

Engineering plot guidelines

Engineering plots need to be well formulated so that they show the important data easily and clearly.

The following general guidelines should be used on all engineering graphs.

- All graphs should contain a descriptive title.
- All graph axes should be clearly labeled and should include the units.
- Axis values should contain only enough digits to adequately represent the values on the plot. Additional unnecessary zeros should be removed from the values. A single zero following a decimal point is acceptable, however more are not. Scientific notation is acceptable for very small numbers but unit multiplication is preferred. Examples of unit multiplication would be 5 millivolts instead of .005 volts. This method is preferred to scientific notation ($5e-3$) for very small numbers.
- Labels should be easy to read and not squeezed together.
- If long number labels are required on the X axis, rotate the labels on an angle to make the chart more readable.

The following chart shows the proper way to do a single black and white plot.

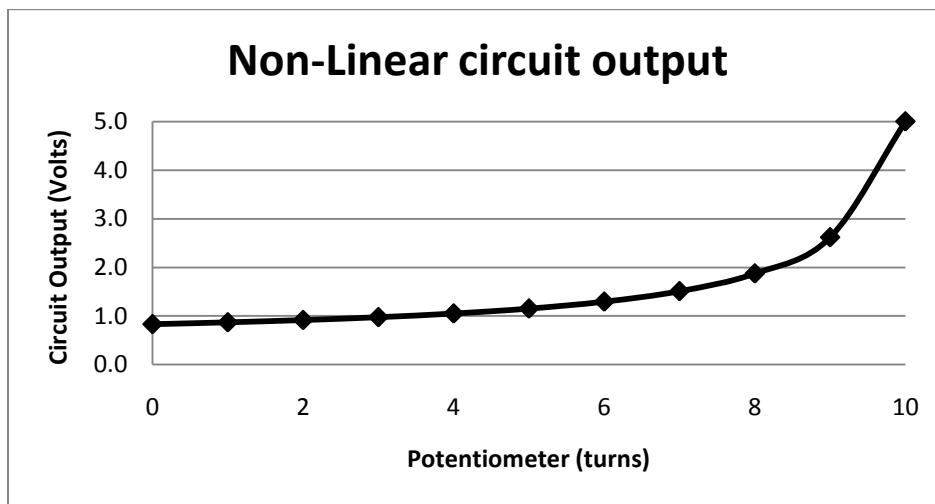


Figure 1: Proper single axis plot

Note that the size of the plot is appropriate for a single graph plot, generally a quarter page plot. Each axis is properly labeled with a descriptor and the units. Note that there is only one extra 0 on the Y axis. This zero may be used or left off, since it is the first digit past the decimal. Additional zeros here would be improper. Also note that the lines and symbols are all in black with a white background. The axis are both fully filled to the nearest whole increment. In other words, the x axis stops when the data stops,

not at 12 or 14, for data that is only plotted to 10. Similarly the Y axis starts at 0 and goes to 5, covering the range of the data. The Y axis does NOT start at a fractional value, even though the data starts between 0 and 1. This formatting is appropriate for a black and white report, or a report that will be copied. Color graphs are acceptable ONLY if the report is being prepared or copied in color. Color graphs can be a great help in conveying complex information with many traces, but are unsuitable in many instances, especially if the report is likely to be reproduced on a black and white copier. Printing or copying a color graph in black and white often leads to ambiguous trace shading.

Note also that there are only horizontal grid lines on this example. Vertical gridlines here are optional and were left off to keep the chart from looking too “busy”.

Figure 2 shows the same data plot improperly graphed.

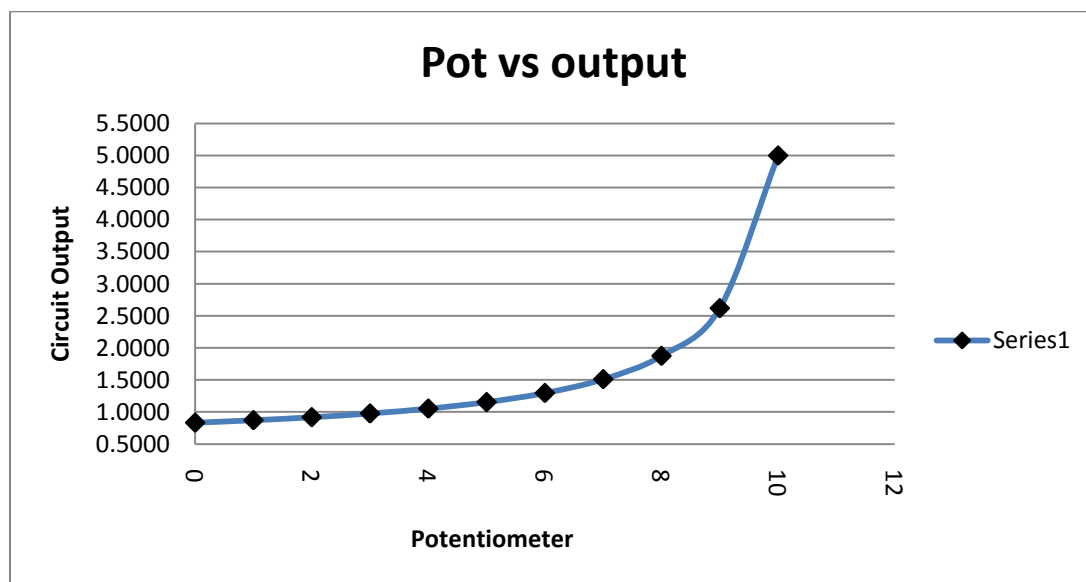


Figure 2: Improper graph

The above graph has a number of significant errors. The Y axis is improperly scaled, and far too cluttered. The labels also contain extraneous zeros which need to be removed. Also, it is missing any indication of units. We have no idea if this is volts or fortnights.

The X axis also is missing any units, and while the labels have been rotated, they are rotated in the wrong direction. All labels should be readable with the page either right side up or rotated clockwise 90 degrees. The data ends at 10, however the X axis is plotted to 12.

This plot contains a colored trace and a legend. The legend is not needed since the plot has only one trace, and the trace color should be in black.

The Plot title, while present and appropriately formatted, conveys no useful information. Each plot title should indicate what the graph is depicting.

Multi trace plots require a bit more finesse to get the multiple traces to show up properly in black and white. Traces should use varying line types first, and then varying line thicknesses second. Figure 3 shows a properly formatted multi-trace plot.

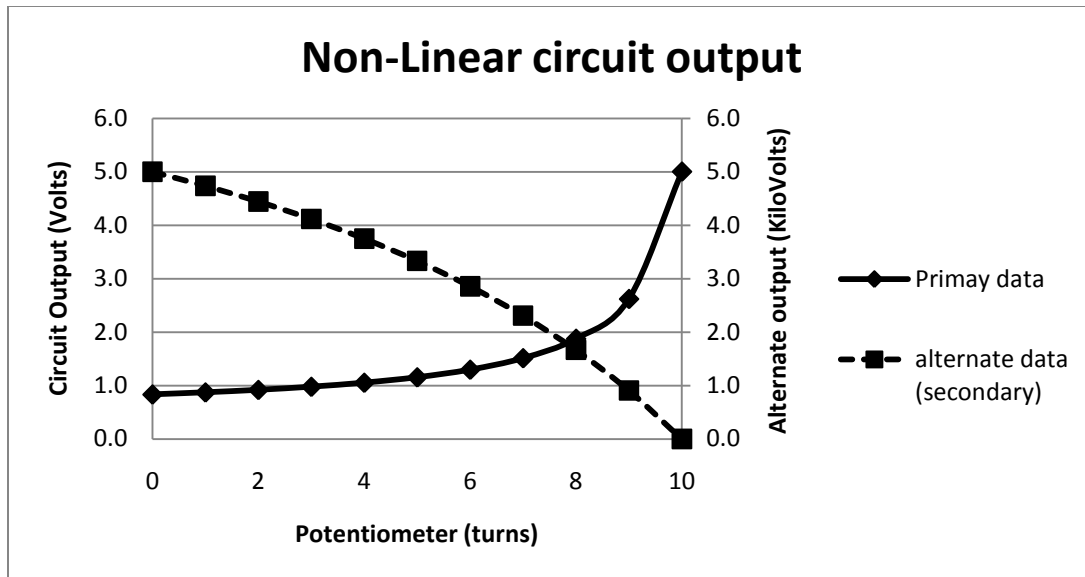


Figure 3: Multi-trace plot

This figure shows two traces, one associated with a primary axis and one associated with a secondary Y axis. The legend indicates which trace(s) are associated with the secondary axis.

Note that all axis include unit labels. Even though the primary and secondary Y axis have the same numeric values, they are not the same numbers. The secondary Y axis uses a multiplier of 1000.