



## Program Cycling

### Temperature Program Cycling:

Program cycling is the ability in a temperature program to repeat a series of program segments. This is a very useful feature for users who do repetitive program cycles as they would only have to enter a few segments and then repeat those segments up to 999 times. Further explanation is given by example.

Suppose an experiment is needed to heat and cool a specimen 500 times in a single experiment. The same ramp rate and target temperatures are used as shown below:

Segment 1: heat at 5 degrees per minute to 1000 degrees and hold for 5 minutes.  
Segment 2: cool at 5 degrees per minute to 500 degrees and hold for 5 minutes.

To enter this experiment, the above two lines would have to be entered manually for 1000 segments, 500 heating and 500 cooling. This would be a rather tedious job in itself.

To simplify this type of experiment, use program cycling as shown below:

Segment 1: heat at 5 degrees per minute to 1000 degrees and hold for 5 minutes.  
Segment 2: cool at 5 degrees per minute to 500 degrees and hold for 5 minutes,  
                  Jump to segment 1, cycle 500 times.

In this program, the same heat/cool cycle is entered only once. In segment 2, the addition of the Jump To segment 1 is added. It will cycle 500 times back to segment 1 and then continue on to segment 3 if it exists or end the experiment. In the same two lines of program, 500 cycles (1000 program segments) are executed.

To enable the cycling, click on the mouse pointer while over the "Jump to segment" check box while in the Edit Segment window. If there is a check mark in this box, cycling is enabled and valid segment numbers must be entered into the segment# and cycle times boxes. If invalid numbers are entered into either one of these boxes, the "Jump To" box will automatically un-check, disabling the cycling.

There are certain limitations to program cycling as explained below:

Nesting of cycles is not allowed. For example, using the above program. If a segment 3 was added to heat the specimen to 800 degrees, then a segment 4 was added to cool to 300 degrees. Segments 3 and 4 could not cycle back to segment 1 or 2. This type of cycling would never end and is therefore not allowed. Segment 4 could jump to

segment 3 however because it is not contained in the cycling of segment 2.

The limit on the number of cycles is 999. If more are needed, the program could be duplicated in more segments and a new cycle could be used as segments 3 and 4 were added above.

Caution should be used in very long experiments as the total number of data points stored in the data file may become excessive. This could be alleviated by adding more segments to control the temperature where data is not logged. For example, if the specimen has to be heated through a range of 500 degrees but the data is only needed for the range of 400 to 500 degrees, use an added segment to heat to 400 and not log data. Then use a segment to heat from 400 to 500 and do log data. That way unneeded data points will not be logged in the data file.

Segment 1 can not cycle as cycling is always to a lower segment number.

Care should be taken in the program itself. When cycling, the new target setpoint will be the current specimen temperature when the cycling starts. To effect cycling, the specimen must be heated to a temperature and then cooled to a lower temperature. When the cycle starts, this lower temperature will become the new setpoint for the first heating segment when it is jumped to. If no cooling segment is used, the specimen temperature would not change, the setpoint would be set at that temperature and the segment would simply end as the target temperature of the segment has been reached.

If any further explanation or clarifications are needed, or for any suggestions offered, see the [Contact Theta](#) section of the help file.