MECE-301 Engineering Applications Laboratory
Assignment #2

An industrial tank reactor is used to process pharmaceuticals for eventual retail sale. In order for the reaction occurring inside the tank to proceed properly, the reactor must not exceed a certain "setpoint" temperature T_s at the same time that it exceeds a certain setpoint pressure P_s. It is acceptable for either setpoint to be exceeded individually, but not at the same time. Also, the tank itself cannot withstand any temperature above $T_{max} = 550\,°F$ regardless of the pressure, nor any pressure above $P_{max} = 875$ psi regardless of the temperature. For a particular application, it is known that $T_s = 230\,°F$, and $P_s = 700$ psi. With this information, create a LabVIEW VI that monitors the tank temperature and pressure and provides an operating status to the user, as described in further detail below.

- In actual use, the tank conditions would be monitored by a set of hardware sensors and a data acquisition interface to the computer. Since we do not have such a setup in reality, you should simply use a pair of numeric controls to enter values for the temperature and pressure manually. This is not very realistic, but the remaining details of the logic behind the process will still be preserved. The details of making realistic measurements for such a scenario will be covered later in this class.

- With the monitored temperature and pressure, generate a status indicator on the front panel as follows. If either of the maximum values for the tank is exceeded, the status should indicate "Danger!" If the maximum values are not exceeded, but both setpoints are, then the status should indicate "Product ruined!" If only one of the setpoints is exceeded, but not the other, then the offending value should be indicated simply for informative purposes (such as: "Temperature setpoint exceeded—no danger yet"). If neither the setpoints nor the maximum values are exceeded, then the status should indicate "Normal".

- The setpoint values T_s and P_s should be passed as generic arguments to the VI (that is, as controls), while the maximum values T_{max} and P_{max} are to be defined within the VI's code itself (not changeable during use).

- Note that all of the logic for this assignment can be handled with the various Boolean functions, and repeated use of the *Select* function shown in the figure. To do so, check for the danger conditions first, then the ruined product, and lastly either of the individual over-conditions.