

In-Line Low Current Digital Ammeter for under \$20 Phil Salas – AD5X

Introduction

I recently purchased a Mountain Radio WHATT Meter (www.westmountainradio.com). This is an in-line digital voltage, power, and current meter equipped with Anderson PowerPole connectors which simply connects in series with your power source. Much more convenient to use than trying to run cables in and out of your digital multi-meter. However, unfortunately the current resolution is limited to 0.1 amps. Therefore, as a supplementary piece of test equipment, I wanted to build a digital ammeter that would give better accuracy at lower currents.

The Design

All Electronics Corporation (www.allelectronics.com) is a great source of components for the ham radio hobbyist. You can spend considerable time looking through their catalog and dreaming up neat things to build. In recent catalogs, they list several low current 3-1/2 digit LCD displays set-up for 200 millivolts, 20 volts, or 200 volts. These displays are not polarity sensitive, and indicate the polarity of the voltage applied. The 200 mv meter is only \$7. The higher voltage displays are \$9 each since they consist of the 200 mv unit with modifications to directly read the higher voltages. These units fit into a rectangular hole just 2.12" x 1.5" and must be powered from a 9-volt battery. So it appeared that the 200 mv meter would be perfect for a 2-amp current meter.

Building The Current Meter

All the parts needed, except for Anderson PowerPole connectors, can be purchased from All Electronics. The parts list is shown below:

Parts List

<u>QTY</u>	<u>Cat. Number</u>	<u>Description</u>	<u>Price each</u>
1	PM-200	200 mv digital display	\$7.00
1	FHPM-45	GMA Fuse Holder	2/\$1.00
1	GMA-3	3-amp GMA fuse	5/\$0.75
1	TB-2	3-5/16"x2-1/8"x1-3/8" box	\$1.95
1	SSW-37	Miniature slide switch	4/\$1.00
10	1-1/4w	1-ohm 1/4-watt resistors	10/\$0.50

Refer to the schematic (Figure 1) and the side view of the display (Figure 2). I originally used a precision 0.1-ohm current sensing resistor, but have since determined that ten 1-ohm resistors in parallel give pretty good accuracy! If you want a precision resistor, Mouser Electronics (www.mouser.com) has a good variety of units for you to consider.

I used a nibbling tool to cut out the hole in the metal box cover for the digital display. For the size of the box used, the corners of the digital display will interfere with the cover mounting screws. Therefore, I carefully rounded the display corners with a small file. A photo of the unmodified digital display is shown in "Display – Unmounted & mounted". Before soldering any wires to the display, you need to unsolder the solder jumper across

“P1” on the display pcb. This is clearly marked on the board, and can be seen on the left side of the bottom of the board in photo “Display Backside”. You’ll need to use a small solder sucker or solder wick to do this. This turns-off the decimal point on the display.

Next, I mounted the miniature on/off slide switch on one side of the box, and the fuse holder in the opposite side of the box as shown in photos “Switch” and “Fuse Holder”. I used 18 gauge DC cabling terminated in Powerpole connectors for the input and output wires. The internal 9-volt battery is simply held in place with double-sided tape. Photo “Inside” shows the internal wiring, and photos “Final” and “Final & Leads” show the completed unit. For labeling, I used Casio “White-on-clear” tape on the box and display, and Casio “Black-on-clear” tape on the metal cover as can be seen in the photos.

Conclusion

Convenient in-line current meters are very handy for the experimenter to have. The unit described here is an excellent addition to the normal test equipment used by hams, and provides accuracy down to one milliamp limited by the accuracy of your sense resistor. The range of this particular design is 2-amps maximum, but you can easily modify it to cover other current ranges simply by changing the sense resistor. But in any case, a convenient digital in-line current meter for less than \$20 is a pretty good deal!

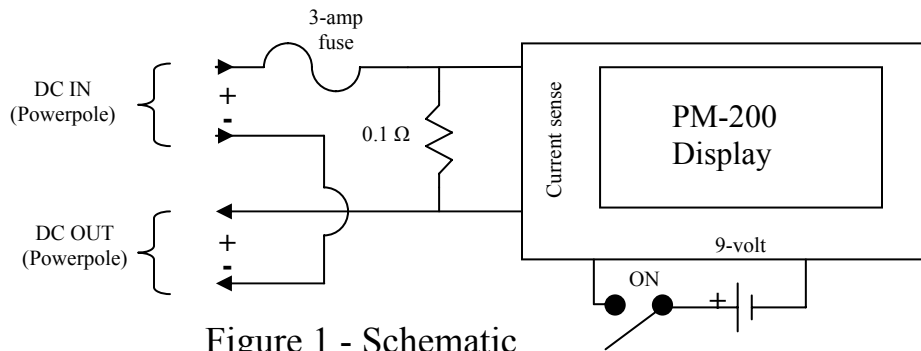


Figure 1 - Schematic

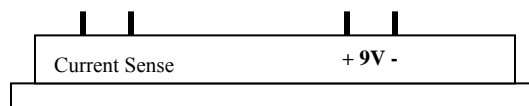
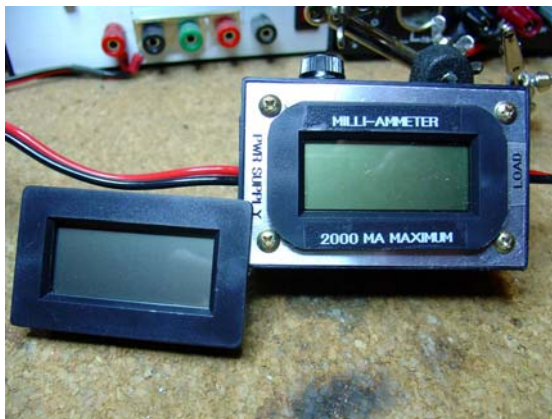
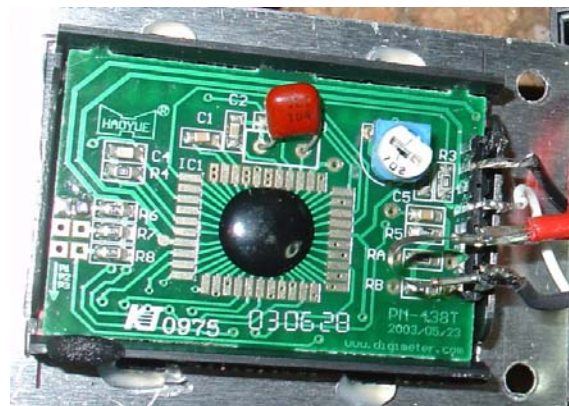


Figure 2 – Display Side View



Display – Unmounted and Mounted



Display Backside



Switch Position



Fuseholder



Inside Wiring



Final Assembly



Final milliammeter with leads