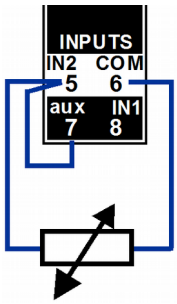
SL340 with high input offset and linearisation table.

1 Purpose

Calibrate an SL340 with the following detail and provide linearisation capability.

Input: 2-wire Resistance
Cal: 618.2...1060.9ohms
Output 4 – 20mA

Input Resistance ohms	degC	Output mA
618.2	-40	4
718.2	-18	7.74468085106383
857.5	15	13.3617021276596
972.2	38	17.2765957446809
1060.9	54	20



Approximate probe response y = (4.6413 * x) + 7.99.5853

2 Problems

1. The calibration required has an input offset > 50% of the input range used. In order to maintain a measure accuracy of 0.1% the input circuits of the SL340 have programmable offset circuits that sum in the instrumentation amplifier before entering the A to D converted ensuring the maximum number of BITS are use over the measurement range. The offsets and the input scaling are automatically set via the SL300 pc programmer. Some of the logic involved needs to be worked around in order to measure offsets greater than 50%.
2. The solution to point one requires some calculation when entering values on the process output so that it is responding over the required measurement range.
3. Because some measurement linearisation is required additional thought needs to be made when creating the linearisation table.

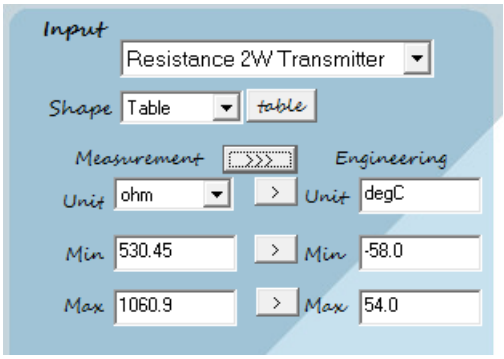
3 Procedure

3.a Select measurement range.

Because the output is a 4mA to 20mA I have elected to have the extra portion of input range operate in the 0-4mA portion of the output signal.

For this reason the maximum input is set at 1060.9Ω and the minimum input at 1060.9/2 = 530.45 then found the closed whole output unit based on Approximate probe response where -58°C = 530.3899Ω.

It can be seen that the SL340 will convert the resistance measurement into the degC engineering unit.



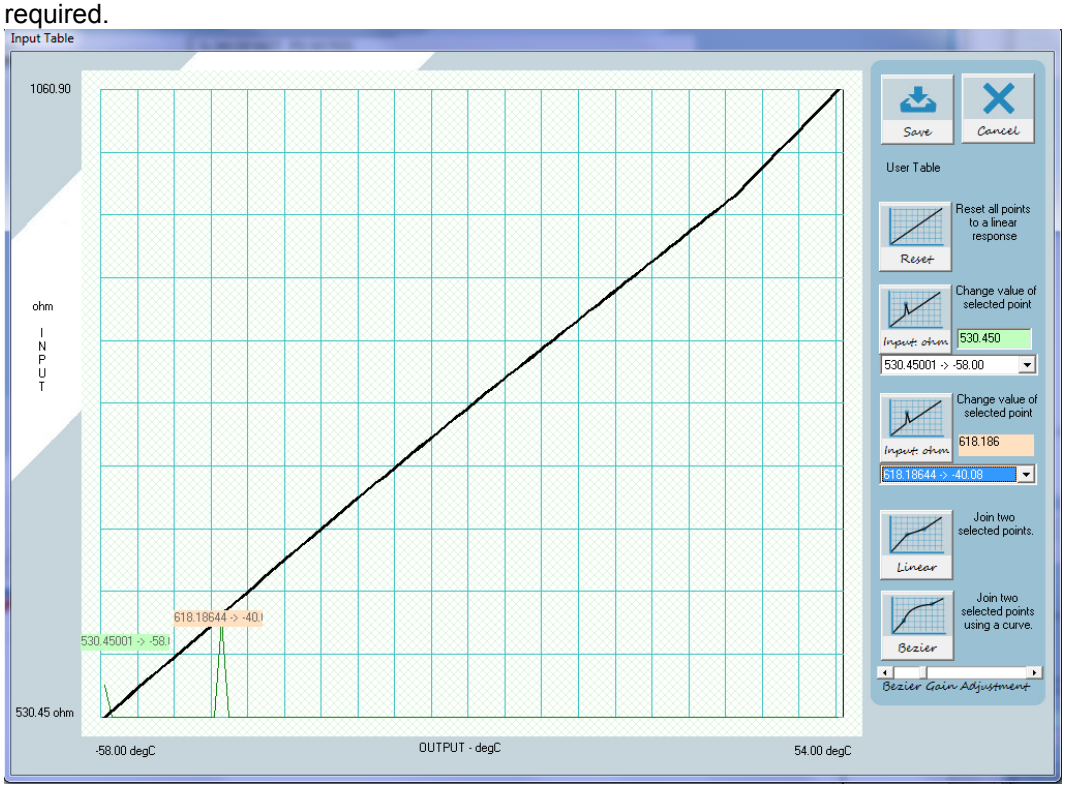
Enter points on next page . . . .

3.b Enter the points into the table

Ensure that Shape is set to Table as shown above then click the table button.

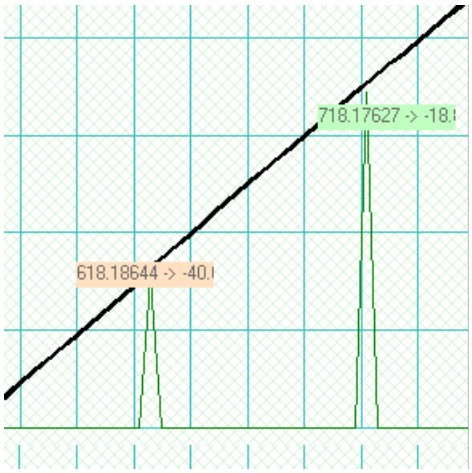
When the table entry screen loads it will contain the any existing table data for the current program. It may set to a linear response with the Reset button. The bottom axis consists of 101 points or steps in the output value. The width of the step cannot be changed, as a result the first and last value are the engineering unit values you entered on the input screen in the previous step and all the output fixed on the list boxes above used to edit the points

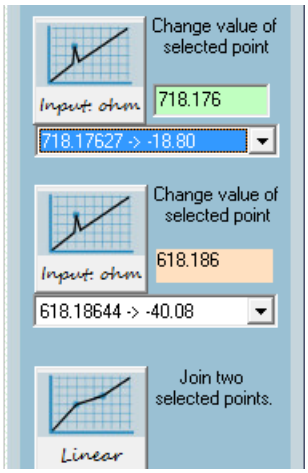
1. The diagram below shows -58 out selected with value 530.45 AND -40.08 out selected with value 618 and pressed the associated input save button. With the two points selected I pressed the join button. The software will calculate and update the intermediate points as required.



2. I used the green drop down list to select point -18.8. I then entered 718.20 and pressed the associated input save button.

   With the two points selected I pressed the join button. The software will calculate and update the intermediate points as required.





3. Continue this process for all known input points then press save.

Set output range on the next page

3.c Set Required Output Range

We now have input measuring and displaying on temperature the SL300 programmer for the appropriate input resistance all that is left is to scale the output.

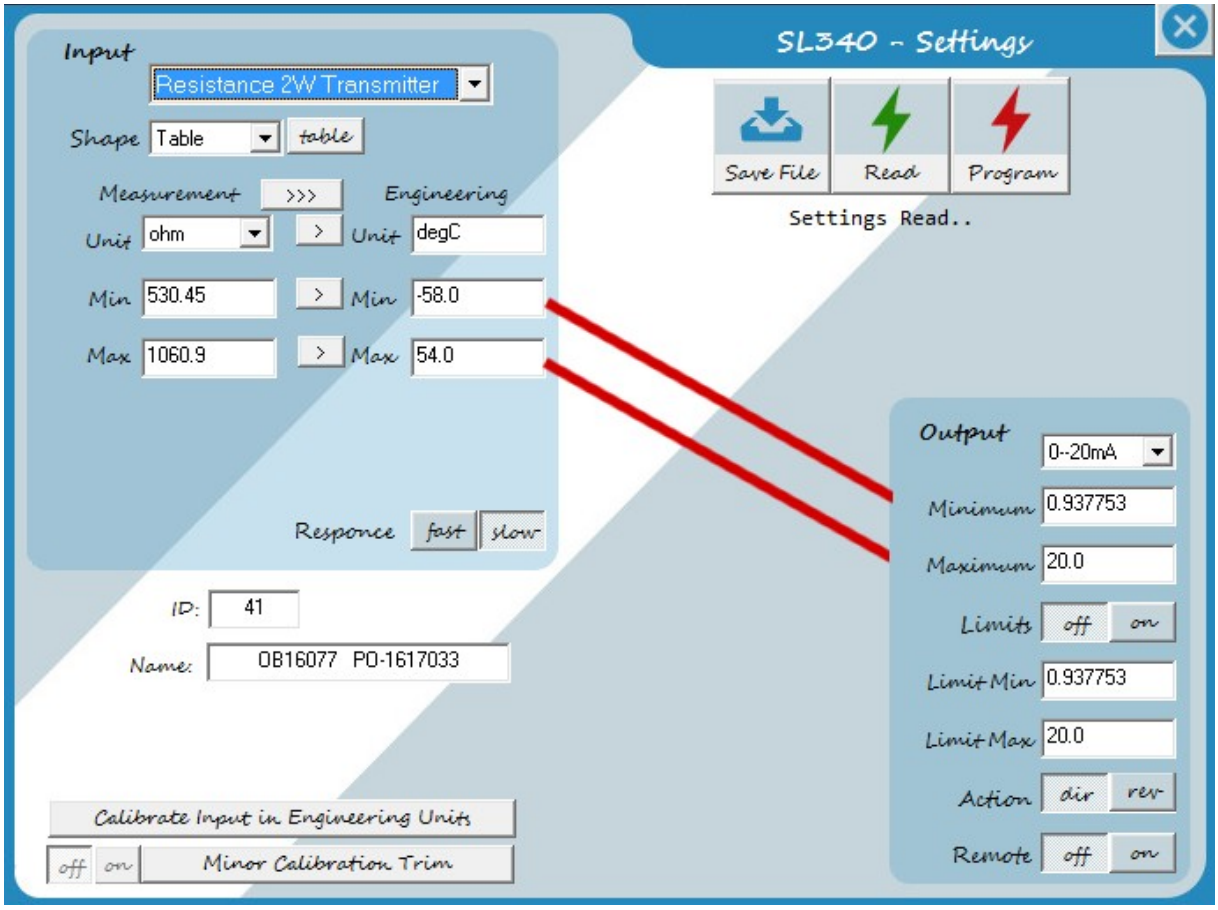
=(B11+40)/94 * 16 +4

We want 4mA out when the input is -40 and 20mA out when the input is 54.

We must calculate the output mA when the input is -58.

mAmin =(minIn+zeroIn)/inputRange x outputRange + outputOffset

mAmin = -18 / 94 x 16mA + 4 mA = 0.936170213



Press program and test