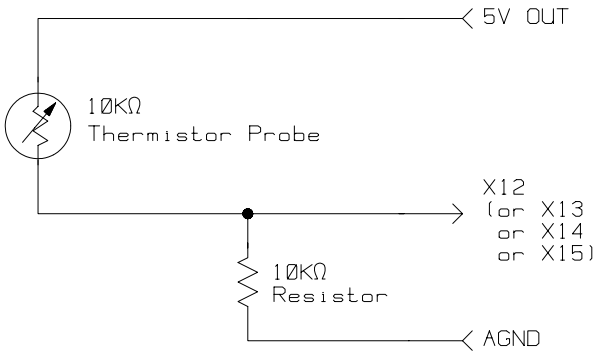
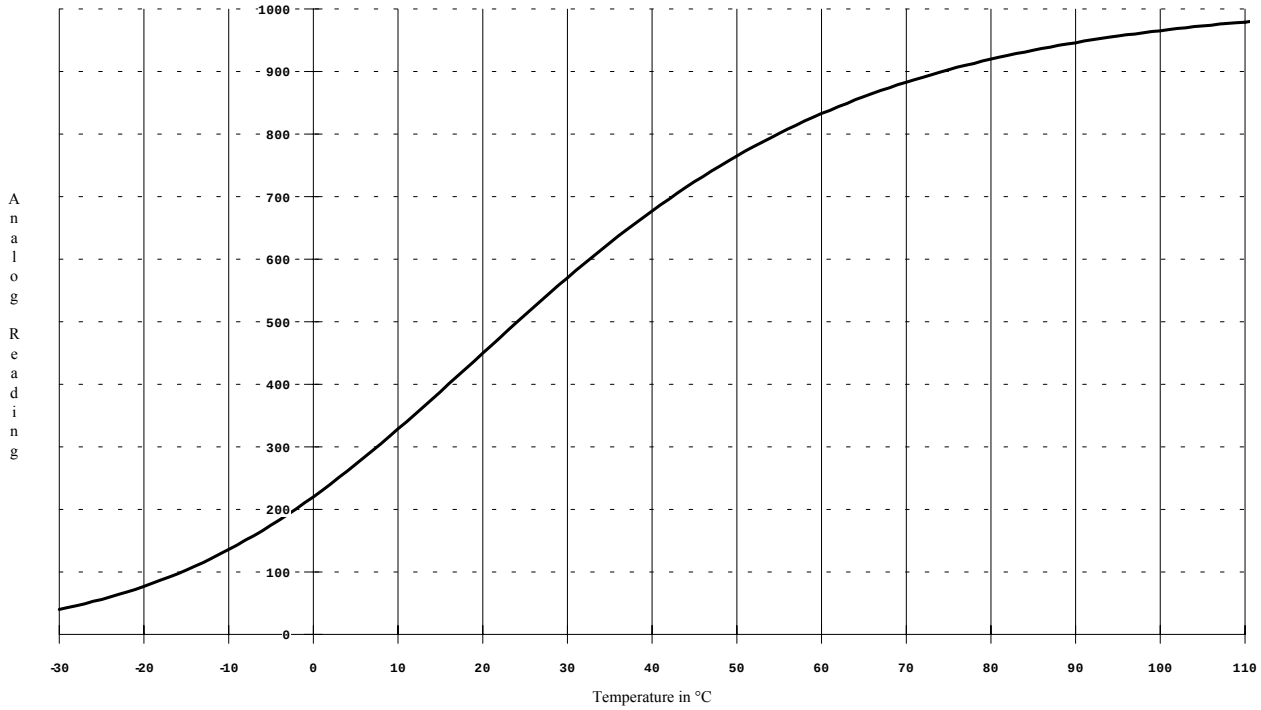
# Thermistor data acquisition

If your measurement requirement is not too stringent (say, if you want to measure temperature within the -30° to +70° Celsius range, with ±2° accuracy), you may make your life easier by skipping the calibration procedure. Choose a 0.5° or 1 ° tolerance 10 KΩ at 25° C NTC thermistor of the interchangeable type, a 1% or better precision 10 KΩ resistor placed away from the thermal environment, and use the following A12 vs. T curve,



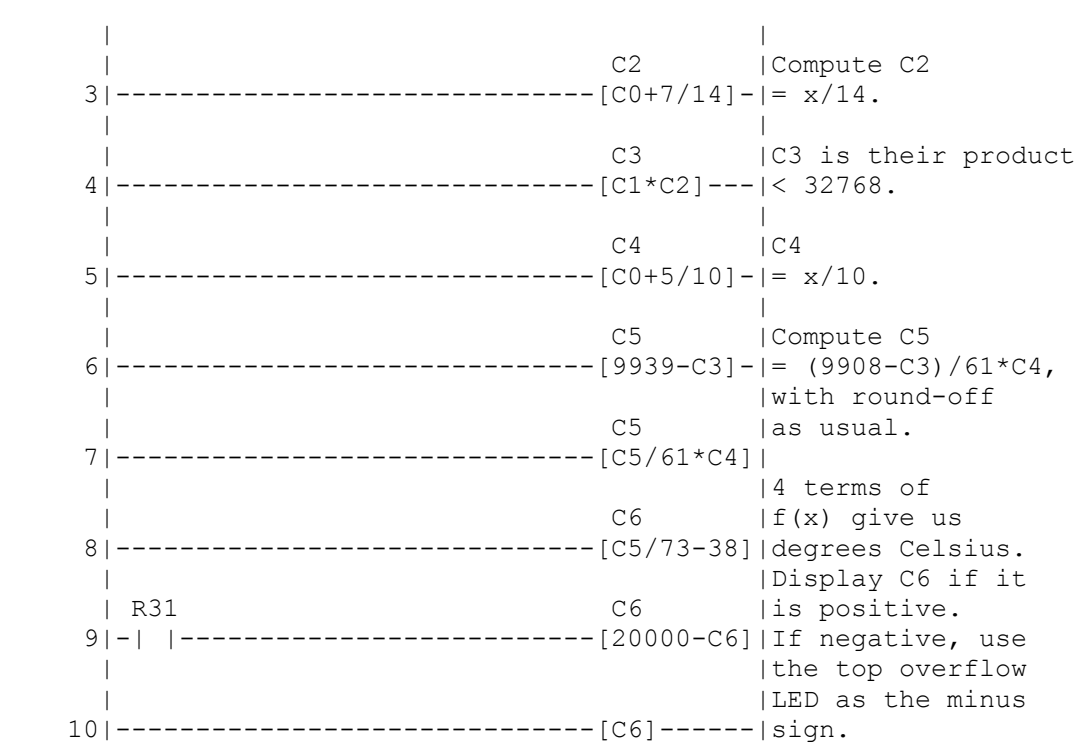

Or more conveniently, you can actually let the IP1612 compute the temperature from the A12 reading in lieu of a table look-up. A spline approximation serves our purpose:

$$f(x) = 0.0000002293x^3 - 0.0003110x^2 + 0.2225x - 38.445$$

$$= (9939 - \frac{1361 - x}{7} * \frac{x}{14}) / 61 * \frac{x}{10} / 73 - 38$$

where x is the A12 reading. The IP1612 can evaluate this with its existing positive integer arithmetic if you use the following program. Results are quite satisfactory (within one degree) even when compared with a PLC with floating point capabilities.

```
  |                              C0       |C0 is the raw
1|------------------------------[A12]-----|data x.
  |                                       |
  |                              C1       |Compute (1357-x)/7
2|------------------------------[1361-C0/7]|with round off.
```


C2
[C0+7/14]
Compute C2
= x/14.
C3
[C1*C2]
C3 is their product
< 32768.
C4
[C0+5/10]
C4
= x/10.
C5
[9939-C3]
Compute C5
= (9908-C3)/61*C4,
with round-off
as usual.
C5
[C5/61*C4]
4 terms of
f(x) give us
C6
[C5/73-38]
degrees Celsius.
Display C6 if it
R31
C6
[20000-C6]
is positive.
If negative, use
the top overflow
LED as the minus
[C6]
sign.