USER GUIDE

MAN0143 rev 4

CXpro^{HD} Macro Library

Style conventions used in this document:

UI Text: Text that represents elements of the UI such as button names, menu options etc. is presented with a grey background and border, in Tahoma font which is traditionally used in Windows UIs. For example:

`Ok`

Standard Terms (Jargon): Text that is not English Language but instead refers to industry standard concepts such as Strategy, BACnet, or Analog Input is represents in slightly condensed font. For example:

BACnet

Code: Text that represents File paths, Code snippets or text file configuration settings is presented in fixed-width font, with a grey background and border. For example:

```
$config_file = c:\CYLON\settings\config.txt
```

Parameter values: Text that represents values to be entered into UI fields or displayed in dialogs is represented in fixed-width font with a shaded background. For example

`10°C`

Product Names: Text that represents a product name is represented in bold colored text. For example

INTEGRA™

Company Brand names: Brands that are not product names are represented by bold slightly compressed text:

ABB Active Energy

PC Keyboard keys: Text representing an instruction to press a particular key on the keyboard is enclosed in square brackets and in bold font. For example:

[Ctrl]+[1]

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1 Introduction

WHAT ARE CXPRO^{HD} MACROS?

A macro is a combination of modules used in **CXpro^{HD}** that can be saved and subsequently inserted into another strategy when required.

If there are parts of a strategy that you use frequently or if you have a special strategy which involves a lot of repetition, then it is quicker to use a macro than to continuously rewrite one piece of strategy. Eu

WHAT IS THE CXPRO^{HD} MACRO LIBRARY?

This **Macro Library** consists of macros representing standard strategy applications. Each represents a piece of strategy that controls a particular piece of equipment, or causes specific behaviour within a set of equipment. The following macros are included:

ACCESSING THE MACRO LIBRARY

The Macro Library is installed as part of the main **CXpro^HD** install.

The macros can be easily accessed by selecting the button representing the macro required from the Macro bar at the bottom of the **CXpro^HD** screen and then clicking over the part of the canvas where the macro is to be placed. To view the function components of the macro click inside it with the right-hand mouse button.

Information about each macro is also available within the **Engineering Tool**. To access this, double-click the button of the desired macro on the bar at the bottom of the screen. This will open a text file with explanations and an example for the macro.

Real constants, Digital constants and Integers can be changed inside the macro, as can function-block variables, such as integration time in a PID loop. However, point numbers should not be changed or adjusted as the macro always takes the next available point and block numbers automatically.

2 Macro Library

SINGLE PLANT CONTROL

SYSTEM OVERVIEW

This module can be used to control any single plant set such as a pump or fan.

Inputs

Flow	Flw
Trip	Trip
Pressure	PR
Pressure SP	PRSP
Reset	RS
Maintenance RS	MRS
Override	OR
Demand OR Value	DMOR
Emergency OR	EOR
Enable	En

Internal

Values

Plant Status	0 ··· 15
Run Time	(hours)

Settings

Fault Select	0 ··· 7
DPS Fault Monitor	0 ··· 1
Fault Monitor Delay	2 ··· 300 s
Fault Delay	2 ··· 60 s
Stop On Alarm	0 ··· 2
Pressure Mismatch	0 ··· 500 Pa
Plant Start Delay	0 ··· 120 s
Min Off Time	0 ··· 120 s
Maintenance Limit	0 ··· 10,000 hours
Run On Time	0 ··· 900 s
PI Gain	0.01 ··· 10
PI Integral	0 ··· 900 s
Maximum Demand	Min Demand ··· 100%
Minimum Demand	0% ··· Max Demand
Soft Start Delay	0 ··· 120 s
Emergency State	Off : On

Alarms

Trip	Trip : Normal
DPS Fault	Flow Fail : Normal
Pressure Mismatch	Failed : Normal
Maintenance	Limit : Normal

Outputs

En	Enable
Dmd	Demand
CF	Common Fault

SYSTEM OBJECT DESCRIPTION

Hardware inputs

Object	Comments	Object options
Flow Flw	Status of a DPS monitoring the flow of the system.	0. Not used 1. Monitor flow only 2. Monitor flow and no flow
Trip Trip	Trip status of the starter for the plant.	0. Not used 1. Monitor
Pressure PR	Measurement of the static pressure in the system.	0. Not used 1. Monitor
Pressure SP PRSP	The demand of the system will be modulated to achieve this setpoint.	0. Not Required 1. Required.
Reset RS	Set to Hi to clear any active alarms.	Required if Fault Select is not 0
Maintenance reset MRS	Set to Hi to clear an active Maintenance alarm.	Required if a maintenance alarm is required.
Override OR	Operator override. Options 0 and 4 the system will follow the enable input. Options 2 and 6 the system will operate 24/7 but stop if set to when in alarm. Options 3 and 7 the system will run 24/7 and will ignore all alarms. Options 0-3 the demand will be in automatic control. Options 4-7 the demand will be set by the operator and the mismatch alarm will be disabled.	0. Auto 1. System always off 2. System always on (Except if Alarm) 3. System always on (Ignore Alarms) 4. Auto with Demand override 5. System always Off 6. System always on with demand override (Except if Alarm) 7. System always on (Ignore Alarms) with demand override.
Demand Override Value DMOR	This is the value the demand will be set to when it is overridden and the plant is enabled.	0 … 100%
Emergency OR EOR	Option 0 plant will be in auto. Option 1 the plant will be off. Option 2 the plant will be on. Option 3 the plant will be in the state of set by EORS. This will take precedence over all other demands.	0. Auto 1. Off 2. On 3. Set to value of EORS
Enable EN	When active (on) the plant will run if no alarms or overrides at active.	1. Required

Outputs

Object	Comments	Object options
Enable EN	Set active to run the plant	1. Required
Demand DM	Set to the required demand to meet the pressure setpoint.	0. Not required. 1. Required.
Common Fault CF	Will be set if any fault either a DPS, Trip or pressure fault is active.	0. Not Used 1. Used

Internal Settings

Object	Comments	Object options
Fault Select (1)	Used to select which inputs are used to control plant changeover on fault.	0. None 1. DPS Only 2. Trip Only 3. DPS + Trip 4. Pressure Mismatch 5. DPS + Pressure Mismatch 6. Trip + Pressure Mismatch 7. DPS + Trip + Pressure Mismatch
DPS Fault Monitor (0)	Used to select if the flow is monitored for fault when the plant is in standby.	0. Run Only 1. Run and Standby
Fault Monitor Delay (20)	When the plant starts all faults will be ignored for this time.	0 ⋯ 300 Seconds
Fault Delay (10)	If flow is monitored and a mismatch between the plant enable and flow status, then a flow failed alarm will be raised. If pressure is monitored and a mismatch between the pressure and pressure setpoint +/- the "Pressure Mismatch Deviation" then a Pressure Mismatch alarm will be raised.	0 ⋯ 60 Seconds
Stop on Fault (0)	Selects if a plant item should run if in fault.	0. Yes 1. No-Standby plant continues to run 2. No–Plant is continuous retried.
Max Pressure Error (100)	The amount the pressure has to deviate from the setpoint for an alarm to be raised.	50 ⋯ 200 Pa
Start Delay (10)	When the system is call to run the plant will be delayed by the time. Used for load sequencing.	0 ⋯ 60 Seconds
Minimum off Delay (30)	Time delay between the plant stopping and being allowed to run again.	0 ⋯ 120 Seconds
Maintenance Limit (5000)	The number of hours the plant has run before a maintained alarm is raised.	0 ⋯ 10,000 hours
Run On Time (120)	Time in seconds the plant will run for after the enable signal has gone to Off	0 ⋯ 1200 Seconds
Emergency State (Off)	The state the plant will be set when a emergency state of 3 is set.	Off: On
Gain (0.1)	The gain for demand PI loop	0.01 ⋯ 10
Integral (0)	The integral for the demand PI loop	0 ⋯ 900 Seconds
PI Deadband	The dead band for the demand PI loop	0 ⋯ 200
Soft Start Delay (30)	The minimum time taken for the loop to maximum when the system starts.	0 ⋯ 120 Seconds
Min Speed	The minimum demand the plant item to be allowed to run.	0% ⋯ Max Demand
Max Speed	The maximum demand the plant item to be allowed to run.	Min Demand ⋯ 100%

Internal Values

Object	Comments	Object options
Status	This will indicate the status of plant item. With a controlled override the plant will still follow the fault criteria. With a permanent override the plant will ignore the fault criteria and remain in the selected state.	0. Auto - Off 1. Auto - On 2. Auto – Off – Fault 3. Auto – On – Fault 4. Controlled Override – Off 5. Controlled Override – On 6. Controlled Override – Off – Fault 7. Controlled Override – On – Fault 8. Permanent Override – Off 9. Permanent Override – On 10. Permanent Override – Off – Fault 11, Permanent Override – On – Fault 16. Auto – Off With Demand OR 17. Auto – On With Demand OR 18. Contrl OR – Off With Demand OR. 19. Contrl OR – On With Demand OR. 18. Contrl OR – Off Demand OR - Fault. 19. Contrl OR – On Demand OR - Fault. 20. Permt OR – Off With Demand OR. 21. Permt OR – On With Demand OR. 22. Permt OR – Off Demand OR - Fault. 23. Permt OR – On Demand OR - Fault.
Runtime (RT)	Time the plant has run since last maintenance reset.	0. Not Used 1. Used
Minimum off Time	Time delay between the plant stopping and being allowed to run again.	0 ⋯ 120 Seconds

Alarms

Object	Comments	Object options
DPS Fault	Will alarm if DPS Fault is selected via the fault select and there is a mismatch between the run status and the DPS.	0. Not Used 1. Used
Trip	Will alarm if Trip is selected via the fault select and the trip input goes high.	0. Not Used 1. Used
Pressure Mismatch	Will alarm if Pressure Fault is selected via the fault select and there is a mismatch between required pressure and the pressure sensor.	0. Not Used 1. Used
Maintenance Alarm	Active when the plant runtime as exceeded the maintenance limit.	0. Not Used 1. Used

TWIN PLANT CONTROL

SYSTEM OVERVIEW

This module can be used to control any twin plant set such as a pump set or twin fans.

Inputs

Flow 1	Flw1
Trip 1	Trp1
Flow 2	Flw2
Trip 2	Trp2
Pressure	PR
Pressure SP	PRSP
Reset	RS
Maintenance RS 1	MRS1
Maintenance RS 2	MRS2
Lead	Lead
Override	OR
Demand OR Value	DMOR
Emergency OR	EOR
Enable	En

Internal

Values

Plant Status 1	0 ··· 15
Run Time 1	(hours)
Plant Status 2	0 ··· 15
Run Time 2	(hours)

Settings

Fault Select	0 ··· 7
Fault Monitor	0 ··· 1
Fault Monitor Delay	2 ··· 300 s
Fault Delay	2 ··· 60 s
Stop On Alarm	0 ··· 2
Pressure Mismatch	0 ··· 500 Pa
Plant Start Delay	0 ··· 120 s
Min Stop Time	0 ··· 120 s
Maintenance Limit	0 ··· 10,000 hours
Run On Time	0 ··· 900 s
PI Gain	0.01 ··· 10
PI Integral	0 ··· 900 s
Maximum Demand	Min Demand ··· 100%
Minimum Demand	0% ··· Max Demand
Soft Start Delay	0 ··· 120 s
Emergency State	Off : On
Lead Changeover	0 ··· 3
Time Of Day Change Day	Monday-Sunday
Time Of Day Change Hour	0 ··· 23 hours
Hours Run Changeover	0 ··· 10000 hours
Changeover Time	0 ··· 120 s

Alarms

Trip 1	Trip : Normal
DPS Fault 1	Flow Fail : Normal
Pressure Mismatch 1	Failed : Normal
Maintenance 1	Limit : Normal
Trip 2	Trip : Normal
DPS Fault 2	Flow Fail : Normal
Pressure Mismatch 2	Failed : Normal
Maintenance 2	Limit : Normal

Outputs

En1	Enable 1
Dmd1	Demand 1
En2	Enable 2
Dmd2	Demand 2
CF1	Common Fault 1
CF2	Common Fault 2

SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
Flow 1 Flw1	Status of a DPS monitoring the flow of plant item 1.	0. Not used 1. Monitor flow only 2. Monitor flow and no flow
Trip 1 Trp1	Trip status of the starter for the plant item 1.	0. Not used 1. Monitor
Flow 2 Flw2	Status of a DPS monitoring the flow of plant item 2.	0. Not used 1. Monitor flow only 2. Monitor flow and no flow
Trip 2 Trp2	Trip status of the starter for the plant item 2.	0. Not used 1. Monitor
Pressure PR	Measurement of the static pressure in the system.	0. Not used 1. Monitor
Pressure SP PRSP	The demand of the system will be modulated to achieve this setpoint.	0. Not Required 1. Required.
Reset RS	Set to Hi to clear any active alarms.	Required if Fault Select is not 0
Maintenance reset MRS1	Set to Hi to clear an active maintenance alarm.	Required if a maintenance alarm is required.
Maintenance reset MRS2	Set to Hi to clear an active maintenance alarm.	Required if a maintenance alarm is required.
Lead LC Lead	Setting this object to 0 the system will automatically select the lead plant. When set to 1 or 2 the lead plant will be fixed and the plant will still operate as a duty/standby system. When set to 3 or 4 only the selected plant will run.	0. Auto 1. Pump 1 lead 2. Pump 2 lead 3. Pump 1 only 4. Pump 2 only
Override OR	Operator override. Options 0 and 4 the system will follow the enable input. Options 2 and 6 the system will operate 24/7 but stop if set to when in alarm. Options 3 and 7 the system will run 24/7 and will ignore all alarms. Options 0-3 the demand will be in automatic control. Options 4-7 the demand will be set by the operator and the mismatch alarm will be disabled.	0. Auto 1. System always off 2. System always on (Except if Alarm) 3. System always on (Ignore Alarms) 4. Auto with Demand override 5. System always Off 6. System always on with demand override (Except if Alarm) 7. System always on (Ignore Alarms) with demand override.
Demand Override Value DMOR	This is the value the demand will be set to when it is overridden and the plant is enabled.	Not Required
Emergency OR EOR	Option 0 plant will be in auto. Option 1 the plant will be off. Option 2 the plant will be on. Option 3 the plant will be in the state of set by EORS. This will take precedence over all other demands.	0. Auto 1. Off 2. On 3. Set to value of EORS
Enable En	When active (on) the plant will run if no alarms or overrides at active.	Required

Outputs

Object	Comments	Object options
Enable 1 EN1	Set active to run the plant item 1	Required
Demand 1 DM1	Set to the required demand of plant item 1 to meet the pressure setpoint.	0: Not required. 1: Required.
Enable 2 EN2	Set active to run the plant item 2	Required
Demand 2 DM2	Set to the required demand of plant item 2 to meet the pressure setpoint.	0: Not required. 1: Required.
Common Fault 1 CF1	Will be set if any fault either a DPS, Trip or pressure fault is active.	0: Not Used 1: Used
Common Fault 2 CF2	Will be set if any fault either a DPS, Trip or pressure fault is active.	0: Not Used 1: Used

Internal settings

Object	Comments	Object options
Fault Select (1)	Used to select which inputs are used to control plant changeover on fault.	0. None 1. DPS Only 2. Trip Only 3. DPS + Trip 4. Pressure Mismatch 5. DPS + Pressure Mismatch 6. Trip + Pressure Mismatch 7. DPS + Trip + Pressure Mismatch
DPS Fault Monitor (0)	Used to select if the flow is monitored for fault when the plant is in standby.	0. Run Only 1. Run and Standby
Fault Monitor Delay (20)	When the plant starts all faults will be ignored for this time.	0 ⋯ 300 Seconds
Fault Delay (10)	If flow is monitored and a mismatch between the plant enable and flow status, then a flow failed alarm will be raised. If pressure is monitored and a mismatch between the pressure and pressure setpoint +/- the “Pressure Mismatch Deviation” then a pressure mismatch alarm will be raised.	0 ⋯ 60 Seconds
Stop on Fault (0)	Selects if a plant item should run if in alarm.	0. Yes 1. No-Standby plant continues to run 2. No–Plant is continuous retried.
Max Pressure Error (100)	The amount the pressure has to deviate from the setpoint for an alarm to be raised.	50 ⋯ 200 a
Start Delay (5)	When the system is call to run the plant will be delayed by the time. Used for load sequencing.	0 ⋯ 60 s
Minimum off Delay (120)	Time delay between the plant stopping and being allowed to run again.	0 ⋯ 120 s

Maintenance Limit (5000)	The number of hours the plant has run before a maintained alarm is raised.	0 ⋯ 10,000 hours
Run On Time (120)	Time in seconds the plant will run for after the enable signal has go to Off	0 ⋯ 1200 s
Emergency State (Off)	The state the plant will be set when an emergency state of 3 is set.	Off: On
Gain (0.1)	The gain for demand PI loop	0.01 ⋯ 10
Integral (120)	The integral for the demand PI loop	0 ⋯ 900 s
PI Deadband	The dead band for the demand PI loop	0 ⋯ 200
Soft Start Delay (30)	The minimum time taken for the loop to maximum when the system starts.	0 ⋯ 120 s
Min Speed (0)	The minimum demand the plant item to be allowed to run.	0% ⋯ Max Demand
Max Speed (100)	The maximum demand the plant item to be allowed to run.	Min Demand ⋯ 100%
Changeover Mode (0)	This specifies when the lead plant should be changed on "Time Of Day" or "Hours Run". With options 0 and 1 the plant lead will change immediate if the plant is running or not. With options 2 and 3 the system will not change the lead plant until next system start or reset.	0. Time Of Day - Immediate 1. Hours Run - Immediate 2. Time Of Day – Next Start 3. Hours Hour – Next Start
Time Of Day "Day of Week" (Sunday On)	These seven set points are used to select the day of the week to which the plant will be automatically rotated if "Time Of Day" is selected.	1. Monday 2. Tuesday 3. Wednesday 4. Thursday 5. Friday 6. Saturday 7. Sunday
Changeover Hour (2)	This specifies the hour of day which the plant will be automatically rotated if "Time Of Day" is selected.	0 ⋯ 23 hours
Run Hour Changeover (100)	This specifies the time the lead plant will run before it is automatically rotated if "Hours Run" is selected.	0 ⋯ 1000 hours
System start delay (10)	This specifies the delay before the lead plant will start when the system is first started.	0 ⋯ 120 s

Internal Values

Object	Comments	Object options
Status Item 1 **Status Item 2**	This will indicate the status of plant item. With a controlled override the plant will still follow the fault criteria. With a permanent override the plant will ignore the fault criteria and remain in the selected state.	0: Auto - Off 1: Auto - On 2: Auto – Off - Fault 3: Auto – On - Fault 4: Controlled Override – Off 5: Controlled Override – On 6: Controlled Override – Off – Fault 7: Controlled Override – On – Fault 8: Permanent Override – Off 9: Permanent Override – On 10: Permanent Override – Off – Fault 11: Permanent Override – On – Fault 16: Auto – Off With Demand OR 17: Auto – On With Demand OR 18: Contrl OR – Off With Demand OR. 19: Contrl OR – On With Demand OR. 18: Contrl OR – Off Demand OR – Fault. 19: Contrl OR – On Demand OR – Fault. 20: Permt OR – Off With Demand OR. 21: Permt OR – On With Demand OR. 22: Permt OR – Off Demand OR – Fault. 23: Permt OR – On Demand OR – Fault.
Runtime 1 (RT 1) **Runtime 2 (RT 2)**	Time the plant item has run since last maintenance reset.	0: Not Used 1: Used
Minimum off Time	Time delay between the plant stopping and being allowed to run again.	0 ⋯ 120 Seconds

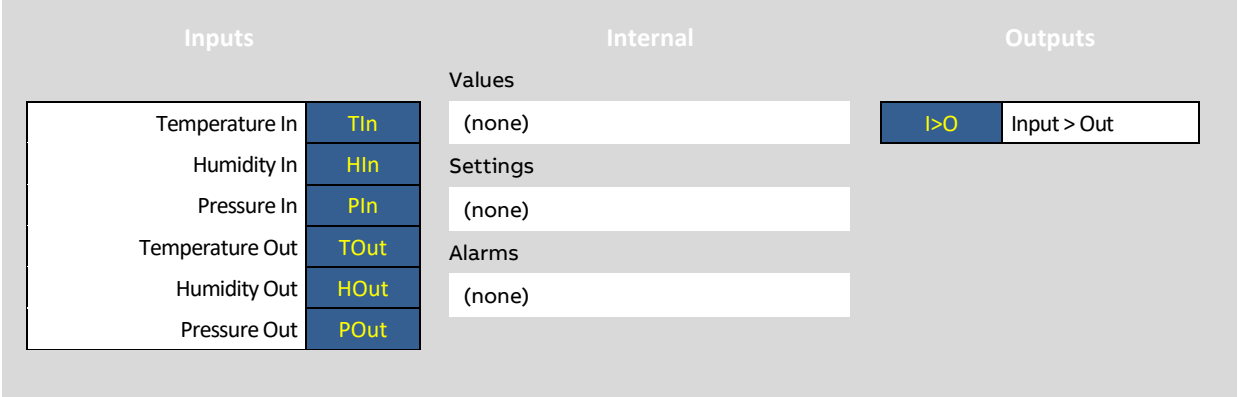
Alarms

Object	Comments	Object options
DPS Fault 1	Will alarm if DPS Fault is selected via the fault select and there is a mismatch between the run status and the DPS.	0: Not Used 1: Used
Trip 1	Will alarm if Trip is selected via the fault select and the trip input goes high.	0: Not Used 1: Used
Pressure Mismatch 1	Will alarm if Pressure Fault is selected via the fault select and there is a mismatch between required pressure and the pressure sensor.	0: Not Used 1: Used
Maintenance Alarm 1	Active when the plant runtime as exceeded the maintenance limit.	0: Not Used 1: Used
DPS Fault 2	Will alarm if DPS Fault is selected via the fault select and there is a mismatch between the run status and the DPS.	0: Not Used 1: Used
Trip 2	Will alarm if Trip is selected via the fault select and the trip input goes high.	0: Not Used 1: Used
Pressure Mismatch 2	Will alarm if Pressure Fault is selected via the fault select and there is a mismatch between required pressure and the pressure sensor.	0: Not Used 1: Used
Maintenance Alarm 2	Active when the plant runtime as exceeded the maintenance limit.	0: Not Used 1: Used

ENTHALPY DIFFERENCE

SYSTEM OVERVIEW

This module will indicate if the enthalpy or temperature is greater for the input or the output.



SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
Temperature In TIn	System temperature sensor input.	Required
Humidity In HIn	System humidity sensor input. If only temperature difference is required then this is not required.	Not required
Pressure In PIn	System pressure sensor input. Will only be required if there is significant differences between the input and out pressures.	Not required
Temperature Out TOut	System temperature sensor output.	Required
Humidity Out HOut	System humidity sensor out. If only temperature difference is required then this is not required.	Not required
Pressure Out POut	System pressure sensor out. Will only be required if there is significant differences between the input and out pressures.	Not required

Outputs

Object	Comments	Object options
Input greater than output I > O	The out will go high if the system input enthalpy goes higher that the system out enthalpy for 60 seconds. It will go low if the system input enthalpy goes lower that the system out enthalpy for 60 seconds	Required

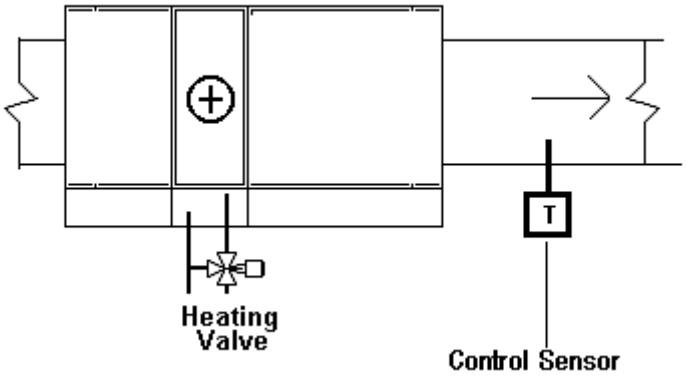
HEATING CONTROL

SYSTEM OVERVIEW

This macro calculates the heating load based on the temperature input. The output range is 0 to +100. The heating load is found by comparing the temperature input with the heating setpoint using a PID loop. The heating PID gain is set at 8. The heating PID is enabled through the enable input. When the override input is on (1), the output is set at the override value of 100. The override replaces the PID loop

output with the override value. The PID does not have to be enabled for this point to work. The override may be used for heating boost or frost protection.

AHU with single stage heating.



Inputs		Internal		Outputs	
		Values			
Setpoint	SP	(none)		Out	Demand %
Temperature	Tmp	Settings			
Override	Ovr	Heating Integral Time	0		
Enable	Enb	Heating Derivative Time	0		
		Heating Gain	8		
		Alarms			
		(none)			

SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
Setpoint SP	Temperature setpoint.	Required
Temperature Tmp	Input point that is monitored.	Required
Override Ovr	When override is on (1) the heating load output is 100%, otherwise heating load takes the PID output	
Enable Enb	Input must be on (1) for macro to calculate load.	Required

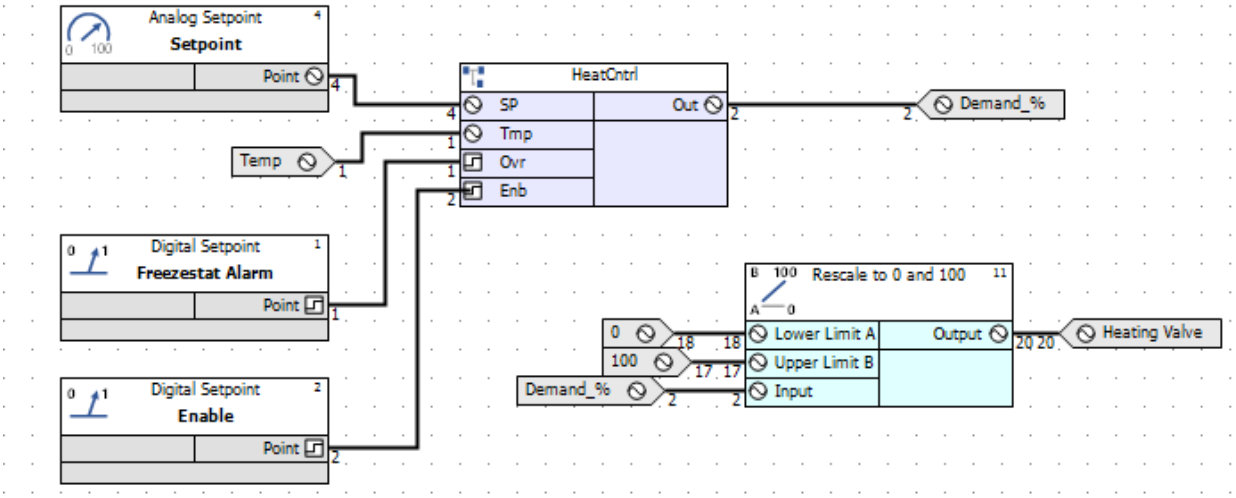
Outputs

Object	Comments	Object options
Out Out	Calculated heating load. 0 = No heating +100 = Full heating	Required

Internal Settings

Object	Comments	Object options
Heating Gain	Adjustable proportional gain to adjust heating PID loop	8

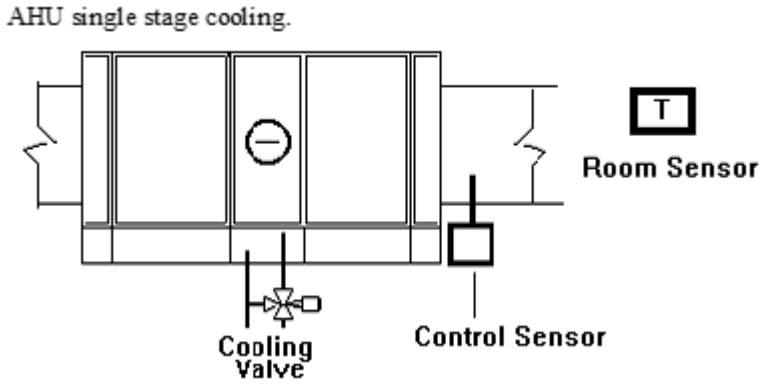
Example



COOLING CONTROL

SYSTEM OVERVIEW

This macro calculates the cooling load based on the temperature input. The output range is 0 to +100. The cooling load is found by comparing the temperature input with the cooling setpoint using a PID loop. The Cooling PID gain is set at 8. The cooling PID is enabled through the enable input. When the override input is on (1), the output is set at the override value of 100. The override replaces the PID loop output with the override value. The PID does not have to be enabled for this point to work. The override may be used for cooling boost.



Inputs

Setpoint	SP
Temperature	Tmp
Override	Ovr
Enable	Enb

Internal

Values

(none)

Settings

Cooling Integral Time	0
Cooling Derivative Time	0
Cooling Gain	8

Alarms

(none)

Outputs

Out	Demand %

SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
Setpoint SP	Temperature setpoint.	Required
Temperature Tmp	Input point that is monitored.	Required
Override Ovr	When override is on (1) the Cooling load output is 100%, otherwise Cooling load takes the PID output	
Enable Enb	Input must be on (1) for macro to calculate load.	Required

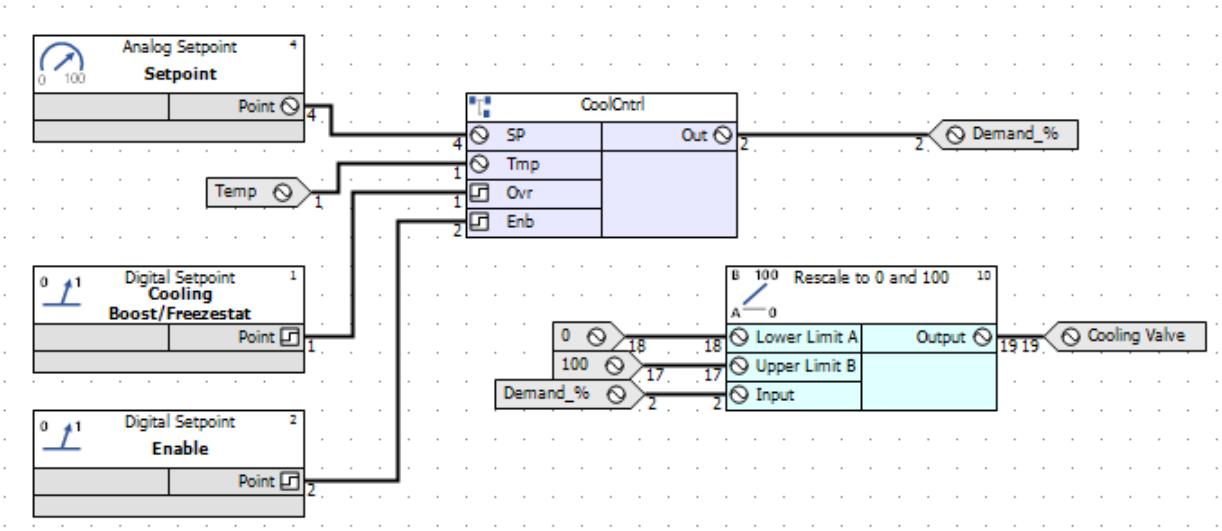
Outputs

Object	Comments	Object options
Out Out	Calculated Cooling load. 0 = No Cooling +100 = Full Cooling	Required

Internal Settings

Object	Comments	Object options
Cooling Gain	Adjustable proportional gain to adjust Cooling PID loop	8

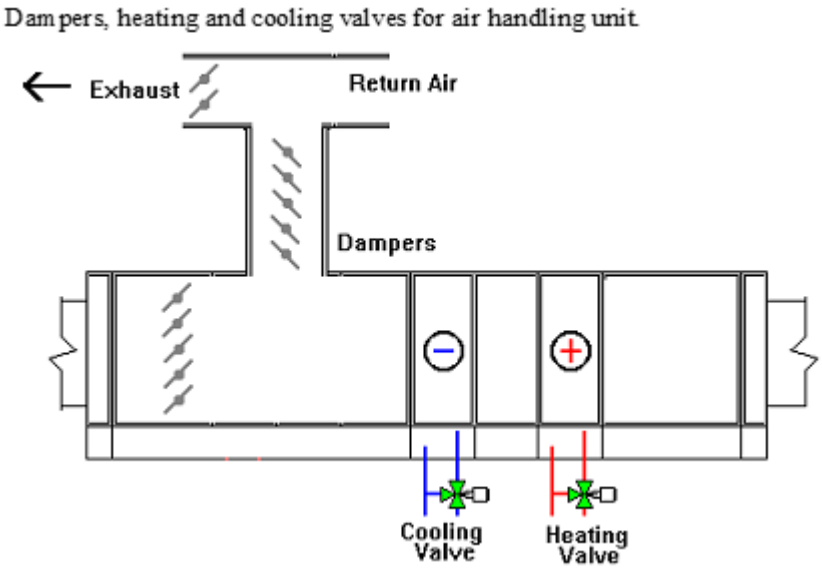
Example



HEATING AND COOLING CONTROL

SYSTEM OVERVIEW

This macro takes the heating-cooling load output from the Heating and Cooling Demand macro and stages the heating valve, damper and cooling valve. The valid input range is from -100 to +100. All outputs are linear. The heating valve operating range is set from +30 (0% open) to +100 (100% open). The damper operating range is set from +30 (0% open) to -30 (100% open). The cooling valve operating range is set from -30 (0% open) to -100 (100% open). These values may be changed in the macro if desired. The heating valve is set to 100% open when the override is enabled. The cooling valve is set to 100% open when the override is enabled. The damper is set to 0% open when the override is enabled. The damper has a minimum position set through the minimum position input. When the minimum position is set to a value greater than 0% the input from the heating cooling load macro is rescaled to the range between this value and 100%. If the input is 0% and the minimum position is 15% the output to the damper is 57%.5 which is 50% of the 15 to 100 range.



Inputs

Input PID Signal	Sig
Min OA Damper Position	Min
Override Heat	OvrH
Override Cool	OvrC
Override Damper	OvrD

Internal

Values

(none)

Settings

Cooling Range	-30 to -100
Heating Range	30 to 100
Damper Range	30 to -30

Alarms

(none)

Outputs

HOut	Heating Valve Signal
COut	Cooling Valve Signal
DOut	Damper Signal

SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
Signal SP	Calculated heating/cooling load. Range is from -100 to +100.	Required
Min OA Damper Position Tmp	Minimum output to the damper	Required
Override Heat Ovr	When this value is on(1) heating valve is set to override position	
Override Cool Enb	When this value is on(1) cooling valve is set to override position	
Override Damper	When this value is on(1) damper is set to override position	

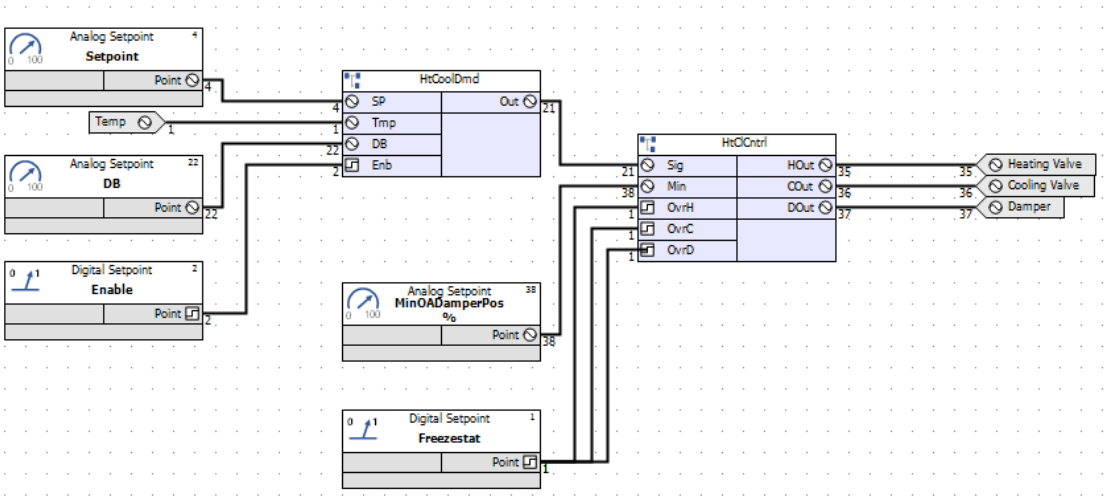
Outputs

Object	Comments	Object options
Heating Valve Out	Commanded heating valve position.	Required
Cooling Valve	Commanded cooling valve position	Required
Damper	Commanded damper position	Required

Internal Settings

Object	Comments	Object options
Cooling Range	Range of Cooling valve signal	-30 to -100
Heating Range	Range of Heating valve signal	30 to 100
Damper Range	Range of Damper signal	30 to -30

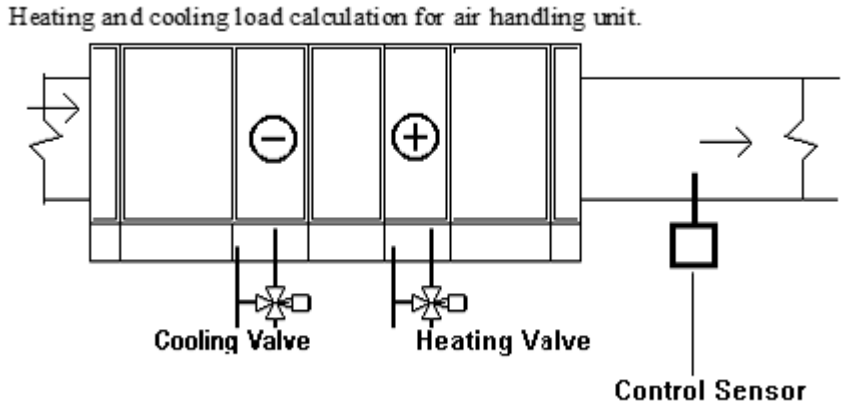
Example



HEATING AND COOLING DEMAND WITH DEADBAND

SYSTEM OVERVIEW

This macro calculates the combined heating and cooling load based on the temperature input. The combined heating and cooling load is determined by subtracting the cooling load from the heating load. The output range is -100 to +100. The heating load is found by comparing the temperature input with the heating setpoint using a PID loop. The cooling load is found by comparing the temperature input with the cooling setpoint using a PID loop. The cooling setpoint is calculated by adding the dead band to the heating setpoint. The enable point must be set “on” for the macro to function, otherwise, the output will be 0.



Inputs

Setpoint	SP
Temperature	Tmp
Dead band	DB
Enable	Enb

Internal

Values

(none)

Settings

Heating Integral Time	0
Heating Derivative Time	0
Heating Gain	8
Cooling Integral Time	0
Cooling Derivative Time	0
Cooling Gain	8

Alarms

(none)

Outputs

Out	Demand %

SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
Setpoint SP	Temperature setpoint.	Required
Temperature Tmp	Input point that is monitored.	Required
Dead band DB	Degrees F above heating setpoint when there is no cooling.	Required
Enable Enb	Input must be on (1) for macro to calculate combined load.	Required

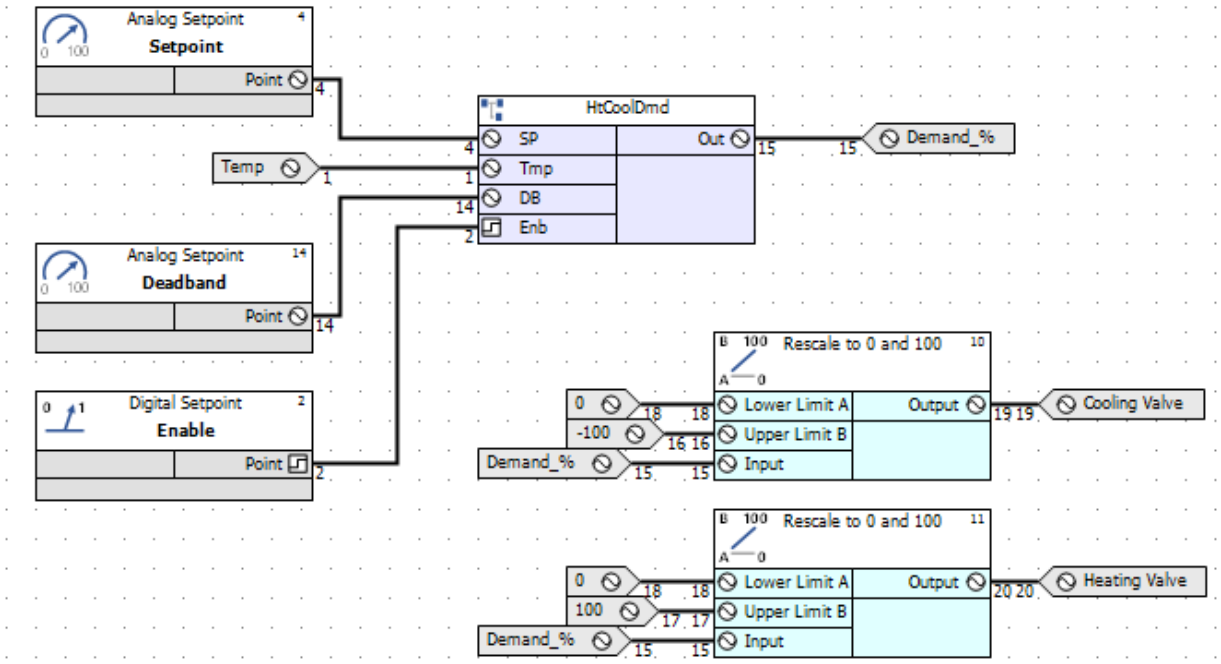
Outputs

Object	Comments	Object options
Out Out	Calculated combined heating and cooling load. -100 = Full cooling 0 = No heating or cooling +100 = Full heating	Required

Internal Settings

Object	Comments	Object options
Cooling Gain	Adjustable proportional gain to adjust cooling PID loop	8
Heating Gain	Adjustable proportional gain to adjust heating PID loop	8

Example



HWS CONTROL

SYSTEM OVERVIEW

This module will control a HWS system. It can have up to 3 temperature sensors, a de-stratification pump and analogue and digital valve.

Inputs

High Level Temp	HTmp
Mid-Level Temp	MTmp
Low Level Temp	LTmp
High Limit Stat	HiLS
Setpoint	SP
Deadband	DB
Destrat Deadband	DSDB
Legionella Start	LStr
Legionella Stop	LStp
Enable	En

Internal

Values

(none)

Settings

Legionella run time	0 ⋯ 120 mins
Legionella Setpoint	70 °C ⋯ 90 °C (18 °F ⋯ 194 °F)
Loop P	2 °C ⋯ 10 ° C (36 °F ⋯ 10 °F)
Loop I	0 ⋯ 300 s

Alarms

High Limit	High Normal
Legionella Failed	Failed Normal

Outputs

AVlv	Analogue Valve
DVlv	Digital Valve
DPmp	Destrat Pump

SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
High Level Temp HTmp	HWS tank high level temperature.	This input must be connected to a temperature sensor. If not present then it should be connected to the low or mid sensor.
Mid-Level Temp MTmp	HWS tank Mid-level temperature.	This input must be connected to a temperature sensor. If not present then it should be connected to the low or high sensor.
Low Level Temp LTmp	HWS tank Low level temperature.	This input must be connected to a temperature sensor. If not present then it should be connected to the high or mid sensor.
Hi Limit stat HiLS	High limit thermostat	Not required.
Setpoint SP	The required temperature of the hot water.	Required
Deadband DB	The deadband that is allowed for the hot water to deviate from the setpoint.	0 °C ⋯ 5 °C (0 °F ⋯ 9 °F)
Destrat deadband DSDB	The difference in temperature between any of the temperature sensors allowed before the destrat pump will be enabled.	2 °C ⋯ 5 °C (4 °F ⋯ 9 °F)
Legionella Start LStr	Pulsed to start the Legionella cycle. This will only start if the system is disabled. The cycle will be stopped the system enable signal goes on.	Not required.
Legionella Stop LStp	Pulsed to stop the Legionella cycle.	Not required.
Enable En	Enable HWS control.	Required.

Outputs

Object	Comments	Object options
Analogue valve AVlv	The demand for an analogue valve.	Not required.
Digital valve DVlv	The demand for a digital valve.	Not required
Destrat pump Pmp	Enable signal for a de-stratification pump.	Not required.

Internal settings

Object	Comments	Object options
Legionella Run Time (60)	The time the HWS will be maintained at the Legionella setpoint for.	0 ⋯ 120 mins
Legionella Setpoint (80)	The setpoint for the Legionella control. The water in the calorifier will be maintained at this temperature for the time defined by the Legionella run time.	60 °C ⋯ 80 °C (140 °F ⋯ 176 °F)
Loop P (4)	PI Loop proportional value	Required
Loop I (120)	PI Loop integral value	Not Required

Alarms

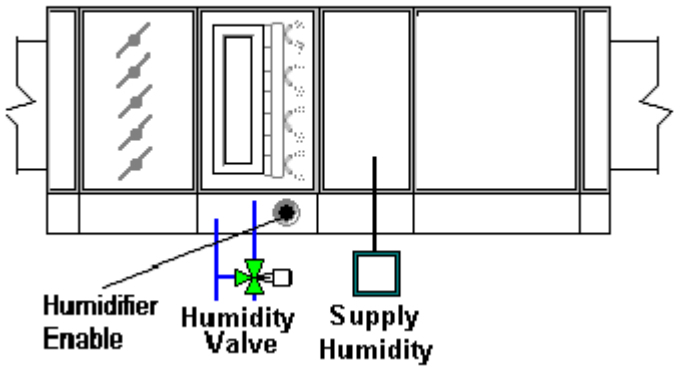
Object	Comments	Object options
High Limit	Will alarm the high limit input goes high.	0: Not Used 1: Used
Legionella Failed	Will alarm if the legionella cycle fails.	0: Not Used 1: Used

HUMIDIFIER CONTROL

SYSTEM OVERVIEW

This macro determines the humidifier load based on the control sensor humidity. The output range is 0 to +100. The humidity load is found by comparing the supply humidity with the humidity setpoint using a PID loop. The humidifier PID gain is set at 8. The integration time is set at 600 seconds. The humidifier is enabled when the supply humidity is less than the humidity setpoint and both E1 and E2 inputs are on (1). E1 and E2 may be tied to a time schedule and the supply fan status respectively. The macro provides a humidifier dem and a humidifier enable.

Humidifier control.



Inputs

Humidity	In
Humidity Setpoint	SP
Enable 1	Enb1
Enable 2	Enb2

Internal

Values

(none)

Settings

Humidifier Gain	8
Humidifier Integration	600 sec
Humidifier Derivative	0
Humidifier on Timer Delay	0 sec

Alarms

(none)

Outputs

VOut	Humidifier Valve %
DOut	Humidifier Enable

SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
Humidity In	Humidity of the supply air	Required
Humidity Setpoint SP	Humidity setpoint of the supply air	Required
Enable 1 Enb1	Both Enb 1 and Enb 2 must be on (1) to enable humidifier and PID	Required
Enable 2 Enb2	Both Enb 1 and Enb 2 must be on (1) to enable humidifier and PID	Required

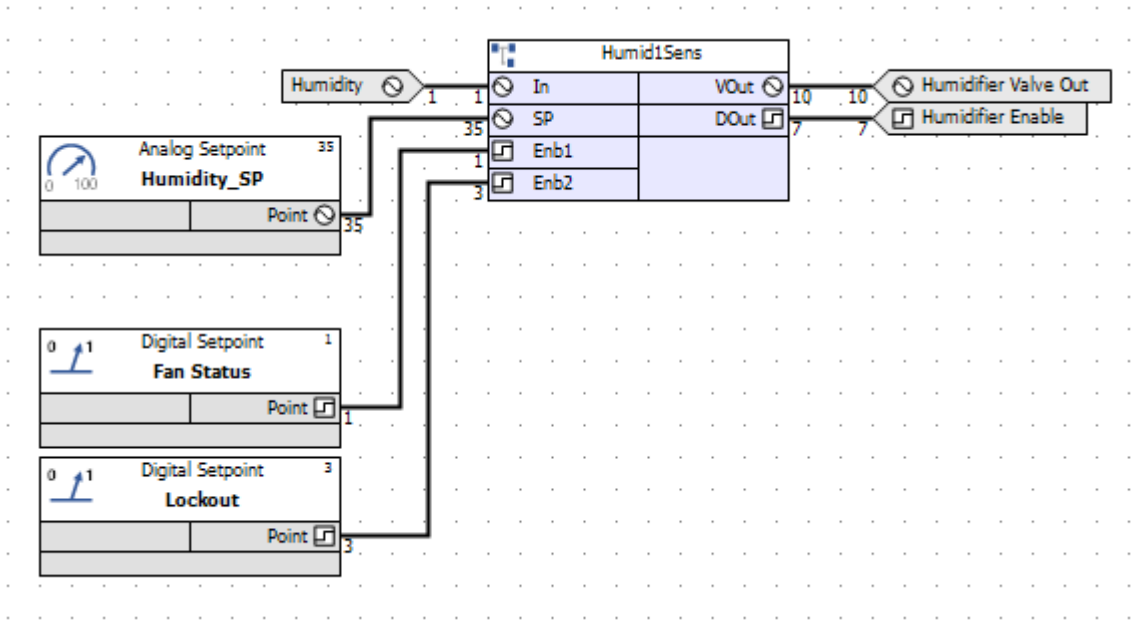
Outputs

Object	Comments	Object options
Humidifier Valve Output VOut	Humidifier valve output. Range is 0% to 100%	
Humidifier Enable Output DOut	Output is on (1) when Enb1 and Enb2 are on and supply humidity is less than humidity setpoint	

Internal Settings

Object	Comments	Object options
Humidifier Gain	Gain of humidity PID	8
Humidifier Integration	Integration time of humidity PID	600 sec
Humidifier Derivative	Derivative time of humidity PID	0 sec
Humidifier on Timer Delay	Humidifier enable on delay	0 sec

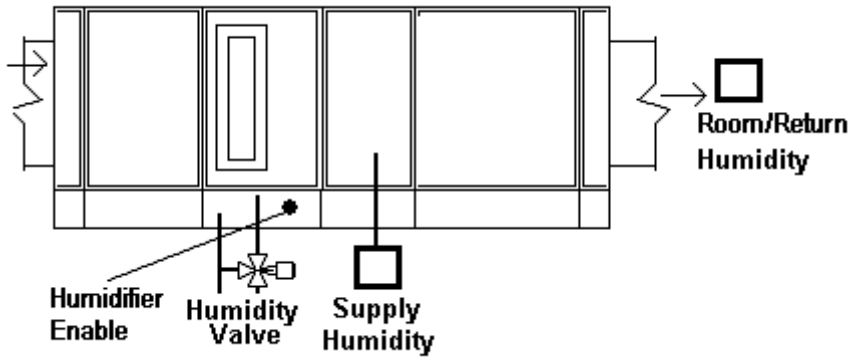
Example



HUMIDIFIER CONTROL WITH LIMITS

SYSTEM OVERVIEW

This macro determines the humidifier load based on the return humidity. The output range is 0 to +100. The supply humidity setpoint is calculated by comparing the return humidity with the room humidity setpoint using a PID loop. Upper and lower limits are applied to the calculated supply humidity setpoint. The resulting setpoint is then used to find the humidifier load. Both gains are set at 8. The integration times are set at 600 sec. The humidifier is enabled with the supply humidity is less than the humidity setpoint and both Enb1 and Enb2 inputs are on (1). Enb1 and Enb2 may be tied to a time schedule and the supply fan status.



Inputs

Return Humidity Setpoint	SP
Low Limit	LowL
High Limit	HiL
Return Humidity	RHum
Supply Humidity	SHum
Enable 1	Enb1
Enable 2	Enb2

Internal

Values

(none)

Settings

Return Humidifier Gain	8
Return Humidifier Integration	600 sec
Return Humidifier Derivative	0
Humidifier on Timer Delay	0 sec
Humidifier Gain	8
Humidifier Integration	600 sec
Humidifier Derivative	0

Alarms

(none)

Outputs

VOut	Humidifier Valve %
DOut	Humidifier Enable

SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
Humidity Setpoint SP	Humidity setpoint of the return air	Required
Low Limit LowL	Low setpoint for supply air humidity	Required
Hi Limit HiL	Hi setpoint for supply air humidity	Required
Return Humidity RHum	Humidity of Return air	Required
Supply Humidity SHum	Humidity of Supply air	Required
Enable 1 Enb1	Both Enb 1 and Enb 2 must be on (1) to enable humidifier and PID	Required
Enable 2 Enb2	Both Enb 1 and Enb 2 must be on (1) to enable humidifier and PID	Required

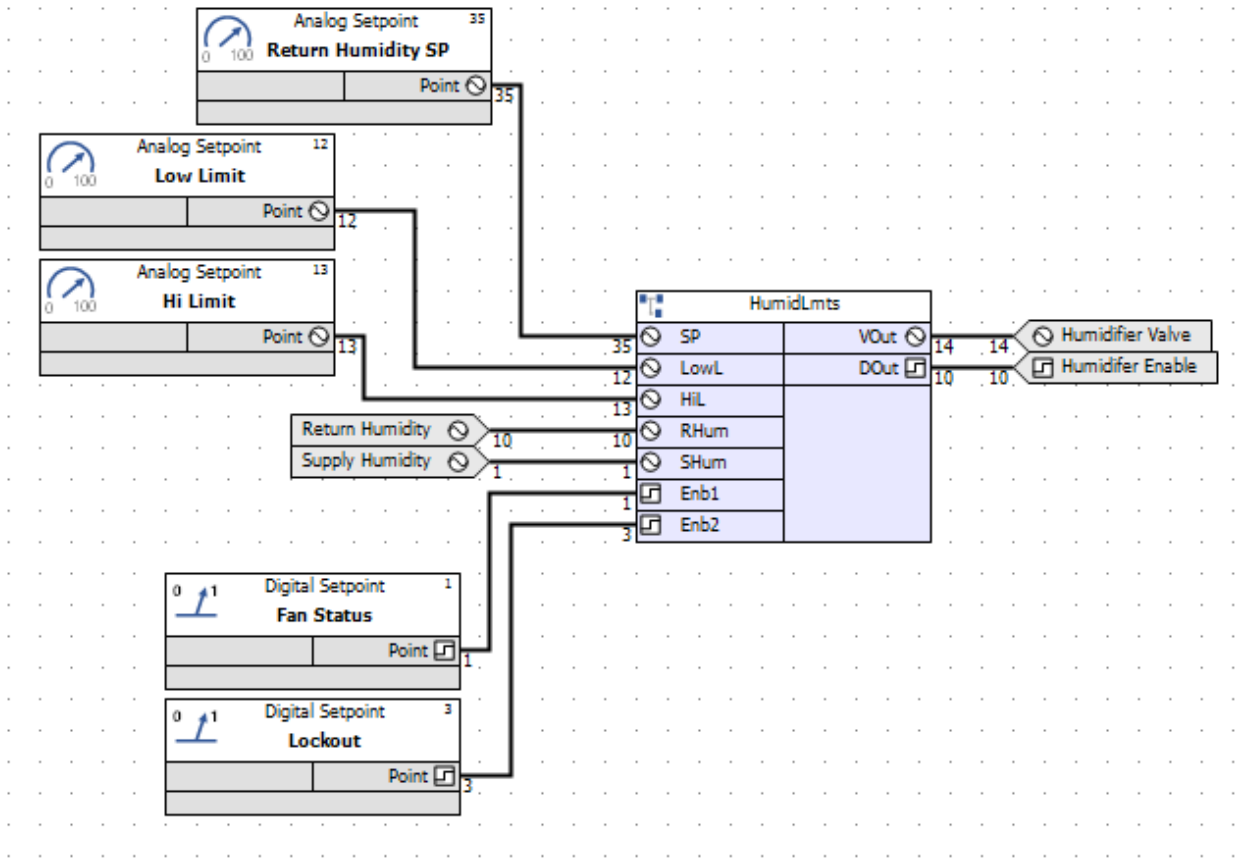
Outputs

Object	Comments	Object options
Humidifier Valve Output VOut	Humidifier valve output. Range is 0% to 100%	
Humidifier Enable Output DOut	Output is on (1) when Enb1 and Enb2 are on and supply humidity is less than humidity setpoint	

Internal Settings

Object	Comments	Object options
Return Humidifier Gain	Gain of humidity PID	8
Return Humidifier Integration	Integration time of humidity PID	600 sec
Return Humidifier Derivative	Derivative time of humidity PID	0 sec
Humidifier Gain	Gain of humidity PID	8
Humidifier Integration	Integration time of humidity PID	600 sec
Humidifier Derivative	Derivative time of humidity PID	0 sec
Timer	Enable Humidifier On Delay Off Delay	 0 sec 0 sec

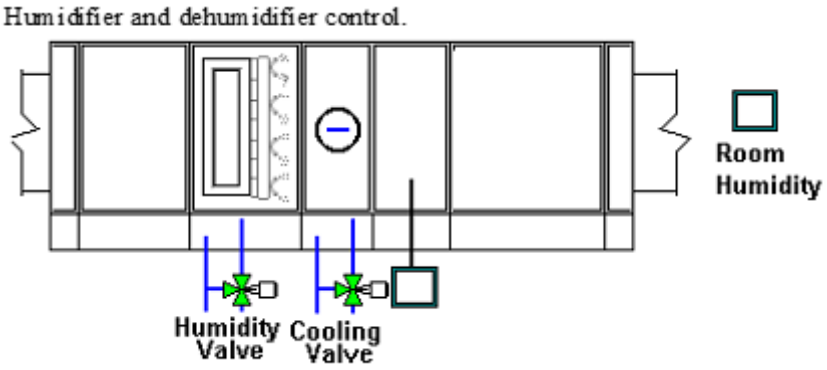
Example



HUMIDITY AND DEHUMIDIFICATION CONTROL

SYSTEM OVERVIEW

The supply humidity setpoint is calculated by comparing the return or room humidity with the humidity setpoint. The calculated supply humidifier setpoint has an upper limit. This high limit setpoint is used to control humidity output. The dead band is added to humidification setpoint to determine the dehumidification setpoint. The dehumidification demand is used as minimum output to cooling valve. The cooling load input should be calculated based on temperature. The cooling demand macro can be used to find this value. Humidification is enabled when the supply humidity is less than the humidity setpoint and Enb1 and Enb2 are on.



Inputs

Cooling Load	Cool
Room Humidity Setpoint	RmSP
Return Humidity	RmH
High Limit	HiL
Dead Band	DB
Supply Humidity	SupH
Enable 1	Enb1
Enable 2	Enb2

Internal

Values

(none)

Settings

Return humidity Gain	8
Return humidity Integration	600 sec
Return humidity Derivative	0
Dehumidification Gain	8
Dehumidification Integration	600 sec
Dehumidificaiton Derivative	0
Humidifier Gain	8
Humidifier Integration	600 sec
Humidifier Derivative	0

Alarms

(none)

Outputs

COut	Cooling Valve %
HOut	Humidifier Valve %
Dout	Humidifier Enable

SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
Cooling Load Cool	Cooling requirement based on temperature.	Required
Return air humidity setpoint RmSP	Humidity setpoint of the return air	Required
Return Air Humidity RmH	Humidity of the return air	Required
Supply air humidity hi limit HiL	Hi setpoint for supply air humidity	Required
Humidity dead band DB	Humidity of Return air	Required
Supply air humidity SupH	Humidity of Supply air	Required
Enable 1 Enb1	Both Enb 1 and Enb 2 must be on (1) to enable humidifier and PID	Required
Enable 2 Enb2	Both Enb 1 and Enb 2 must be on (1) to enable humidifier and PID	Required

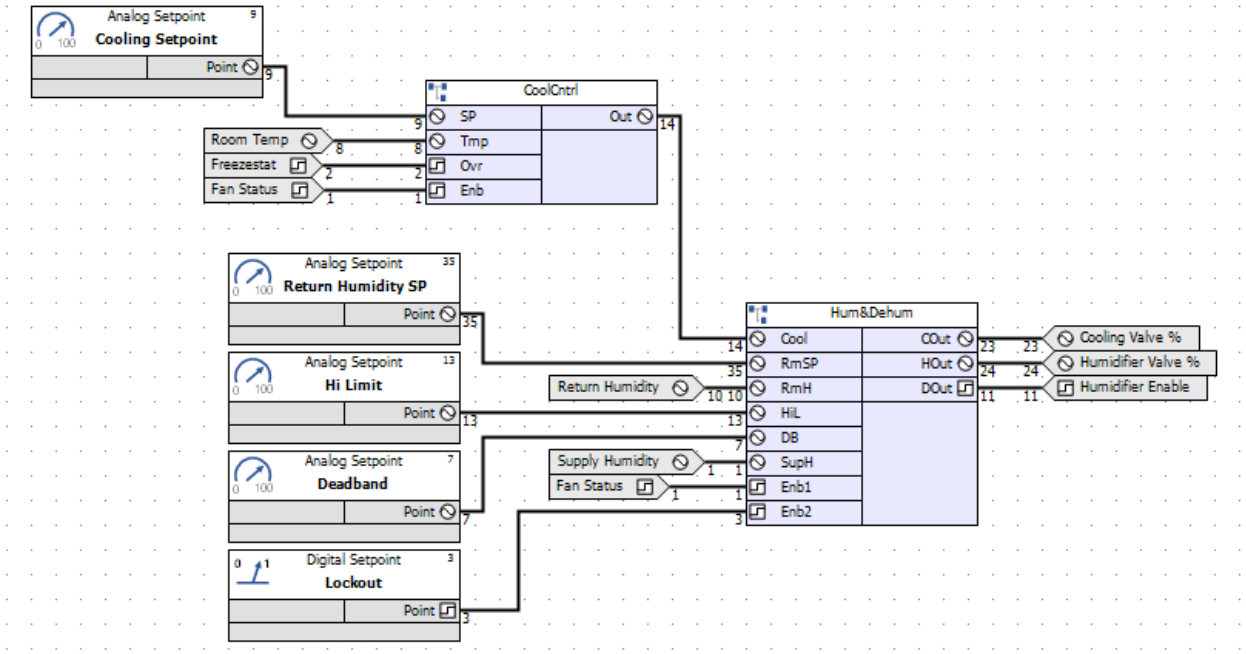
Outputs

Object	Comments	Object options
Cooling Valve Output COut	Output to cooling valve. Range is 0% to 100%	
Humidifier Valve Output VOut	Humidifier valve output. Range is 0% to 100%	
Humidifier Enable Output DOut	Output is on (1) when Enb1 and Enb2 are on and supply humidity is less than humidity setpoint	

Internal Settings

Object	Comments	Object options
Return Humidity Gain	Gain of humidity PID	8
Return Humidity Integration	Integration time of humidity PID	600 sec
Return Humidity Derivative	Derivative time of humidity PID	0 sec
Dehumidification Gain	Gain of humidity PID	8
Dehumidification Integration	Integration time of humidity PID	600 sec
Dehumidification Derivative	Derivative time of humidity PID	0 sec
Humidifier Gain	Gain of humidity PID	8
Humidifier Integration	Integration time of humidity PID	600 sec
Humidifier Derivative	Derivative time of humidity PID	0 sec

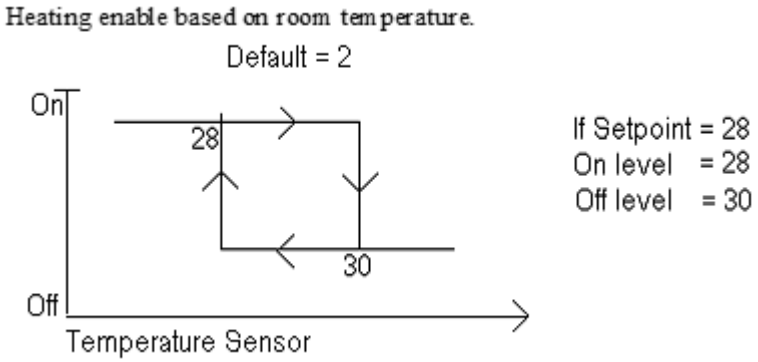
Example



HYSTERESIS WITH PLUS DEADBAND

SYSTEM OVERVIEW

This module provides a hysteresis loop with a plus dead band. When the sensor input falls below the setpoint the enable output is on. The enable output remains on until the sensor input rises by 2F (default dead band value) above the setpoint. The enable then remains off until the sensor input falls below the setpoint value.



Inputs		Internal		Outputs	
		Values			
Sensor Input	In	(none)		Out	Output
Sensor Setpoint	SP	Settings		Comp	Inverse of Output
		Plus Deadband	1		
		Alarms			
		(none)			

SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
OAT In	Analog value from sensor	Required
Room Temp SP	Analog sensor setpoint	0: Not used 1: Monitor

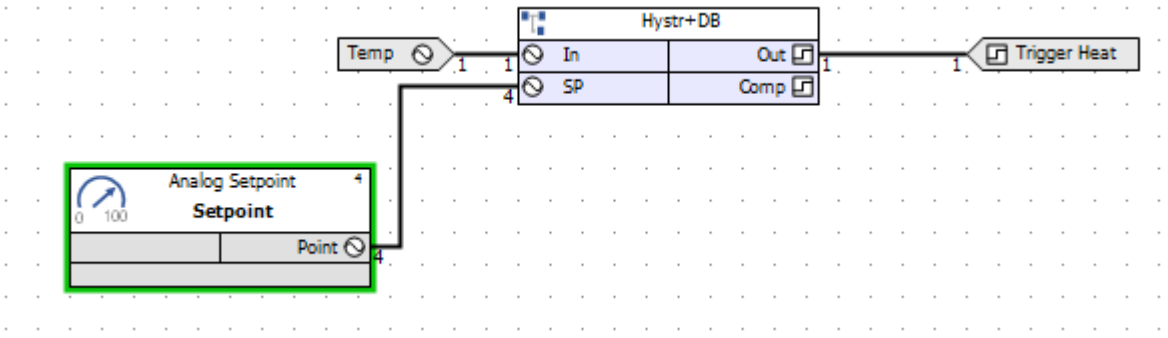
Outputs

Object	Comments	Object options
Out Out	When sensor input is less than setpoint, enable turns on. Remains on until sensor is greater than the setpoint plus deadband.	Required
Comp Comp	Inverse of the output	Not Required

Internal Settings

Object	Comments	Object options
Deadband	Sensor input must rise by this value above the setpoint before enable is set to off.	1 °C (2 °F)

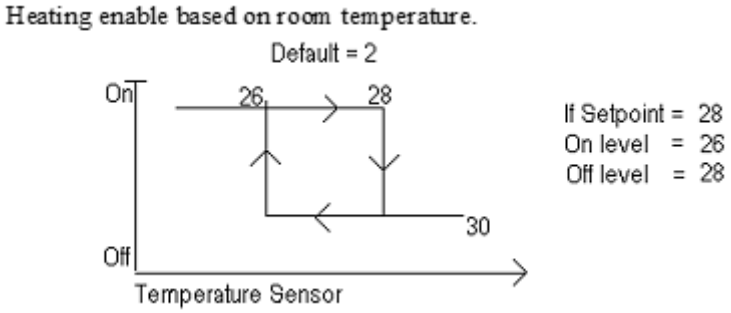
Example



HYSTERESIS WITH NEGATIVE DEADBAND

SYSTEM OVERVIEW

This module provides a hysteresis loop with a minus dead band. When the sensor input falls below the setpoint by 1F (default dead band), the enable output is on. The enable output remains on until the sensor input rises above the setpoint. The enable then remains off until the sensor input falls below the setpoint minus dead band value.



Inputs		Internal		Outputs	
		Values			
Sensor Input	In	(none)		Out	Output
Sensor Setpoint	SP	Settings		Comp	Inverse of Output
		Minus Deadband	1		
		Alarms			
		(none)			

SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
OAT In	Analog value from sensor	Required
Room Temp SP	Analog sensor setpoint	0: Not used 1: Monitor

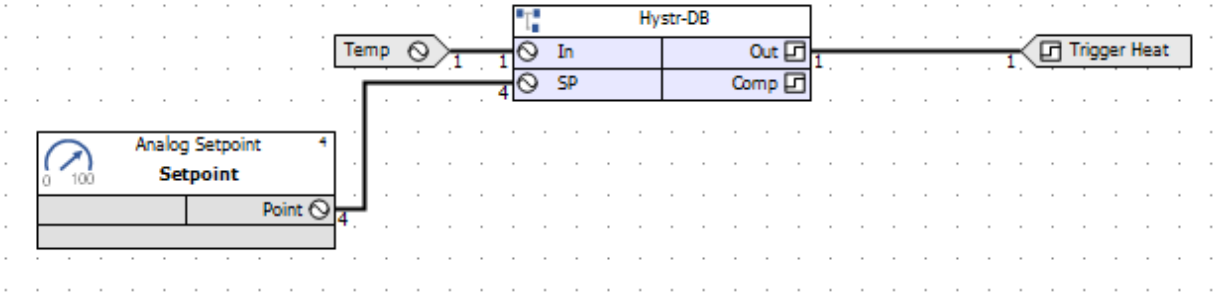
Outputs

Object	Comments	Object options
Out Out	When sensor input is less than setpoint, enable turns on. Remains on until sensor is greater than the setpoint plus deadband.	Required
Comp Comp	Inverse of the output	Not Required

Internal Settings

Object	Comments	Object options
Deadband	Sensor input must fall by this value below the setpoint before enable is set to on.	1 °C (2 °F)

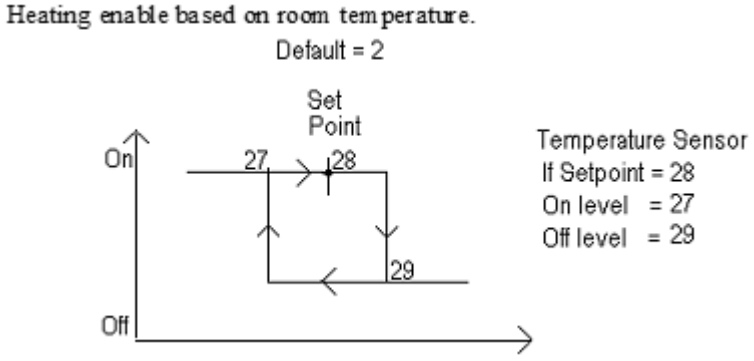
Example



HYSTERESIS WITH PLUS/MINUS DEADBAND

System overview

This module provides a hysteresis loop with plus and minus dead bands. When the sensor input falls below the setpoint by 1F (default minus dead band), the enable output is on. The enable output remains on until the sensor input rises by 1F (default plus dead band) above the setpoint. The enable then remains off until the sensor input falls below the setpoint minus deadland value.



Inputs		Internal		Outputs	
		Values			
Sensor Input	In	(none)		Out	Output
Sensor Setpoint	SP	Settings		Comp	Inverse of Output
		Minus Dead band	1		
		Plus Dead band	1		
		Alarms			
		(none)			

SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
OAT In	Analog value from sensor	Required
Room Temp SP	Analog sensor setpoint	0: Not used 1: Monitor

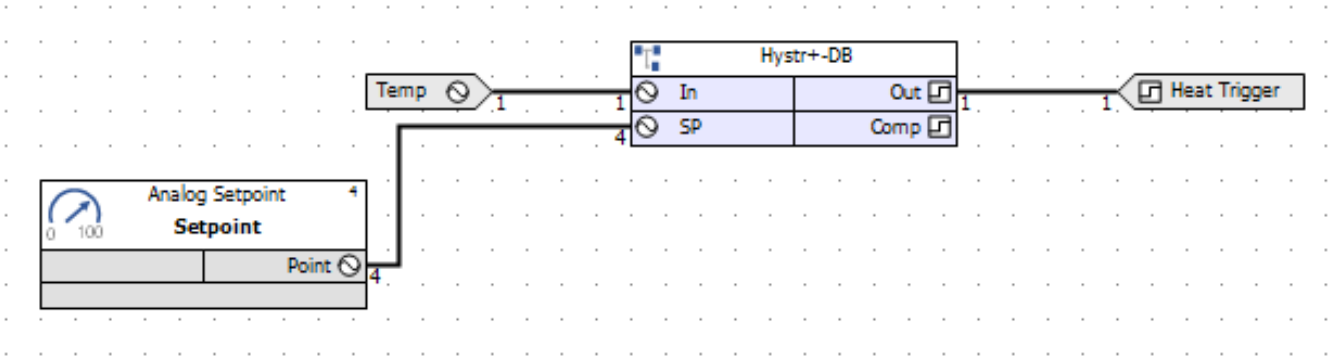
Outputs

Object	Comments	Object options
Out Out	When sensor input is less than setpoint, enable turns on. Remains on until sensor is greater than the setpoint plus dead band.	Required
Comp Comp	Inverse of the output	Not Required

Internal Settings

Object	Comments	Object options
Minus Dead band	Sensor input must fall by this value below the setpoint before enable is set to on.	1 °C (2 °F)
Plus Dead band	Sensor input must rise by this value above the setpoint before enable is set to off.	1 °C (2 °F)

Example



OAT RESET WITH ROOM OFFSET

SYSTEM OVERVIEW

This module can be used to calculate the flow temperature setpoint based on outside air and room temperature.

Inputs

Outside Air Temp	OAT
Room Temp	RT
Room temp Setpoint	RTSP
Boost	BST

Internal

Values

(none)

Settings

OAT Max	15 °C ··· 25 °C (59 °F ··· 77 °F)
OAT Min	-5 °C ··· 10 °C (23 °F ··· 50 °F)
Flow Max	30 °C ··· 80 °C (86 °F ··· 176 °F)
Flow Min	15 °C ··· 25 °C (59 °F ··· 77 °F)
Room Offset Scale	0 ··· 5
Room Offset Max	0 °C ··· 10 °C (32 °F ··· 50 °F)

Alarms

(none)

Outputs

CSP	Calculated Setpoint

SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
OAT OAT	Outside Air Temperature.	Required
Room Temp RT	Room Temperature.	0: Not used 1: Monitor
Room Temp SP RTSP	Room Temperature Setpoint.	0: Not Used 1: Monitor
Boost BST	Boost when set to on the calculated setpoint will go to Max Flow	Not Required

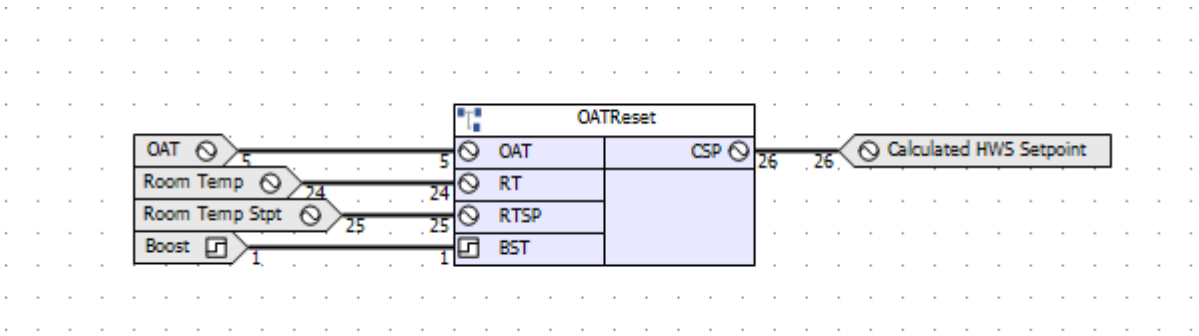
Outputs

Object	Comments	Object options
Calculated Setpoint CSP	Calculated Setpoint	Required

Internal Settings

Object	Comments	Object options
Max OAT (68)	Maximum outside air temperature value for compensation. If the OAT is above this value then this value will be used for the calculation.	15 °C ⋯ 25 °C (59 °F ⋯ 77 °F)
Min OAT (0)	Minimum outside air temperature value for compensation. If the OAT is below this value then this value will be used for the calculation.	-5 °C ⋯ 10 °C (23 °F ⋯ 50 °F)
Max Flow (80)	Maximum flow temperature value for compensation. If the Calculated flow temperature setpoint is above this value then the setpoint will be set to this value.	30 °C ⋯ 80 °C (86 °F ⋯ 176 °F)
Min Flow (20)	Minimum flow temperature value for compensation. If the Calculated flow temperature setpoint is below this value then the setpoint will be set to this value.	15 °C ⋯ 25 °C (59 °F ⋯ 77 °F)
Room Offset Scale (0.5)	Factor that the difference between the room temperature and the setpoint is multiplied by before it is added to the calculated flow setpoint.	0 ⋯ 5
Room Offset Max (5)	The maximum the room temperature can affect the calculated flow setpoint.	0 °C ⋯ 10 °C (32 °F ⋯ 50 °F)

Example



The following formula is used calculate the flow setpoint.

OATCal = Maximum (OAT Min (Minimum(OAT,OAT Max))

FlowCal = Flow Max – (Flow Max – Flow Min) * (OAT Max – OAT Min)/ (OATCal – OAT Min)

RMoffSet = Minimum (Room OffsetMax, Maximum (-Room OffsetMax, ((RT – RTSP) * Room Offset Scale)))

FlowTempSP = Maximum (Flow Min, Min (Minimum(FlowCal + RMOffSet,Flow Max))

RESET

SYSTEM OVERVIEW

This module will supply a 10 second pulse from Off-On-Off for resetting plant.

Inputs	Internal	Outputs
	Values	
(none)	(none)	RS Reset
	Settings	
	(none)	
	Alarms	
	(none)	

SYSTEM OBJECT DESCRIPTION

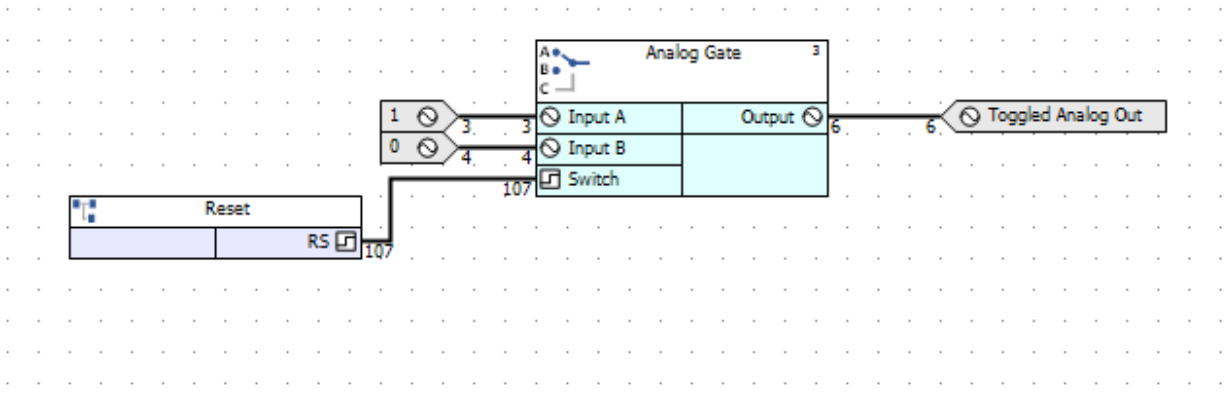
Outputs

Object	Comments	Object options
Reset	Will go high for 10 seconds when set.	

Internal Settings

Object	Comments	Object options
Reset	Set to on to generate a reset pulse.	

Example



SENSOR ALARM AND LOG

SYSTEM OVERVIEW

This module will monitor a sensor and if required generate an out of limits alarm and/or a sensor failed alarm. It will also log the sensor values.

Inputs

Sensor	SIn
Out Of Limits SP	OLSP
Out Of Limits DB	OLDB
Out Of Limits En	OLEn
Failed En	FEn

Internal

Values

(none)

Settings

Out of limits delay on time	0 ⋯ 600 s
Out of limits delay off time	0 ⋯ 600 s
Fail Hi SP	Unit dependent
Fail Low SP	Unit dependent
Fail delay on time	0 ⋯ 600 s
Fail delay off time	0 ⋯ 600 s

Alarms

Out of Limits	Alarm : Normal
Failed	Fail : Normal

Outputs

(none)

SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
Sensor Sin	Sensor to be monitored.	Required
Setpoint OLSP	If the OLEn is active and the sensor value goes outside OLSP +/- OLDB for the time set in Internal Setting Out Of Limits Delay On Time then an Out Of Limits alarm will be generated.	Not Required
Deadband OLDB	The deadband for the Out Of Limits alarm.	Not Required
Enable sensor out of limits OLEn	Set high (ON) to enable Out Of Limits alarm	Off: Alarm disabled On: Alarm enable
Enable sensor failed alarm FEn	Set high (ON) to enable Sensor Failed alarm	Off: Alarm disabled On: Alarm enable

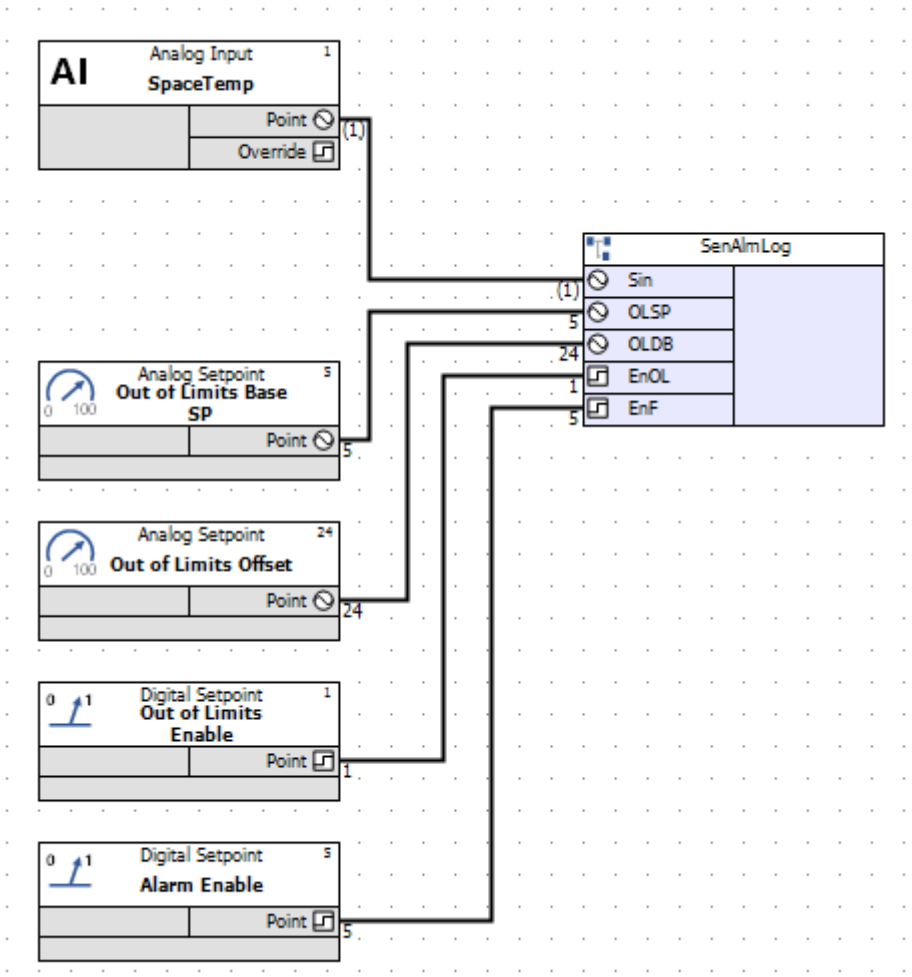
Internal Settings

Object	Comments	Object options
Out Of Limits Delay On Time (120)	The delay before an out of limits alarm will be generated.	Not Required
Out Of Limits Delay Off Time (120)	The delay before an out of limits alarm will be cleared.	Not Required
Fail Hi Setpoint (130)	The value the sensor has to go above before it is deemed as failed.	Not Required
Fail Lo Setpoint (-20)	The value the sensor has to go below before it is deemed as failed.	Not Required
Fail Delay On Time (10)	The delay before a Sensor Failed alarm will be generated.	Not Required
Fail Delay Off Time (10)	The delay before a Sensor Failed alarm will be cleared.	Not Required

Alarms

Object	Comments	Object options
Out of Limits	Will alarm if the sensor is outside OLSP +/- OLDB for the time set in Out Of Limits Delay On Time.	0: Not Used 1: Used
Failed	Will alarm if the sensor is either below the Fail Lo Setpoint or above the Fail Hi Setpoint for the Fail Delay On Time on time.	0: Not Used 1: Used

Example



SEQUENCE CONTROL

SYSTEM OVERVIEW

This macro can be used to sequence any number modules. These modules can be boilers chillers and DX units. It requires the module sequence macro. The macro includes lockout and runtime alarms.

Inputs

SCD2	SCD2
Process Variable	PV
Setpoint	SP
Deadband	DB
PI Direction	PDIR
Auto Lead Select	ALS
Auto Demand Select	ADS
Auto Module Select	AMS
Boost	BST
Enable	EN

Internal

Values

Plant Status	0 ··· 15

Settings

Time Of Day (Day)	Monday ··· Sunday
Time Of Day (Hour)	0 ··· 23 hours
Changeover Mode	0 ··· 1
Type Select *	0 ··· 3
PI Loop Hold	0 ··· 3
PI Loop Gain	1 ··· 20
PI Loop Integral	0 ··· 600 s
PI Loop Offset	0 ··· 100 %
Next Stage On Delay	0 ··· 600 s
Next Stage Off Delay	0 ··· 600 s
Minimum On Time	0 ··· 600 s
Minimum Off Time	0 ··· 600 s
Stage On *	10 ··· 110 %
Stage Off *	5 ··· 90 %
Stage 1 On *	10 ··· 30 %
Stage 1 Off *	5 ··· 20 %

Alarms

(none)

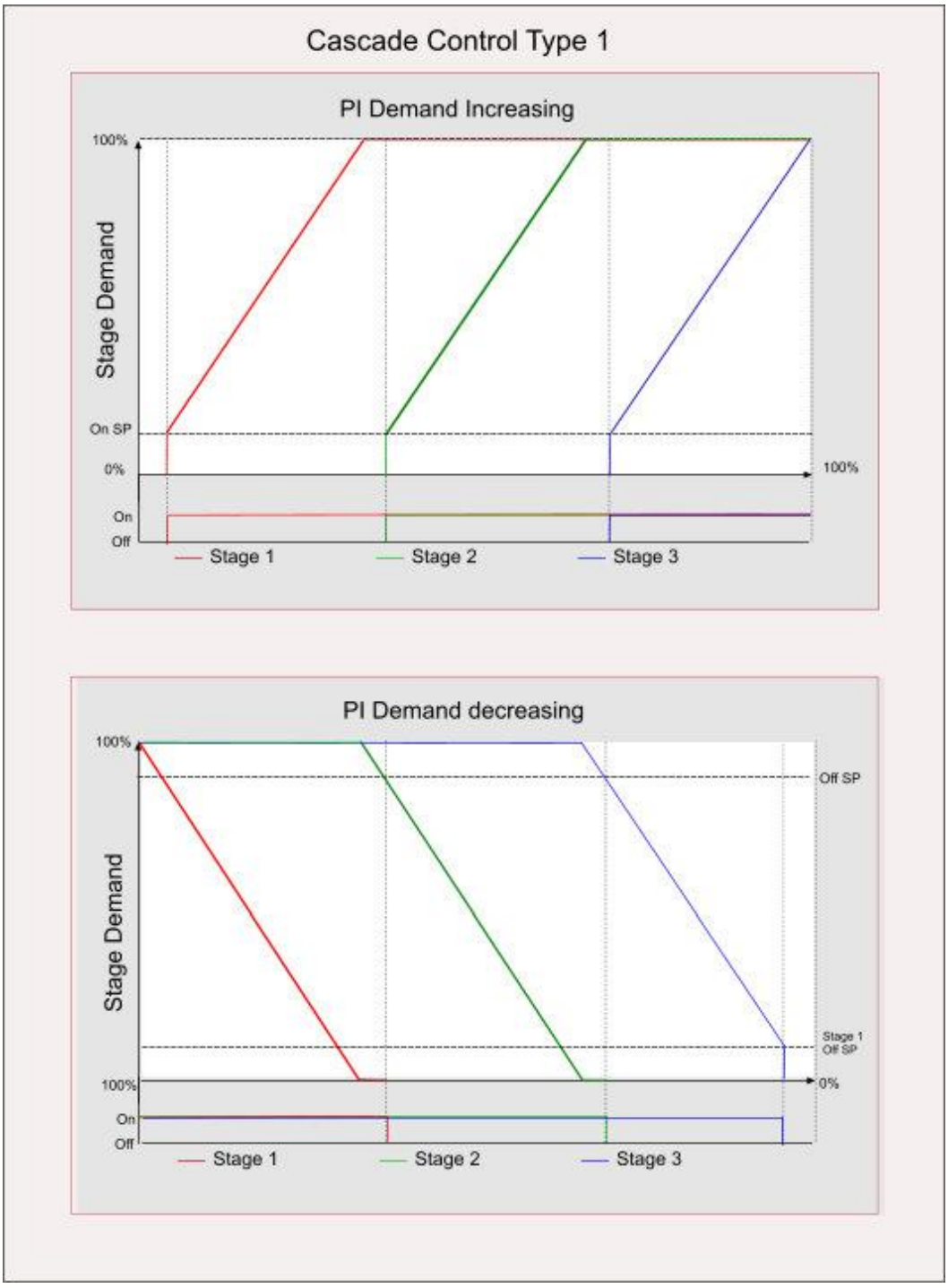
Outputs

SCD2	SCD2
SCD3	SCD3

* There are four modes of operation for this sequencer. Two cascade modes and two parallel mode. The cascade modes will sequence each stage individually with all enabled stages set to 100% except the last one enabled with will be modulated to achieve setpoint. The parallel modes will sequence all enabled stages to the same value. Each mode is described on the following pages:

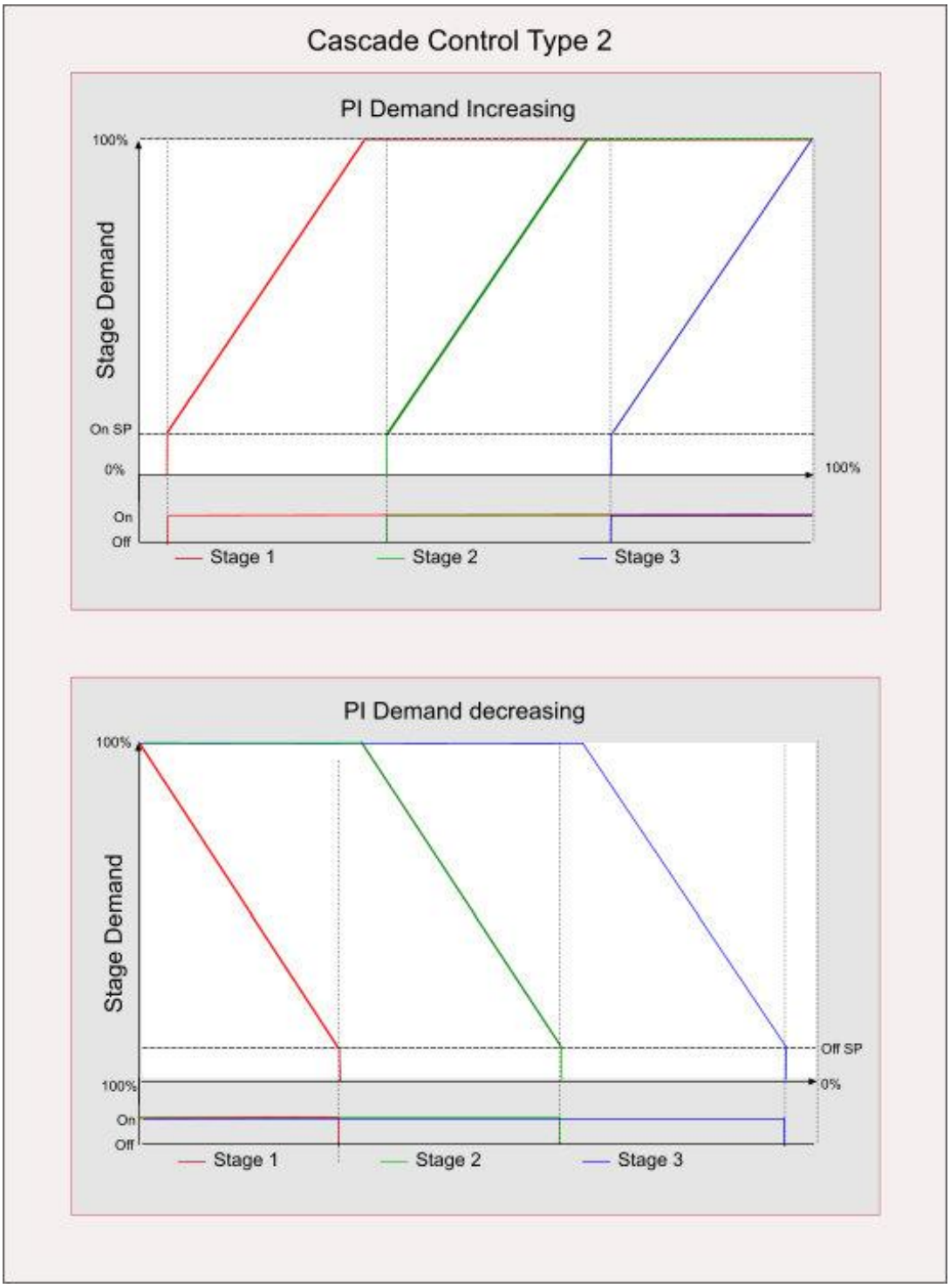
Cascade 1

This will enable the next stage when the calculated output for that stage is greater than the “Stage On SP”. This will disable the current stage when the calculated demand for the previous stage is less that the “Stage Off SP”. Stage 1 will be disabled when the output for stage 1 falls below the “Stage 1 Off SP”.



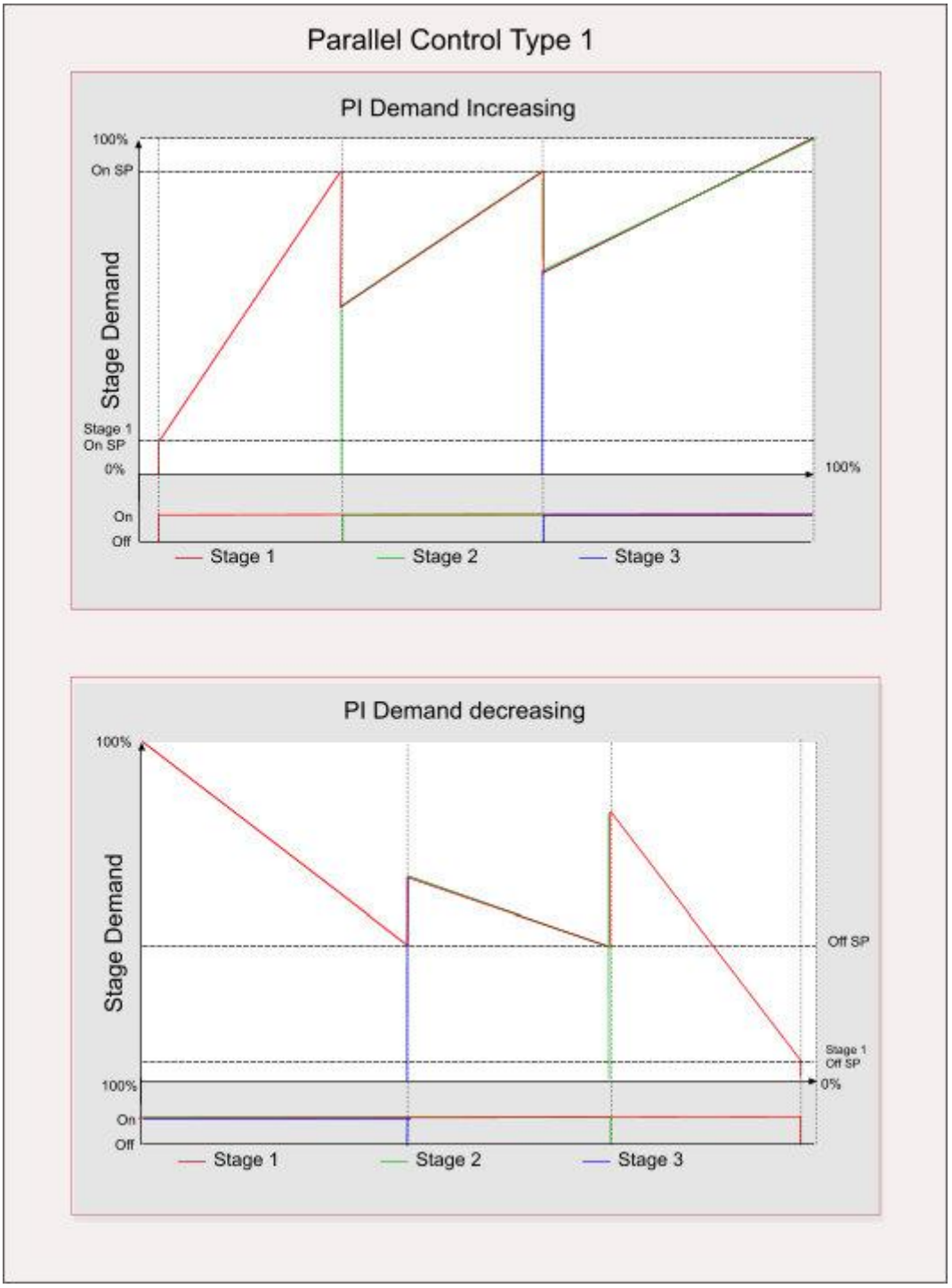
Cascade 2

This will enable the next stage when the calculated output for that stage is greater than the “Stage On SP”. This will disable the current stage when the calculated demand for the current stage is less that the “Stage Off SP”.



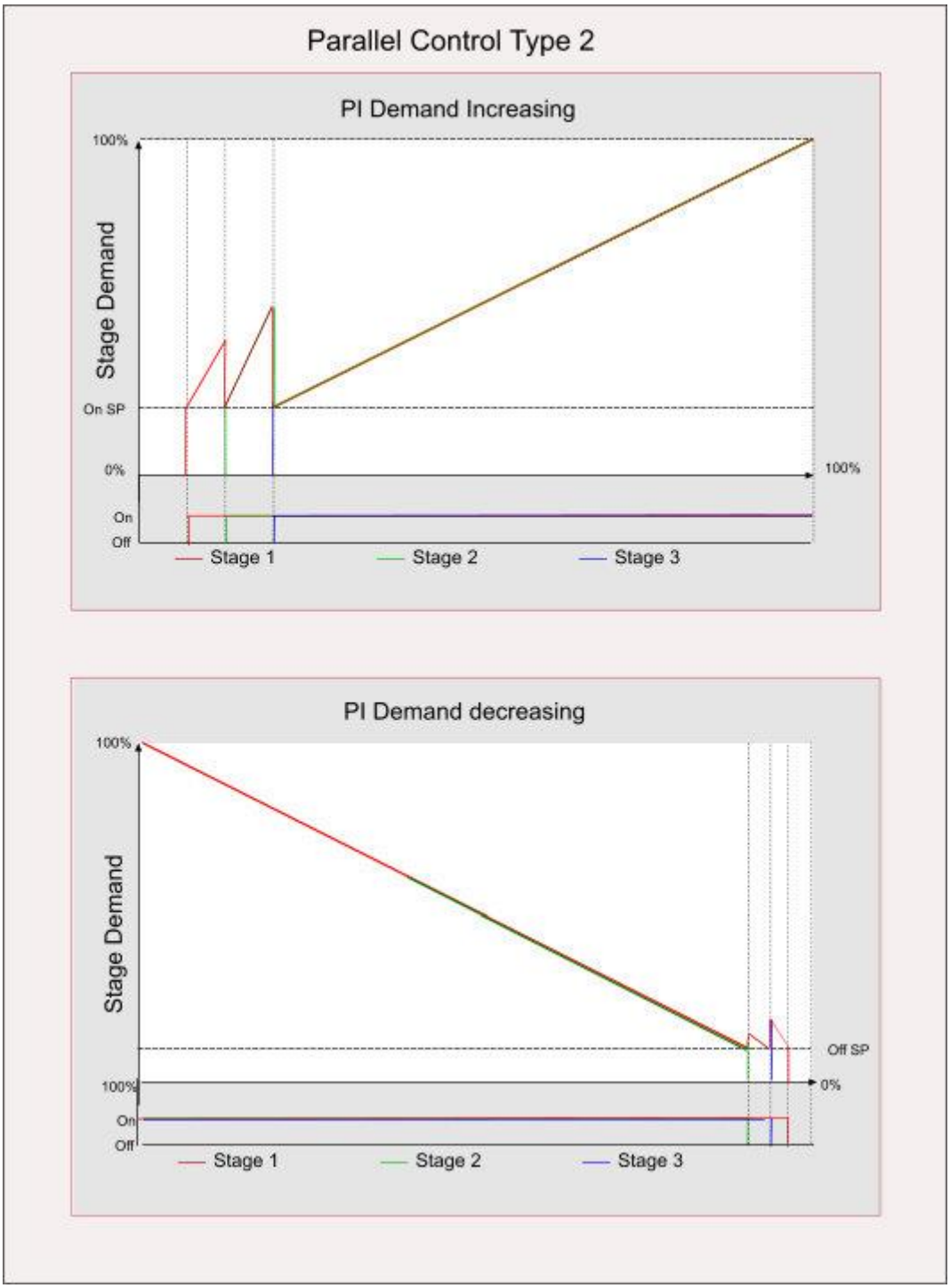
Parallel 1

This will enable the next stage when the calculated output for the current stage is greater than the “Stage On SP”. This will disable the current stage when the calculated demand for the current stage is less that the “Stage Off SP”. Stage 1 will be enabled when the output for stage 1 is above the “Stage 1 On SP”. Stage 1 will be disabled when the output for stage 1 falls below the “Stage 1 Off SP”.



Parallel 2

This will enable the next stage when the calculated output for the next stage is greater than the “Stage On SP”. This will disable the current stage when the calculated demand for the current stage is less that the “Stage Off SP”.



SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
System Control Data 2 SCD2	Used internally to control modules. This should be connected to the output of the last module being controlled.	Required
Process Variable PV	The temperature sensor used to sequence the boiler modules.	Required
Setpoint SP	This is the setpoint that the boiler module sequence will control to.	Required
Deadband DB	When the PV reaches the setpoint the control loop will remain fixed until the PV goes outside the setpoint value +/- the Deadband.	Not Required
PI Direction PDIR	Selects the direction of the PI loop	0: Reverse (Heating) 1: Forward (Cooling)
Boost BST	Overrides the delay on timer allowing more than one stage to come on together.	Off: On On: Override
Auto Lead Select ALS	Used to fix the lead module. A value 0 will enable automatic lead selection.	0: Auto 1: Module 1 2: Module 2.
Auto Demand Select ADS	Used to fix the number of modules enabled. A value 0 will enable automatic module selection.	0: Auto Demand 1: 1 ⋯ 100 1 ⋯ 100% Demand
Auto Module Select AMS	Used to fix the number of modules enabled. A value 0 will enable automatic module selection.	0: Auto > 1: value specifies the number of Modules
Enable EN	Set this to On for the sequencer to operate.	Off: Sequencer Off On: Sequencer On

Outputs

Object	Comments	Object options
System Control Data 2 SCD2	Used internally to control the modules. The output must be connect the first module being controlled.	Required
System Control Data 3 SCD3	Used internally to control the modules. The output must be connect the first module being controlled.	Required

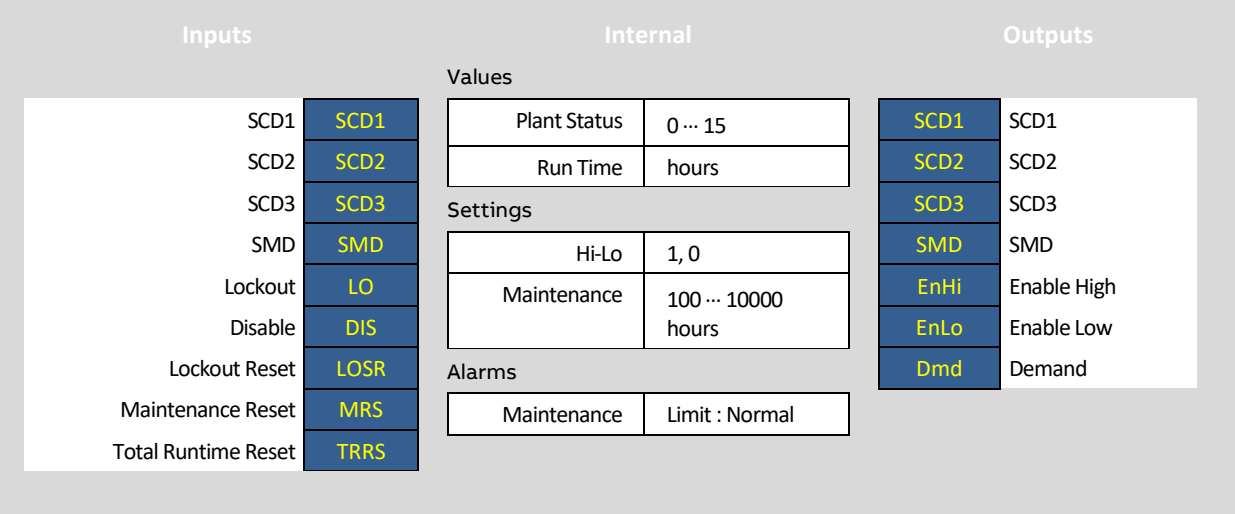
Internal Settings

Object	Comments	Object options
Time Of Day "Day of Week"	These seven set points are used to select the day of the week to which the plant will be automatically rotated if "Time Of Day" is selected.	1: Monday 2: Tuesday 3: Wednesday 4: Thursday 5: Friday 6: Saturday 7: Sunday
Time Of Day Hour	This specifies the hour of day which the plant will be automatically rotated if "Time Of Day" is selected.	
Changeover Mode	Use to select if auto changeover should change to the next module in the sequence or the module with the minimum run time.	0: Next Module
PI Loop Hold	Used to select if the PI control should be held when a stage is sequenced On or Off. If selected the PI loop will be held in its current state for the duration of the next stage timer.	0: Off 1: On Delay Only 2: Off Delay Only 3: Both
PI Loop Gain	Sets the gain for the PI Loop	1 ⋯ 10
PI Loop Integral	Sets the integral for the PI Loop	0 ⋯ 600 s
Next Stage On Delay	Time delay when one stage is enabled before the next stage can be enable if required.	0 ⋯ 600 s
Next Stage On Delay	Time delay when one stage is enabled before the next stage can be enable if required.	0 ⋯ 600 s
Minimum On Time	Minimum time a stage enabled before it can be disabled.	0 ⋯ 600 s
Minimum Off Time	Minimum time a stage disabled before it can be enabled.	0 ⋯ 600 s
Stage On *1	Out value for next stage to be enabled.	10 % ⋯ 110 %
Stage Off *1	Out value for current stage to be disabled.	5% ⋯ 100 %
Stage 1 On *1	Output value for stage 1 to be enabled.	5% ⋯ 20 %
Stage 1 Off *1	Output value for stage 1 to be disabled.	5% ⋯ 20 %

SEQUENCE MODULE

SYSTEM OVERVIEW

This macro is used in conjunction with the sequence control module to control a number of plant items such as boilers and chillers. The macro includes lockout and runtime alarms.



SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
System Control Data 1 SCD1	Used internally to control the module. The input of the first module must be connected to the Sequence controller. The input of other module should be connected to the previous module.	Required
System Control Data 2 SCD2	Used internally to control the module. The input of the first module must be connected to the Sequence controller. The input of other modules should be connected to the previous module.	Required
System Control Data 3 SCD3	Used internally to control the module. The input of the first module must not be connected. The input of other modules should be connected to the previous module.	Required
System Module Data SMD	Used internally to control the module. The input of the first module must be connected to the output of the last module. The input of other modules should be connected to the previous module.	Required
Lockout LO	Plant lockout or fault.	Not Required
Disable DIS	Set to Hi to remove the module for the sequence and disable the outputs.	Not Required
Lockout Reset LOSR	Set to Hi to clear a lockout fault.	Not Required
Maintenance Reset MRS	Set to Hi to clear an active maintenance alarm.	Not Required
Total RunTime Reset TRRS	Set to Hi to clear an active maintenance alarm.	Not Required

Outputs

Object	Comments	Object options
System Control Data 1 SCD1	Used internally to control the module. The output of the last module must not be connected. The output of other modules should be connected to the next module.	Required
System Control Data 2 SCD2	Used internally to control the module. The output of the last module must be connected to the sequence module. The output of other modules should be connected to the next module.	Required
System Control Data 3 SCD3	Used internally to control the module. The output of the last module must not be connected. The output of other modules should be connected to the next module.	Required
System Module Data SMD	Used internally to control the module. The output of the last module must be connected to the input of the first module. The output of other modules should be connected to the next module.	Required
Enable High EnHi	Active state to enable the boiler high fire to run	Not Required
Enable Low EnLo	Active state to enable the boiler low fire to run	Not Required
Demand Dmd	This is a 0 ⋯ 100% output used to control modulating boilers	Not Required

Internal Settings

Object	Comments	Object options
Hi-Lo	This sets the macro to control a signal fire boiler or a Hi-Lo fire.	0: On-Off 1: Hi-Lo
Maintenance Limit (5000)	This is the runtime of the plant before a maintenance alarm is raised.	100 ⋯ 10000

Internal Values

Object	Comments	Object options
Status	This will indicate the status of module.	0: Auto – Off 1: Auto On 2: Lockout 3: Disabled
Runtime	Time the plant has run since last maintenance reset.	0: Not Used 1: Used

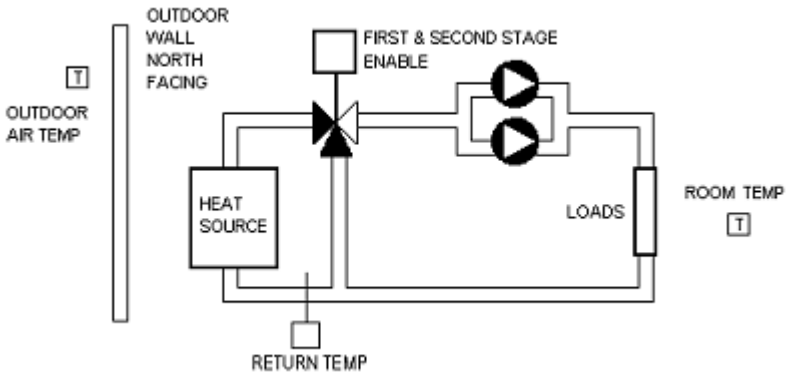
Alarms

Object	Comments	Object options
Maintenance Alarm	Active when the plant runtime as exceeded the maintenance limit.	0: Not Used 1: Used

THREE STAGE FROST

SYSTEM OVERVIEW

This macro provides first, second, and third stage frost logic protection for heating circuits. When the outdoor air temperature is less than the setpoint, stage 1 is enabled. The output remains enabled until the outdoor air temperature rises 2F above the setpoint. The second stage frost is only enabled when the first stage has been enabled and the boiler return temperature falls below 15C. The second stage turns off when the boiler return temperature rises above 30C. When any of the room temperature falls below 10C the third stage is enabled. The third stage operates independently from stages 1 and 2.



Inputs

Outdoor Air Temp	OAT
Stage 1 Setpoint	S1SP
HWR Temperature	HwrT
Stage 2 Setpoint	S2SP
Room Temperature	RmT
Stage 3 Setpoint	S3SP

Internal

Values

(none)

Settings

OAT SP Offset	2F
HWR SP Offset	10F
Room SP Offset	2F

Alarms

(none)

Outputs

Stg1	Stage 1 Alarm
Stg2	Stage 2 Alarm
Stg3	Stage 3 Alarm

SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
Outdoor Air Temperature OAT	Outdoor air temperature	
Stage One Setpoint S1SP	Outdoor air temperature setpoint for stage 1	
Boiler Return Temperature HwrT	Hot water return temperature	
Stage Two Setpoint S2SP	Hot water return temperature setpoint for stage 2	
Room Temperature RmT	Room temperature	
Stage Three Setpoint S3SP	Room temperature setpoint for stage 3	

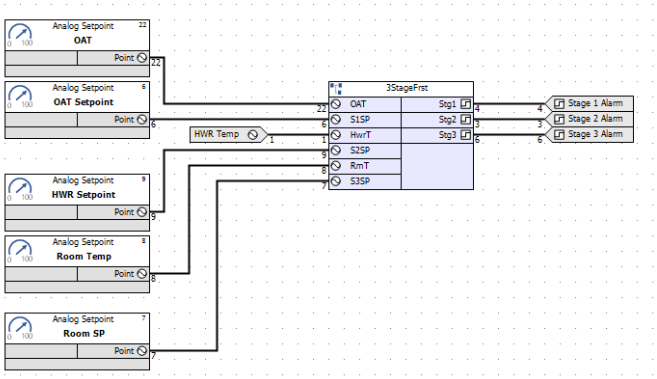
Outputs

Object	Comments	Object options
Stage 1 Alarm Stg1	If OAT < S1SP + Offset then the stage 1 alarm will trigger	
Stage 2 Alarm Stg2	If HWR < S2SP + Offset and Stg1 is on, then the stage 2 alarm will trigger	
Stage 3 Alarm Stg3	If RmT < S3SP + Offset then the stage 3 alarm will trigger	

Internal Settings

Object	Comments	Object options
Outdoor air temperature offset	Offset difference for OAT Setpoint	2F
Boiler Return Temperature offset	Offset difference for HWR Setpoint	10F
Room Temperature offset	Offset difference for RmT Setpoint	2F

Example

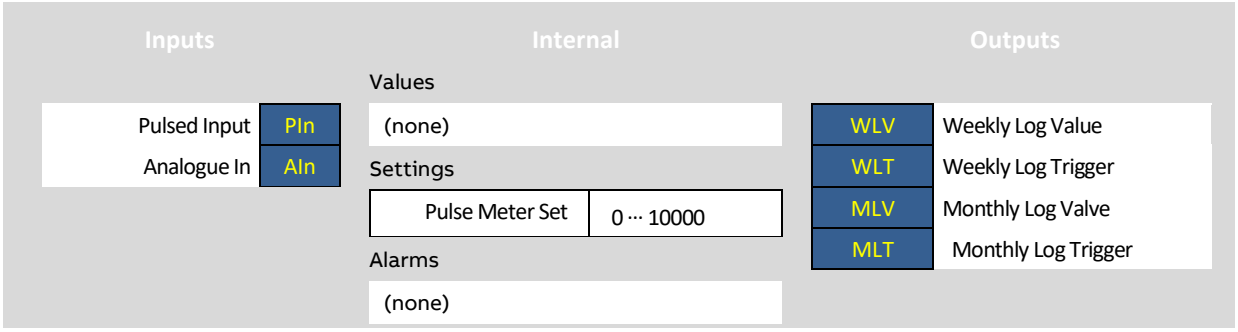


METER

SYSTEM OVERVIEW

This module will monitor a pulsed and analogue meter and produce the following data.

1. Total value
2. 15-minute total log
3. 1-hour log
4. Last hour value
5. Daily log
6. Yesterday value
7. Weekly value (With external point to log)
8. Last week value
9. Monthly value (With external point to log)
10. Last month value.



SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
Pulsed Input PIn	Pulse meter input. The must be an universal input with the type set to Pulse(V/F)	Not Required
Analogue Input AIn	Must be an analogue, typically from a Modbus meter. Only one input must be connected either PIn or AIn.	Not Required

Outputs

Object	Comments	Object options
Weekly Log Value WLV	If a weekly data log is required, then connect this output to the Log Point (I) of a data log. Data log must be set to Falling edge trigger only. (Advanced options).	Not Required.
Weekly Log Trigger WLT	If a weekly data log is required then connect this output to the Log Trigger (T) of a data log.	Not required.
Monthly Log Value WLV	If a Monthly data log is required, then connect this output to the Log Point (I) of a data log. Data log must be set to Falling edge trigger only. (Advanced options).	Not Required.
Monthly Log Trigger WLT	If a Monthly data log is required then connect this output to the Log Trigger (T) of a data log.	Not required.

Internal Settings

Object	Comments	Object options
Pulsed Meter Set (0)	The meter output will be set to this value.	Not Required.

OPTIMIZER

SYSTEM OVERVIEW

This module can be used for heating and cooling optimization.

Inputs

Outside Air Temp	OAT
Room Temp	RT
Room Temp Setpoint	RTSP
Heat Deadband	HDB
Cool Deadband	CDB

Internal

Values

(none)

Settings

Frost SP	8 ··· 14
Frost DB	1 ··· 4
Max Heat Start	0 ··· 180 mins
Max Heat Stop	0 ··· 180 mins
Max Cool Start	0 ··· 180 mins
Max Cool Stop	0 ··· 180 mins
Monday	On: Off Times
Tuesday	On: Off Times
Wednesday	On: Off Times
Thursday	On: Off Times
Friday	On: Off Times
Saturday	On: Off Times
Sunday	On: Off Times

Alarms

(none)

Outputs

HDmd	Heat Demand
HBst	Heat Boost
HDay	Heat Day
HFst	Heat Frost
CDmd	Cool Demand
CBst	Cool Boost
CDay	Cool Day
Sch	Schedule

SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
Outside Air Temp OAT	Outside air temp.	Required
Room Temp RT	Room Temp.	Required
Room Temp Setpoint RTSP	Room Temp Setpoint. Optimum target temp.	Required
Heat Deadband HDB	The maximum temp the room temp is allowed to fall below the setpoint during an optimum stop. If exceeded the demand will be turned on.	Required for heating optimizer.
Cool Deadband HDB	The maximum temp the room temp is allowed to increase above the setpoint during an optimum stop. If exceeded the demand will be turned on.	Required for cooling optimizer.

Outputs

Object	Comments	Object options
Heat Demand HDmd	Heating demand. On when heat is required.	Required for heating optimizer.
Heat Boost HBst	Heating Boost. On during a heating optimum start.	Not required.
Heat Day HDay	Heating Day. On from end of boost to start of optimum stop.	Not required.
Heat Frost HFst	On if the room temp falls below the frost setpoint. Off if the room temp is above the frost setpoint + frost deadband.	Not required
Cool Demand CDmd	Cooling demand. On when cool is required.	Required for cooling optimizer.
Cool Boost CBst	Cooling Boost. On during a cooling optimum start.	Not required.
Cool Day HDay	Cooling Day. On from end of boost to start of optimum stop.	Not required.
Schedule Sch	On if the optimizer time schedule is active.	Not required.

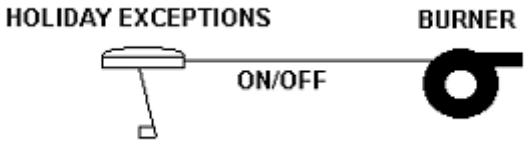
Internal Settings

Object	Comments	Object options
Frost SP (12)	Frost setpoint.	8 ⋯ 14 Degrees
Frost DB (2)	Used to select if the flow is monitored for fault when the plant is in standby.	1 ⋯ 4 Degrees
Max Heat Start (120)	Maximum time allowed for a heating optimum start.	0 ⋯ 180 Minutes
Max Heat Stop (60)	Maximum time allowed for a heating optimum stop.	0 ⋯ 180 Minutes
Max Cool Start (120)	Maximum time allowed for a cooling optimum start.	0 ⋯ 180 Minutes
Max Cool Stop (60)	Maximum time allowed for a cooling optimum stop.	0 ⋯ 180 Minutes
Monday	Contains two Off:On times for Monday.	
Tuesday	Contains two Off:On times for Tuesday.	
Wednesday	Contains two Off:On times for Wednesday.	
Thursday	Contains two Off:On times for Thursday.	
Friday	Contains two Off:On times for Friday.	
Saturday	Contains two Off:On times for Saturday.	
Sunday	Contains two Off:On times for Sunday.	

HOLIDAY SCHEDULE

SYSTEM OVERVIEW

Adds 5 exception schedules. If any of these are on, then the output is also on. The macro may be used to make holiday programming easier.



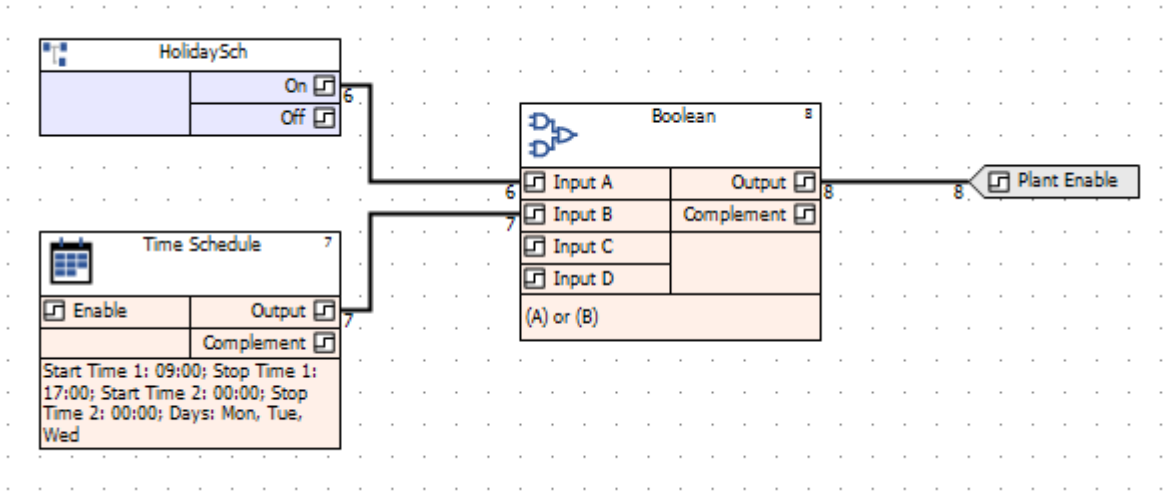
Inputs	Internal	Outputs
	Values	
(none)	(none)	On Holiday On
	Settings	Off Holiday Off
	(none)	
	Alarms	
	(none)	

SYSTEM OBJECT DESCRIPTION

OUTPUTS

Object	Comments	Object options
Holiday On	On if any of the holiday outputs are on	
Holiday Off	On when all of the holiday outputs are off	

Example



ONE SHOT

SYSTEM OVERVIEW

This module will toggle a digital output on for 2 seconds, then off.

Inputs	Internal	Outputs
	Values	
Input **In**	(none)	**Out** Output
	Settings	
	(none)	
	Alarms	
	(none)	

SYSTEM OBJECT DESCRIPTION

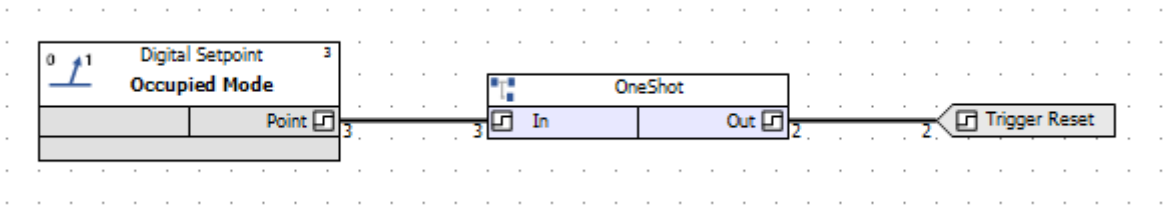
Inputs

Object	Comments	Object options
Input In	Digital input to toggle change	Required

Outputs

Object	Comments	Object options
Output Out	Toggled output	Required.

Example



RAMP

SYSTEM OVERVIEW

This module will ramp the rate of change of an analogue value.

Inputs		Internal		Outputs	
		Values			
Input	In	(none)		Out	Output
Disable	Dis	Settings			
		Max Change	0 ⋯ 200		
		Alarms			
		(none)			

SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
Input In	The analogue value to be ramped	Required
Disable Dis	When this input is set, ramping is NOT applied to the output.	Not Required

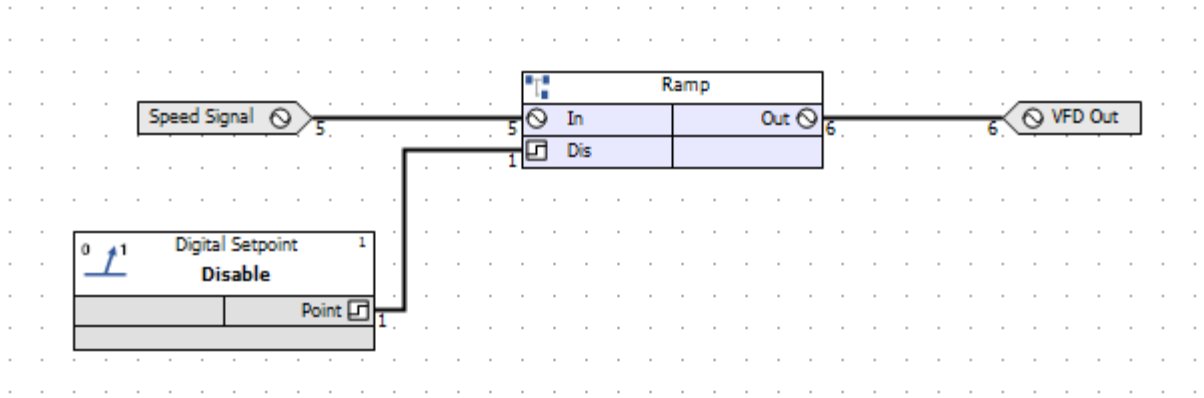
Outputs

Object	Comments	Object options
Output Out	The ramped output.	Required.

Internal Settings

Object	Comments	Object options
Max Change	The rate of change per second	Required.

Example

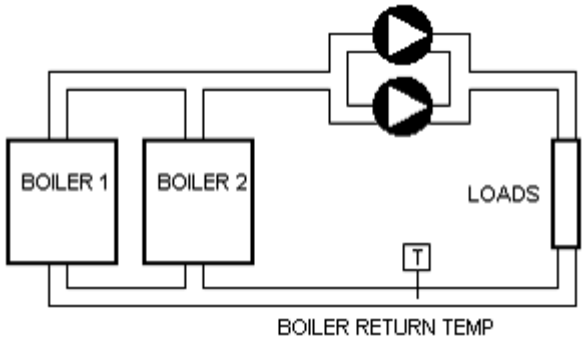


TWO BOILER SEQUENCE

SYSTEM OVERVIEW

This macro provides control of two boilers with duty sharing. The lead boiler is rotate every week. The macro finds the heating load based on the supply setpoint when the PID is enabled. If the heating load is greater than 25% then the lead boiler is selected. The setting for the lag boiler is 99%. The boilers have an on delay of 60 seconds.

Boiler sequencing and control.



Inputs

HWS Setpoint	SP
HWS Temperature	Tmp
Changeover	Chng
Enable	Enb

Internal

Values

(none)

Settings

Lead Enable	25%
Lag Enable	99%
Boiler 1 On Delay	60 sec
Boiler 2 On Delay	60 sec

Alarms

(none)

Outputs

Out1	Boiler 1 Enable
Out2	Boiler 2 Enable

SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
Hot water supply Temperature SP	Hot water supply temperature	Required
Hot water supply Setpoint Tmp	Hot water supply temperature setpoint	Required
Changeover Chng	Weekly flag allowing lead and lag boilers to be rotate	Required
Enable Enb	Should be joined to time schedule. Boiler and pumps are disabled when value is (0) off	Required

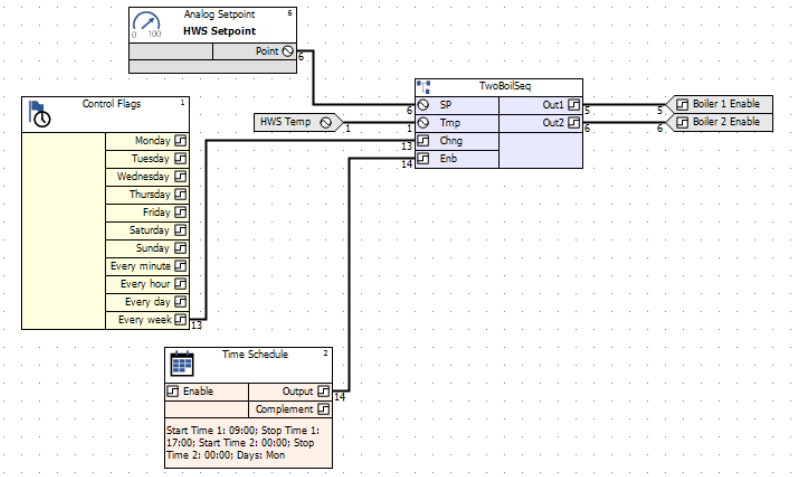
Outputs

Object	Comments	Object options
Boiler 1 Enable Out1	Output is on (1) when boiler 1 is selected as desired output	
Boiler 2 Enable Out2	Output is on (1) when boiler 2 is selected as desired output	

Internal Settings

Object	Comments	Object options
Lead Enable	Heating load > value to enable lead boiler	25%
Lag Enable	Heating load > value to enable lag boiler	99%
Boiler 1 On Delay	Time delay before boiler 1 is set on	60 seconds
Boiler 2 On Delay	Time delay before boiler 2 is set on	60 seconds

Example

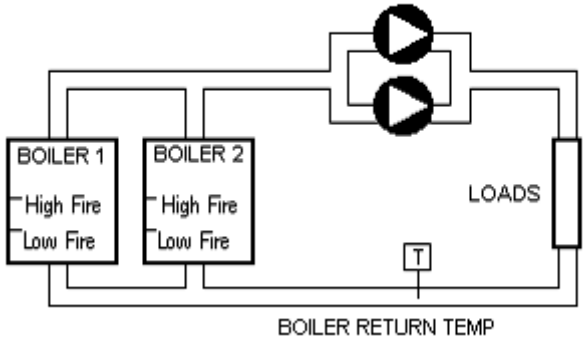


TWO BOILER SEQUENCE WITH HI LOW

SYSTEM OVERVIEW

This macro provides control of two boilers with duty sharing. The lead boiler is rotate every week. The macro finds the heating load based on the supply setpoint when the PID is enabled. The lead boiler is selected when the load is less than 50%. When the load reaches 25% of th 0-50% range i.e. 12.5% the low fire setting on the lead is enabled. When the load reaches 99% of the 0-50% range the high fire setting on the lead is enabled. The lag boiler is selected when the load is greater than 50%. When the load reaches 25% of the 50-100% range the low fire setting on the lag is enabled. When the load reaches 99% of the 50-100% range the high fire setting on the lag is enabled. The boilers have an on delay of 60 seconds.

Boiler sequencing and control.



Inputs

HWS Setpoint	SP
HWS Temperature	Tmp
Changeover	Chng
Enable	Enb

Internal

Values

(none)

Settings

Lead Enable	25%
Lag Enable	99%
Boiler 1 Low Fire On Delay	30 sec
Boiler 1 Hi Fire On Delay	60 sec
Boiler 1 Low Fire On Delay	30 sec
Boiler 1 Hi Fire On Delay	60 sec

Alarms

(none)

Outputs

Low1	Boiler 1 Low Enable
Hi1	Boiler 1 Hi Enable
Low2	Boiler 2 Low Enable
Hi2	Boiler 2 Hi Enable

SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
Hot water supply Temperature SP	Hot water supply temperature	Required
Hot water supply Setpoint Tmp	Hot water supply temperature setpoint	Required
Changeover Chng	Weekly flag allowing lead and lag boilers to be rotate	Required
Enable Enb	Should be joined to time schedule. Boiler and pumps are disabled when value is (0) off	Required

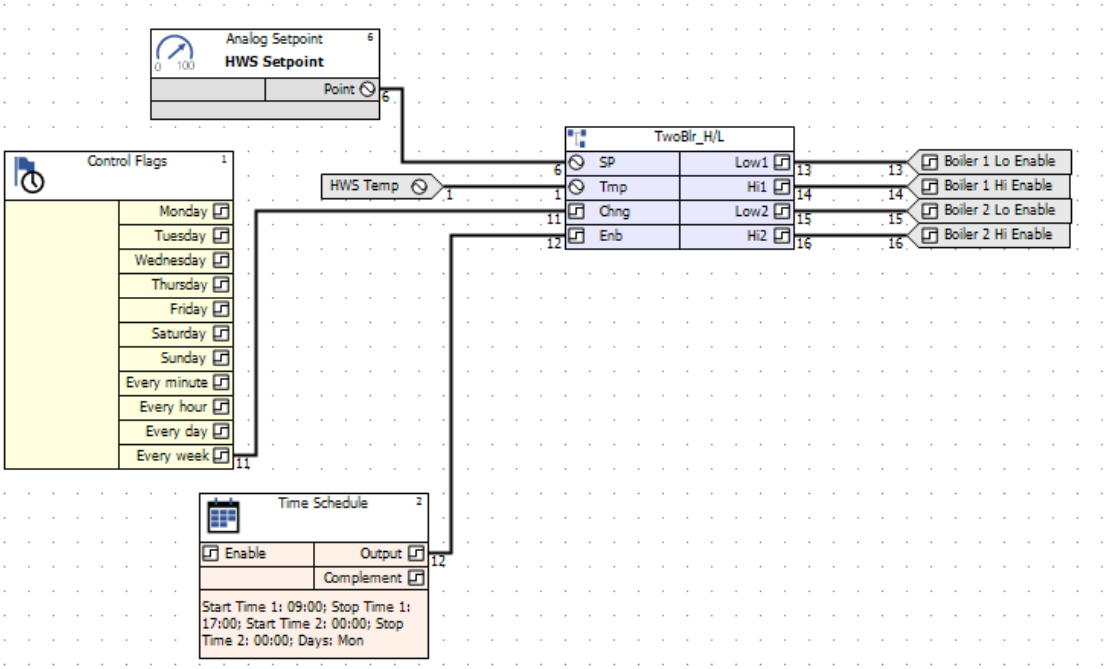
Outputs

Object	Comments	Object options
Boiler 1 Low Fire Low1	Output is on (1) when boiler 1 low fire is selected as desired output	
Boiler 1 Hi Fire Hi1	Output is on (1) when boiler 1 hi fire is selected as desired output	
Boiler 2 Low Fire Low2	Output is on (1) when boiler 2 low fire is selected as desired output	
Boiler 1 Hi Fire Hi2	Output is on (1) when boiler 2 hi fire is selected as desired output	

Internal Settings

Object	Comments	Object options
Lead Enable	Heating load > value to enable lead boiler	25%
Lag Enable	Heating load > value to enable lag boiler	99%
Boiler 1 Low Fire On Delay	Time delay before boiler 1 low fire is set on	30 seconds
Boiler 1 Hi Fire On Delay	Time delay before boiler 1 hi fire is set on	60 seconds
Boiler 2 Low Fire On Delay	Time delay before boiler 2 low fire is set on	30 seconds
Boiler 2 Hi Fire On Delay	Time delay before boiler 2 hi fire is set on	60 seconds

Example

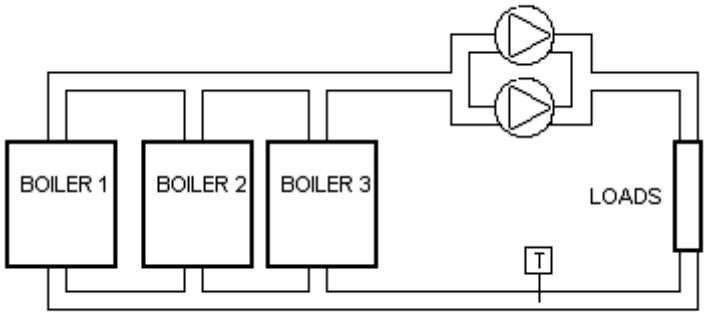


THREE BOILER SEQUENCE

SYSTEM OVERVIEW

This macro provides control of three boilers with duty sharing. The lead boiler is rotate every week. The macro finds the heating load based on the supply setpoint when the PID is enabled. IF the heating load is greater than 25% then the load boiler is selected. The setting for the lag boiler is 75%. The setting for the lag-lag boiler is 99%. The boiler sequence is 1-2-3, 2-3-1, 3-1-2. The boilers have an on delay of 60 seconds.

Boiler sequencing and control.



Inputs

HWS Setpoint	SP
HWS Temperature	Tmp
Changeover	Chng
Enable	Enb

Internal

Values

(none)

Settings

Lead Enable	25%
Lag Enable	99%
Boiler 1 On Delay	60 sec
Boiler 2 On Delay	60 sec
Boiler 3 On Delay	60 sec

Alarms

(none)

Outputs

Out1	Boiler 1 Enable
Out2	Boiler 2 Enable
Out3	Boiler 3 Enable

SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
Hot water supply Temperature SP	Hot water supply temperature	Required
Hot water supply Setpoint Tmp	Hot water supply temperature setpoint	Required
Changeover Chng	Weekly flag allowing lead and lag boilers to be rotate	Required
Enable Enb	Should be joined to time schedule. Boiler and pumps are disabled when value is (0) off	Required

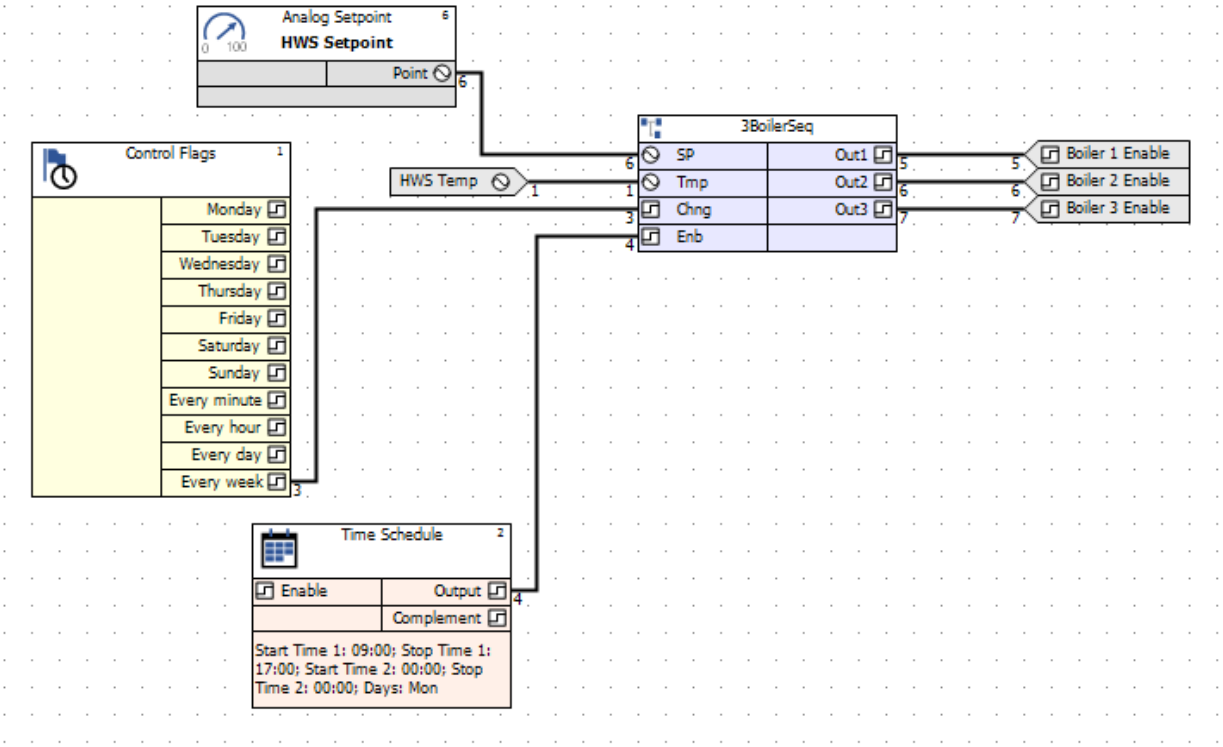
Outputs

Object	Comments	Object options
Boiler 1 Enable Out1	Output is on (1) when boiler 1 is selected as desired output	
Boiler 2 Enable Out2	Output is on (1) when boiler 2 is selected as desired output	
Boiler 3 Enable Out3	Output is on (1) when boiler 3 is selected as desired output	

Internal Settings

Object	Comments	Object options
Lead Enable	Heating load > value to enable lead boiler	25%
Lag Enable	Heating load > value to enable lag boiler	75%
Lag Lag Enable	Heating load > value to enable lag-lag boiler	99%
Boiler 1 On Delay	Time delay before boiler 1 is set on	60 seconds
Boiler 2 On Delay	Time delay before boiler 2 is set on	60 seconds
Boiler 3 On Delay	Time delay before boiler 3 is set on	60 seconds

Example

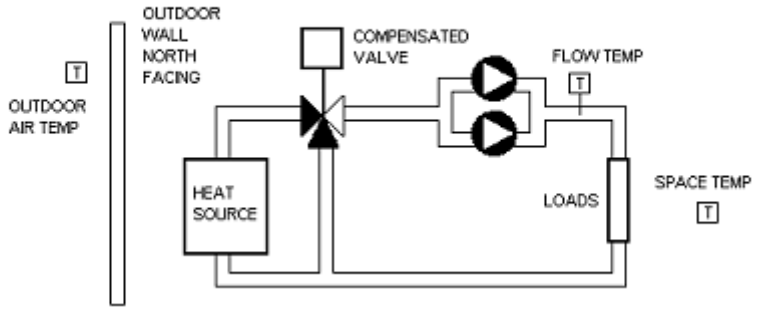


WEATHER COMPENSATOR

SYSTEM OVERVIEW

This macro provides PID control of compensated heating valve. The valve compensation is reset based on outside air temperature. The flow temperature setpoint (FlwA) is the flow setpoint when the outdoor air temperature is 68F. The flow temperature setpoint (FlwB) is the flow setpoint at 32F. The space influence is found by multiplying the difference between the space temperature and the space setpoint by the space influence gain. The space influence is added to both flow setpoints. The compensation setpoint limits are set tin the macro. The PID is enabled through the enable input point.

Heating reset from outside air temperature with space influence.



Inputs

HWS Flow Temperature	FlwT
Flow SP at 68 F	FlwA
Flow SP at 32F	FlwB
Outdoor Air Temp	OAT
Room Setpoint	RmSP
Room Temperature	RmT
Enable	Enb

Internal

Values

(none)

Settings

Min HWS SP	68F
Max HWS SP	180F
Room Influence Gain	5
Integration Time	600 sec
Derivative Time	0 sec
Gain	8

Alarms

(none)

Outputs

SP	Calculated Setpoint
VOut	Valve Signal

SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
Flow Temperature FlwT	Hot water supply temperature	Required
Flow SP at 68F FlwA	Hot water supply temperature setpoint at 68F	Required
Flow SP at 32F FlwB	Hot water supply temperature setpoint at 32F	Required
Outdoor air temperature OAT	Active outdoor air temperature	Required
Room Setpoint RmSP	Room temperature setpoint	Required
Room Temperature RmT	Active room temperature	Required
Enable Enb	This input must be set toon (1) for the module to function	Required

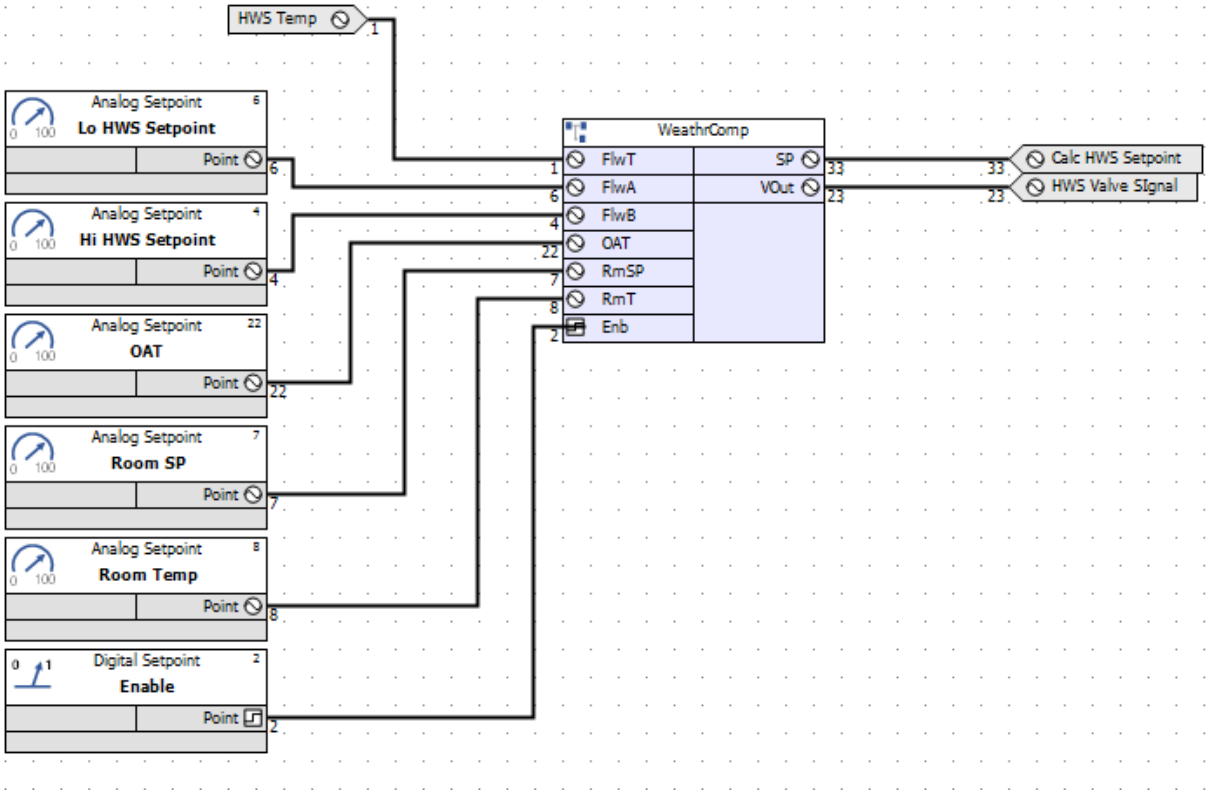
Outputs

Object	Comments	Object options
Calculated HWS Setpoint SP	Recalculated Hot water supply setpoint	
Valve Signal VOut	Output for the Hot water supply valve.	

Internal Settings

Object	Comments	Object options
Minimum Hot Water Supply Setpoint	Adjustable proportional gain to adjust cooling PID loop	68F
Maximum Hot Water Supply Setpoint	Adjustable proportional gain to adjust heating PID loop	180F
Room Influence Gain	Gain value for room influence	5
Integration Time	Integration time for PID loop	600 seconds
Derivative Time	Derivative Time for PID loop	0
Gain	Gain value for PID loop	8

Example

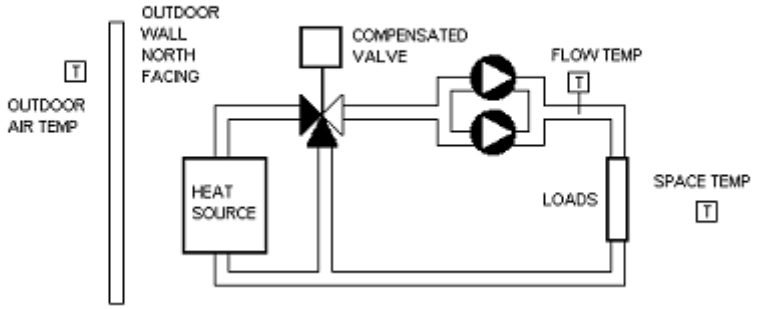


WEATHER COMPENSATOR WITH SETBACK

SYSTEM OVERVIEW

This macro provides PID control of compensated heating valve. The valve compensation is reset based on outside air temperature. The flow temperature setpoint (FlwA) is the flow setpoint when the outdoor air temperature is 68F. The flow temperature setpoint (FlwB) is the flow setpoint at 32F. The space influence is found by multiplying the difference between the space temperature and the space setpoint by the space influence gain. The space influence is added to both flow setpoints. The compensation setpoint limits are set tin the macro. The PID is enabled through the enable input point. When the night setback input is on the macro uses the setback setpoint instead of the room setpoint.

Heating reset from outside air temperature with space influence.



Inputs

HWS Flow Temperature	FlwT
Flow SP at 68 F	FlwA
Flow SP at 32F	FlwB
Outdoor Air Temp	OAT
Setback Setpoint	SbSP
Room Setpoint	RmSP
Room Temperature	RmT
Setback Enable	SbEn
Enable	Enb

Internal

Values

(none)

Settings

Min HWS SP	68F
Max HWS SP	180F
Room Influence Gain	5
Integration Time	600 sec
Derivative Time	0 sec
Gain	8

Alarms

(none)

Outputs

SP	Calculated Setpoint
VOut	Valve Signal

SYSTEM OBJECT DESCRIPTION

Inputs

Object	Comments	Object options
Flow Temperature FlwT	Hot water supply temperature	Required
Flow SP at 68F FlwA	Hot water supply temperature setpoint at 68F	Required
Flow SP at 32F FlwB	Hot water supply temperature setpoint at 32F	Required
Outdoor air temperature OAT	Active outdoor air temperature	Required
Setback Setpoint SbSP	The setpoint of the space air temperature when night setback is off.	
Room Setpoint RmSP	Room temperature setpoint	Required
Room Temperature RmT	Active room temperature	Required
Setback Enable SbEn	When set to on macro uses setback input as the room setpoint, else occupied setpoint is used.	Required
Enable Enb	This input must be set toon (1) for the module to function	Required

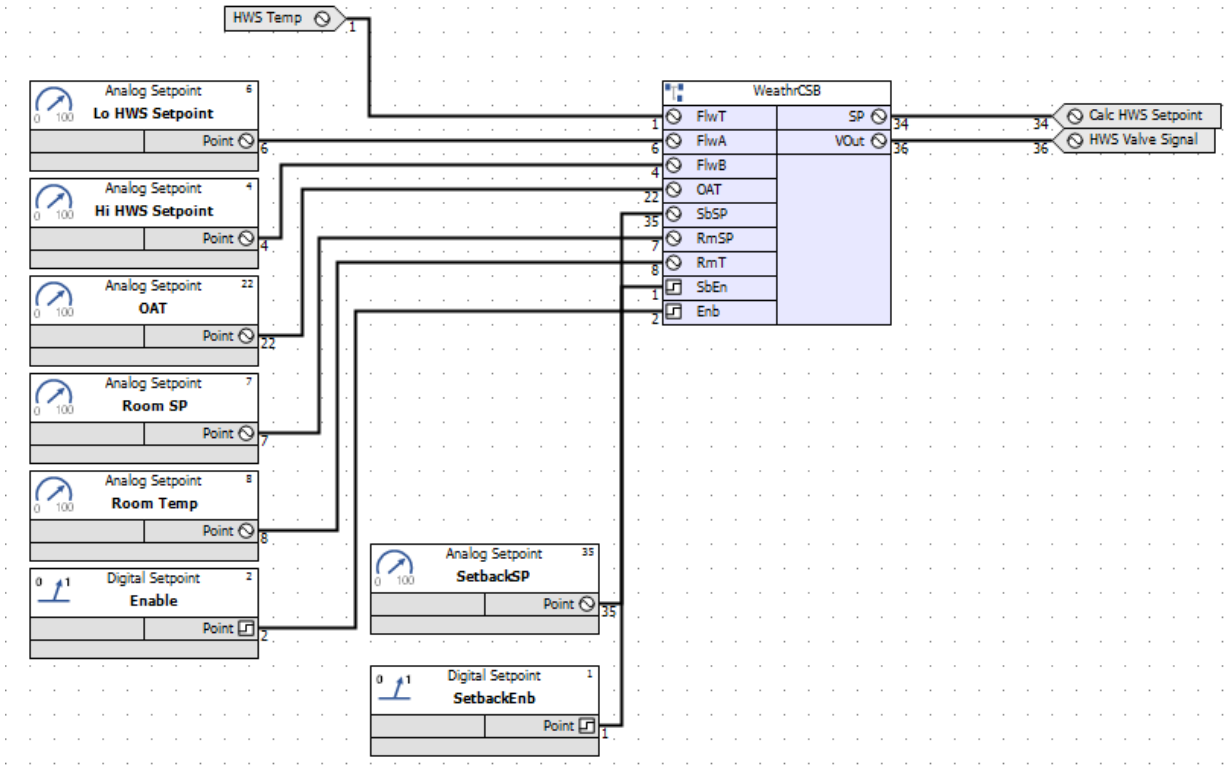
Outputs

Object	Comments	Object options
Calculated HWS Setpoint SP	Recalculated Hot water supply setpoint	
Valve Signal VOut	Output for the Hot water supply valve.	

Internal Settings

Object	Comments	Object options
Minimum Hot Water Supply Setpoint	Adjustable proportional gain to adjust cooling PID loop	68F
Maximum Hot Water Supply Setpoint	Adjustable proportional gain to adjust heating PID loop	180F
Room Influence Gain	Gain value for room influence	5
Integration Time	Integration time for PID loop	600 seconds
Derivative Time	Derivative Time for PID loop	0
Gain	Gain value for PID loop	8

Example



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