

## HOW DO LIMIT AND ALARM STATEMENTS WORK IN VERSION 3.5 RECIPES?

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Included is a sample recipe that illustrates the two options for abnormal process detection.

### MAIN PROGRAM

#### LIMIT / ALARM STATEMENT TEST

1	G	0180	Set Temp. Limit to 1400, 93 alarm
2	C	0085	*Set Carbon to 0.85%
3	H	1650	*Set furnace temperature to 1650 deg. F
4	S	00:01	Let temperature at to set point
5	h	1650	*Test Temp for setpoint.
6	b	08.07	If yes start soak no alarm 10
7	A	0010	Did not get to set point
8	C	0081	Set carbon to .81%
9	S	00:01	Let carbon get to set point
10	c	0080	*Is carbon above 0.80% ?
11	b	13.12	If not branch to step 12 otherwise step 13
12	A	0020	Sound alarm if carbon is not up.
13	S	04:00	*Soak period 2 for 4 hours.
14	C	0110	Set carbon to 1.10

#### BATCH SUBROUTINE 180

1	h	1400	Is Temp back up to 1400?
2	L	00:01	Limit Max time to reach 1400. PAL 93 if exceeded.

The above program starts by going to subroutine 180. This subprogram tests to see if the temperature has been achieved within one minute. If the temperature has not been reached within the time specified, an alarm 93 "Recipe Limit Timeout" occurs. If the operator acknowledges the alarm by pressing the instrument ENTER key, the limit time is reset and starts to test the temperature conditions again. THE RECIPE WILL NOT CONTINUE UNTIL THE CONDITION IS MET. The alarm will continue to appear each time the limit times out. The only way to bypass this program step without reaching the temperature is to bypass the LIMIT step manually in the recipe control menu. Using this opcode will guarantee firm corrective action for a process fault before anything else happens in the recipe.

The other example of a test condition option is shown in the main program, steps 3-7. Here the temperature set point is set to 1650. A one-minute soak to set to allow the furnace to get to temperature. A temperature test is done to see if the temperature is at 1650 or greater. If the temperature is less than 1650, Alarm 10 is sounded. If the operator responds to this alarm by pressing the ENTER key on the instrument, the recipe will continue to the next step even if the temperature has not reached set point.

The choice of which fault detection to use is based on the responsibility of the operator, risk of running the part at a lower temperature than required, and operator response time to alarms.