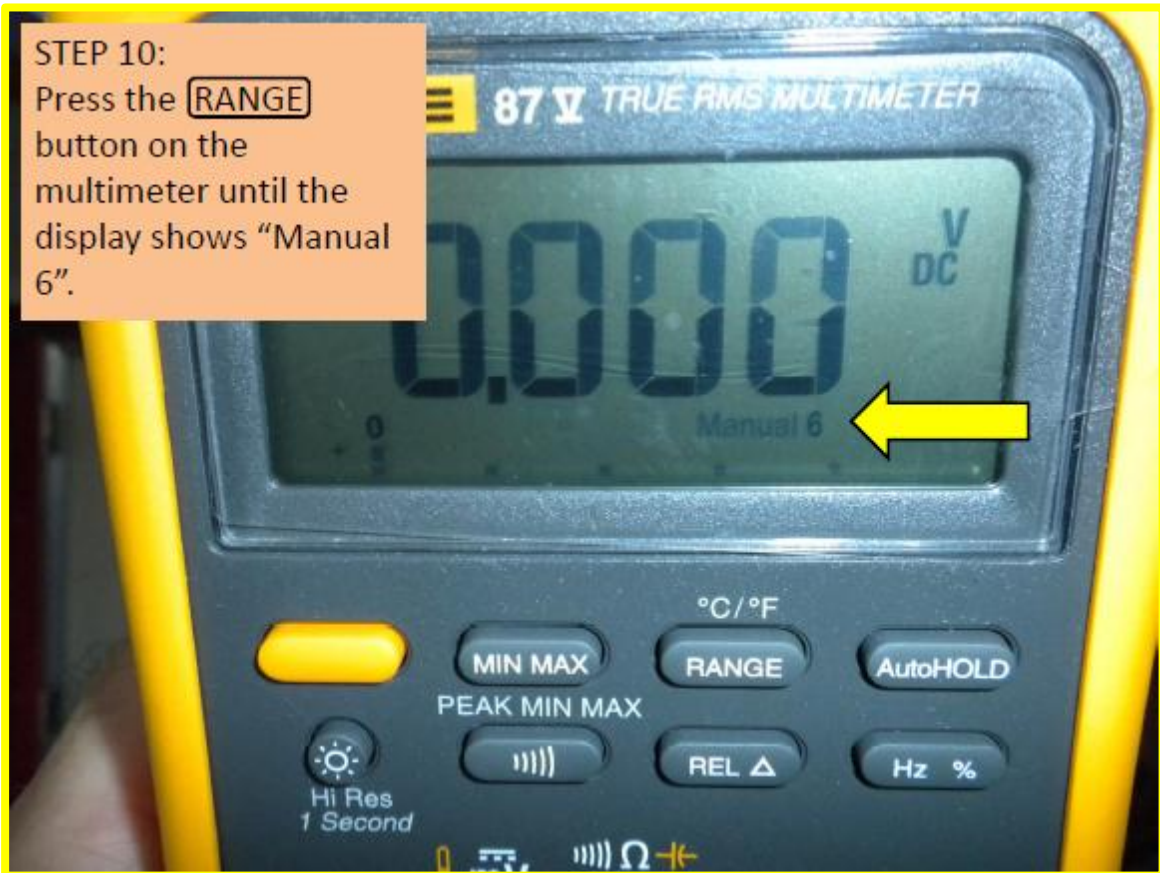


STEP 9:

Turn the multimeter off and connect the current clamp as indicated in the photo (make sure the current clamp is turned off). Turn the multimeter dial back to the “Volts DC” setting:



STEP 10:
Press the **RANGE**
button on the
multimeter until the
display shows "Manual
6".

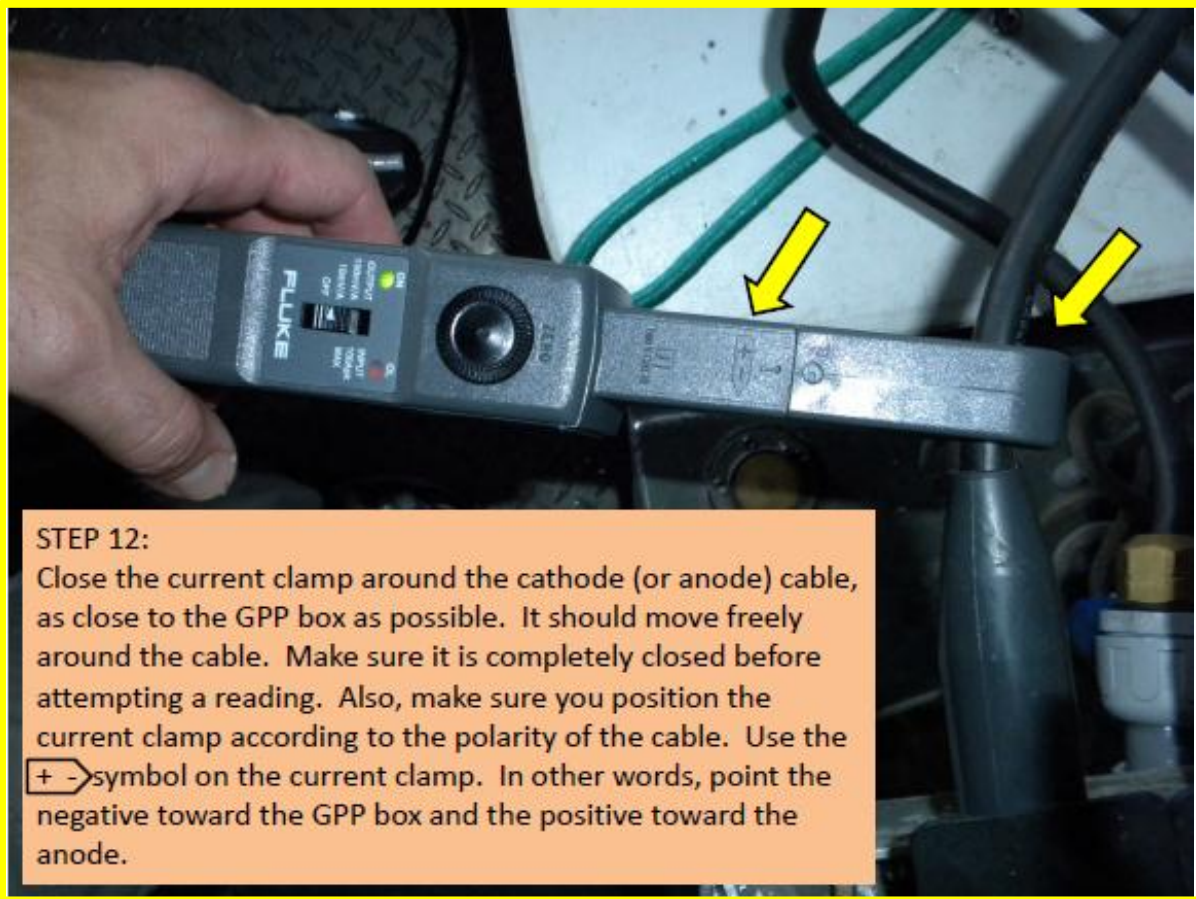


STEP 11:

Turn the current clamp
switch to the "10mV/A"
setting.

At this point, you can
zero the multimeter's
display using the black
dial on the current
clamp.

Next, repeat steps 6-8
to display "PEAK – MIN
MAX – MAX" on the
multimeter.



Record the measurement in millivolts. Then take that value and divide by the current clamp scale (usually 10 mV/amp or 100 mV/amp; in this case, 10 mV/amp) to get the amperage. For example, a reading of 342 mV peak would translate to $342/10 = 34.2$ peak amps.

Notes:

The notation here is for measuring a system with a Smith-Root GPP power source. You can use the same techniques with any control box model.

A meter that reads “true RMS” means that an accurate RMS voltage will be displayed whether the waveform is a pure sine wave or not. Since AC waveforms in electrofishing vary substantially in their form, we recommend using peak AC voltage only.