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# -*- shell-script -*-
#
# "Control" for "Tank" Simulation
#

record(ai, "${user}:setpoint")
{
    field(DESC, "Temperature Setpoint")
    field(EGU, "C")
    field(HOPR, "0")
    field(LOPR, "100")
    field(PREC, "1")
    field(INP, "30")
    field(PINI, "YES")
}

# Temperature error
# A - current temperature
# B - setpoint
record(calc, "${user}:error")
{
    field(DESC, "Temperature Error")
    field(SCAN, "1 second")
    field(INPA, "${user}:setpoint")
    field(INPB, "${user}:tank MS")
    field(CALC, "A-B")
    field(PREC, "1")
    field(FLNK, "${user}:integral")
}

# Integrate error (A) but assert that
# it stays within limits (C)
record(calc, "${user}:integral")
{
    field(DESC, "Integrate Error for PID")
    field(PREC, "3")
    field(INPA, "${user}:error PP MS")
    field(INPB, "${user}:integral")
    field(INPC, "20.0")
    field(CALC, "(B+A>C)?C:(B+A<-C)?(-C):(B+A)")
    field(FLNK, "${user}:PID")
}

# Every second, calculate new heater voltage via PID (PI)
# A - Kp
# B - error
# C - Ki
# D - error integral
record(calc, "${user}:PID")
{
    field(DESC, "Water Tank PID")
    field(PREC, "3")
    field(LOPR, "0")
    field(HOPR, "110")
    field(INPA, "10.0")
    field(INPB, "${user}:error MS")
    field(INPC, "5.0")
    field(INPD, "${user}:integral MS")
    field(CALC, "A*B+C*D")
}
```