PV (Proportional Valve) (0-10v Modulation)
Eng Manual

Ver 18.6.01.-134
Release Date 2-3-21

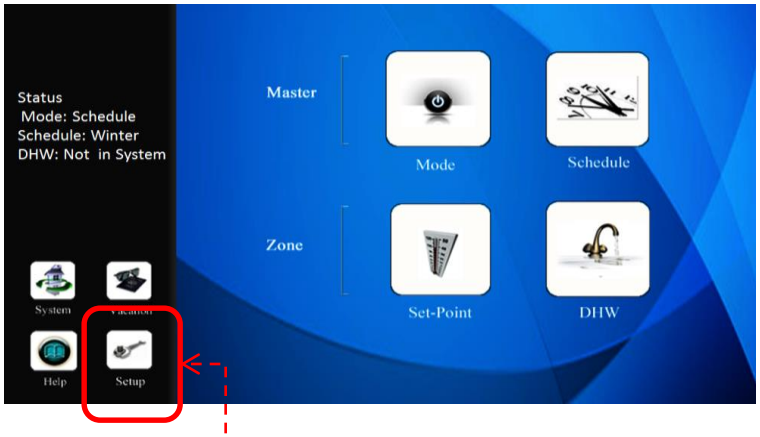
Title Page

Publication details:
Title: iCon Touch Screen User Manual
Part Number: CC-200TSEM

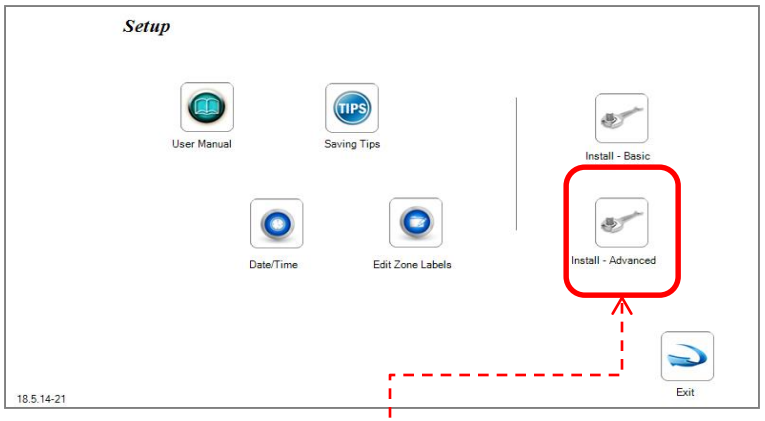
Produced by:
Product Support Department
Comeragh Controls Ltd
Upper Irish Town
Clonmel
Co. Tipperary

ComeraghControls
Intelligent Control Systems

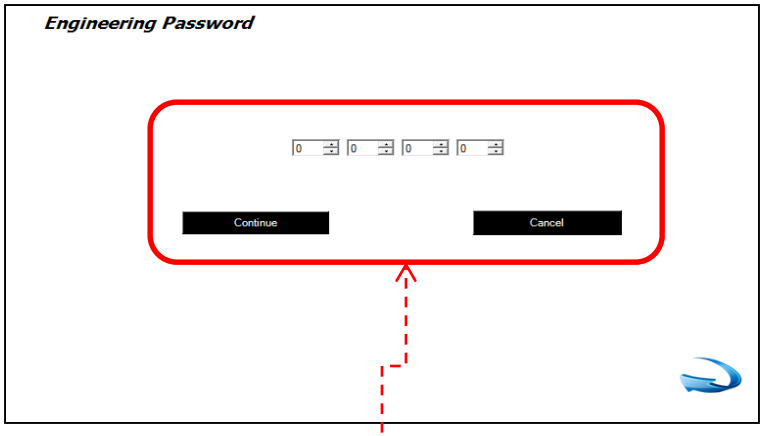
1. Access Engineering Menu



Step 1. Press Setup



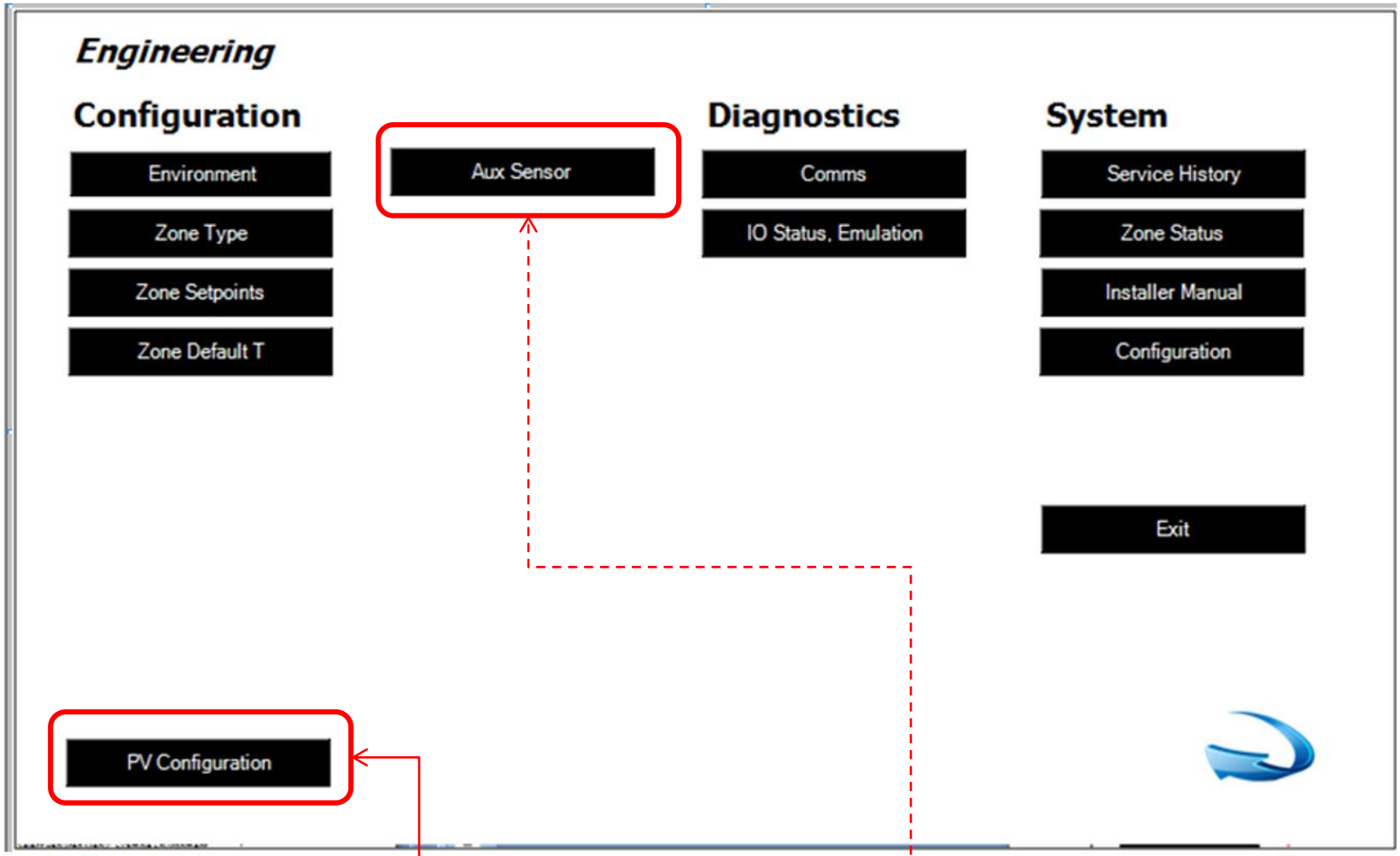
Step 2. Press - Install Advanced



3. Enter code 3105 & Press Continue

ComeraghControls
Intelligent Control Systems

2. Engineering Menu – PV (Proportional Valve) (0-10v Modulation)

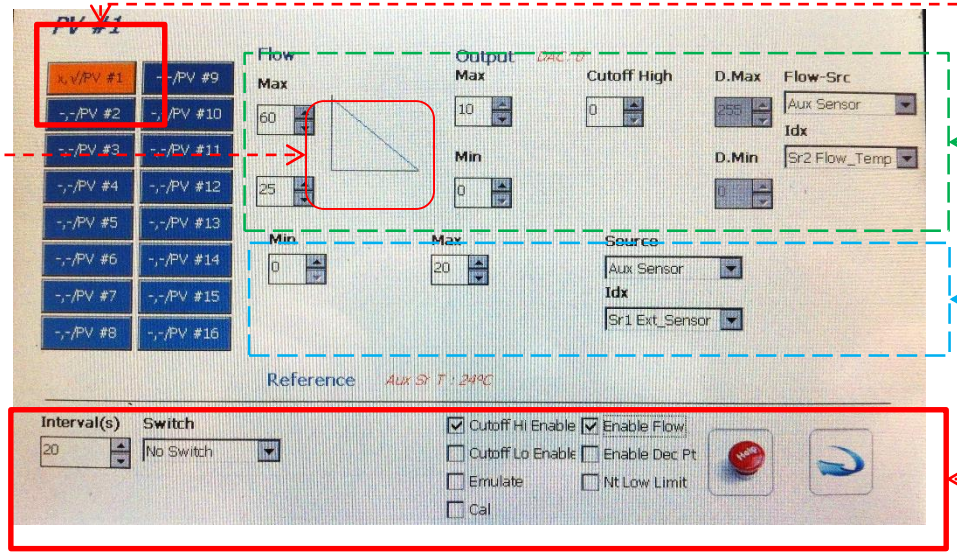


Select PV Config

Note Aux Sensor used in Conjunction with PV.

ComeraghControls
Intelligent Control Systems

3.1 Proportional Valve (0-10v Port) – Basic



1/0 #1 PV
Overview
Each R16 I/O (Logic Box) has a 0-10v modulation port.
Each 0-10v port can be configured for 1 x Weather Compensation

Load Line A

Comment	Only App Weather Compensation	
Flow Temp	Source	Aux Sensor
	Idx	Flow Sensor
	Min Flow	0-99
	Max Flow	0-99
	Cut Off	0-99
☐ Flow Temp: flow sensor	Enable or disable feed back from	
Reference	Source	Aux Sensor
	Idx	External Sensor
	Min	0-99
	Max	0-99

Note Grey Out Fields
Not Adjustable

Basic
Only applies to PV output #1

Load Line B
Not applicable

Load Line A
Comment Only App Weather Compensation

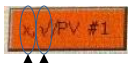
Load Line Direction

The load line can be change from incline to decline by simply clicking on the load line image

Intervals	Adjust to set the response time of the 01-0v port **(Sec)**
	Min & Default setting 20 sec for each step
Switch	Not available on Basic
CutOff Hi Enable	Limit 0-10v output to a set Hi level e.g. 8v
	Must be left check for cut off to operate
CutOff Lo Enable	Limit 0-10v output to a set Lo level e.g. 2v
	Must be left check for cut off to operate
Emulate:	Enables the system to be tested before shipping
Cal:	Enables 0-10v D(Desired) Max, D Min to be calibrate
	Check box to edit cal,
	Cal will be in effect irrespective of check box
	Max o/p voltage is 10v
Enable Flow:	Enables close loop feed back from a flow sensors
NT Low Limit	Night Time Low Limit Not available on Basic

Additional Comments:

Error	If problem encounter – Error note displayed
DAC	(Digital Analogue Converter) Only for engineer reference:
	Valve opens 0-10v in 255 digital steps

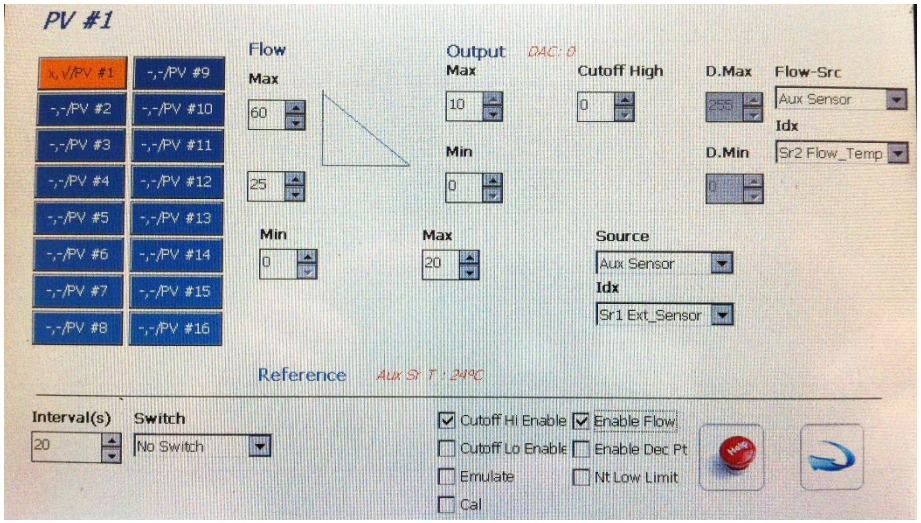


Comms Check for I/O Board

Comms Check for PV8 Board

ComeraghControls
Intelligent Control Systems

3.2 Proportional Valve (0-10v Port) – Basic - (Example Weather Compensation)



Operation:
The system will now monitor the outside temperature and based on your load line setting, it will calculate a desired Flow Temperature (DF) .
The system will now check the actual flow temp (FT)
Depending on whether the DF is greater or less then the FT, the proportional valve (PV) output (0-10v) will either step open or close.
Depending on (ΔT) the difference between DF and FT, the 0-10v output the modulate in at a faster or slower rate.
[ΔT>3°c Step = .8v] [3°>ΔT>2°c Step = .4v] [2°>ΔT>.5°c Step = .2v]

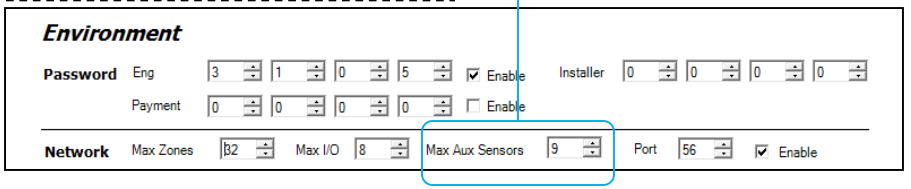
Sample Setup: Weather Compensation
Step 1: Decide which I/O (Relay Board) will be managing the mixer (I/O#1-8)
Step 2: Load Line A ,(Basic)
(Advanced System) load line B can be used if you are switching to e.g. cooling via the same mixer.
Step 3: ***External Temp*** Set up your reference
Note you will need to assign items in ***Environment Tab*** & ***Aux Tab***

Source	Aux Sensor	
Idx	External Sensor	
Min	0	(Range 0-99)
Max	20	(Range 0-99)

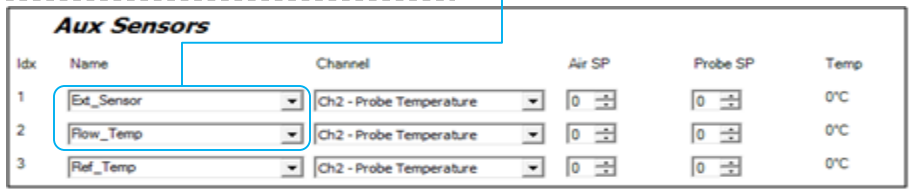
Sept 4 ***Flow Temp:*** Enable feed back from flow sensor
Step 5: Set up your required flow temperatures

Source	Aux Sensor	
Idx	Flow Sensor	
Min Flow	25	(Range 0-99)
Max Flow	55	(Range 0-99)
Cut Off	50	(Range 0-99)

Environment Tab
Set the Max Aux Sensor to 2

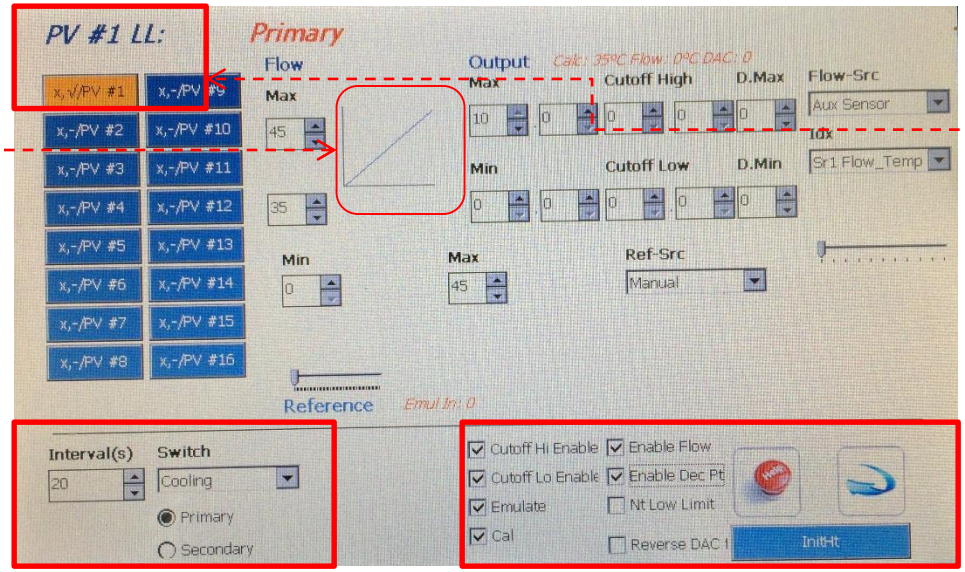


Aux Tab
Set Idx 1 – External Sensor
Set Idx 1 – External Sensor



ComeraghControls
Intelligent Control Systems

3.3 Proportional Valve (0-10v Port)- Advanced Overview



Load Line Direction
The load line can be change from incline to decline by simply clicking on the load line image

Slope
Adjusting Max Output or Cut Off High will affect the slope
i.e by using a Cut Off the o/p will be higher across the input range

Additional Comments:

Error	If problem encounter – Error note displayed
DAC	(Digital Analogue Converter) Only for engineer reference: Valve opens 0-10v in 255 digital steps
Pri/Sec	Primary & Secondary Load lines, alternate via switch

Intervals	Adjust to set the response time of the 01-0v port **(Sec)** Min & Default setting 20 sec for each step
Switch	Activation to switch between Load Line A & Load Line B Idx – Switch trigger
	Options: No Switch / Cooling (As per Image) Zone Relay Input

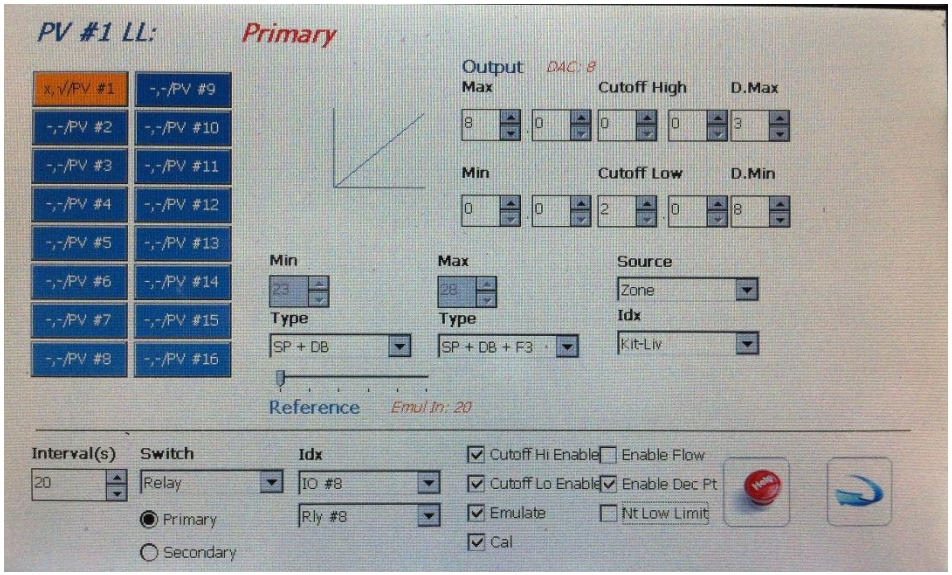
1/0 #1 LL (Load Line)
Overview
Each i/o (Logic Box) has a 0-10v modulation port.
Each 0-10v port can be configured for different application such as;

- Weather Compensation
- Cooling flow temperature modulation [Referencing the Return Temp]
- Cooling flow temperature modulation [Referencing the Zone]
- Cooling flow temperature modulation [Referencing the Hottest Zone]

CutOff Hi Enable	Limit 0-10v output to a set Hi level e.g. 8v Must be left check for cut off to operate
CutOff Lo Enable	Limit 0-10v output to a set Lo level e.g. 2v Must be left check for cut off to operate Only operate when 0-10v output is running (i.e. above 1)
Emulate:	Enables the system to be tested before shipping Note Fast DAC Response for test Note Physical 0-10v output not update in this mode
Cal:	Enables 0-10v D(Desired) Max, D Min to be calibrate Check box to edit cal, Cal will be in effect irrespective of check box Emulation must be switch OFF during cal. Use sensor to adjust SP to move the DAC output
Enable Flow:	Enables close loop feed back from a flow sensors
Enable Dec Pt:	This enable decimal point values
NT Low Limit	Night Time Low Limit (Display at Output Low) This value (e.g. 2v) will override the 0-10V at set times (Note Night Time Sch Cl – Enabled in Environment) (Enable by end user in Advance Zone settings) (NT Check Box & Value Hidden - Check NT to see value)
Reverse DAC:	Use only for cooling via Underfloor Pipework Typically the 2nd Load Line is use for 0-10 control on FCU (Fan Coil Unit) cooling. However the cooling can be via the uf pipe work. For cooling via uf pipe, the DAC needs to be in reverse. Reference is Flow Temp

If Actual flow is **above** Calculated Flow, Mix Opens allows more cold water
If Actual flow is **below** Calculated Flow, Mix Closes allows less cold water
(Without Reverse DAC, the mixer operate normally (for Hot Water)
(i.e if AF>CF =Close Mixer to reduce the HOT water flow)
(i.e.if AF<CF= Open Mixer to Increase the HOT water flow)

3.4 Proportional Valve (0-10v Port)- Advanced Example – Cooling via FCU (LL1)



Load Line A

Comment	Typical App Cooling Modulation Ref Individual Zones	
Reference	Source	Zone
	Idx	Kitchen
	Min	SP+DB
	Max	SP+DB+F3
☐ Flow Temp:	Enable or disable feed back from flow sensor Normally disable for e.g. FCU	

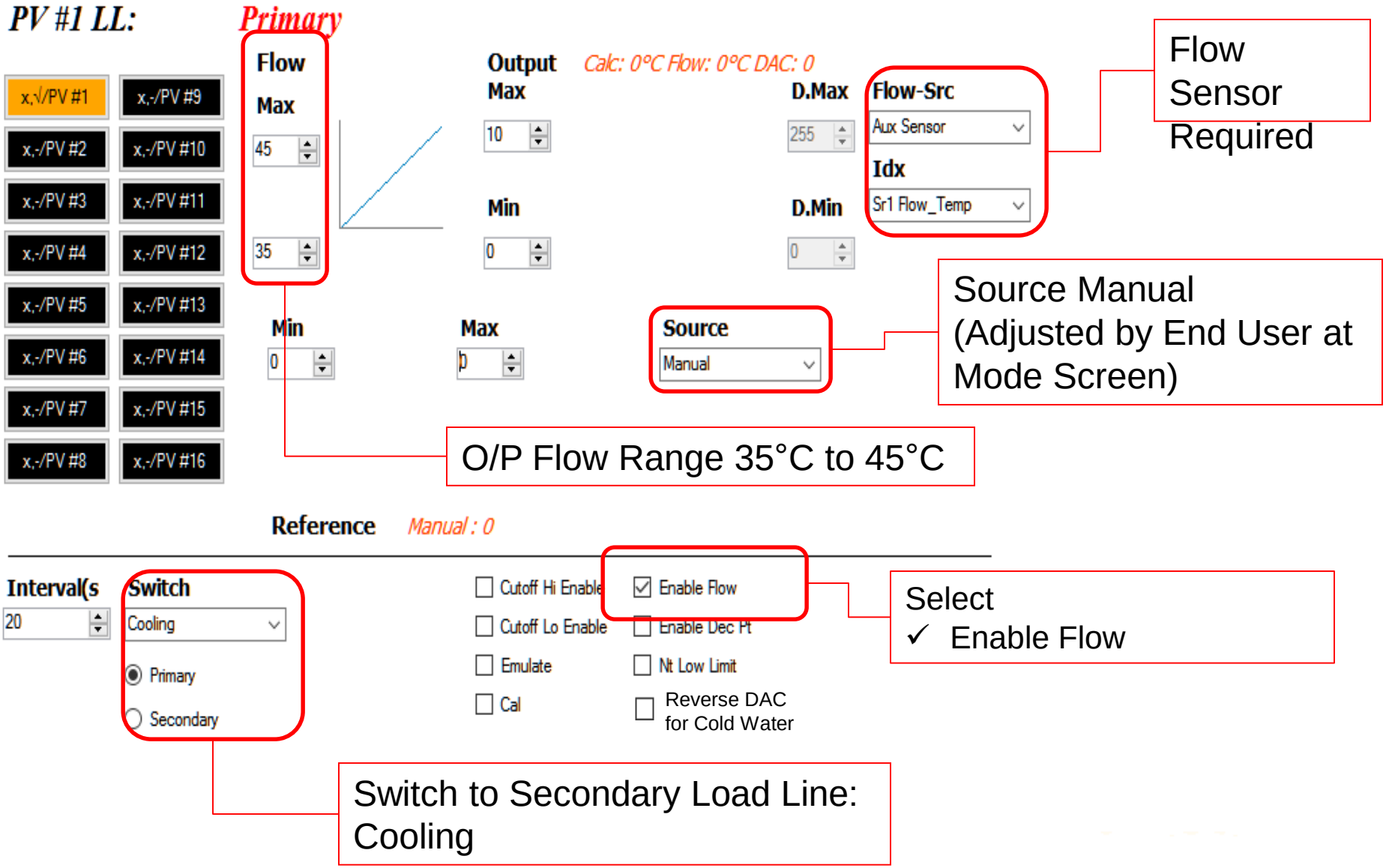
Load Line B

Comment	Typical App Cooling Modulation Ref Hottest Zones	
Reference	Source	Hottest Zone (dt)
	Idx	(n/a)
	Min	SP+DB
	Max	SP+DB+F3
☐ Flow Temp:	Enable or disable feed back from flow sensor Normally disable for e.g. FCU	

Hottest Zone (dt)
The system is intelligent, it first finds the hottest zone and uses it Delta Temp (dt) difference between it's Room Temp & Room SP+DB, to decide mix o/p

ComeraghControls
Intelligent Control Systems

3.5 Proportional Valve (0-10v Port)- Advanced Example – Heating via UFH Pipe work (LL1)



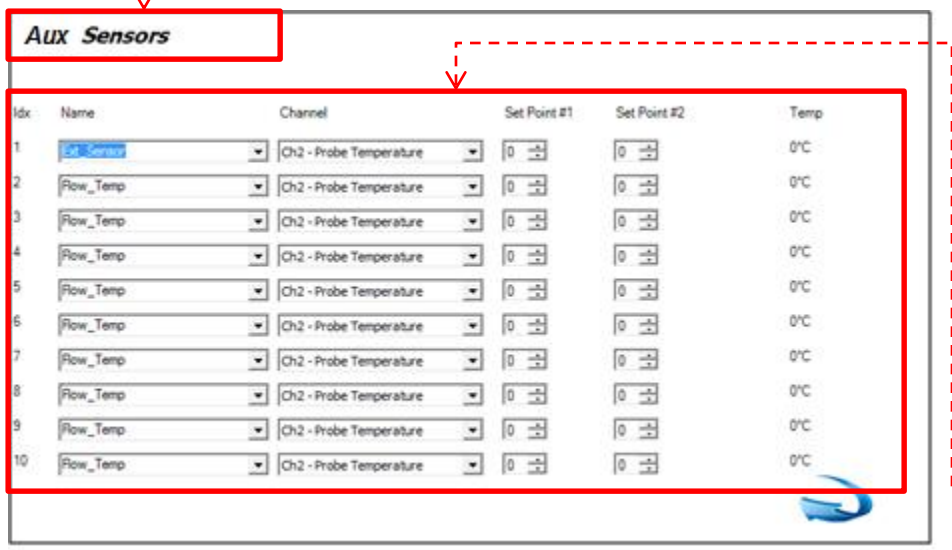
0-10v: Heating Setup (Load Line 1)

3.6 Proportional Valve (0-10v Port)- Voltage Steps

Results: In steps of .8, .4, .2 +/- volts or Full Open/Closed								
IF DT>5	IF PT> MPT	IF Dt>3	IF 3>Dt>2	IF 2>Dt>.5	IF -.5<Dt>.5	IF2 <Dt<-.5	IF- 3 <Dt<-2	IF Dt<-3
-	CLOSE FULL	-	-	-	-	-	-	-
-	CLOSE FULL	-	-	-	-	-	-	-
-	-	-.8 VOLTS	-	-	-	-	-	-
-	-	-.8 VOLTS	-	-	-	-	-	-
-	-	-.8 VOLTS	-	-	-	-	-	-
-	-	-	-.4 VOLTS	-	-	-	-	-
-	-	-	-.4 VOLTS	-	-	-	-	-
-	-	-	-	-.2 VOLTS	-	-	-	-
-	-	-	-	-.2 VOLTS	-	-	-	-
-	-	-	-	-	NO ACTION	-	-	-
-	-	-	-	-	-	+.2 VOLTS	-	-
-	-	-	-	-	-	+.2 VOLTS	-	-
-	-	-	-	-	-	-	+.4 VOLTS	-
-	-	-	-	-	-	-	+.4 VOLTS	-
-	-	-	-	-	-	-	-	+.8 VOLTS
-	-	-	-	-	-	-	-	+.8 VOLTS
-	-	-	-	-	-	-	-	+.8 VOLTS
OPEN FULL	-	-	-	-	-	-	-	-
OPEN FULL	-	-	-	-	-	-	-	-

Closed Loop Control

4. Aux Sensors



Overview:
The Aux sensors are typically used in conjunction with the 0-10v Proportional Valve (PV)

Typical Application
External Weather Compensation
Cooling flow temperature modulation
Differential temperate control

Aux Sensors

Idx	Identification Number	
Name	External	(External Sensor)
	Flow	(Flow Sensor)
	Ref	(Reference Sensor)
	Temperature	(General – Temperature Sensor)
Channel	Ch2 – Probe Temp (Default Reference)	
	Ch1 – Air Temp	
Set Point #1 /2	Set Point temp for Ch1 (Air) & Ch2 (Probe)	
Temp	Actual measured temp	

5. Schedule Cooling Max

End User

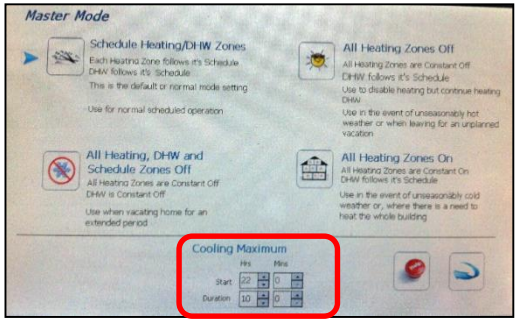
a) Master Mode: Set Cooling Max

- **Start Time**
- **Duration in Hr.**

Cooling Maximum is applied during the period defined by the Start time and Duration.

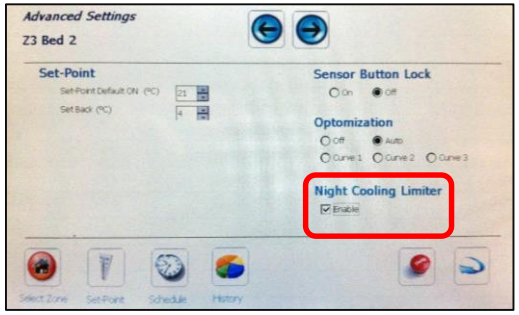
Note:Only actives when it goes through a transition period

Default Time 23 Hr Duration 5 Hr

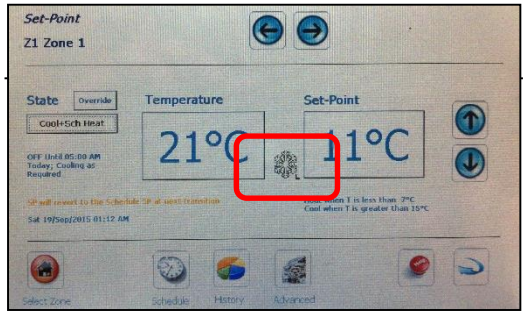


b) Individual Zone Advance settings

- **Enable Night Time Max Cooling**



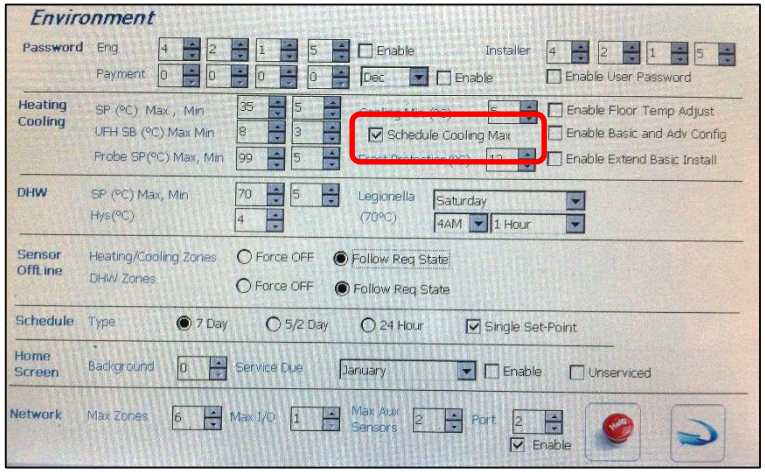
C) When active: "L" (Limiter) displayed beside Cooling symbol



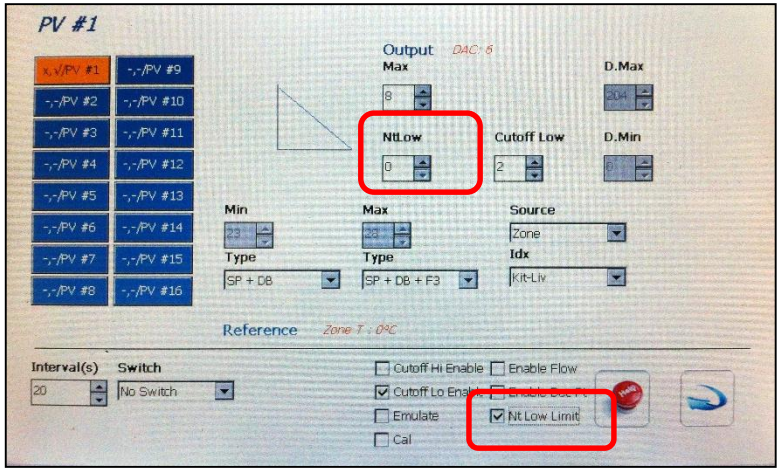
Engineering Enable

1. Night Time Cooling Maximum available with PV Advance Module

2. Cooling Maximum must be enabled. (Set in Environment Tab in Eng Mode)



3.The 0-10v output is held at the Night Time Cooling Max value set in the PV screen



Note:

a) If set to 0 , the NT Cooling Max will be 0v (no cooling)

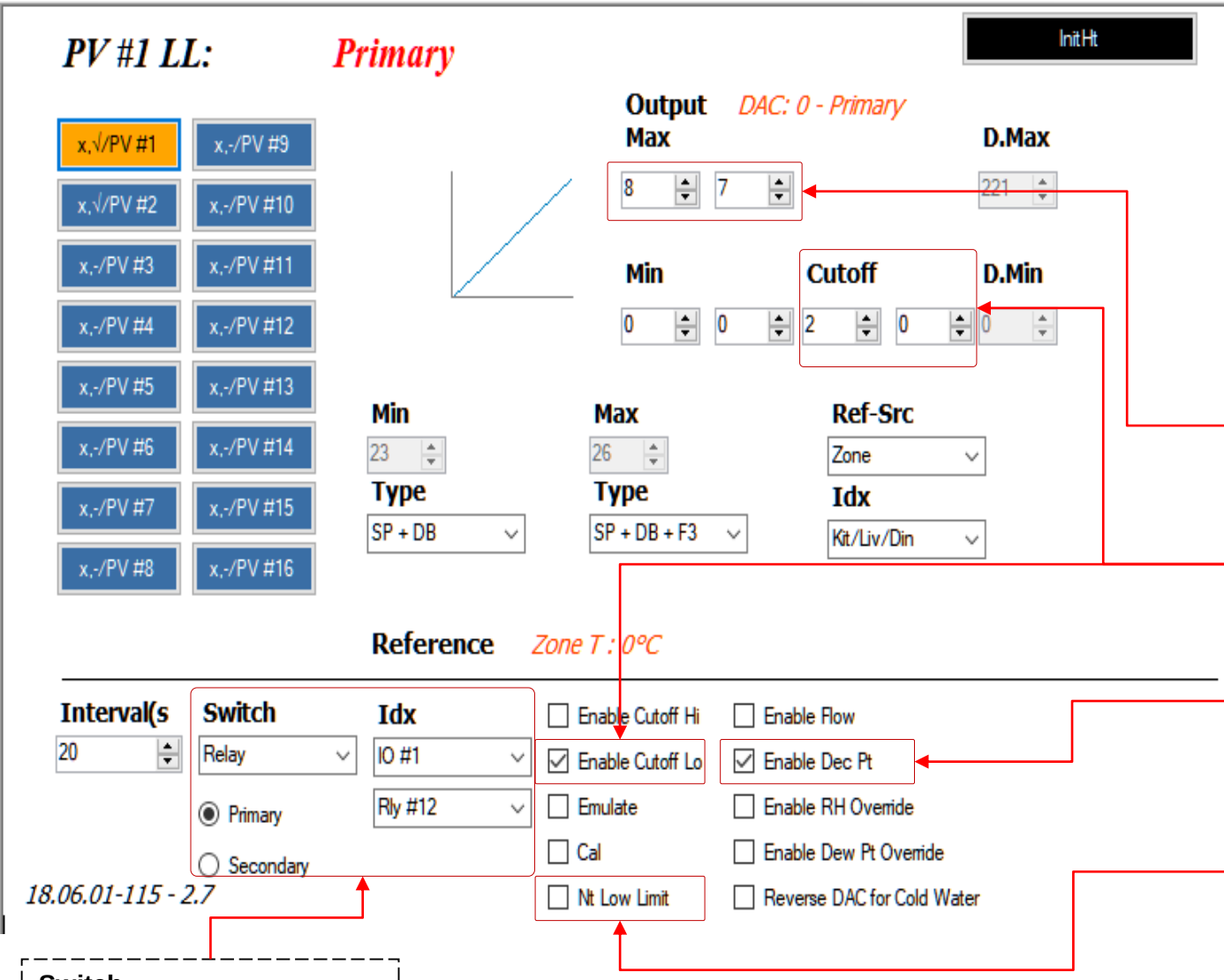
b) Check box is only use to display the value

c) NT Cooling is enable or Disable by the end user in Zone Advance Settings

ComeraghControls Intelligent Control Systems

6.1 FCU assist ufh ref Diff

LL1 setup as Cooling (as usual)



Overview:

- Z1 Living
- FCU #1
- PV#1
- Load Line 1
- Cooling

Output Max
As specified by FCU Manufacture

Enable Cut off Lo
To allow exeat settings

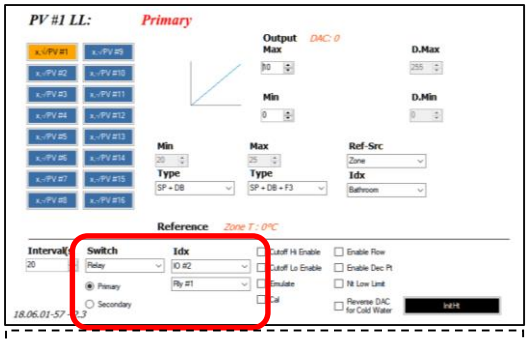
Enable Dec Pt
To allow exeat settings

Nt Low Limit
Limit FCU o/p During Night Time
Check Box to View setting

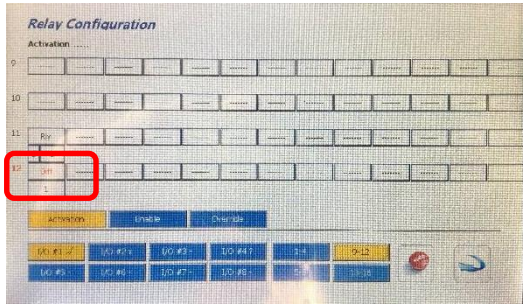
Switch
Switch from LL1 : Cooling to
LL2: FCU assist ufh with Heating

ComeraghControls
Intelligent Control Systems

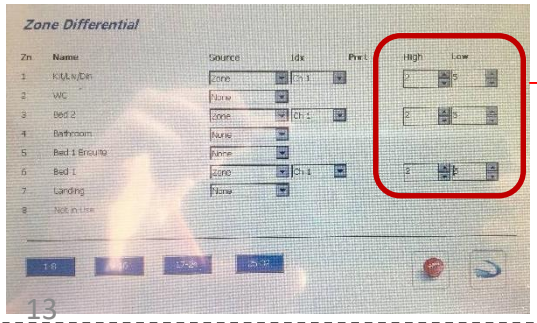
6.2 FCU assist ufh ref Diff



Load Line 1 (LL1)
Setup as normal to manage FCU Cooling
Switch to LL2 if Relay Active (e.g. R2:1)

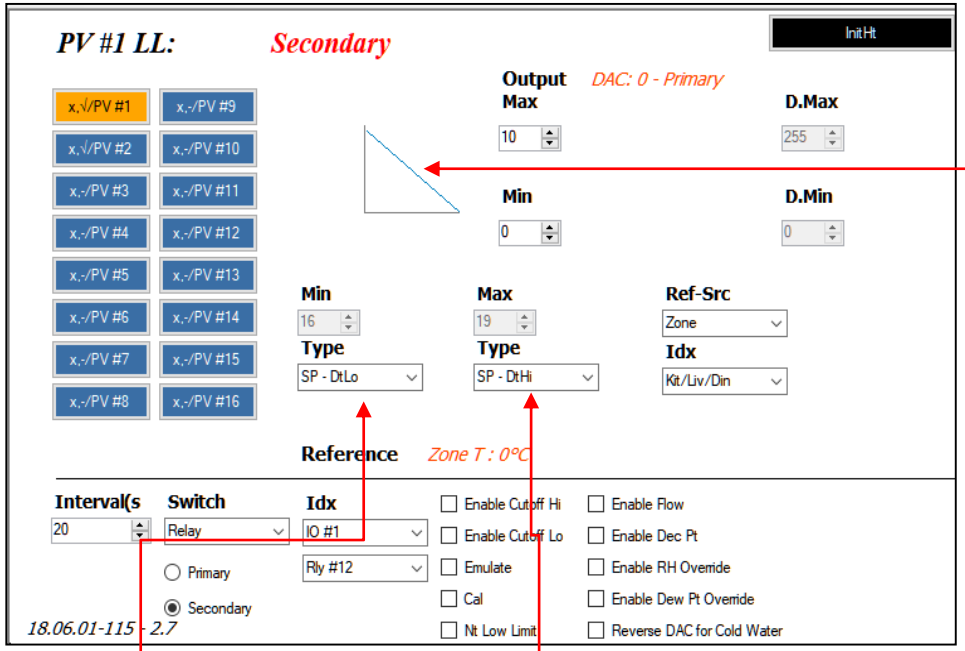


Relay 12: Activate by Diff of relevant zone 1
Zone Diff only operates during Sch ON Time



Differential set up in Zone Differential Module

Overview:
The FCU can be configure to use 2the 2nd load line to generate heat to assist the ufh , if the air them is below the SP-ΔT (DtLo)



Load Line:

Min Limit
SP-DtLo

Max Limit
SP-DtHi

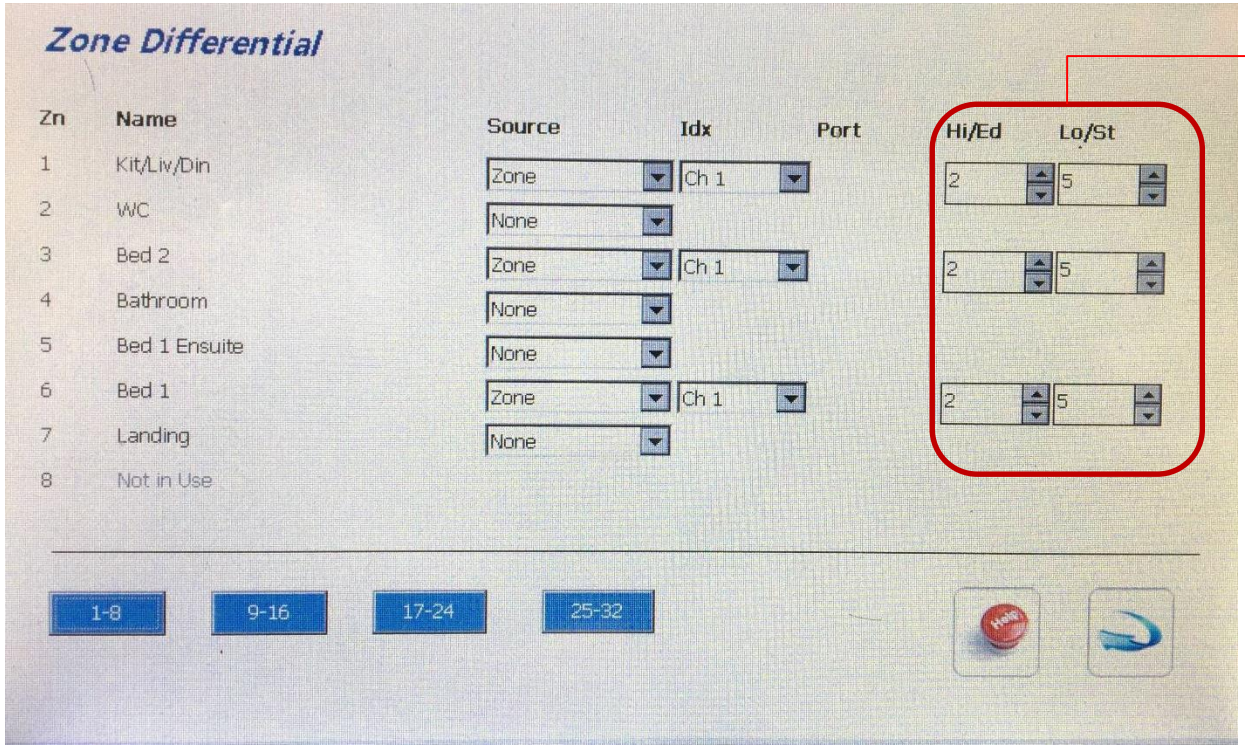
Note: If Δt of 2 Required with 3 steps
In the Differential Setup page
Set DtHi to 2
Set DtLo to 5

Note: Relay 12: Activate by Diff of relevant zone 1
Zone Diff only operates during **Sch ON Times**

ComeraghControls
Intelligent Control Systems

6.3 FCU assist ufh ref Diff

Diff Setup



Zone Differential Setup

Hi/ Ed (High/ End)
Value : 2
*This valve must be the Smaller value – **End** reference point for the 0-10v control*

Lo/St (Low / Start)
Value : 5
*This valve must be the Larger value – **Start** reference point for the 0-10v control*

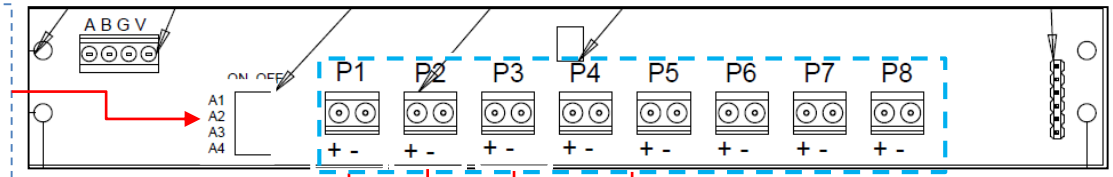
DHW Differential Setup
Hi = Larger value e.g.5
Lo = Lower Value e.g. 2

ComeraghControls
Intelligent Control Systems

7: PV8 0-10v Addressing Operation

Comments :
PV8 Board Address no. 1……. manages PV outputs 1-8

Add 1 – PV 1-8



o/p 1-8

o/p Mirror any exiting R16

R16 -I/O#1

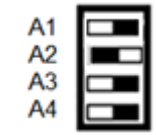
R16 -I/O#2

R16 -I/O#3

Comments :
If there are R16 and PV8 boards in a system, the 0-10v output signal will be mirrored by both
i.e. PV8 o/p #1 = R16 Address #1 , PV8 o/p #2 = R16 Address #2

Comments :
PV8 Board Address no. 2……. manages PV outputs 9-16

o/p 9-16

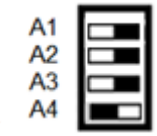


Comments :
PV8 Board Address no. 3……. manages PV outputs 9-16

o/p 17-24

Comments :
PV8 Board Address no. 4……. manages PV outputs 9-16

o/p 25-32

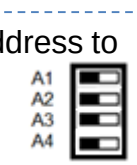


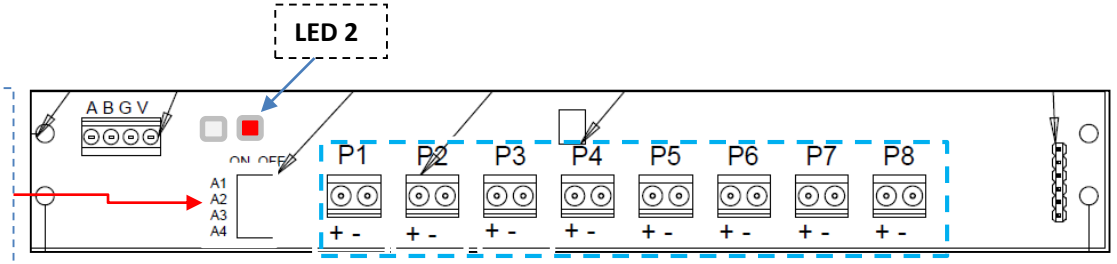
ComeraghControls
Intelligent Control Systems

8: PV8 0-10v Diagnostics- Hardware Test

Comments : Hardware Test
- Set address to 0000
- Power on the boards with no A & B attached
- Led 2 will remain ON in Red (No Comms) — O/P voltage on all ports will be 10v
- Now move A3 address switch to right - — O/P voltage on all ports will be approx. 4v
- Now move A3 address switch to left (off position)
- Now move A4 address switch to right - — O/P voltage on all ports will be approx. 8v
- This will prove the hardware 0-10v o/p are working

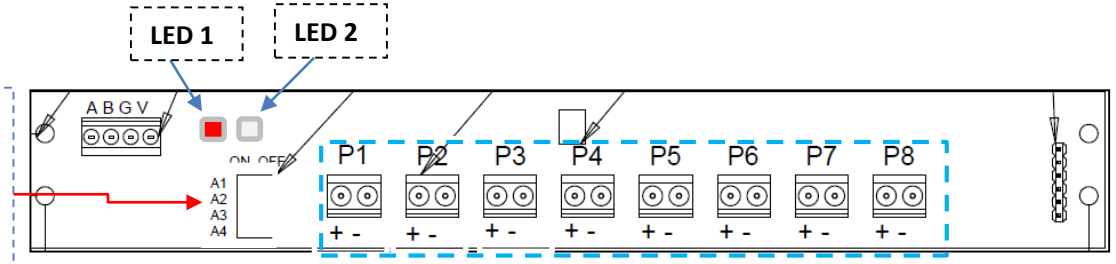
Set address to 0000





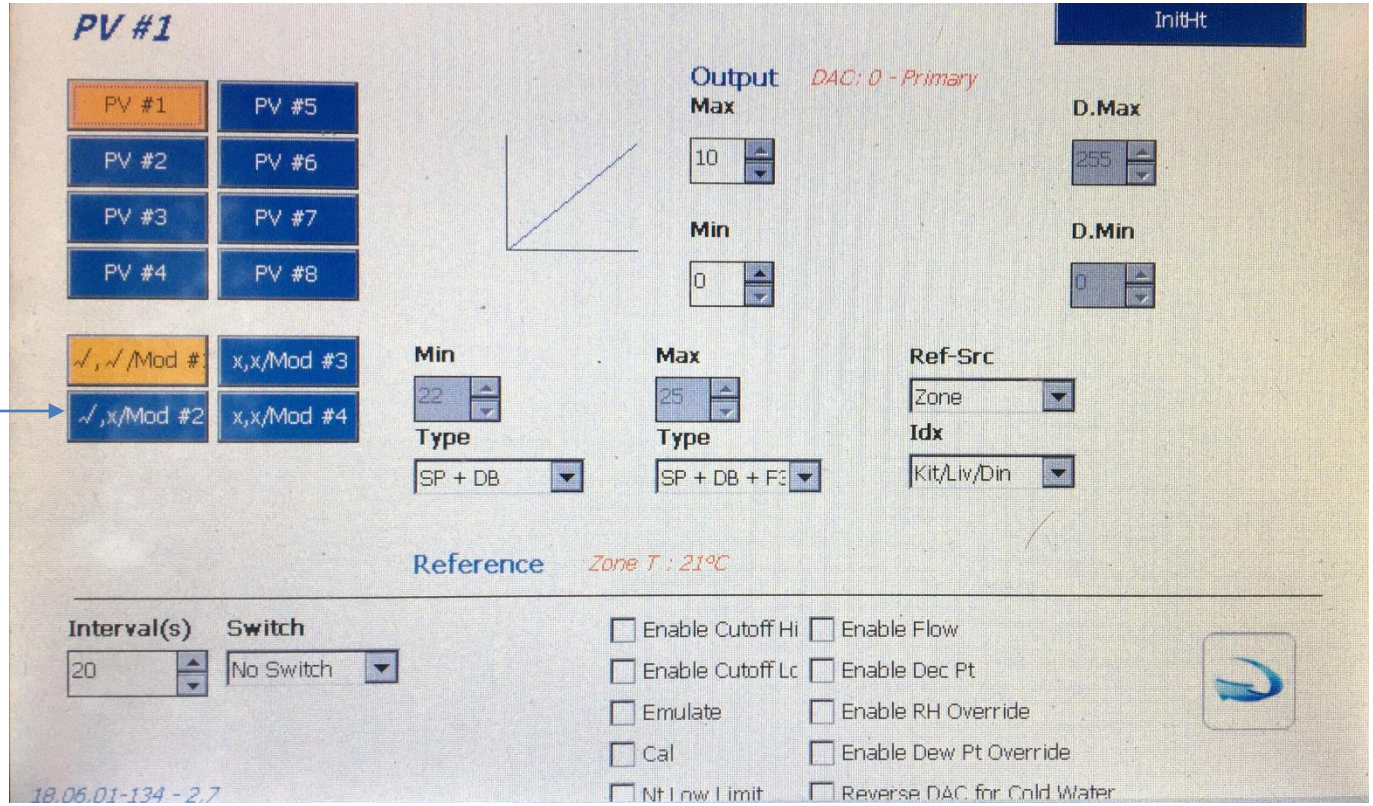
Comments : Comms
Set address to 0001 (A1 On)
- Power on the boards with A & B attached
- Led 2 will remain ON in Red until communication is received and then switches off.
- Led 1 will starts flashing during communication: ON= Reiving Comms , Off=Transmitting Comms

Set address to 0001



ComeraghControls
Intelligent Control Systems

8.1 : PV8 0-10v New layout with PV8 X 4 & Comms Notations



Comms Check for I/O Board

Comms Check for PV8 Board

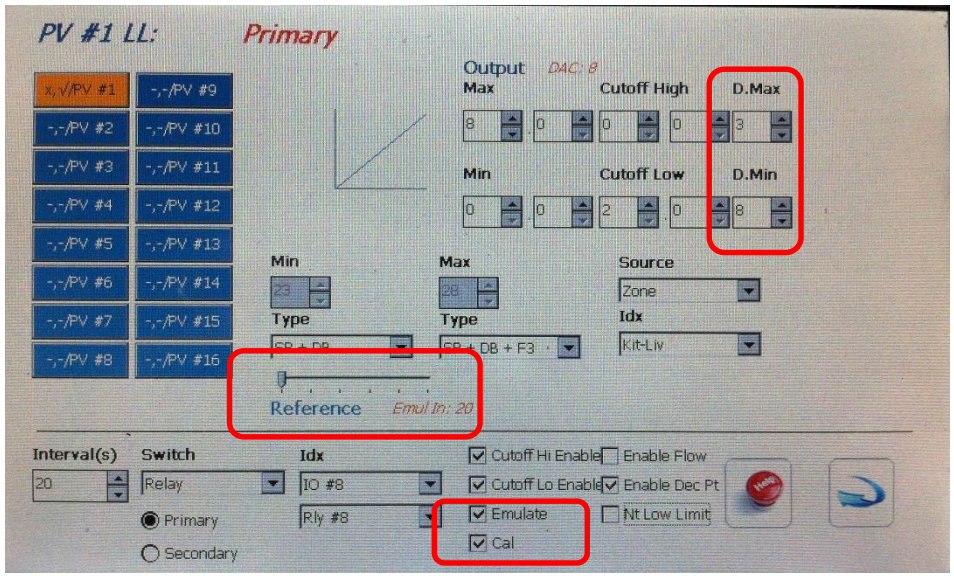
ComeraghControls
Intelligent Control Systems

9: PV8 0-10v Calibration

Description

For each 0-10v output, the Max & Min output voltage can be calibrate to suite the attached FCU(s) .
Outlined below is the TICS calibration to suit the FCU(s) resistance via touch screen GUI (Graphical User Interface)
This ensures the minimum and maximum voltage output levels correspond with requirements.

Access the require PV (Proportional Valve)



Steps:

1. **Access PV (Proportional Valve) GUI via Engineer Password access.**
2. **Select the require PV (Proportional Valve) (1-16 Available)**
3. **With the FCU attached to the required 01-0v output , place a DVM (Digital Volt Meter) on the output and set the range to DC volts**
4. **Check the "Cal" and "Emulate" functions on the screen**

The D. Min & D. Max can now be adjusted

5. **Now calibrate the Min output voltage**

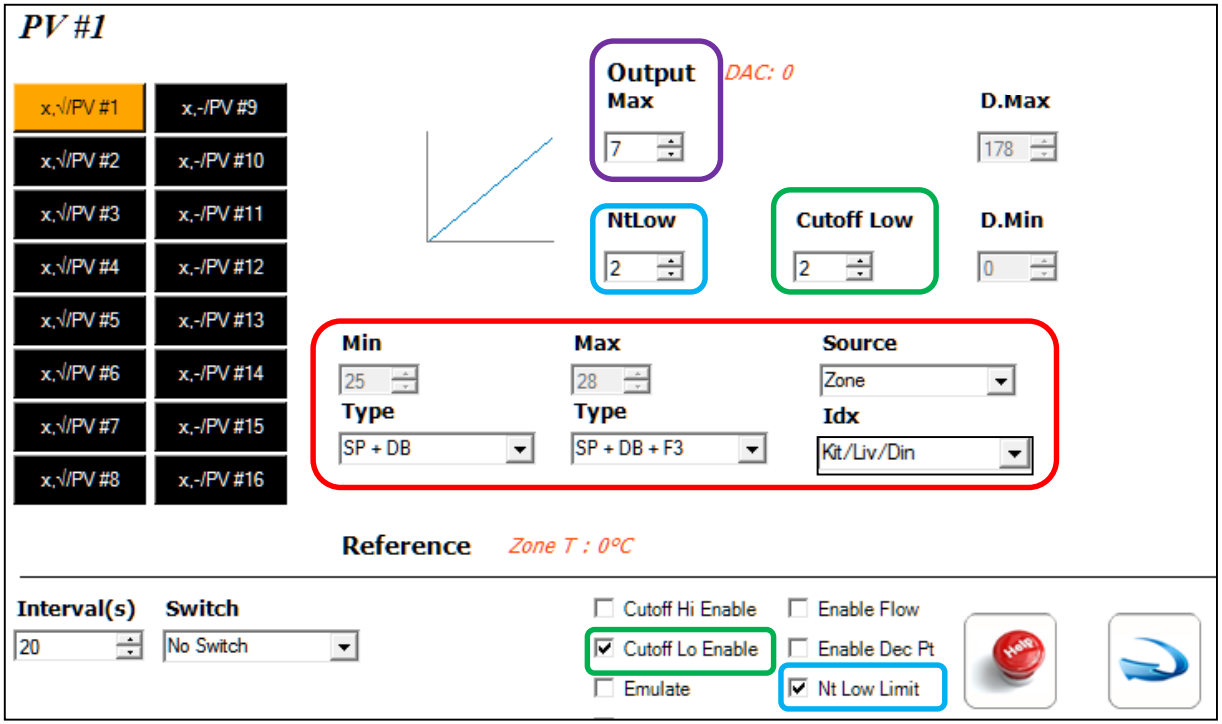
a. **Set Cut Off Low to 2 v (Dac=51)**
b. **Use the Emulate slider bar to move the output to its 1st increment setting**
c. **The system will see the min is 2v and try to o/p 2v**
d. **Now calibrate the mi to 2v**

6. **Use the Emulate slider bar to move the output to its maximum setting**
7. **Now calibrate the Max output voltage**
8. **Once you are satisfied with the output voltage , uncheck the "Cal" and "Emulate" functions on the screen**

ComeraghControls
Intelligent Control Systems

Example: GMF-P2

FCU 1: 0-10v O/P Setup Kitchen / Living / Dining Max o/p= 7V



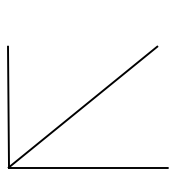
Step 2: Setup Cut Off Lo
Set Cut off to 2 (on All FCU)

Step 3: Setup Nt Lo Limit
Set NT Cut off to 2 (on All FCU)
User has the ability to enable or disable

Step 4: Setup Output Max
Set Output Max FCU)

Step 1: Setup source
Source Individual Zone
Idx: Select reference Zone e.g. Kitchen
Range Between
[SP+DB] & [SP+DB+F3]
Note DB (Deadband) set to 2
(Set in Eng / Zone SP Tab)

0-10 o/p Operation



Output
Cut Off Low = 2v

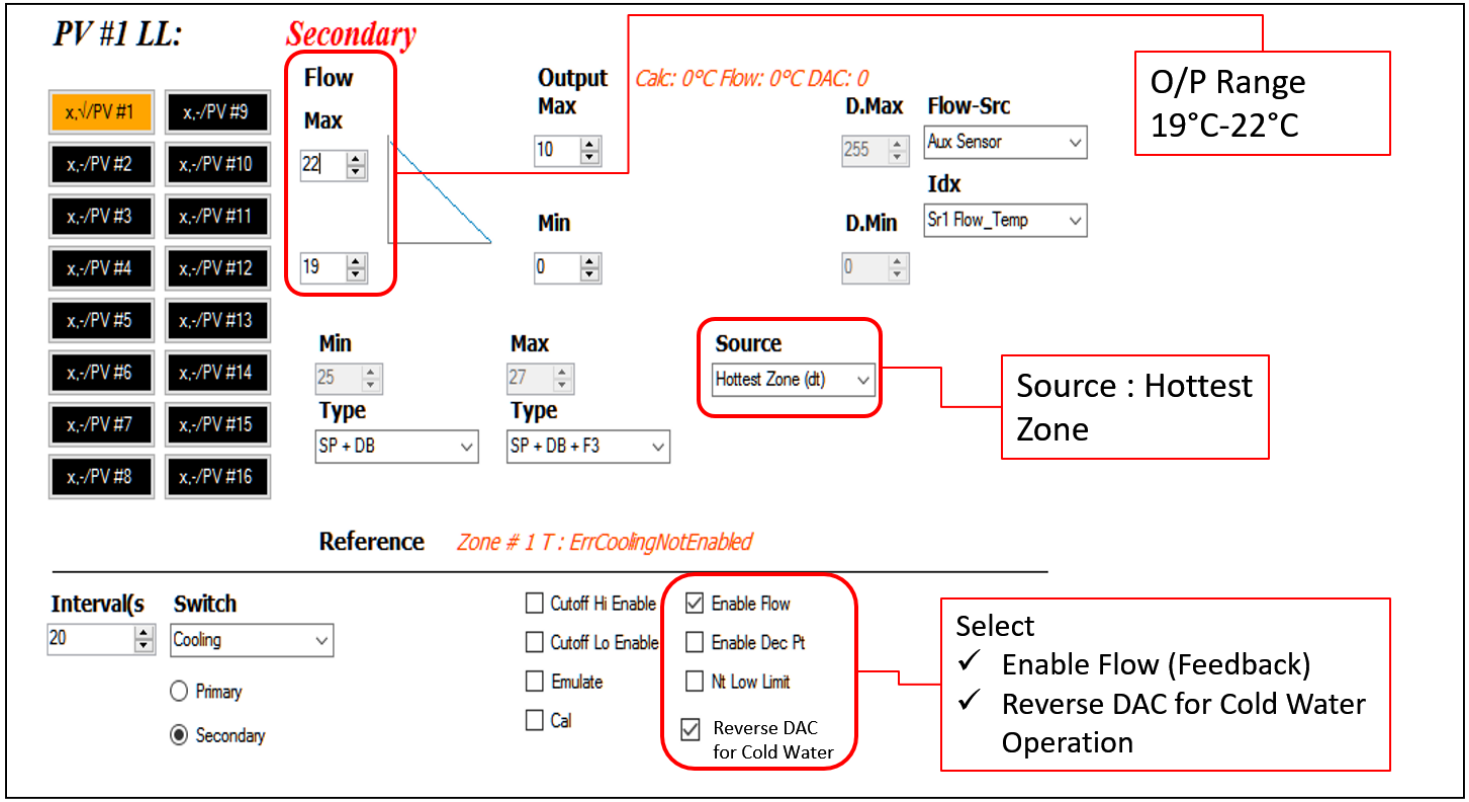
[>(SP+DB)]
[21+2]
[23°]

[>(SP+DB+F3)]
[21+2+5]
[28°]

[Range 5 Steps]

ComeraghControls
Intelligent Control Systems

Example: Cambridge University - Charles Darwin- Cooling Via UF Pipework



Example of Operation

Step 1: System identifies the Hottest Zone

Zone 3 (Hottest Zone) has the following Settings
SP = 20
DB = 4
F3 = 3

Step 2: System calculates the Desired Flow using Load Line

Ref Range [SP+DB=24] to [SP+DB+F3=27]
Room Temp = 27
Flow Temp range is 19C-22C
System calculate it needs a Desired Flow (DF)Temp of 19C

Step 3: System uses the Aux Flow Sensor as Feedback

Calculate Desired Flow Temp	19C
Actual Flow (FT) Temp	21C

System will starts opening 1-10 to send more cold water to pipework

Step 4: 0-10V Modulations

Depending on whether the DF is greater or less then the FT, the proportional valve (PV) output (0-10v) will either step open or close. Depending on (ΔT) the difference between DF and FT, the 0-10v output the modulate in at a faster or slower rate.
[ΔT>3°c Step = .8v] [3°>ΔT>2°c Step = .4v] [2°>ΔT>.5°c Step = .2v]

ComeraghControls
Intelligent Control Systems

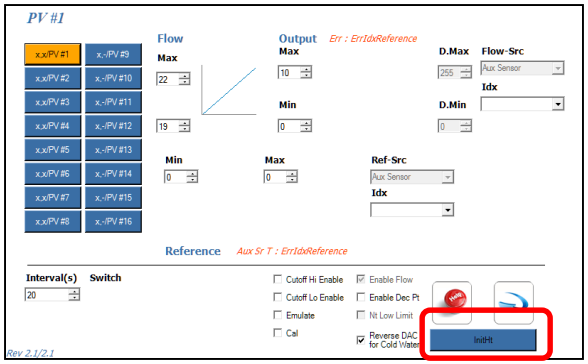
UFH Initial Heat Up Sequence

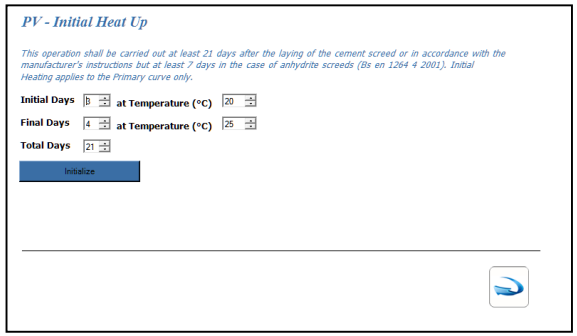
Overview:

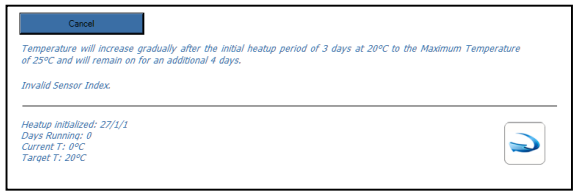
The UFH Initial Heat Up Sequence is used to slowly heat the scree over time

This operation will be carried out over 21 days after laying the cement screed or in accordance with the screed manufactures instructions, but at least 7 days in the case of anhydrite screed (BS EN 1264 4 2001)

Initial Heating applied to the primary curve (load Line) only







Set-Up

Attached an Digital Sensor & Probe to the Flow Pipe

Set this Sensor up as an Aux Sensor. (ST - Stat Type =1, SR Sequence No. 1)

On Primary Load Line: Select "Enable Flow"

(This sensor will be use as feedback, to ensure the desired Flow Temp is assigned)

Attached Mix to the 0-10v port on the relevant I/O#

Now Press the INIT Button

Default Settings

Initial Days [3:] at Temperature [20°C]

Final Days [4:] at Temperature [25°C]

Total Day [21]

Press the Initialize button to begin [Initialize]

Operation

One operational the system will trach and display the following

- Start Date
- Days Running
- Current Temp
- Target Temp

Different Floor Types

Multiple different Init can be manage (Up to 16)

Separate Mixer and I/O required for each Init

Revision Notes

Rev	(Date)	Changes
18.6.01.-126	(15-1-21)	Cooling F1,F2,F3 Triggered when temp is “>” (as before), but also now includes “=“ FCU will active if the room temp is > / = SP+DB+F1 This ensure the User Visual indicator F1, F2 F3 , matches exactly FCU speed (DAC o/p) Setting Change DB=1, F1=1,F2=2,F3=3 (Previously DB=2, F1=0,F2=1,F3=3)
18.6.01.-134	(12-3-21)	Qty PV8 increased from 2 to 4