

Z1567-01-01 SEM1720 auto manual control

Auto manual control.

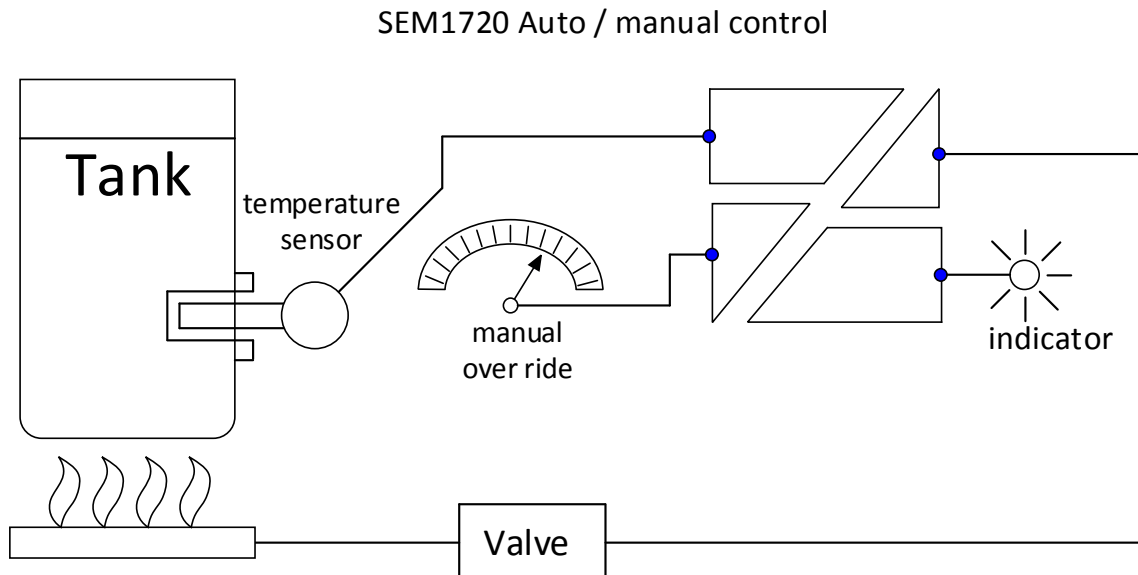
With some processes it can be required to switch between automatically monitoring a “live” temperature probe and manually controlling the “Simulated” temperature. The manual entering of a simulated temperature can be useful to control a temporary set point or to override a live temperature signal; it can also be used to hold a value once the live temperature has changed.

This application note explains how to configure a SEM1720 to change input source between a “live” and a “simulated” temperature input with an external switch to make the changeover.

Once the configuration plan for the SEM1720 is understood it will be possible to change the behaviour of the SEM1720 to suit individual applications.

Example application

The example below is working over an input range of (0 to 150) °C giving a linear (4 to 20) mA output on output channel 1 depending on the input source selected. A (0 or 10) V signal on output channel 2 is given to indicate the source selected for output channel 1, either a live, or a simulated, temperature input.





Input range (0 to 150) °C

CH1 input PT100 3 wire temperature probe.

CH2 input 1 K ohm slide wire multi turn pot, used for manual input of the simulated temperature.

External switch in position 1

CH1 output = (4 to 20) mA ranged (0 to 150) °C controlled by live probe on CH1 input.

CH2 output = 0 VDC.

External switch in position 2

CH1 output = (4 to 20) mA ranged (0 to 150) °C controlled by the rotational position of a slide wire pot on CH2 input.

CH2 output = 10 VDC (failure of the input probe will also give 10 VDC on CH2 output).

Note: The SEM1720 must be connected according to the user manual; an external switch will be used to change between auto and manual operation.

The external switch used must be a two pole switch and wired to open or close the connection from the input sensors on the SEM1720.

In position 1 SEM1720 input pin 101 must be connected to an input and SEM1720 input pin 203 must be open.

In position 2 SEM1720 input pin 101 must be open and SEM1720 input pin 203 must be connected to an input.

Configuration

Screen configuration for the example application.

The screenshot shows the 'Dual Channel Temperature Conditioner' software interface. It is divided into several sections for configuring two channels, CH1 and CH2.

CH1 Configuration:

- CH1 In:** Sensor type is RTD (Pt100_003B51). On Error Fail is set to Low. Setpoint SP1 is 0.00. Preset to SP1 is unchecked.
- Profile A:** Input is CH1. Seg. is 4. Units Out is °C. The profile table is:

Seg.	°C	C
1	-273.00	-0.50
2	0.00	0.00
3	100.00	100.00
4	10,000.00	10,000.00
- CH1 Out:** Source is Highest (PROFILE A or PROFILE B). Range is 0.00 to 150.00. Signal is mA (4.000 to 20.000). Damping is 0. Rise and Fall are 0. Tag 1 is Live. Fixed Output is unchecked.
- CH1 Sensor:** 43.93 °C. **CH1 Ambient:** 25.5 °C.
- Profile A In:** 43.93. **Profile A Out:** 43.93 C.
- CH1 Out:** 43.93. **CH1 Signal Out:** 8.685 mA.

CH2 Configuration:

- CH2 In:** Sensor type is SW (SW KΩ is 10). On Error Fail is set to Low. Setpoint SP2 is 0.00. Preset to SP2 is unchecked.
- Profile B:** Input is CH2. Seg. is 4. Units Out is °C. The profile table is:

Seg.	% Swing	C
1	-200.00	-200.00
2	0.00	0.00
3	100.00	150.00
4	200.00	200.00
- CH2 Out:** Source is PROFILE A. Range is -0.50 to -0.49. Signal is V (10.000 to 0.000). Load in KΩ is 100000. Damping is 0. Rise and Fall are 0. Tag 2 is Manual. Fixed Output is unchecked.
- CH2 Sensor:** 0.08% swing. **CH2 Ambient:** 25.5 °C.
- Profile B In:** 0.08. **Profile B Out:** 0.12 C.
- CH2 Out:** 43.93. **CH2 Signal Out:** 0.000 V.

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The configuration for Channel 1 input is set as follows:

CH1 In (-200.0 to 850.0)

RTD Pt100_003851

TC

SW Offset 0.00

On Error Fail High Low

Setpoint SP1 0.00

Preset to SP1

Profile A In CH1

Seg. 4 Units Out C

	°C	C
▶ 1	-273.00	-0.50
2	0.00	0.00
3	100.00	100.00
4	10,000.00	10,000.00

CH1 Sensor **CH1 Ambient**

43.93 °C 25.5 °C

Profile A In 43.93

Profile A Out 43.93 C

The input probe is a PT100, in the profiling tool input value = output value, apart from -273 °C = -0.5 °C. This in effect will make the profile track the input unless the temperature drops below 0.0 °C or the sensor input is lost (when the external switch is in position 2). At this point the Profile A tool will output -0.5 °C as its value.

The configuration for Channel 2 input is set as follows:

CH2 In (-5.0 to 105.0)

RTD

TC SW kΩ 10

SW Offset 0.00

On Error Fail High Low

Setpoint SP2 0.00

Preset to SP2

Profile B In CH2

Seg. 4 Units Out C

	% Swing	C
▶ 1	-200.00	-200.00
2	0.00	0.00
3	100.00	150.00
4	200.00	200.00

CH2 Sensor **CH2 Ambient**

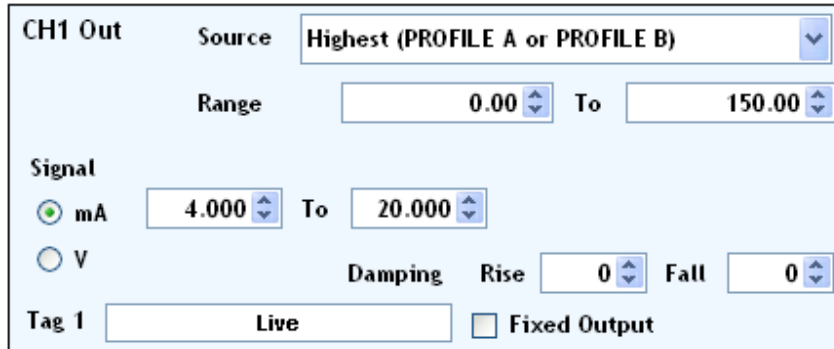
0.08% swing 25.5 °C

Profile B In 0.08

Profile B Out 0.12 C

The input for channel 2 is a slide wire. This has a (0 to 100) % input swing that is scaled in the Profile B tool to give (0 to 150) °C profile B out.

The configuration for Channel 1 output is set as follows.



CH1 Out Source: Highest (PROFILE A or PROFILE B)
 Range: 0.00 To 150.00
 Signal: mA (selected) 4.000 To 20.000
 V (unselected)
 Damping Rise: 0 Fall: 0
 Tag 1: Live Fixed Output

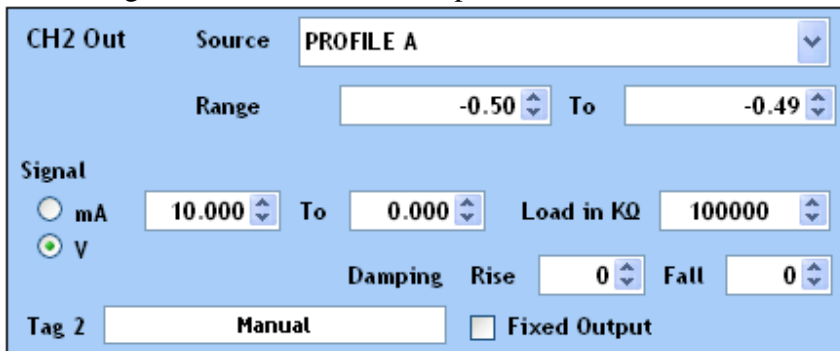
The output for Channel 1 is set to give (4 to 20) mA = (0 to 150) °V.
 The output will take its source from the highest reading of the two Profile tools (Profile A or Profile B).

The way in which the input channels are configured will mean this is dependent on the position of the external switch.

In switch position 1 Profile A will be used.

In switch position 2 Profile B will be used.

The configuration for Channel 2 output is set as follows:



CH2 Out Source: PROFILE A
 Range: -0.50 To -0.49
 Signal: mA (unselected) 10.000 To 0.000 Load in KΩ: 100000
 V (selected)
 Damping Rise: 0 Fall: 0
 Tag 2: Manual Fixed Output

The output for Channel 2 is set to give 10 V when the value from profile A is -0.5°C ;when above -0.49 it will give 0 V.

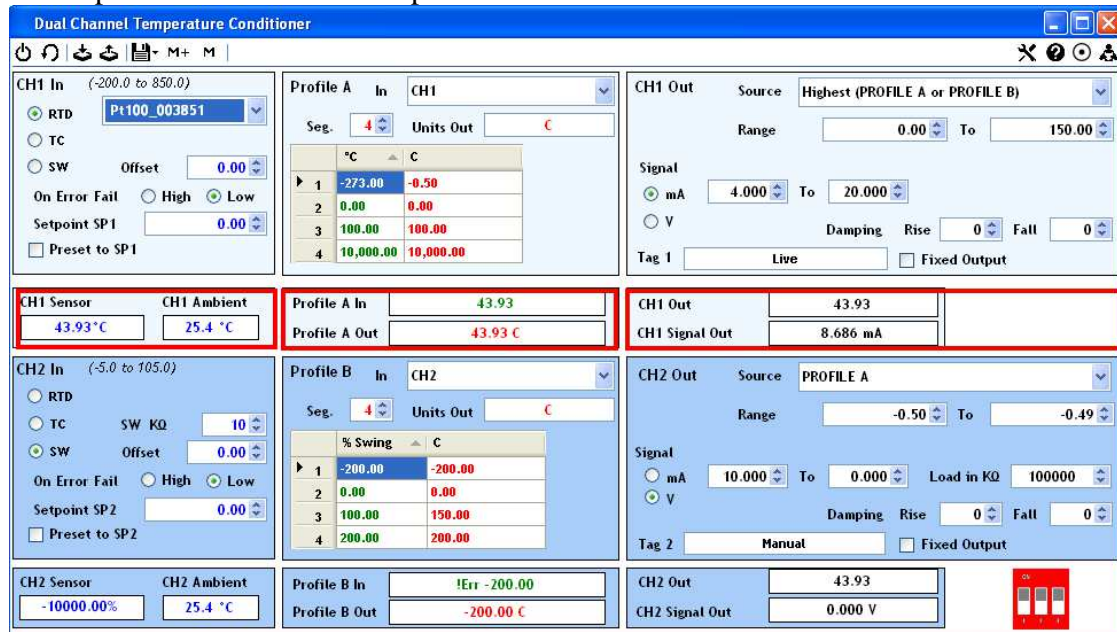
So in effect this indicates on channel 2 output the position of the external switch and if the system is in auto or manual mode.

In switch position 1 Profile 0 VDC will be output indicating auto mode.

In switch position 2 Profile 10 VDC will be output indicating manual.

Operation

Auto operation: external switch position 1



The screenshot displays the 'Dual Channel Temperature Conditioner' software interface. It is divided into several sections for Channel 1 (CH1) and Channel 2 (CH2).

CH1 Section:

- CH1 In:** RTD sensor Pt100_003B51, range (-200.0 to 850.0). On Error Fail is set to Low. Setpoint SP1 is 0.00.
- Profile A:** In CH1, Seg. 4, Units Out C. The profile table is:

Seg.	°C	C
1	-273.00	-0.50
2	0.00	0.00
3	100.00	100.00
4	10,000.00	10,000.00
- CH1 Out:** Source: Highest (PROFILE A or PROFILE B), Range: 0.00 to 150.00. Signal: mA, 4.000 to 20.000. Damping: 0, Rise: 0, Fall: 0. Tag 1: Live.
- Real-time Data (highlighted in red):** CH1 Sensor: 43.93 °C, CH1 Ambient: 25.4 °C, Profile A In: 43.93, Profile A Out: 43.93 C, CH1 Out: 43.93, CH1 Signal Out: 8.686 mA.

CH2 Section:

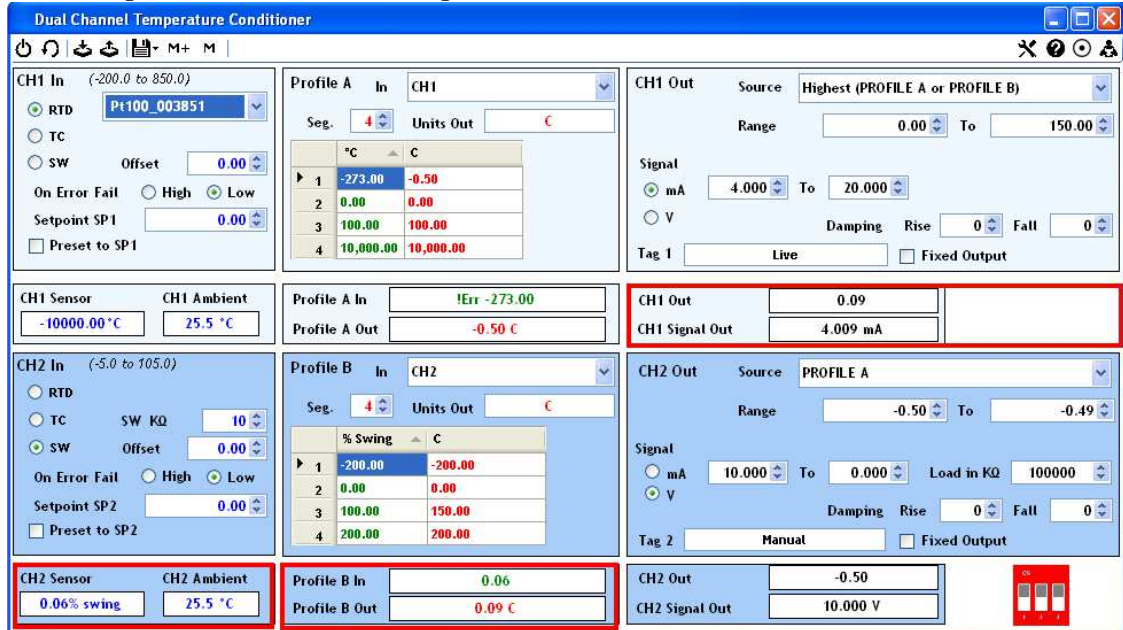
- CH2 In:** RTD sensor, range (-5.0 to 105.0). SW KΩ: 10, Offset: 0.00. On Error Fail is set to Low. Setpoint SP2 is 0.00.
- Profile B:** In CH2, Seg. 4, Units Out C. The profile table is:

Seg.	% Swing	C
1	-200.00	-200.00
2	0.00	0.00
3	100.00	150.00
4	200.00	200.00
- CH2 Out:** Source: PROFILE A, Range: -0.50 to -0.49. Signal: mA, 10.000 to 0.000, Load in KΩ: 100000. Damping: 0, Rise: 0, Fall: 0. Tag 2: Manual.
- Real-time Data:** CH2 Sensor: -10000.00%, CH2 Ambient: 25.4 °C, Profile B In: !Err -200.00, Profile B Out: -200.00 C, CH2 Out: 43.93, CH2 Signal Out: 0.000 V.

In this mode the signal output by channel 1 (CH1 out) will be based on the input value of the PT100 probe connected to channel 1 input (CH1 In)

In the screen above this is shown as 43.93 °C giving an output of 8.69 mA

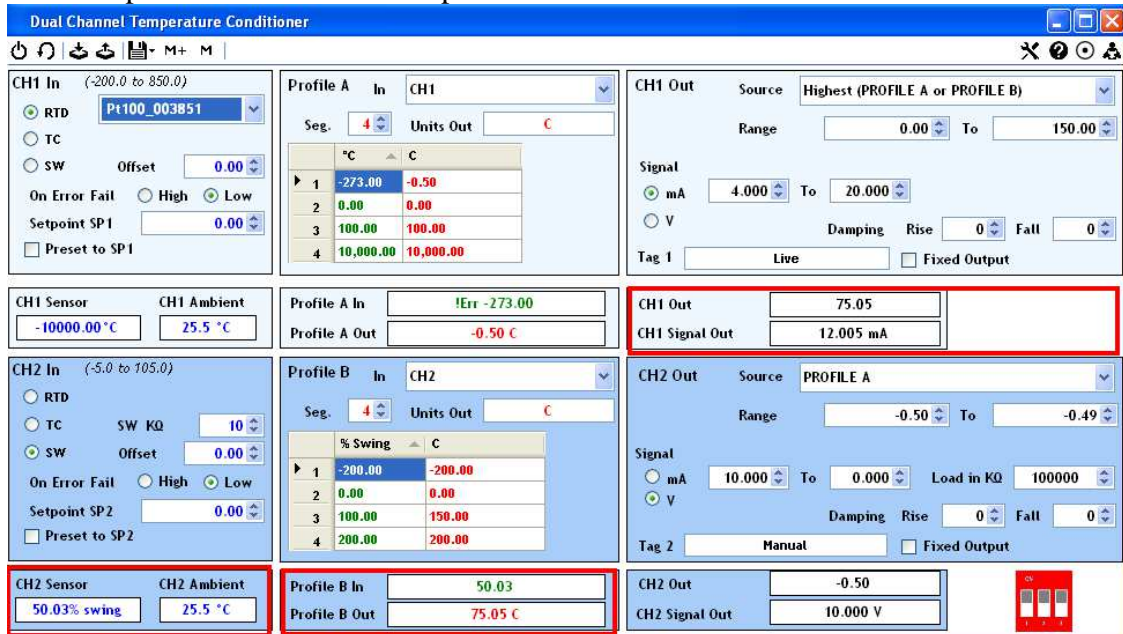
Manual operation: external switch position 2



The screenshot shows the 'Dual Channel Temperature Conditioner' software interface. The 'CH1 In' section is set to RTD Pt100_003851 with a setpoint of 0.00°C. The 'Profile A' table shows a 4-segment profile with a 0.00% swing at 0.00°C. The 'CH1 Out' section shows a signal of 4.009 mA. The 'CH2 In' section is set to SW with a setpoint of 0.00°C. The 'Profile B' table shows a 4-segment profile with a 0.06% swing at 0.06°C. The 'CH2 Out' section shows a signal of 10.000 V. The 'CH1 Sensor' and 'CH2 Sensor' sections show ambient temperatures of 25.5°C and 0.06% swing respectively.

This shows the value when the external switch has been set to position 2. The slide wire pot had been positioned at the 0.06% movement position. This is equal to 0.09°C and so gives 4.01 mA.

Manual operation: external switch position 2



The screenshot shows the 'Dual Channel Temperature Conditioner' software interface. The 'CH1 In' section is set to RTD Pt100_003851 with a setpoint of 0.00°C. The 'Profile A' table shows a 4-segment profile with a 0.00% swing at 0.00°C. The 'CH1 Out' section shows a signal of 12.005 mA. The 'CH2 In' section is set to SW with a setpoint of 0.00°C. The 'Profile B' table shows a 4-segment profile with a 50.03% swing at 50.03°C. The 'CH2 Out' section shows a signal of 10.000 V. The 'CH1 Sensor' and 'CH2 Sensor' sections show ambient temperatures of 25.5°C and 50.03% swing respectively.

The slide wire pot has been set at the 50.03% movement position. This is equal to 75.05°C and so gives 12.01 mA.