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'CR1000 Series Datalogger Program for Measuring Apogee Model SI-111 and SI-121 (Infrared Radiometers)

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'Wiring instructions for Apogee model SI-111 and SI-121 (Infrared Radiometers)

'Red Wire (positive lead for thermopile) = high side of differential channel (2H in program below)

'Black Wire (negative lead for thermopile) = low side of differential channel (2L in program below)

'Clear Wire (shield wire) = ground

'Green Wire (positive lead for thermistor) = single-ended channel (SE1 in program below)

'Blue Wire (negative lead for thermistor) = ground

'White Wire (excitation for thermistor) = excitation channel (EX1 in program below)


'Explanation of variables and constants used in program

'PanelT = datalogger panel temperature

'BattV = datalogger battery voltage

'SBTempC = sensor body temperature in degrees Celsius

'SBTempK = sensor body temperature in Kelvin

'TargmV = mV output of thermopile infrared detector (dependent on temperature difference between target and sensor body)

'm = slope of equation relating target and sensor body temperatures to mV output of thermopile

'b = intercept of the equation relating target and sensor body temperatures to mV output of thermopile

'TargTempK = target temperature in Kelvin

'TargTempC = target temperature in degrees Celsius

'mC2 = polynomial coefficient (C2) used to calculate slope (m)

'mC1 = polynomial coefficient (C1) used to calculate slope (m)

'mC0 = polynomial coefficient (C0) used to calculate slope (m)

'bC2 = polynomial coefficient (C2) used to calculate intercept (b)

'bC1 = polynomial coefficient (C1) used to calculate intercept (b)

'bC0 = polynomial coefficient (C0) used to calculate intercept (b)

'Note that all calibration coefficients are sensor-specific; those listed below are examples and must be changed based on the sensor being used.
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'Declare public variables
Public PanelT, BattV, SBTempC, SBTempK, TargmV, m, b, TargTempK, TargTempC

'Declare constants (replace the listed values with coefficients received with sensor)
Const mC2 = 82213
Const mC1 = 7841000
Const mC0 = 1419700000
Const bC2 = 13114
Const bC1 = 185020
Const bC0 = -17215000

'Define data table (table is outputting data every 60 seconds)
DataTable (IRR,1,-1)
    DataInterval (0,60,Sec,10)
    Minimum (1,BattV,FP2,0,False)
    Sample (1,PanelT,FP2)
    Average (1,TargmV,FP2,False)
    Average (1,SBTempC,FP2,False)
    Average (1,TargTempC,FP2,False)
EndTable

'Main program (program is making a measurement every 5 seconds)
BeginProg
    Scan (5,Sec,0,0)
        PanelTemp (PanelT,_60Hz)
        Battery (BattV)

    'Instruction to measure sensor body temperature (green wire to SE1, white wire to EX1, blue wire to ground)
        Therm109 (SBTempC,1,1,Vx1,0,_60Hz,1.0,0)

    'Instruction to measure mV output of thermopile detector (red wire to 2H, black wire to 2L, clear wire to ground)
        VoltDiff (TargmV,1,mV2_5,2,True ,0,_60Hz,1.0,0)
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        'Calculation of m (slope) and b (intercept) coefficients for target temperature calculation
            m = mC2 * SBTempC^2 + mC1 * SBTempC + mC0
            b = bC2 * SBTempC^2 + bC1 * SBTempC + bC0

        'Calculation of target temperature
            SBTempK = SBTempC + 273.15
            TargTempK = ((SBTempK^4) + m * TargmV + b)^0.25
            TargTempC = TargTempK - 273.15

'Call output tables
            CallTable IRR
        NextScan
EndProg
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