LabVIEW 5: Final Project – PID Temperature Control

Reading :

Hands-On Introduction to LabVIEW by J. Essick

Reading	pages
Chapter 12	All
Appendix	All

Main focus :

- Integrate your LabVIEW programming skills and analog circuit knowledge to construct a temperature control device.

Most relevant VI's :

- PID control vi

Suggested Due Date: Wednesday, Dec. 10 (Advantage of doing this early: I will be around to troubleshoot circuits).

Last possible due date: End of Finals Week, Friday, Dec. 19

Assignment: Hand in a short **report** on the PID project that contains an introduction to the utility and uses of PID temperature controllers, a brief explanation of how PID feedback control works, a brief overview of the experimental setup and a section discussing the results. The printout of the *Block Diagram* and *Front Panel* of your LabVIEW program should be attached at the end of your report.

[See Chapter 12 and Appendix for details!]

Construct on the NI-Elvis board the circuit that provides the constant current to the thermistor and the circuit that drives the prebuilt current source for the TE element. The thermistor circuit and thermistor are the same as those used for the digital thermometer project. The circuits are discussed in J. Essick's book and are also shown in Fig. 1. The TE element with cooling fan and the TE current source are prebuilt for you. Use the PS280 Power supply for the required ± 8 Volt. Measure and include in the report a plot of the TE current source response, *i.e.* determine the dependence of I_{TE} on V_{in} and use the measured relation to determine the saturation voltages $V_{\pm sat}$ that you are going to use in your LabVIEW program.

Write the PID-feedback control LabVIEW program as described in chapter 12.

Put it all together. Does it work? Quantify! Show me the working system.

There are many questions that can be explored and written up in the result section. Be creative.

Here are some things that may be addressed: Check whether your system can stabilize temperature to within 0.05°C. What are the optimal PID parameters that you have found? Can you choose PID parameters to both reach the set temperature quickly and also maintain the temperature with good accuracy once the system has reached the set temperature? Can you cool small amounts of liquid so as to observe flash freezing? Can you explain why this happens? .....

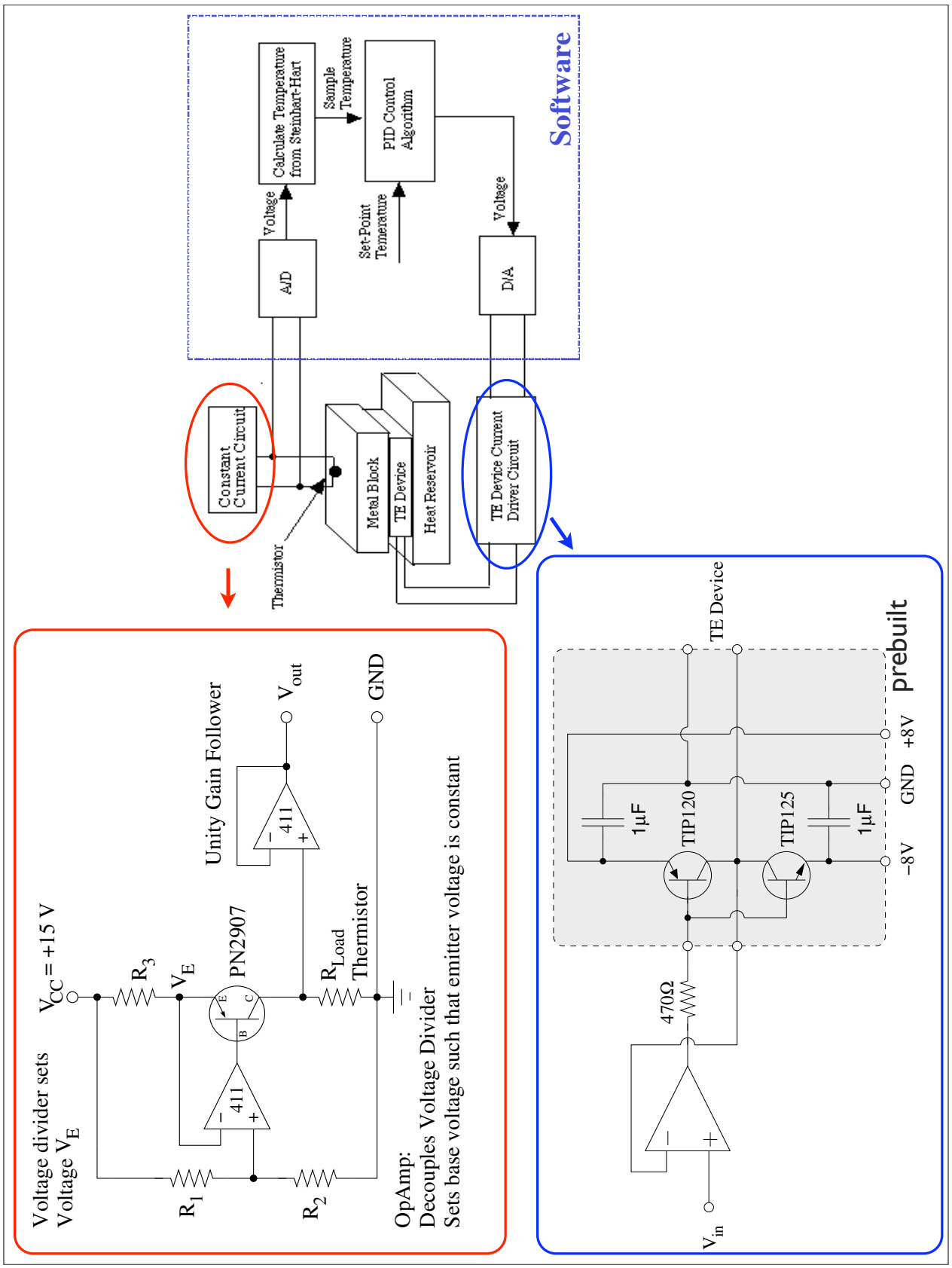

Figure 1: Temperature control project. Both construction of the analog circuits and interfacing with the computer is best done utilizing the NI Elvis board.