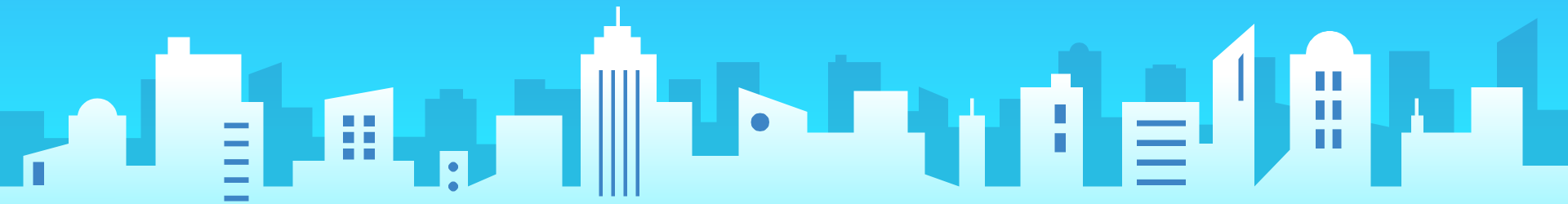
Building Tuning and Optimisation

By Mike Dowling (Alerton Australia)



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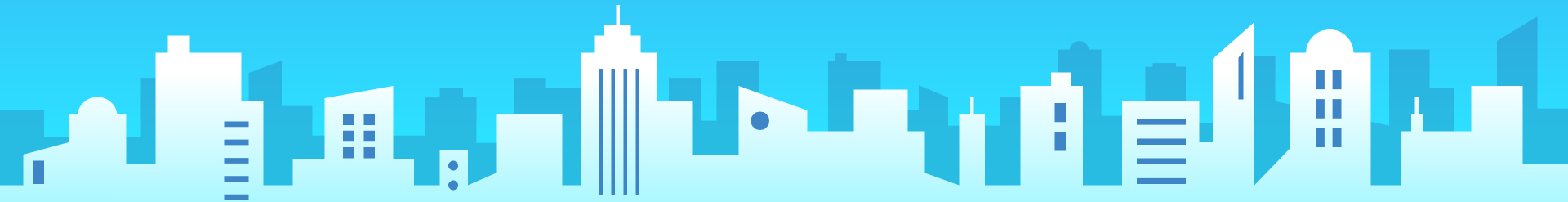


FD and Control Strategies, interface schedule

FUNCTIONAL DESCRIPTION

1. Air Conditioning

1.1. Air Handling Units (AHU)

1.1.1. System Overview

There are 3 Air Handling Units that provides tempered fresh air to each level of the buildings. Each unit comprises of a supply air fan, supply air temperature and pressure sensors, a chilled water coil and control valve, and outside air and return air dampers.

As a part of the upgrade Alerton will implement return air temperature and humidity monitoring for refined economy control.

VAV units provide zoning control and will respond to the demand in their particular zone.

1.1.2. Controlled Equipment

EQUIPMENT	SERVES
AHU1	North Side VAVs
AHU2	Centre Zone VAVs
AHU3	South Side VAVs

1.1.3. Points List

POINTS	TYPE	COMMENTS
Supply Fan Status	BI	Volt Free Contact (VFC) from Current Switch
Duct Heater Status	BI	Volt Free Contact (VFC) from Current Switch
Supply Air Temperature	AI	Duct Mounted Temperature Sensor
Supply Fan Static Pressure	AI	Duct Mounted Pressure Sensor
Return Air Temperature	AI	Duct Mounted Temperature Sensor
Supply Fan Start/Stop	BO	Relay at MSSB
Supply Fan VSD Speed	AO	VSD Output
Chilled Water Valve	AO	Modulating Control Valve
Return Air Damper	AO	Modulating Damper Actuator
Outside Air Damper	AO	Modulating Damper Actuator

1.1.4. Start/Stop Control

Each unit is enabled when any of the following condition are met:

- The time of day is equal to or passed the unit's schedule start time.

Or

- Any VAV served by the respective AHU afterhours pushbutton has been activated.

Each unit is disabled when the following conditions is met:

- The time of day is equal to or passed the unit's schedule stop time.

And

- The afterhours run time for all VAVs has lapsed.

1.1.5. Supply Fan Operation

The supply air fan speed modulates via a PI loop in response to a single static pressure sensor located in the supply air duct. Once the fan is enabled the supply air static duct pressure set point shall be fixed at its maximum for a period of 10 minutes and no pressure reset strategy is employed within this time.

1.1.6. Supply Air Pressure Reset

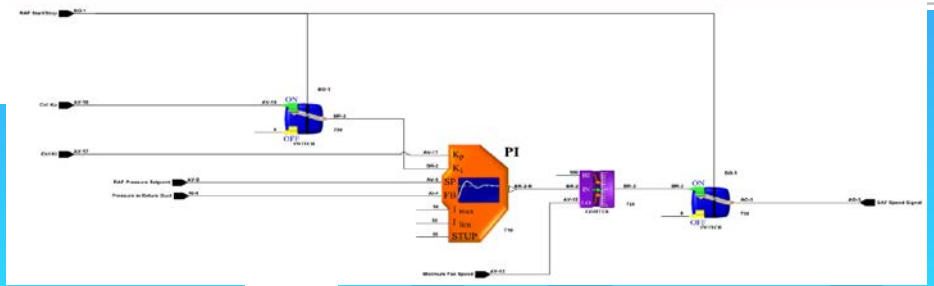
Each unit employs a supply air differential pressure set point reset strategy whereby the duct static pressure set point will be adjusted upwards and downwards as required but only below the original set point.

The average zone temperature of the VAVs served by an AHU is monitored and compared to the average zone temperature set point of those VAVs. If the temperature is within ±0.5°C of the set point the static pressure set point will be adjusted down at a rate of 5Pa per minute until the minimum static pressure set point is achieved (TBA during commissioning, nominally 30% of maximum air flow). Once the minimum static pressure is achieved the static pressure set point will remain fixed for a period of at least 5 minutes (adjustable).

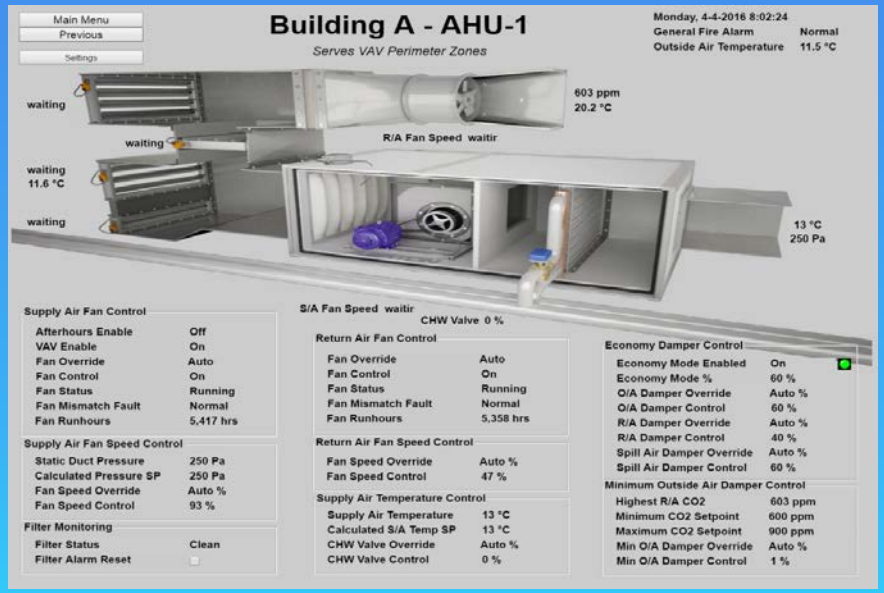
If average temperature drifts ±1°C outside of the set point for a period of 2 minutes (adjustable) then the static pressure set point will be reset upwards at a rate of 5Pa per minute until the maximum static pressure set point is achieved. Should the static pressure set point be increased back to the nominal set point (determined during commissioning), all further set point change requests will be disregarded for a period of 5 minutes. The

Service	Points	Preferred Protocol	Ports	VLAN
Integration Platform		SNMP	10	1
BMCS	20,000	BACnet/Modbus	70	2
Mechanical	300	BACnet/Modbus	Included in BMCS	2
HVAC Feedback System	100	BACnet/Modbus	Included in BMCS	2
Water + Gas Metering	100	M Bus/BACnet/Modbus	70	2
Electrical	1,000	BACnet/Modbus	120	2
Lighting and Emergency Ligh	2500	KNX/BACnet/Dali/SQL	30	2
Fire	100	Modbus/BACnet	15	2
Security (CCTV)	250	nvis/Milestone mobile client/SNM	250 (POE)	3
Security Access Control	1000	OPC/BACnet	70	3
Vertical Transport	100	OPC/BACnet	15	4
Hydraulic	100	BACnet/Modbus	15	2
AV Distribution System	NA	NA	7	5
Base Building Wi-Fi	500	SNMP	66	6
Waste Management System	100	API	7	7
People Counting System	100	API	9	8
Car park Management Syste	100	API	7	9
VOIP	NA	NA	6	10
Smart Lockers	100	API/OPC	22	11
Irrigation System	100	API/BACnet	5	2
		SNMP	-	1
		NA	7 (Fibre)	

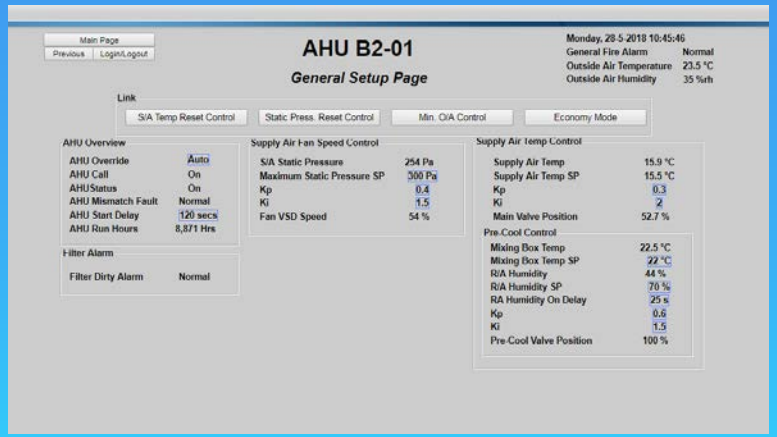
RAF Speed Control



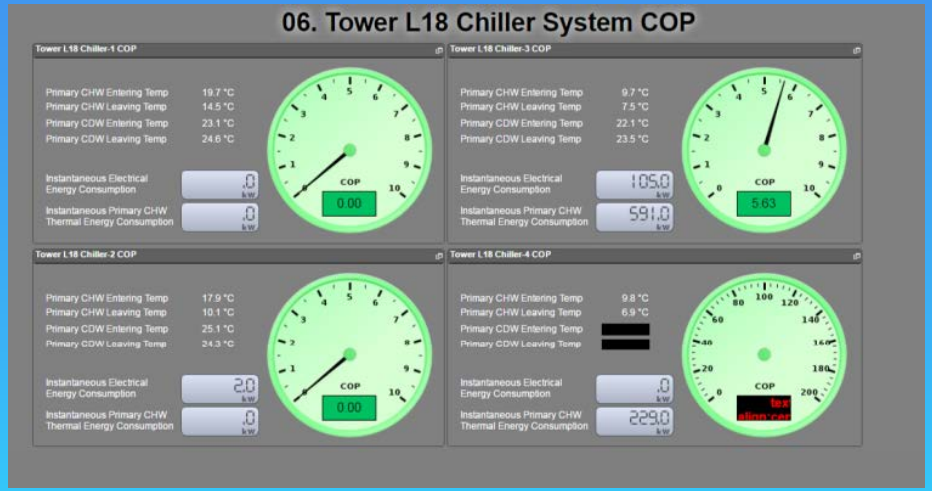
Graphic page design

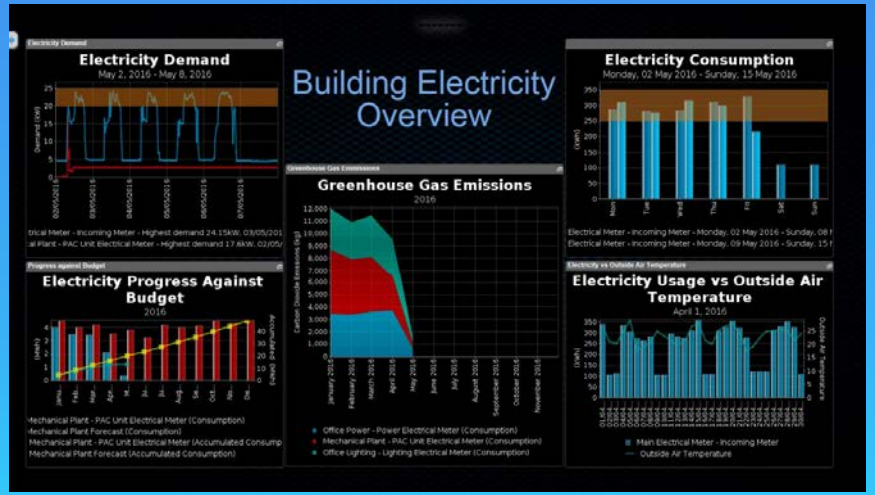


Tuning pages and control strategies
Live data tuning page



COP calculations and dashboards



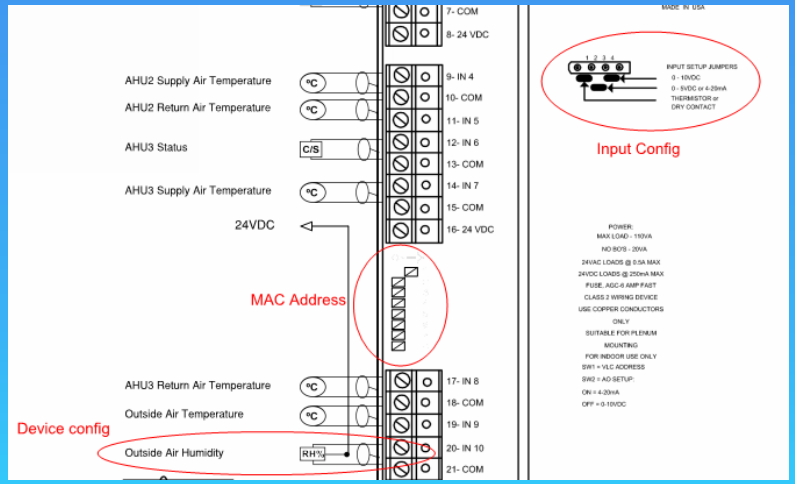


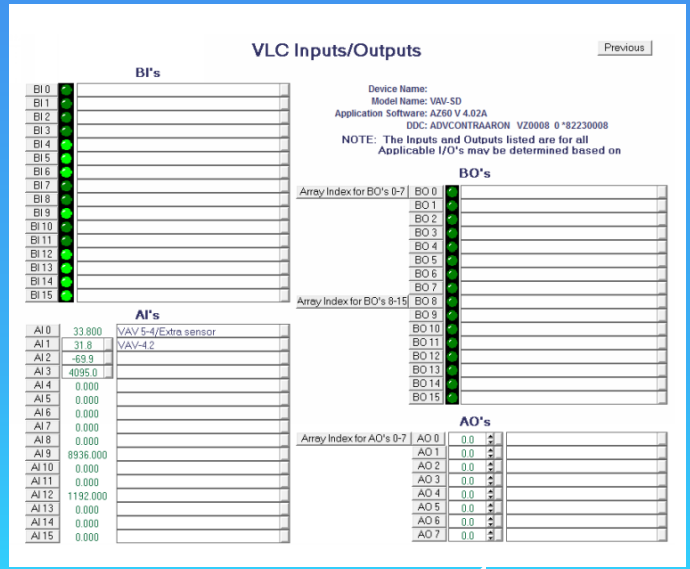
Documentation

Table of Contents

Field Controller Model	Network Number	Device Location	Device Number	AI	BI	AO	BO	Drawing Number	MAC	Commissioned By	Commissioned Date
	Point Description	Point Location	Point Notes					Point Device	HLI	Commissioned By	Commissioned Date
VLC-4188	1071	Cole Street	10710001						1		
	PAC_R_07 Fan Start/Stop						0	Relay Output		SS	9/4/2018 15:06
	PAC_R_07 Compressor 1 Start/Stop						1	Relay Output		SS	9/4/2018 15:06
	PAC_R_07 Compressor 2 Start/Stop						2	Relay Output		SS	9/4/2018 15:06
	PAC_R_07 Heat Enable						3	Relay Output		SS	9/4/2018 15:06
	EC_R_04 Pump Start/Stop						4	Relay Output		SS	9/4/2018 15:06
	AEF_R_04 & EF_R_04 Start/Stop						5	Relay Output		SS	9/4/2018 15:06
	EC-AEF On/Off Neon						6	Green Led		SS	9/4/2018 15:06
	EC Vent/Cool Neon						7	Green Led		SS	9/4/2018 15:06
	EC_R_04 VSD Speed		Hi Spd = 30Hz (81%), Med Spd = 25Hz (66%), Lo Spd = 20Hz (52%)			0		VSD Output 0-10V		SS	9/4/2018 15:06
	AEF_R_04 VSD Speed		Hi Spd = 48Hz (81%), Med Spd = 34Hz (75%), Lo Spd = 23Hz (57%)			1		VSD Output 0-10V		SS	9/4/2018 15:06
	PAC_R_07 Zone Temperature		Pushbutton used for PAC Start/stop	0				10k thermistor and Push Button		SS	9/4/2018 15:06
	Spare				1			Switch Input			
	EC Vent/Cool Switch				3			Switch Input		SS	9/4/2018 15:06
	EC-AEF On/Off Switch				4			Switch Input		SS	9/4/2018 15:06
	EC-AEF Lo Speed selection switch				5			Switch Input		SS	9/4/2018 15:06
	EC-AEF Med Speed selection switch							Software Point		SS	9/4/2018 15:06
	EC-AEF Hi Speed selection switch				7			Switch Input		SS	9/4/2018 15:06
	EF_R_04 Status				8			Current Switch		SS	9/4/2018 15:06
	AEF_R_04 Status				9			Current Switch		SS	9/4/2018 15:06
	Spare				10			Switch Input			
VLC-4188	1071	Cole Street	10710002						2		
	PAC_R_10 Fan Start/Stop						0	Relay Output		SS	9/4/2018 15:06
	PAC_R_10 Compressor 1 Start/Stop						1	Relay Output		SS	9/4/2018 15:06
	PAC_R_10 Compressor 2 Start/Stop						2	Relay Output		SS	9/4/2018 15:06
	PAC_R_10 Heat Enable						3	Relay Output		SS	9/4/2018 15:06
	EC_R_05 Pump Start/Stop						4	Relay Output		SS	9/4/2018 15:06
	AEF_R_05 & EF_R_05 Start/Stop						5	Relay Output		SS	9/4/2018 15:06
	EC-AEF On/Off Neon						6	Green Led		SS	9/4/2018 15:06
	EC Vent/Cool Neon						7	Green Led		SS	9/4/2018 15:06
	EC_R_05 VSD Speed		Hi Spd = 30Hz (81%), Med Spd = 25Hz (66%), Lo Spd = 20Hz (52%)			0		VSD Output 0-10V		SS	9/4/2018 15:06
	AEF_R_05 VSD Speed		Hi Spd = 48Hz (80%), Med Spd = 36Hz (79%), Lo Spd = 24Hz (48%)			1		VSD Output 0-10V		SS	9/4/2018 15:06
	PAC_R_10 Zone Temperature		Pushbutton used for PAC Start/stop	2				10k thermistor and Push Button		SS	9/4/2018 15:06
	Spare				1			Switch Input			
	EC Vent/Cool Switch				3			Switch Input		SS	9/4/2018 15:06
	EC-AEF On/Off Switch				4			Switch Input		SS	9/4/2018 15:06
	EC-AEF Lo Speed selection switch				5			Switch Input		SS	9/4/2018 15:06
	EC-AEF Med Speed selection switch							Software Point			
	EC-AEF Hi Speed selection switch				7			Switch Input		SS	9/4/2018 15:06
	EF_R_05 Status				8			Current Switch		SS	9/4/2018 15:06
	AEF_R_05 Status				9			Current Switch		SS	9/4/2018 15:06
	Spare				10			Switch Input			

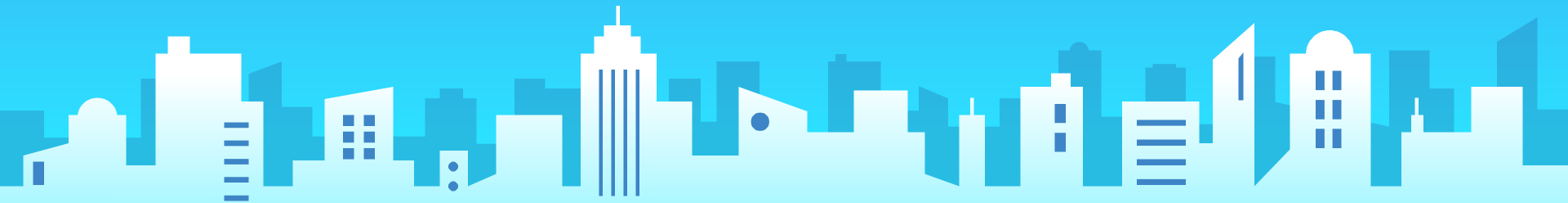
Pre commissioning





Commissioning

- Functional Testing
- Client and consultant witnessing
- Training and remote access for support



Thank you