Boiler control

Monitor outside air temperature to control boiler Setpoint

This white paper discusses an application where the temperature of a boiler is controlled by referencing the outside air temperature. As the air temperature outside decreases, the boiler Setpoint is automatically increased.

Theory of operation and tuning:

This application will use the Series 988 control running in cascade control. When the outside temperature is 60 degrees or above the boiler will run at 120 degrees. As the outside temperature decreases to -20 degrees the boiler will increase to 180 degrees. This can be accomplished with cascade control running Proportional only control on the outer loop to calculate a Setpoint for the boiler and using PID control on the inner loop to control the boiler temperature.

The Setpoint is set at 60 degrees to establish the upper outside temperature.

Components of the system:

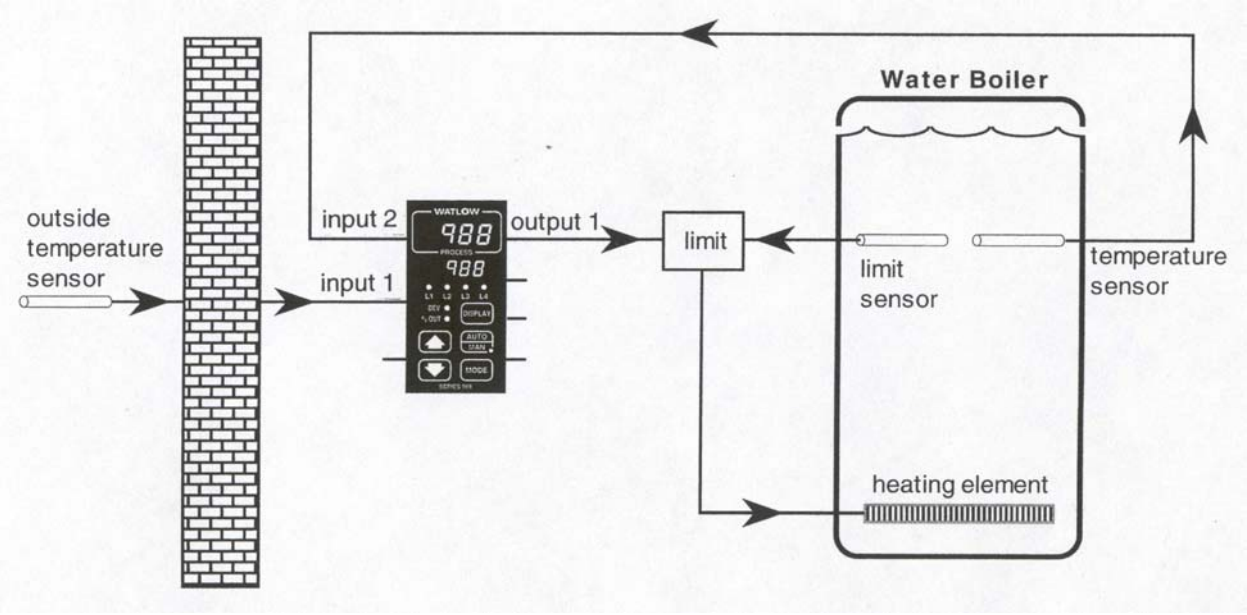
Control is: 988B-11CA-AARG
Power switching devices: Din-a-mites with DC inputs.
Immersion heaters will be used to heat the water in the boiler.

For applications with gas burners and modulating gas valves, change the control outputs to “F” 4 to 20 mA.

Tuning the System

The PID A outer loop will need to be manually set from the calculations for outside temperature range. The Proportional Band for “PID A” will be set for the temperature range of the outside temperature, 60 degrees to -20 degrees equals a temperature range of 80 degrease. No Reset or Rate action should be used.
Set: PB1 A = 80, rE1 A = 0.00 and rA1 A = 0.00

The PID B inner loop should be Auto-tuned and run under PID control.



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Setup for Series 988 control

Input
In 1 = K
rL 1 = 60
rH 1 = 60
Cal 1 = 0
Ftr 1 = 0
In 2 = K
rL 2 = 120
rH 2 = 180
CAL 2 = 0
Ftr 2 = 0

Output 1
Out 1 = Heat

Global
C_F = *F
Fail = bPLS
Err = nLAt
CntL = CSCd
CSAC = dir
Eil = no
Anun = on
LoP = 0
HiP = 100
AtSP = 90
rP = Off

Operations menu

System
Aut = Off

Pid 1
Pb 1A = 80
rE 1A = 0.00
rA 1A = 0.00

Pid 2
Auto-tune after setting up PID A.

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