

Universtiy - X

8487 My Way Blvd.
Houston, Tx, 77079

Architect:
Engineer:
Contractor:

Project Number: XX##X####

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Branch Name, ST

Street Address
Street Address2
City, ST 99999
Main: (555) 555-5555
Service: (555) 555-5555



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Universtiy - X
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Title Page

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Symbol Legend

Input/Output Blocks

Damper or Valve Actuator

<p>Temperature Sensor, Duct Probe</p>	<p>Temperature Sensor, Immersion</p>	<p>Temperature Sensor, Averaging</p>	<p>Temperature Sensor, Outside Air</p>	<p>Temperature Sensor, Room</p>	<p>Temperature Sensor, Bulb (Strap-On)</p>
<p>Hydronic Heating Coil</p>	<p>Hydronic Cooling Coil</p>	<p>Gas Heating</p>	<p>Current Sensor</p>	<p>Pressure Sensor</p>	<p>Pressure Switch</p>
<p>DX Cooling 1 Stage</p>	<p>HeatPump or Dual Pipe Coil</p>	<p>Electric Heating</p>	<p>Smoke Detector</p>	<p>Transformer</p>	<p>Filter</p>
<p>Chiller</p>	<p>Boiler</p>	<p>Cooling Tower</p>	<p>Pump</p>	<p>Heat Exchanger</p>	<p>....</p>
<p>VFD</p>	<p>Motor Starter</p>	<p>3-way Valve</p>	<p>2-way Valve</p>	<p>Fan</p>	<p>Damper</p>

General Notes

1. All room thermostats/sensors/controllers shall be installed at 60" above fixed floor for ADD compliance for new installations. For replacement of existing devices, leave sufficient rolled coil of wire above the ceiling should the device need to be moved down to meet this requirement in the future.
2. All sensor or thermostat pulls that are new require 1 extra conductor to be pulled as well for future use. The shield/drain is not suitable for a conductor.
3. All panel keys will be collected daily and removed from the panels installed. These keys are to be giving to the Energy Solutions Site Supervisor.
4. All thermowells shall be filled with heat conductive compound that is provided.
5. Wiring Terminations designated as 'X' or 'XX' indicate information was unavailable at time of submittal. Please inform Schneider Electric before making field terminations.
6. Remote control devices, not in local panels, shall be accessible for adjustment and service - below 7' above fixed floor whenever possible or as shown on the provided Construction prints.
7. Only prints marked Construction are to be used during installation. If the prints are not marked Construction, the installer will correct any discrepancies between prints used and Construction at no cost to Schneider Electric.
8. All new BAS controller panels shall have a dedicated 120Vac power source. This source shall be located and marked in the electrical panel as well as on the control prints returned to Schneider Electric for Record prints.
9. Installer responsible for maintaining existing safeties into new BAS control – electrically or pneumatically connected.
10. See Division 23 09 15 00 for any additional information on installation standards.

Wiring Legend

Low Voltage (50 volts or less) control wiring for inputs and outputs shall be 18 AWG or larger rated for 600-volt service. Terminate any shields or drains for input/outputs at the controller only. See Section 4.2 for additional details.

..... Indicates need for conduit to be ran by installer. Distances noted on plans are approximate values.

Ethernet
Ethernet Wiring: Unless stated differently by the client or the Schneider Electric Site Supervisor, network cable shall meet or exceed all requirements of Category 5 cable as specified in ANSI/TIA/EAI 568-A. No other devices other than stated in these Construction drawings will be added to or removed from the client's Ethernet backbone or WAN.

MS/TP BACnet or I/Net Wiring: Wiring to be installed using 24 AWG 7/26 Bare Copper – 2 conductor stranded, 7/32 drain wire, 12.5 pF/ft @ 1 KHz nominal UL TYPE CMP/CL3P 24 AWG. Maximum length is 4000' or 110 controllers. End of Line resistor (120Ω 1/4W) to be installed at both ends of network segments. All communication cabling to be installed in a daisy chain configuration, no T's are permitted. Shield on communication cable is to remain continuous and grounded only at a controller. Polarity of the wires must be observed. Splicing of communication cable is not permitted. Cable can be purchase through Schneider Electric using this part number: **WBAC-4-242P-OR-SP**

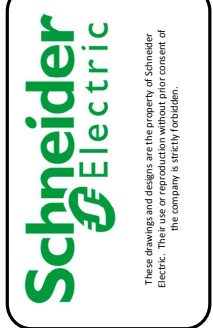
LON or FFT-10 Wiring to be installed using Level IV network cable. Level IV network cable is 22 AWG 7/30 Bare Copper, 2 conductor stranded, with or without a 7/32 drain wire, 17 pF/ft, and impedance of 100 ohm (1-20MHz) nominal UL TYPE SUBJECT 444, CMP. The same cable shall be used through out the project to avoid impedance issues. Maximum length is 4600' or 55 controllers without use of repeater. Terminator to be installed at both ends of network segments. All LON/FFT-10 cabling to be installed in a daisy chain configuration (not FTT-10A). This cable is not to run in the same conduit with power for more than 5'. Splicing of communication cable is not permitted. Cable can be purchase through Schneider Electric using this part number: **WLON-3-221P-BL-BX**

Detail Name

Color	3-Letter	2-Letter	1-Letter
Black	BLK	BK	b
Brown	BRN	BR	n
Red	RED	RD	r
Orange	ORG	OR	o
Yellow	YEL	YL	y
Green	GRN	GN	g
Blue	BLU	BU	u
Violet	VIO	VL	v
Gray	GRY	GY	a
White	WHT	WH	w
Gold	GLD	GL	d
Silver	SLV	SV	s
Pink	PNK	PK	p

1-Letter abbreviations used for color of stripe on wire. (WH/o = White wire with orange stripe)

Floor Plan Legend is independent, please refer to Legend on that Page



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Legends

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BILL OF MATERIAL LISTING

Part Number	Description	Qty	Vendor	Manufacturer
AFS-262	Air Pressure Sensing Switch with Adjustable Set Point .05 +/-	3	Schneider Electric	Schneider Electric
b3814	b3814, 8 UI, 4 DO, 4 AO w/overrides, 1 Smart Sensor/Rm Sens In, Exp Port	3	Schneider Electric	Schneider Electric
b3866-V	b3866, 4 UI, 1 Airflow, 1 IBS Act.,3 FA Triac Out,2 AO,1 Sm/Rm Sens In	1	Schneider Electric	Schneider Electric
EPD102	PRESSURE TRANSDUCER, DUCT DIFFERENTIAL, DRY MEDIA, 0-10" W.C., 24VAC/12-30VDC	4	Schneider Electric	Schneider Electric
ETD500-12	TEMPERATURE SENSOR, DUCT MOUNT, MOUNTING BOX, 12", 10K T3 THERMISTOR	3	Schneider Electric	Schneider Electric
ETD500-6	TEMPERATURE SENSOR, DUCT MOUNT, MOUNTING BOX, 6", 10K T3 THERMISTOR	6	Schneider Electric	Schneider Electric
ETD500-NE-4	TEMPERATURE SENSOR, DUCT MOUNT W/FLANGE, NO BOX, 4", 10K T3 THERMISTOR	1	Schneider Electric	Schneider Electric
ETI500-6	10k Type 3 Immersion Sensor 6" with out the well	4	Schneider Electric	Schneider Electric
ETI-WELL-6S	6" 2-part Stainless Well	4	Schneider Electric	Schneider Electric
KEL-105SP	Double row terminal blocks, five poles	2	Schneider Electric	Marathon Special Products
KEL-110SP	Double Row Terminal Blocks: 10 Poles	8	Schneider Electric	Kele
KEL-A-302-K	Static Pressure Tip, 1/4 Inch Barb	10	Schneider Electric	Kele
KEL-BAM-2	End Stop (two required), Gray to use with Models M4/6 and M6/8, DIN Rail Terminal Blocks	4	Schneider Electric	Kele
KEL-DIN-3F	DIN rail is the standard method for mounting relays and terminal blocks. Kele offers four models with	2	Schneider Electric	Iboco
KEL-JSPS	Jumper Strip: 10 Pole	8	Schneider Electric	Kele
KEL-M4/6	Din Rail Terminal Block, Gray, 6mm	8	Schneider Electric	ABB
KEL-M4/6SNBT	Switch Terminal, Gray and Orange Handle	4	Schneider Electric	ABB
KEL-PRK-FLS	Panel Receptacle Assembly with Fuse Holder and Green Light	5	Schneider Electric	Kele
KEL-T1-1530W	Wire duct, 1.5"X3"X6.5' with cover, White	8	Schneider Electric	Iboco
MS41-7073	DURADRIVE VLV/DMP ACT ELEC SR 0-10 VDC 24 VAC/VDC	9	Schneider Electric	Schneider Electric
SXWAUTSVR10001	AS Automation Server with support for BACnet and LON	2	Schneider Electric	Schneider Electric
SXWPS24VX10001	PS-24V Power Supply 24 VAC/VDC	2	Schneider Electric	Schneider Electric
SXWTBASW110001	TB-AS-W1 Term Base AS W1	2	Schneider Electric	Schneider Electric
SXWTBIOW110001	TB-IO-W1 Term Base I/O W1	3	Schneider Electric	Schneider Electric
SXWTBPSW110001	TB-PS-W1 Term Base Pwr Sup W1	2	Schneider Electric	Schneider Electric
SXWUI8A4X10001	UI-8/AO-4 UI/AO(V/mA)	1	Schneider Electric	Schneider Electric
SXWUI8D4X10001	UI-8/DO-FC-4 UI/DO(FormA)	2	Schneider Electric	Schneider Electric
TC-5241	LOW LIMIT, MAN. RESET 20' ELEM. 34/60F, 1-16C (5F/3C DIFF)	3	Schneider Electric	Schneider Electric
TTS-SD-LCD-B-1	SMART SENSOR, LCD DISPLAY, 10K OHM (TYPE 3) THERMISTOR FOR C	2	Schneider Electric	Schneider Electric
ULT-AMS-911-32X30	AIRFLOW MEASURING STATION	2	Schneider Electric	Ultratech Industries
UNM-SCH243610RC	ENCL 24X36X10 RECS GRY CVR	2	Schneider Electric	Unity Manufacturing
VER-H608	CURRENT SWITCH N.O. SPLIT CORE	3	Schneider Electric	Veris Industries
VER-V100	ENCLOSED RELAY - 1/2" NPT NIPPLE MOUNT, 1 POS SPDT 10-30 VAC/DC, 120 VAC, 10A, LEI	11	Schneider Electric	Veris Industries
VER-X050BAB	TRANSFORMER CONTROL 50VA 120V	10	Schneider Electric	Veris Industries
xPAO4	XP EXPANSION MODULE - 4 AO WITH OVERRIDE SWITCHES	2	Schneider Electric	Schneider Electric
xPDI8	XP EXPANSION MODULE - 8 DI	2	Schneider Electric	Schneider Electric



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Roll-Up BOM

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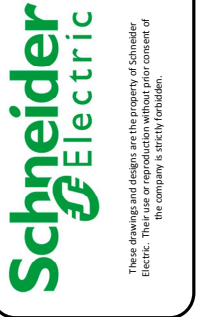
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AUTOMATIC TEMPERATURE CONTROL VALVE SCHEDULE (PLEASE SEE INSTALLATION NOTES)

TAG	QTY	SERVICE	PART #		SPRING RANGE	POS. POSIT.	VLV. TYPE	VLV. SIZE	PIPE SIZE	VLV. ACTION	CONN. TYPE	FLOW GPM	#/HR	VALVE CV		ACT. PRESS. DROP (PSI)	CLOSE OFF (PSI)		PIPING DETAIL
			VALVE ASSEMBLY	ACTUATOR										CALC.	ACT.		STEM UP	STEM DN.	
AHU1-CHW	1	CHW	VS-7213-546-4-09	MS41-7073	2-10 VDC, 4-20mA	N	2 Way Straight	1-1/4"	2"	Fails Normally Open	Screwed	33.50		14.98	20.0	2.81	120	120	Detail "2C02"
AHU2-CHW	1	CHW	VS-7213-546-4-09	MS41-7073	2-10 VDC, 4-20mA	N	2 Way Straight	1-1/4"	2-1/2"	Fails Normally Open	Screwed	36.40		16.28	20.0	3.31	120	120	Detail "2C02"
AHU3-CHW	1	CHW	VS-7213-546-4-09	MS41-7073	2-10 VDC, 4-20mA	N	2 Way Straight	1-1/4"	2-1/2"	Fails Normally Open	Screwed	37.60		16.82	20.0	3.53	120	120	Detail "2C02"
AHU1-HW	1	HW	VS-7213-536-4-05	MS40-7043	2-10 VDC, 4-20mA	N	2 Way Straight	3/4"	1-1/2"	Fails Normally Open	Screwed	9.10		4.07	5.5	2.74	250	250	Detail "2H02"
AHU2-HW	1	HW	VS-7213-536-4-05	MS40-7043	2-10 VDC, 4-20mA	N	2 Way Straight	3/4"	1-1/2"	Fails Normally Open	Screwed	9.90		4.43	5.5	3.24	250	250	Detail "2H02"
AHU3-HW	1	HW	VS-7213-536-4-04	MS40-7043	2-10 VDC, 4-20mA	N	2 Way Straight	1/2"	1-1/4"	Fails Normally Open	Screwed	6.10		2.73	4.4	1.92	250	250	Detail "2H02"
AHU3-HW	1	HW	VS-2213-841-9-01	MS4D-6083-100	2-10 VDC	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.47		0.21	0.4	1.53	130	130	Detail "2H02"
VAV-1-1	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.50		0.22	0.3	2.78	130		Detail "2H02"
VAV-1-2	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.50		0.22	0.3	2.78	130		Detail "2H02"
VAV-1-3	1	HW	VBB2N01+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.70		0.31	0.7	1.00	130	130	Detail "2H02"
VAV-1-4	1	HW	VBB2N01+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.70		0.31	0.7	1.00	130	130	Detail "2H02"
VAV-1-5	1	HW	VBB2N01+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.70		0.31	0.7	1.00	130	130	Detail "2H02"
VAV-1-6	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.50		0.22	0.3	2.78	130		Detail "2H02"
VAV-1-7	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.50		0.22	0.3	2.78	130		Detail "2H02"
VAV-1-8	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.50		0.22	0.3	2.78	130		Detail "2H02"
VAV-1-9	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.50		0.22	0.3	2.78	130		Detail "2H02"
VAV-1-10	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.50		0.22	0.3	2.78	130		Detail "2H02"
VAV-1-11	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-1-12	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-1-13	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-1-14	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-1-15	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-1-16	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-1-17	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-1-18	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-1-19	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-1-20	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.50		0.22	0.3	2.78	130		Detail "2H02"
VAV-2-1	1	HW	VBB2N01+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.70		0.31	0.7	1.00	130	130	Detail "2H02"
VAV-2-2	1	HW	VBB2N01+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.70		0.31	0.7	1.00	130	130	Detail "2H02"
VAV-2-3	1	HW	VBB2N01+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.70		0.31	0.7	1.00	130	130	Detail "2H02"
VAV-2-4	1	HW	VBB2N01+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.70		0.31	0.7	1.00	130	130	Detail "2H02"
VAV-2-5	1	HW	VBB2N01+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.80		0.36	0.7	1.31	130	130	Detail "2H02"
VAV-2-6	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-2-7	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-2-8	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-2-9	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-2-10	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-2-11	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-2-12	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-2-13	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-2-14	1	HW	VBB2N01+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.80		0.36	0.7	1.31	130	130	Detail "2H02"
VAV-2-15	1	HW	VBB2N01+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.80		0.36	0.7	1.31	130	130	Detail "2H02"
VAV-2-16	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-2-17	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-2-18	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-2-19	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-2-20	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-2-21	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-2-22	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-2-23	1	HW	VBB2N00+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.30		0.13	0.3	1.00	130		Detail "2H02"
VAV-2-24	1	HW	VBB2N01+M131A01	M131A01	FLOATING	N	2 Way Straight	1/2"	1/2"	No Fail Safe Position	Screwed	0.80		0.36	0.7	1.31	130	130	Detail "2H02"
CtByViv	1	CW	VSUS-6301-E12-L-14	700051B	VDC, 2-10 VDC, 4-2	N	3 Way Mixing/Diverting	4"	4"	No Fail Safe Position	Lug	240.00		107.33	841.0	0.08	50	50	Detail "3C09"



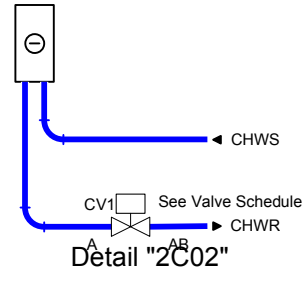
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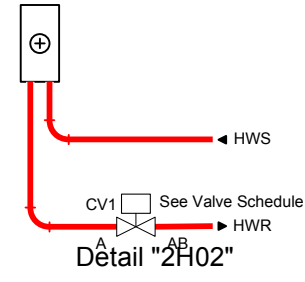
Architect: University - X
 Engineer: 8487 My Way Blvd.
 Contractor: Houston, Tx, 77079
 Designed by: Valve Schedule
 Software by:
 Checked by:

Job Number: XX##X###
 Last Saved: 2/7/2013
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 Last Printed: 3/14/2013
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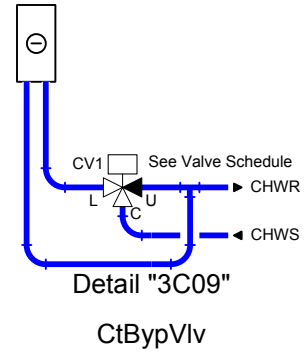
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AHU1
AHU2
AHU3



AHU1 VAV-2-17
AHU2 VAV-2-18
AHU3 VAV-2-19
VAV-1-1 VAV-2-2
VAV-1-10 VAV-2-20
VAV-1-11 VAV-2-21
VAV-1-12 VAV-2-22
VAV-1-13 VAV-2-23
VAV-1-14 VAV-2-24
VAV-1-15 VAV-2-3
VAV-1-16 VAV-2-4
VAV-1-17 VAV-2-5
VAV-1-18 VAV-2-6
VAV-1-19 VAV-2-7
VAV-1-2 VAV-2-8
VAV-1-20 VAV-2-9
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VAV-1-8
VAV-1-9
VAV-2-1
VAV-2-10
VAV-2-11
VAV-2-12
VAV-2-13
VAV-2-14
VAV-2-15
VAV-2-16



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Valve Piping Detail

Job Number	XX##X###	Last Saved	2/7/2013
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AUTOMATIC TEMPERATURE CONTROL DAMPER SCHEDULE

ITEM	TAG ID	MECHANICAL		DESCRIPTION	QTY	SUBMITTED SIZE		APPROVED SIZE		BLADE ACTION		FAIL POSITION	MANUFACTURER	MODEL NUMBER	SUBMITTED		TORQUE	CONTROL ACTUATOR							
		DRAWING	REFERENCE			WIDTH	HEIGHT	WIDTH	HEIGHT	(CHECK PAR OR OPP)	(N.O. - OPEN,	AIRFLOW			VELOCITY	REQ'D	QTY	MFG.	MODEL NUMBER	CONTROL SIGNAL	CONTROL VOLTAGE	POS. FEEDBACK	FAIL-SAFE POSITION	TORQUE (IN.LB.)	
						(inches)	(inches)	(inches)	(inches)	PARALLEL	OPPOSED	N.C. CLOSED)			(CFM)	(FPM)									(IN.LB.)
1	AHU1-OaDpr		AHU1	Outside Air	1	12	12				X	NC	Ruskin	CD60	1200	1200	7	1	Schneider Electric	MS40-7043	2-10Vdc	24 Vac	No	Closed	35
2	AHU1-RaDpr		AHU1	Return Air	1	28	28				X	NO	Ruskin	CD60	6815	1251.7347	38.111111	1	Schneider Electric	MS41-7073	2-10Vdc	24 Vac	No	Open	60
3	AHU1-EaDpr		AHU1	Exhaust Air	1	14	14				X	NO	Ruskin	CD60	1080	793.46939	9.5277778	1	Schneider Electric	MS40-7043	2-10Vdc	24 Vac	No	Open	35
4	AHU2-OaDpr		AHU2	Outside Air	1	14	12				X	NC	Ruskin	CD60	1305	1118.5714	8.1666667	1	Schneider Electric	MS40-7043	2-10Vdc	24 Vac	No	Closed	35
5	AHU2-RaDpr		AHU2	Return Air	1	30	28				X	NO	Ruskin	CD60	7405	1269.4286	40.833333	1	Schneider Electric	MS41-7073	2-10Vdc	24 Vac	No	Open	60
6	AHU2-EaDpr		AHU2	Exhaust Air	1	16	14				X	NO	Ruskin	CD60	1175	755.35714	10.888889	1	Schneider Electric	MS40-7043	2-10Vdc	24 Vac	No	Open	35
7	AHU3-OaDpr		AHU3	Outside Air	1	14	12				X	NC	Ruskin	CD60	1350	1157.1429	8.1666667	1	Schneider Electric	MS40-7043	2-10Vdc	24 Vac	No	Closed	35
8	AHU3-RaDpr		AHU3	Return Air	1	30	30				X	NO	Ruskin	CD60	7650	1224	43.75	1	Schneider Electric	MS41-7073	2-10Vdc	24 Vac	No	Open	60
9	AHU3-EaDpr		AHU3	Exhaust Air	1	16	14				X	NO	Ruskin	CD60	1215	781.07143	10.888889	1	Schneider Electric	MS40-7043	2-10Vdc	24 Vac	No	Open	35
10																									



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8487 My Way Blvd.
Houston, Tx, 77079
Damper Schedule

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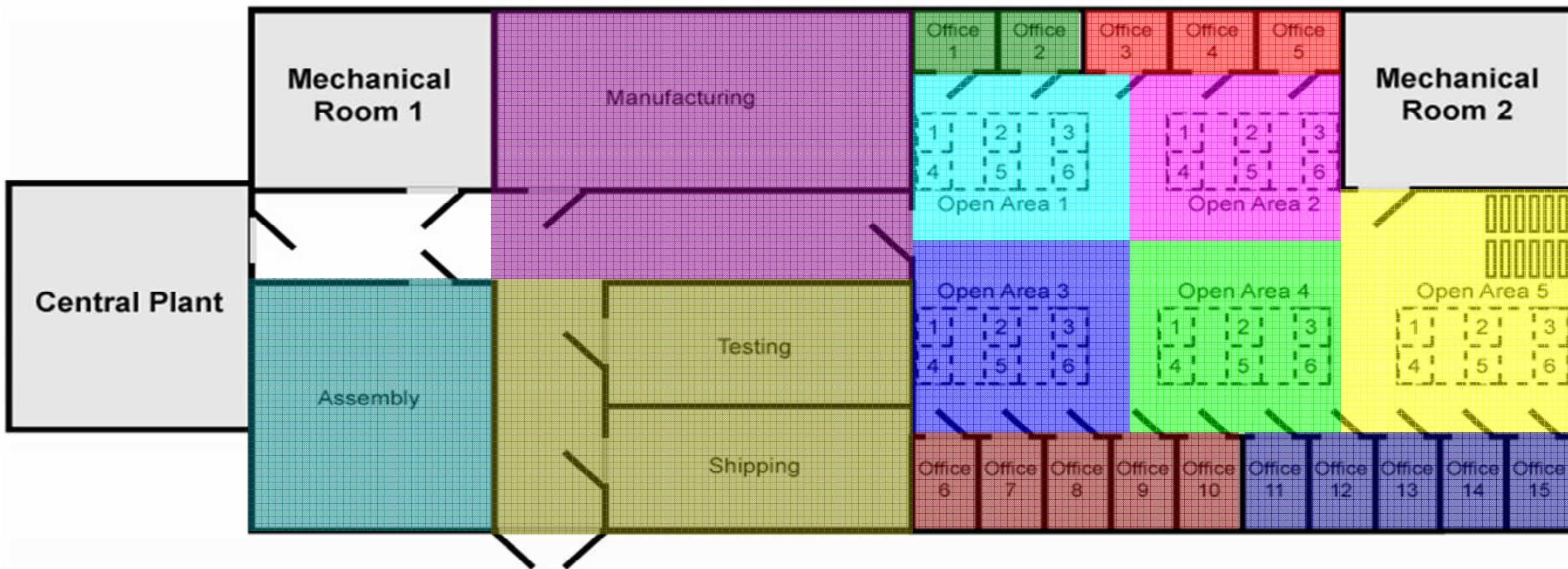
Floor Plan Legend

Color Legend

Not Conditioned or Not Controlled

Floor Plan Notes

General Notes



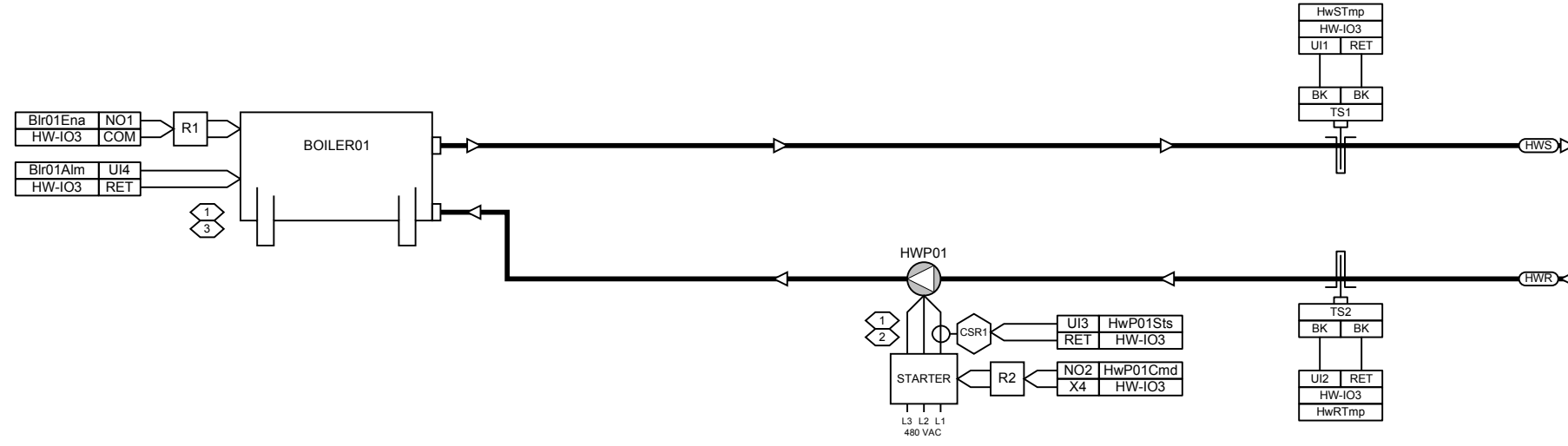
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Architect:	Universtiy - X	Date:
Engineer:	8487 My Way Blvd.	Date:
Contractor:	Houston, Tx, 77079	Date:
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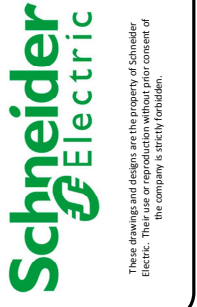
Universtiy - X
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 Floorplan

Job Number: XX##X####
 File Name: Floorplan.vsd
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 Last Printed: 3/14/2013

HW System



Device	Qty	Part Number	Description	Manufacturer
CSR1	1	VER-H608	CURRENT SWITCH N.O. SPLIT CORE	Veris Industries
R1-2	2	VER-V100	RELAY ENC SPDT 10-30AC/DC, 120	Veris Industries [V100]
TS1-2	2	ETI500-6	10k Type 3 Immersion Sensor 6"	Schneider Electric
TS1_1	1	ETI-WELL-6S	6" 2-part Stainless Well	Schneider Electric [ETI-WELL-6S]
TS2_1	1	ETI-WELL-6S	6" 2-part Stainless Well	Schneider Electric [ETI-WELL-6S]



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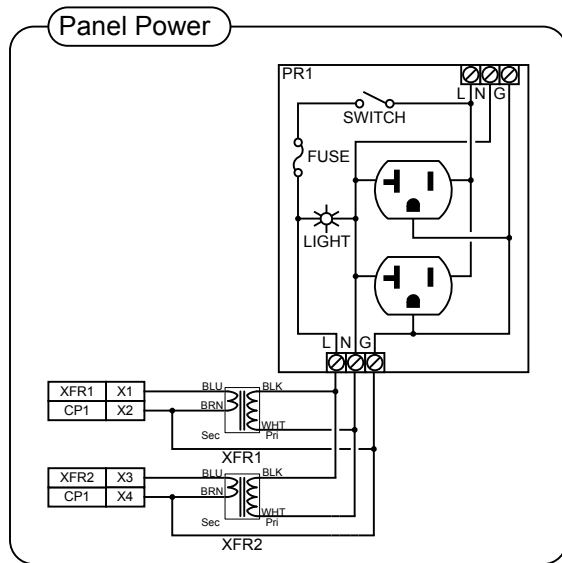
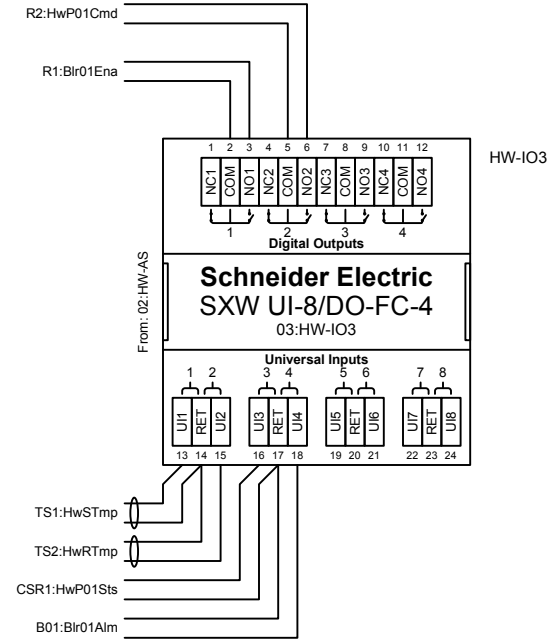
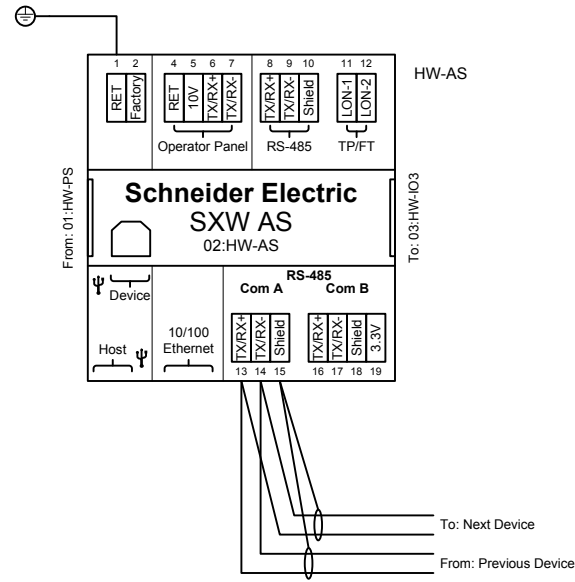
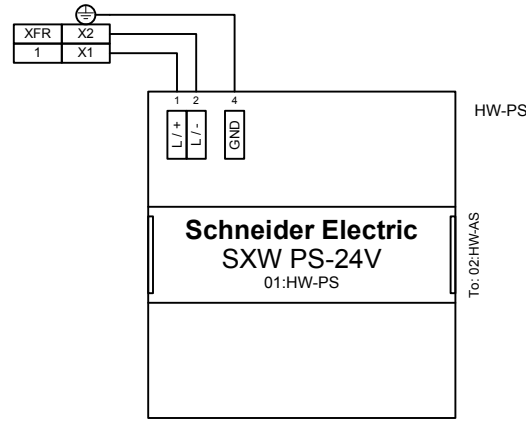
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 Designed by: _____ Date: _____
 Software by: _____ Date: _____
 Checked by: _____ Date: _____

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System Diagram

Job Number: XX##X####
 File Name: HW System.vsd
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Device	Qty	Part Number	Description	Manufacturer
HW-AS	1	SXWAUTSVR10001	AS AUTOMATION SERVER	Schneider Electric [SXWAUTSVR10001]
HW-AS_1	1	SXWTBASW110001	TB-AS-W1 Term Base AS W1	Schneider Electric
HW-IO3	1	SXWUI8D4X10001	UI-8/DO-FC-4 UI/DO(FormA)	Schneider Electric
HW-IO3_1	1	SXWTBIOW110001	TB-IO-W1 Term Base I/O W1	Schneider Electric
HW-PS	1	SXWPS24VX10001	PS-24V Power Supply 24 VAC/VDC	Schneider Electric
HW-PS_1	1	SXWTBPSW110001	TB-PS-W1 Term Base Pwr Sup W1	Schneider Electric
PR1	1	KEL-PRK-FLS	PRK-S W/ FUSE HOLDER GREEN LT	Kele [PRK-FLS]
XFR1-2	2	VER-X050BAB	TRANSFORMER CONTROL 50VA 120V	Veris Industries



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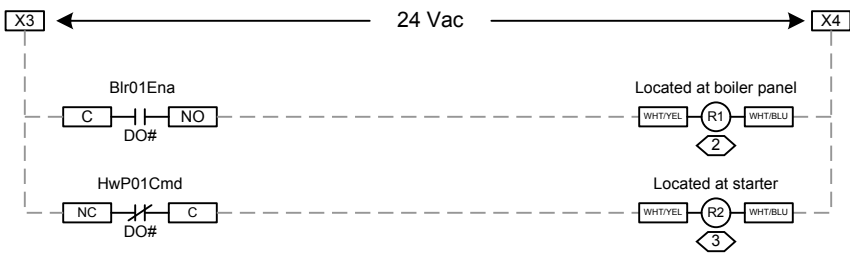
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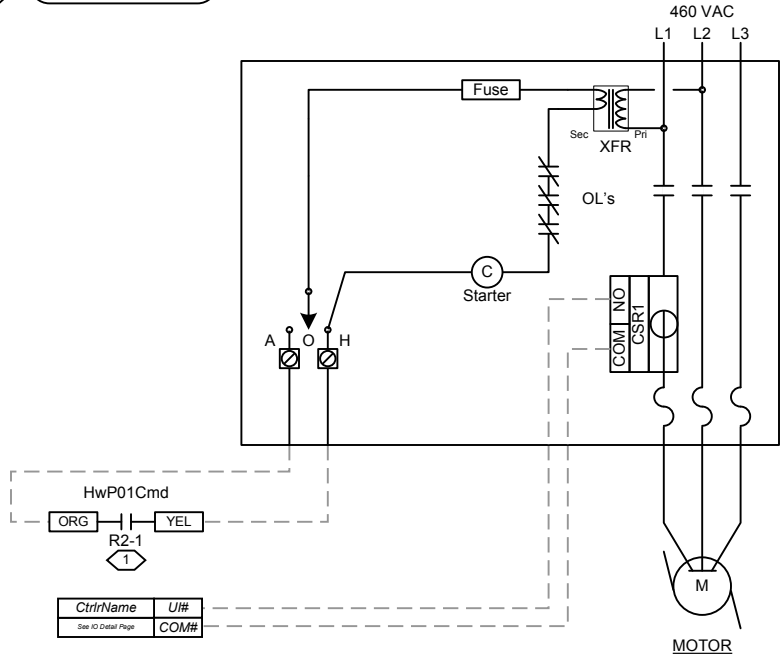
Universtiy - X
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Houston, Tx, 77079
Panel / IO Detail

Job Number: XX##X####
File Name: HW System.vsd
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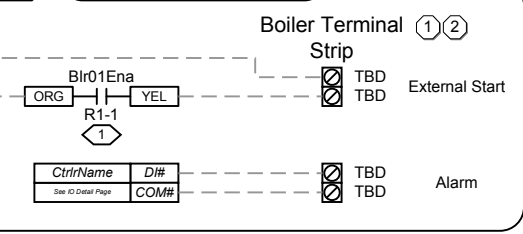
1 Starter Control Circuit



2 Starter Detail

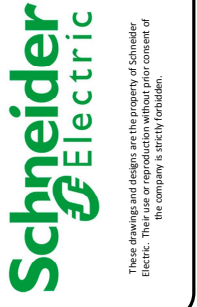


3 Boiler Terminations



Notes

- ① Terminal strip located at boiler control panel
- ② Terminals for reference. Actual unit may have terminal interface labeled, not labeled, or use wire nuts for connection or unit function



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Designed by:	Date:
Software by:	Date:
Checked by:	Date:

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 System Detail

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HW System Sequence of Operation

Unit Description

Name: HW System

- HW-1BLR(HM-NC)-1CVPP
- Non-condensing high mass boiler
- Constant volume hot water pump
- Serves:

Setpoints (All Adjustable)

Outside Air Enable	60°F, 4°F Diff	
Minimum Hot Water Return Temperature	130°F, 20°F Diff	
Low Ambient Operation	35°F, 2°F Diff	
Low Ambient Hot Water Return Temperature	95°F, 90°F Diff	

Sequence of Operation

Normal Operating Modes:

- Heating Mode:** Hot water system operates based on Heating Request or Dehumidification Request from air handling units served by hot water system. The system shall be locked out from operating when the outside air temperature is above the Outside Air Enable setpoint except when a Dehumidification Request is received from air handling units served by hot water system.
- Low Ambient Mode:** When Heating Mode is inactive and the outside air temperature is below the Low Ambient Operation setpoint, the hot water system shall operate in Low Ambient Mode.

Heating Mode:

When Heating Mode is active, the following occurs in the order shown:

1. The hot water pump associated with boiler shall start.
2. Upon proof of hot water flow, the boiler shall be enabled after a 1-minute delay (adjustable).

When Heating Mode is inactive, the following occurs in the order shown:

1. If the hot water return temperature is above the Minimum Hot Water Return Temperature setpoint, the boiler shall be disabled. Otherwise, the boiler shall continue to operate until the Minimum Hot Water Return Temperature setpoint is reached.
2. The hot water pump shall stop after a 3-minute delay (adjustable) when the hot water return temperature is above the Minimum Hot Water Return Temperature setpoint.

Low Ambient Mode:

When Low Ambient Mode is active, the following occurs in the order shown:

1. The hot water pump associated with boiler shall start.
2. Upon proof of hot water flow, the boiler shall be enabled after a 1-minute delay (adjustable) and shall cycle to maintain the Low Ambient Hot Water Return Temperature setpoint.

When Low Ambient Mode is inactive, the following occurs in the order shown:

1. The boiler shall be disabled.
2. The hot water pump shall stop after a 3-minute delay (adjustable).

HW System Sequence of Operation - Cont'd

General:

When the boiler is enabled, the boiler thermostatic temperature controls shall modulate the boiler to maintain the boiler leaving temperature setpoint, set manually at 180°F.

Safeties

High Temperature Safety: The hardwired safety shall internally turn the boiler off when the boiler water temperature exceeds the high thermostatic temperature setpoint.

Calculations

Heating Available Confirmation: A heating available confirmation shall be sent when the hot water supply temperature is above 90°F (adjustable) with 2°F differential and hot water flow has been proven.

Interlocks

Combustion Air Control: Combustion air control shall be hardwired to boiler burner control.

Alarms

Boiler Alarm: An alarm shall be sent if an alarm condition is sensed at any boiler factory control panel.

Hot Water Supply Temperature Alarm: An alarm shall be sent if the hot water supply temperature is below 90°F (adjustable) for a period of 15 minutes (adjustable) when Heating Mode is active.

Sensor Fail Alarm: An alarm shall be sent upon detection of a failed temperature sensor.

Hot Water Pump Alarm: An alarm shall be sent if the pump is commanded to operate and status is not proven or if the pump is commanded to stop and status remains proven for 3 minutes.



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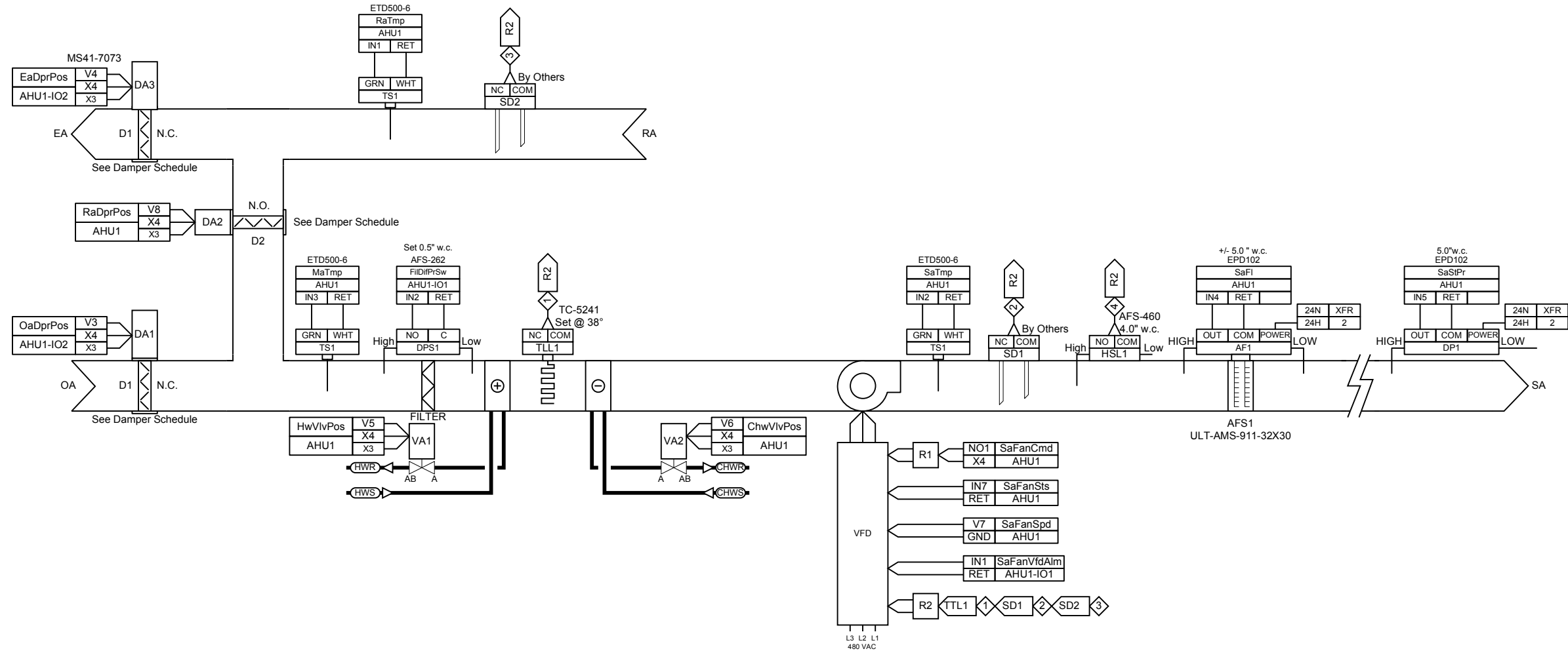
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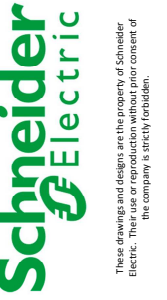
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System Sequence

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AHU1 System Diagram



Device	Qty	Part Number	Description	Manufacturer
AF1	1	EPD102	PRES XDCR 0-10" WC 4-20/0-5/10	Schneider Electric [EPD102]
AFS1	1	ULT-AMS-911-32X30	AIRFLOW MEASURING STATION	Ultratech Industries
DA1-3	3	MS41-7073	DURADRV ACT ELEC SR 0-10 VDC	Schneider Electric
DP1	1	EPD102	PRES XDCR 0-10" WC 4-20/0-5/10	Schneider Electric [EPD102]
DP1_1	2	KEL-A-302-K	STATIC PRESSURE TIP 1/4 BARB	Kele [A-302-K]
DPS1	1	AFS-262	Air Pressure Sensing Switch wi	Schneider Electric [AFS-262]
DPS1_1	2	KEL-A-302-K	STATIC PRESSURE TIP 1/4 BARB	Kele [A-302-K]
HSL1_1	1	KEL-A-302-K	STATIC PRESSURE TIP 1/4 BARB	Kele [A-302-K]
R1-2	2	VER-V100	RELAY ENC SPDT 10-30AC/DC, 120	Veris Industries [V100]
TLL1	1	TC-5241	LOW LIMIT, MAN. RESET 20' ELEM	Schneider Electric
TS1	3	ETD500-6	TEMP SENSOR DUCT WBOX 10KT3 6"	Schneider Electric [ETD500-6]



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AHU1 System Diagram

Job Number: XX##X###
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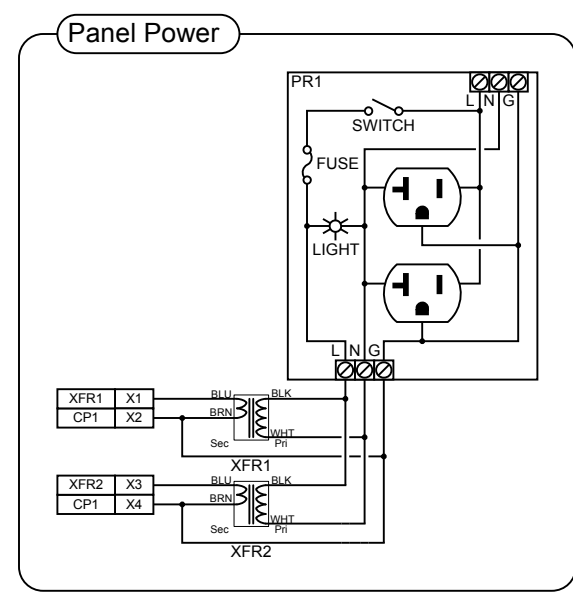
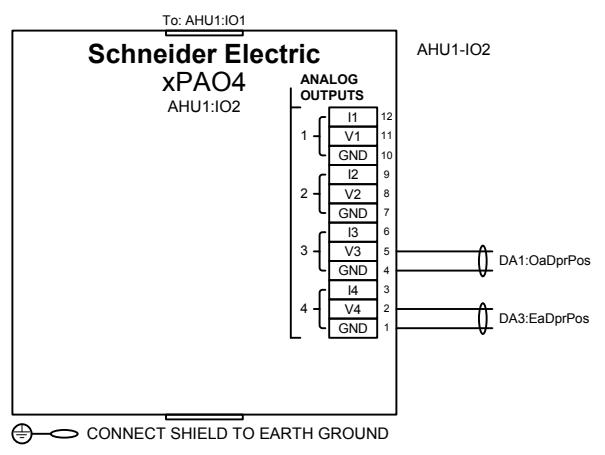
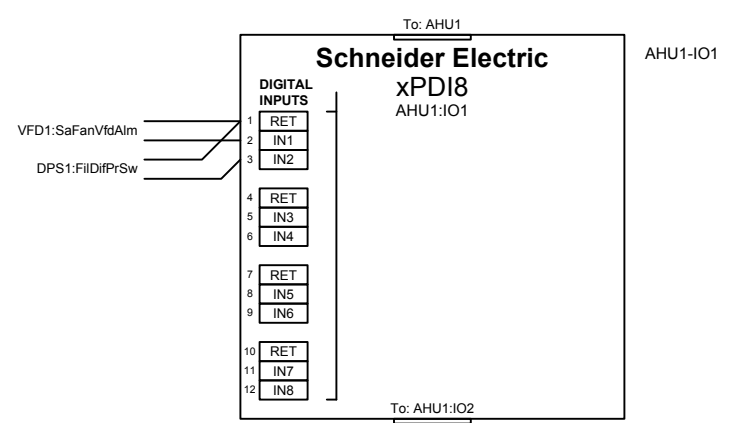
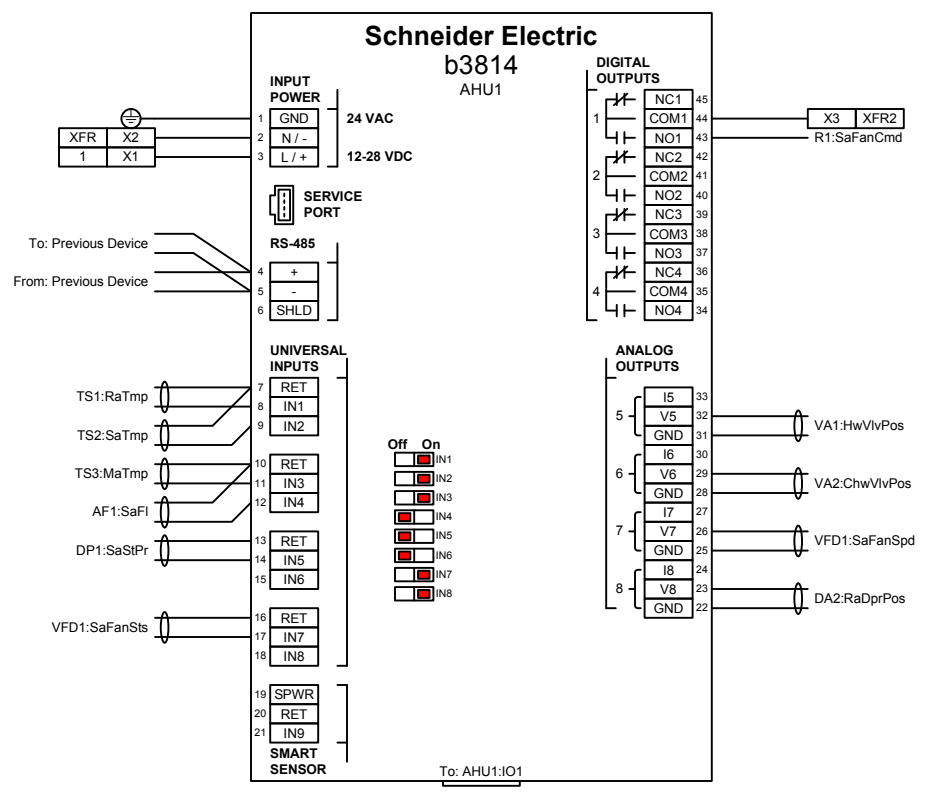
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Architect: University - X
 Engineer: 8487 My Way Blvd.
 Contractor: Houston, Tx, 77079
 Designed by: AHU1 Panel / IO Detail
 Software by:
 Checked by:

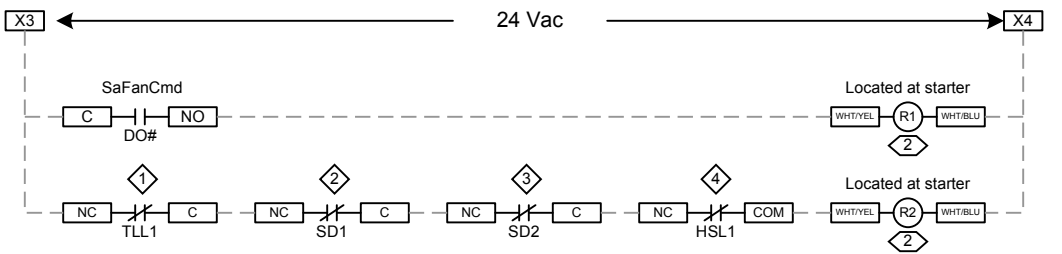
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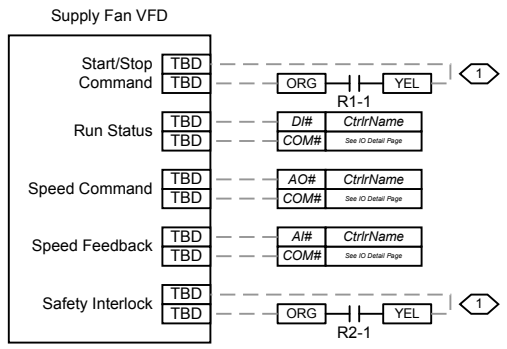


Device	Qty	Part Number	Description	Manufacturer
AHU1	1	b3814	b3814, 8 UI, 4 DO, 4 AO w/over	Schneider Electric [b3814]
AHU1-IO2	1	xPAO4	XP EXP MODULE - 4 AO	Schneider Electric
AHU1-IO1	1	xPDI8	XP EXP MODULE - 8 DI	Schneider Electric
PR1	1	KEL-PRK-FLS	PRK-S W/ FUSE HOLDER GREEN LT	Kele [PRK-FLS]
XFR1-2	2	VER-X050BAB	TRANSFORMER CONTROL 50VA 120V	Veris Industries

1 Starter Control Circuit

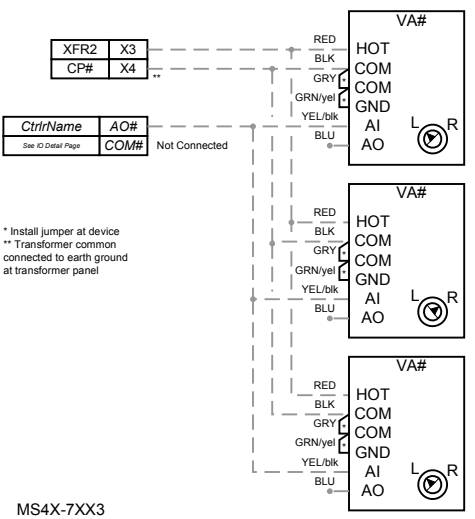


2 Supply Fan VFD Detail



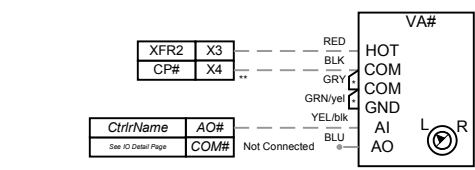
NOTE: Field verify all VFD terminal numbers

3 Economizer Damper Actuator Detail

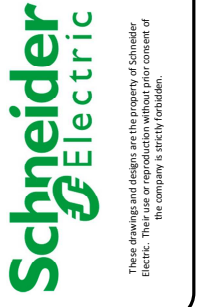


* Install jumper at device
** Transformer common connected to earth ground at transformer panel

4 Valve Actuator Detail



* Install jumper at device
** Transformer common connected to earth ground at transformer panel



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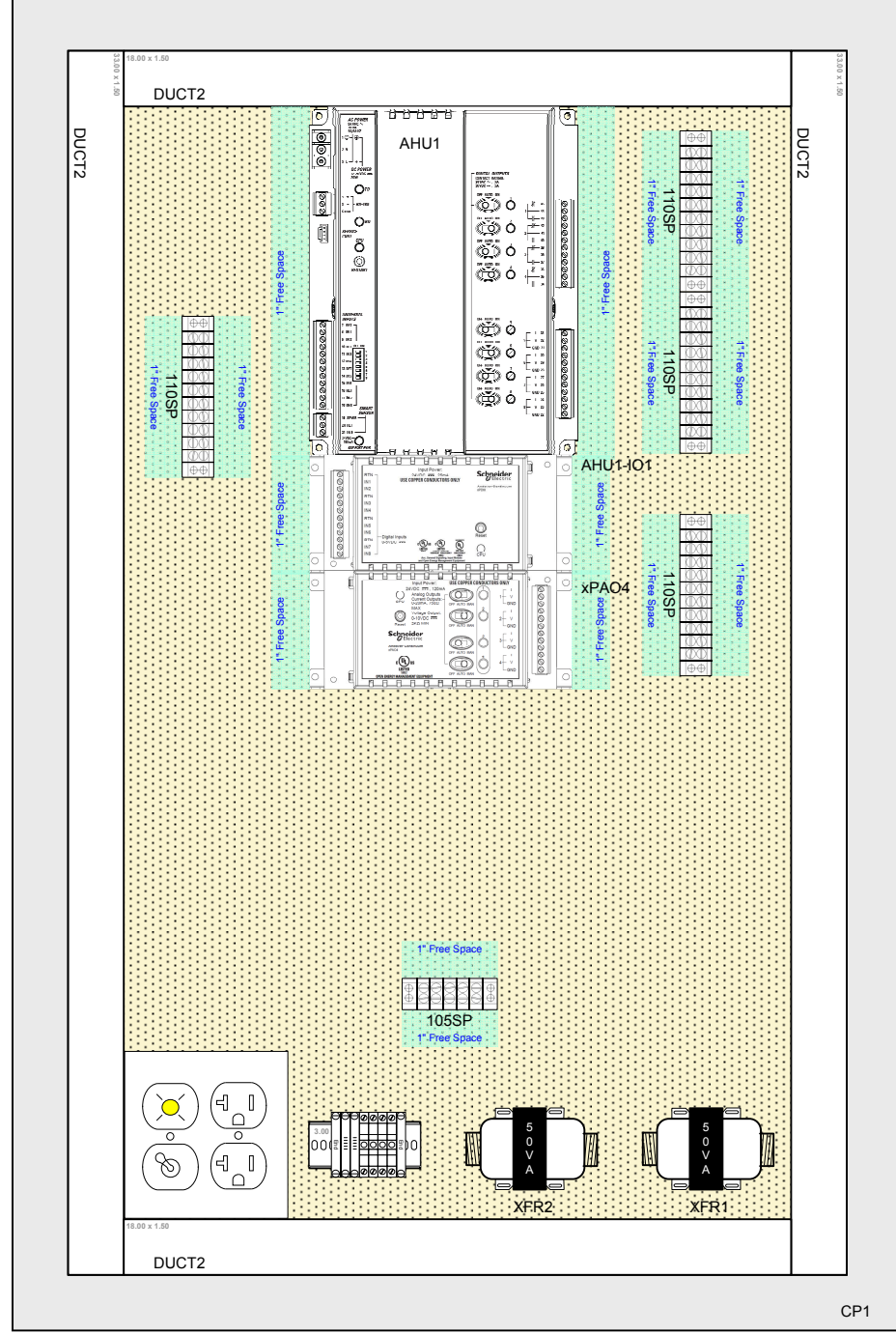
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 AHU1 System Detail

Job Number: XX##X###
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There are no Parts in the Bill of Material



Device	Qty	Part Number	Description	Manufacturer
105SP	2	KEL-105SP	5 PL DOUBLE ROW TERMINAL BLKS	Marathon Special Products [105SP]
110SP	4	KEL-110SP	Double Row 10 Terminal	Kele
110SP_1	4	KEL-JSPS	10 POLE JUMPER STRIP	Kele
CP1	1	UNM-SCH243610RC	ENCL 24X36X10 RECS GRY CVR	Unity Manufacturing
DIN1	1	KEL-DIN-3F	1 METER LONG DIN RAIL STEEL	Iboco [DIN-3F]
DUCT2	4	KEL-T1-1530W	WIRE DUCT 1.5\"X3\" W/CVR WHT	Iboco [T1-1530W]
EST1	2	KEL-BAM-2	BAM-2	Kele
T1	4	KEL-M4/6	6MM (.238IN) TERMINAL BLOCK	ABB [M4/6]
TSW1	2	KEL-M4/6SNBT	SWITCH TERM. GRAY/ORANGE HNDL	ABB [M4/6SNBT]

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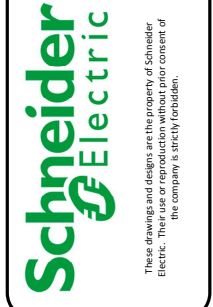
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AHU1 Panel Layout

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AHU1 Sequence of Operation

Unit Description

Name: AHU1

- VAV-CHW-HW-EOA
- Variable volume supply fan
- Chilled water coil with two or three way valve
- Hot water coil with two or three way valve
- Full outside air and return air dampers with independent modulating actuators
- Pressure independent air terminal boxes with or without terminal heating

Setpoints (All Adjustable)

Unoccupied Room Temperature	50°F, 4°F Diff Heating*	90°F, 4°F Diff Cooling
Supply Air Temperature	50°F Minimum Heating, 69°F Maximum Heating	52°F Minimum Cooling, 74°F Maximum Cooling
Supply Air Static Pressure	0.25 in. w.c. Minimum	1.5 in. w.c Maximum
Economizer Lockout	40°F, 4°F Diff	
Low Ambient Temperature	35°F, 2°F Diff	
Low Ambient Valve Position	100% Hot Water Valve	50% Chilled Water Valve
Minimum Economizer Signal	See TAB Report	
Minimum Supply Fan VFD Speed	See TAB Report	
Maximum Recovery Time Period	2 Hours	
Recovery Room Temperature	69°F Heating	74°F Cooling
Override Period	1 Hour	

*fanless air terminal boxes only

TAB Operating Parameters

Minimum Supply Air CFM	See Unit Schedule	
Minimum Outside Air CFM	See Unit Schedule	
Minimum Supply Fan VFD Speed	TAB Requirements during Initial Unit Setup	
Minimum Economizer Signal Schedule	TAB Requirements during Initial Unit Setup	

Sequence of Operation

Normal Operating Modes:

Occupied Mode: When any time chart associated with air terminal box groups served by the unit is scheduled occupied based on time of day and calendar while not overridden by master holiday chart.

The supply fan and return fan shall be commanded to operate continuously after a 60-second delay. When the supply fan status is proven, the outside air, return air, and exhaust air dampers, VFD speed, chilled water valve, and hot water valve shall operate as below. Otherwise, the valves and the outside air damper shall remain closed, and the return air damper shall remain open.

The supply fan VFD speed shall modulate between the Minimum Supply Fan VFD Speed setpoint and full speed to maintain the Supply Air Static Pressure setpoint as measured 2/3 the distance along the main duct trunk.

The outside air, return air and exhaust air dampers shall modulate linearly with the Economizer Signal as defined in Table 1.0.

Table 1.0

AHU1 Sequence of Operation - Cont'd

Table 1.0

Economizer Signal (%)	Outside air damper	Return air damper	Exhaust air damper
0	closed	full return air	closed
50	full outside air	full return air	full outside air
100	full outside air	closed	full outside air

The Economizer Signal shall have a low limit equal to the Minimum Economizer Signal setpoint to provide ventilation. The Economizer Signal shall modulate between the low limit and 100% to provide free cooling when all of the following conditions are met:

- The outside air temperature is below the average room temperature minus 1°F (adjustable) with 2°F differential (adjustable)
- The outside air temperature is above the Economizer Lockout setpoint.

Otherwise, the Economizer Signal shall return to the low limit.

In cooling operation, the economizer damper and chilled water valve shall modulate in sequence to maintain the Supply Air Temperature cooling setpoint. The chilled water valve shall be closed when not in cooling operation.

In heating operation, the hot water valve shall modulate to maintain the Supply Air Temperature heating setpoint. The hot water valve shall be closed when not in heating operation.

Unoccupied Mode:

The supply fan shall be off except under the following conditions:

Setback: When any room temperature for spaces served by the unit (excluding spaces served by a fan-powered air terminal box) is below the Unoccupied Room Temperature heating setpoint, the unit shall operate as in occupied mode except the Economizer Signal shall be 0%.

Setup: When any room temperature for spaces served by the unit is above the Unoccupied Room Temperature cooling setpoint, the unit shall operate as in occupied mode except the Economizer Signal shall have a low limit equal to 0%.

Recovery: Recovery operation shall be initiated to bring the average room temperature for spaces served by the unit to the Recovery Room Temperature setpoint by the scheduled occupied period in the minimum time required. Recovery shall be allowed to operate for no longer than the Maximum Recovery Time Period. The unit shall operate as in occupied mode except the Economizer Signal shall have a low limit equal to 0%.

Bypass: Bypass operation shall be active for the Override Period upon activation of any override pushbutton associated with the unit. The unit shall operate as in occupied mode except the Economizer Signal shall have a low limit equal to 0%.

Safeties

Low Ambient Safety: If the supply fan status is not proven and the outside air temperature is below the Low Ambient Temperature setpoint, the hot water and chilled water valves shall open to the Low Ambient Valve Position Setpoint.

Supply Air High Static Safety: Upon a rise in static pressure above setpoint, the hardwired safety shall stop the supply fan. Manual reset shall be provided.

Smoke Detection: The supply fan, return fan and interlocked exhaust fans shall stop upon receipt of a hardwired signal from the unit duct smoke detector(s).



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AHU1 Sequence of Operation

Fire Alarm Shutdown: The supply fan and interlocked exhaust fans shall stop upon receipt of a hardwired signal from the fire alarm system.

Low Temperature Detection: On a fall in temperature to its setpoint, the hardwired Low Temperature Protection Thermostat shall stop the supply fan.

Calculations

Cooling Operation: Cooling operation shall be active when the supply air temperature is above the Supply Air Temperature cooling setpoint and shall remain active until the supply air temperature drops below the Supply Air Temperature heating setpoint.

Heating Operation: Heating operation shall be active when the supply air temperature is below the Supply Air Temperature heating setpoint and shall remain active until the supply air temperature rises above the Supply Air Temperature cooling setpoint.

Supply Air Temperature Cooling Setpoint: When the supply fan status is proven, the Supply Air Temperature cooling setpoint, initially at maximum, shall modulate to maintain the highest Occupied Room Temperature cooling setpoint error for air terminal boxes served by the unit at 0°F. In heating operation, the Supply Air Temperature cooling setpoint shall be at least 5°F (adjustable) above the Supply Air Temperature heating setpoint.

Supply Air Temperature Heating Setpoint: When the supply fan status is proven, the Supply Air Temperature heating setpoint, initially at minimum, shall modulate to maintain the highest Occupied Room Temperature heating setpoint error for air terminal boxes served by the unit at 0°F. In cooling operation, the Supply Air Temperature heating setpoint shall be at least 2°F (adjustable) below the Supply Air Temperature cooling setpoint.

Supply Fan Status: In order for fan status to be proven, the VFD feedback must exceed a threshold of 5% of full speed.

Return Fan Speed: The supply fan status is proven, the Return Fan speed shall be set to the Supply Fan Speed plus an offset. The offset may be a positive or negative value.

Minimum Economizer Signal Setpoint: The Minimum Economizer Signal setpoint shall be reset based on the supply fan VFD speed to meet the minimum outside air requirement according to the TAB operating parameters.

Supply Air Static Pressure Setpoint: The Supply Air Static Pressure setpoint shall modulate to maintain the highest damper position for air terminal boxes served by the unit at 90% open (adjustable).

Cooling Request: A request for cooling shall be generated when the chilled water valve position is greater than 25% open (adjustable) and shall remain active until the chilled water valve is less than 1% open (adjustable).

Heating Request: A request for heating shall be generated when the hot water valve position is greater than 25% open (adjustable) and shall remain active until the hot water valve is less than 1% open (adjustable).

Interlocks

Exhaust Fans: All exhaust fans, as noted in the exhaust fan narrative, in the zone this unit serves shall operate when the unit is in the occupied mode and the supply fan status is proven.

AHU1 Sequence of Operation - Cont'd

Alarms

Supply Air Temperature Alarm: An alarm shall be sent if the supply fan status is proven and the supply air temperature is above 120°F or below 45°F for a period of 5 minutes (adjustable).

Sensor Fail Alarm: An alarm shall be sent upon detection of a failed temperature sensor.

Supply Fan Alarm: An alarm shall be sent if the fan is commanded to operate and status is not proven or if the fan is commanded to stop and status remains proven for 3 minutes.

Filter Alarm: An alarm shall be sent if the filter pressure switch indicates that a high differential pressure has been detected while the unit is running for 15 minutes.

Low Temperature Alarm: An alarm shall be sent if the low temperature thermostat indicates a low temperature condition has been detected.

Unoccupied Room Temperature Alarm: An alarm shall be sent per air terminal box if, in unoccupied mode, the room temperature is above the Unoccupied Room Temperature cooling setpoint by 10°F (adjustable) for a period of 60 minutes (adjustable). An alarm shall be sent per fanless air terminal box if, in unoccupied mode, the room temperature is below the Unoccupied Room Temperature heating setpoint by 5°F (adjustable) for a period of 60 minutes (adjustable).



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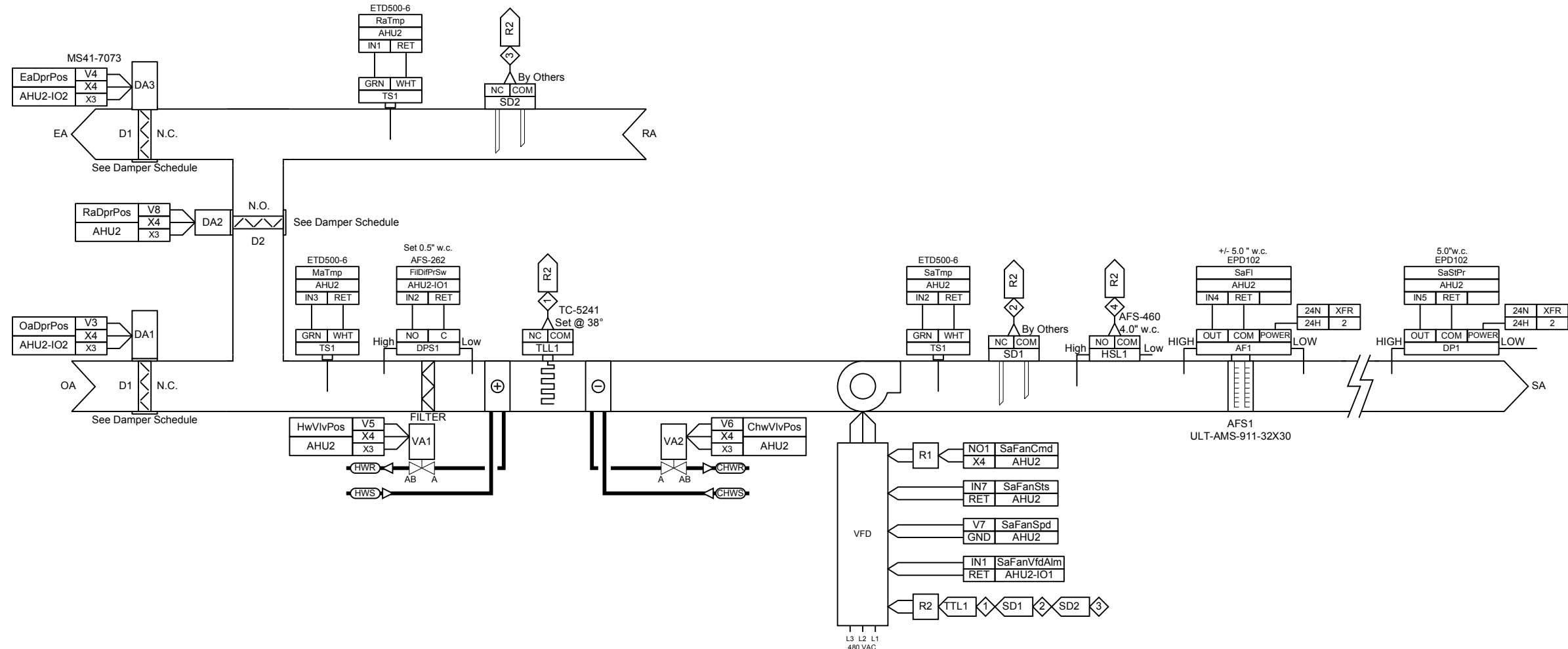
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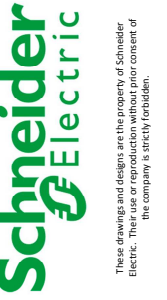
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AHU2 System Diagram



Device	Qty	Part Number	Description	Manufacturer
AF1	1	EPD102	PRES XDCR 0-10" WC 4-20/0-5/10	Schneider Electric [EPD102]
AFS1	1	ULT-AMS-911-32X30	AIRFLOW MEASURING STATION	Ultratech Industries
DA1-3	3	MS41-7073	DURADRV ACT ELEC SR 0-10 VDC	Schneider Electric
DP1	1	EPD102	PRES XDCR 0-10" WC 4-20/0-5/10	Schneider Electric [EPD102]
DP1_1	2	KEL-A-302-K	STATIC PRESSURE TIP 1/4 BARB	Kele [A-302-K]
DPS1	1	AFS-262	Air Pressure Sensing Switch wi	Schneider Electric [AFS-262]
DPS1_1	2	KEL-A-302-K	STATIC PRESSURE TIP 1/4 BARB	Kele [A-302-K]
HSL1_1	1	KEL-A-302-K	STATIC PRESSURE TIP 1/4 BARB	Kele [A-302-K]
R1-2	2	VER-V100	RELAY ENC SPDT 10-30AC/DC, 120	Veris Industries [V100]
TLL1	1	TC-5241	LOW LIMIT, MAN. RESET 20' ELEM	Schneider Electric
TS1	3	ETD500-6	TEMP SENSOR DUCT WBOX 10KT3 6"	Schneider Electric [ETD500-6]



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AHU2 System Diagram

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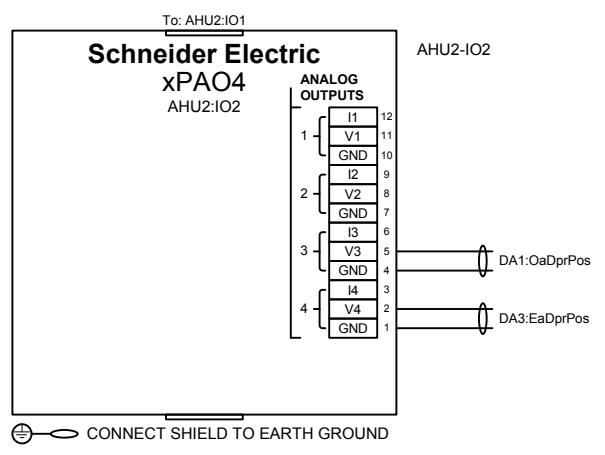
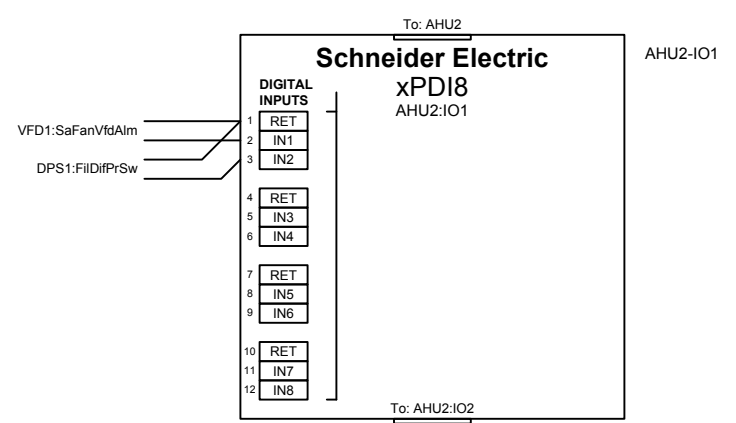
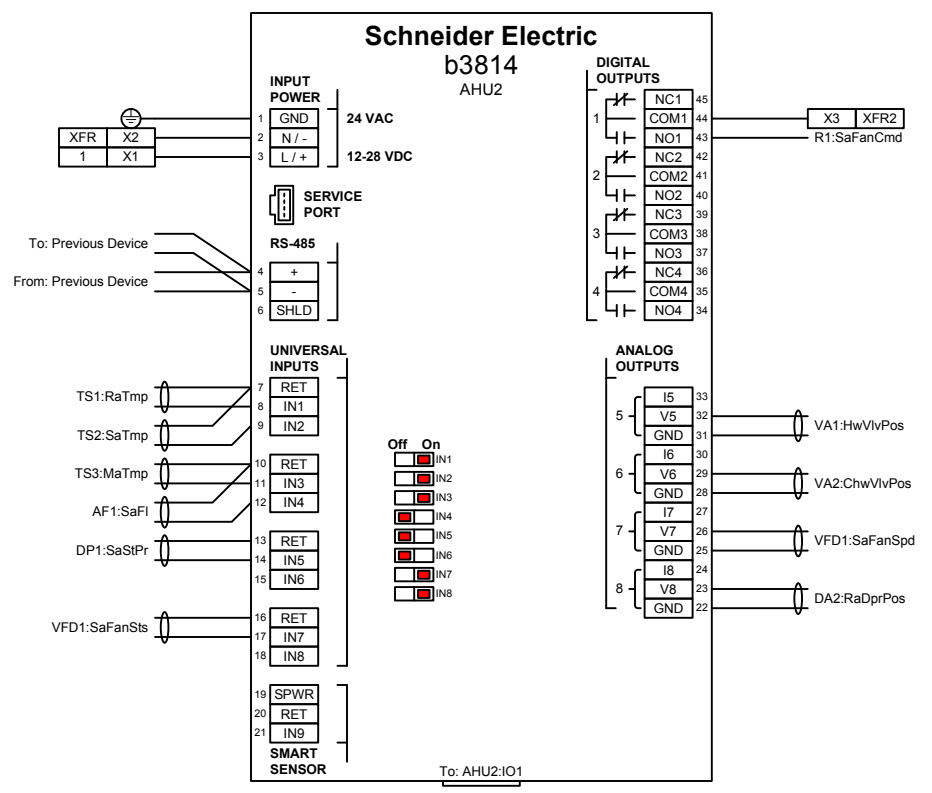
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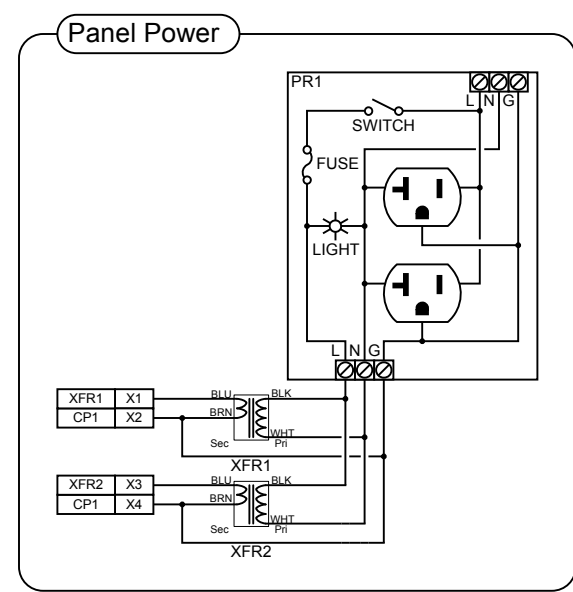
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 Engineer: 8487 My Way Blvd.
 Contractor: Houston, Tx, 77079
 Designed by: AHU2 Panel / IO Detail
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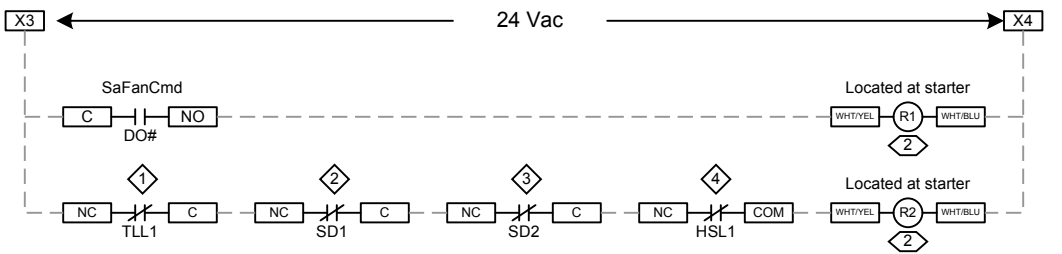


CONNECT SHIELD TO EARTH GROUND

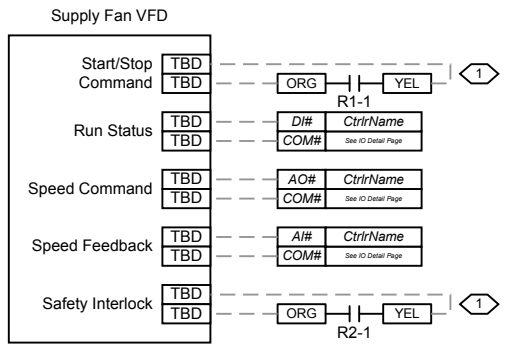


Device	Qty	Part Number	Description	Manufacturer
AHU2	1	b3814	b3814, 8 UI, 4 DO, 4 AO w/over	Schneider Electric [b3814]
AHU2-IO2	1	xPAO4	XP EXP MODULE - 4 AO	Schneider Electric
AHU2-IO1	1	xPDI8	XP EXP MODULE - 8 DI	Schneider Electric
PR1	1	KEL-PRK-FLS	PRK-S W/ FUSE HOLDER GREEN LT	Kele [PRK-FLS]
XFR1-2	2	VER-X050BAB	TRANSFORMER CONTROL 50VA 120V	Veris Industries

1 Starter Control Circuit

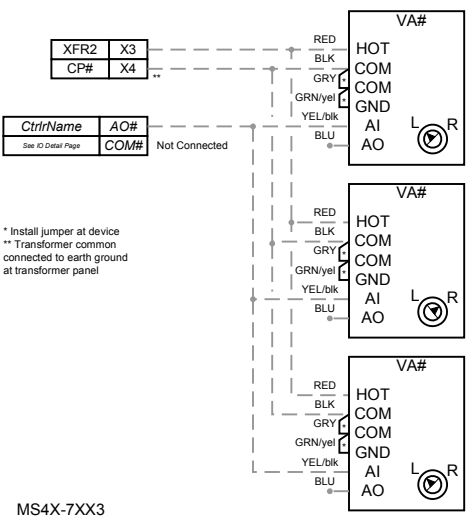


2 Supply Fan VFD Detail



NOTE: Field verify all VFD terminal numbers

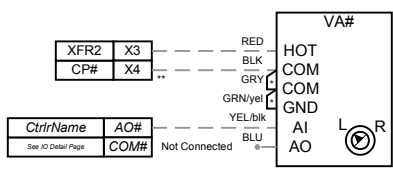
3 Economizer Damper Actuator Detail



* Install jumper at device
** Transformer common connected to earth ground at transformer panel

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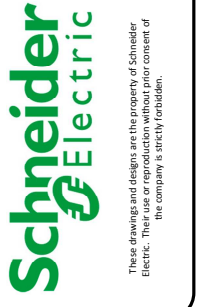
4 Valve Actuator Detail



* Install jumper at device
** Transformer common connected to earth ground at transformer panel

MS4X-7XX3

There are no Parts in the Bill of Material



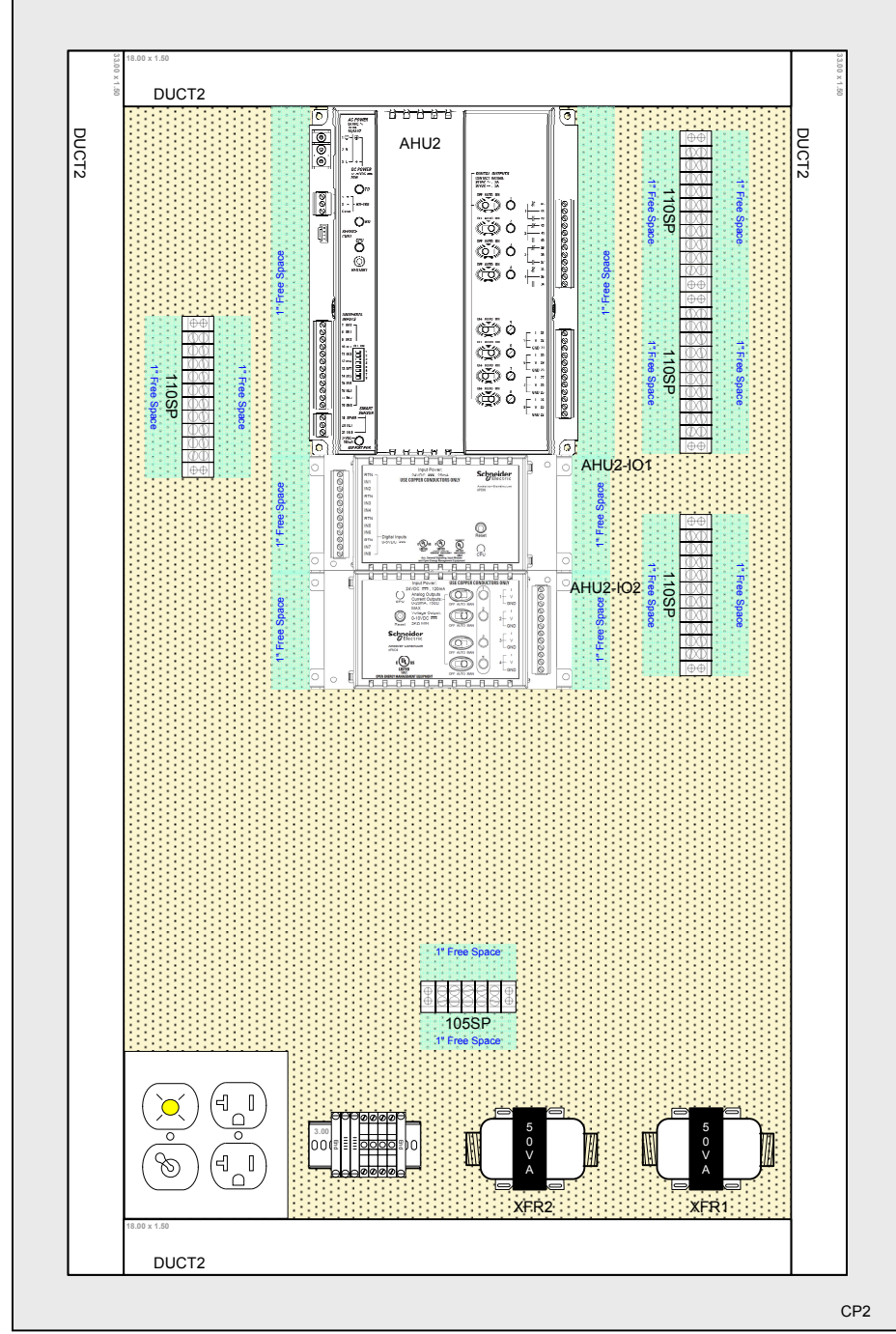
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Device	Qty	Part Number	Description	Manufacturer
105SP	2	KEL-105SP	5 PL DOUBLE ROW TERMINAL BLKS	Marathon Special Products [105SP]
110SP	4	KEL-110SP	Double Row 10 Terminal	Kele
110SP_1	4	KEL-JSPS	10 POLE JUMPER STRIP	Kele
CP2	1	UNM-SCH243610RC	ENCL 24X36X10 RECS GRY CVR	Unity Manufacturing
DIN1	1	KEL-DIN-3F	1 METER LONG DIN RAIL STEEL	Iboco [DIN-3F]
DUCT2	4	KEL-T1-1530W	WIRE DUCT 1.5\"X3\" W/CVR WHT	Iboco [T1-1530W]
EST1	2	KEL-BAM-2	BAM-2	Kele
T1	4	KEL-M4/6	6MM (.238IN) TERMINAL BLOCK	ABB [M4/6]
TSW1	2	KEL-M4/6SNBT	SWITCH TERM. GRAY/ORANGE HNDL	ABB [M4/6SNBT]

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AHU2 Panel Layout

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AHU2 Sequence of Operation

Unit Description

Name: AHU2

- VAV-CHW-HW-EOA
- Variable volume supply fan
- Chilled water coil with two or three way valve
- Hot water coil with two or three way valve
- Full outside air and return air dampers with independent modulating actuators
- Pressure independent air terminal boxes with or without terminal heating

Setpoints (All Adjustable)

Unoccupied Room Temperature	50°F, 4°F Diff Heating*	90°F, 4°F Diff Cooling
Supply Air Temperature	50°F Minimum Heating, 69°F Maximum Heating	52°F Minimum Cooling, 74°F Maximum Cooling
Supply Air Static Pressure	0.25 in. w.c. Minimum	1.5 in. w.c Maximum
Economizer Lockout	40°F, 4°F Diff	
Low Ambient Temperature	35°F, 2°F Diff	
Low Ambient Valve Position	100% Hot Water Valve	50% Chilled Water Valve
Minimum Economizer Signal	See TAB Report	
Minimum Supply Fan VFD Speed	See TAB Report	
Maximum Recovery Time Period	2 Hours	
Recovery Room Temperature	69°F Heating	74°F Cooling
Override Period	1 Hour	

*fanless air terminal boxes only

TAB Operating Parameters

Minimum Supply Air CFM	See Unit Schedule	
Minimum Outside Air CFM	See Unit Schedule	
Minimum Supply Fan VFD Speed	TAB Requirements during Initial Unit Setup	
Minimum Economizer Signal Schedule	TAB Requirements during Initial Unit Setup	

Sequence of Operation

Normal Operating Modes:

Occupied Mode: When any time chart associated with air terminal box groups served by the unit is scheduled occupied based on time of day and calendar while not overridden by master holiday chart.

The supply fan and return fan shall be commanded to operate continuously after a 60-second delay. When the supply fan status is proven, the outside air, return air, and exhaust air dampers, VFD speed, chilled water valve, and hot water valve shall operate as below. Otherwise, the valves and the outside air damper shall remain closed, and the return air damper shall remain open.

The supply fan VFD speed shall modulate between the Minimum Supply Fan VFD Speed setpoint and full speed to maintain the Supply Air Static Pressure setpoint as measured 2/3 the distance along the main duct trunk.

The outside air, return air and exhaust air dampers shall modulate linearly with the Economizer Signal as defined in Table 1.0.

AHU2 Sequence of Operation - Cont'd

Table 1.0

Economizer Signal (%)	Outside air damper	Return air damper	Exhaust air damper
0	closed	full return air	closed
50	full outside air	full return air	full outside air
100	full outside air	closed	full outside air

The Economizer Signal shall have a low limit equal to the Minimum Economizer Signal setpoint to provide ventilation. The Economizer Signal shall modulate between the low limit and 100% to provide free cooling when all of the following conditions are met:

- The outside air temperature is below the average room temperature minus 1°F (adjustable) with 2°F differential (adjustable)
- The outside air temperature is above the Economizer Lockout setpoint.

Otherwise, the Economizer Signal shall return to the low limit.

In cooling operation, the economizer damper and chilled water valve shall modulate in sequence to maintain the Supply Air Temperature cooling setpoint. The chilled water valve shall be closed when not in cooling operation.

In heating operation, the hot water valve shall modulate to maintain the Supply Air Temperature heating setpoint. The hot water valve shall be closed when not in heating operation.

Unoccupied Mode:

The supply fan shall be off except under the following conditions:

Setback: When any room temperature for spaces served by the unit (excluding spaces served by a fan-powered air terminal box) is below the Unoccupied Room Temperature heating setpoint, the unit shall operate as in occupied mode except the Economizer Signal shall be 0%.

Setup: When any room temperature for spaces served by the unit is above the Unoccupied Room Temperature cooling setpoint, the unit shall operate as in occupied mode except the Economizer Signal shall have a low limit equal to 0%.

Recovery: Recovery operation shall be initiated to bring the average room temperature for spaces served by the unit to the Recovery Room Temperature setpoint by the scheduled occupied period in the minimum time required. Recovery shall be allowed to operate for no longer than the Maximum Recovery Time Period. The unit shall operate as in occupied mode except the Economizer Signal shall have a low limit equal to 0%.

Bypass: Bypass operation shall be active for the Override Period upon activation of any override pushbutton associated with the unit. The unit shall operate as in occupied mode except the Economizer Signal shall have a low limit equal to 0%.

Safeties

Low Ambient Safety: If the supply fan status is not proven and the outside air temperature is below the Low Ambient Temperature setpoint, the hot water and chilled water valves shall open to the Low Ambient Valve Position Setpoint.

Supply Air High Static Safety: Upon a rise in static pressure above setpoint, the hardwired safety shall stop the supply fan. Manual reset shall be provided.

Smoke Detection: The supply fan, return fan and interlocked exhaust fans shall stop upon receipt of a hardwired signal from the unit duct smoke detector(s).



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AHU2 Sequence of Operation

Fire Alarm Shutdown: The supply fan and interlocked exhaust fans shall stop upon receipt of a hardwired signal from the fire alarm system.

Low Temperature Detection: On a fall in temperature to its setpoint, the hardwired Low Temperature Protection Thermostat shall stop the supply fan.

Calculations

Cooling Operation: Cooling operation shall be active when the supply air temperature is above the Supply Air Temperature cooling setpoint and shall remain active until the supply air temperature drops below the Supply Air Temperature heating setpoint.

Heating Operation: Heating operation shall be active when the supply air temperature is below the Supply Air Temperature heating setpoint and shall remain active until the supply air temperature rises above the Supply Air Temperature cooling setpoint.

Supply Air Temperature Cooling Setpoint: When the supply fan status is proven, the Supply Air Temperature cooling setpoint, initially at maximum, shall modulate to maintain the highest Occupied Room Temperature cooling setpoint error for air terminal boxes served by the unit at 0°F. In heating operation, the Supply Air Temperature cooling setpoint shall be at least 5°F (adjustable) above the Supply Air Temperature heating setpoint.

Supply Air Temperature Heating Setpoint: When the supply fan status is proven, the Supply Air Temperature heating setpoint, initially at minimum, shall modulate to maintain the highest Occupied Room Temperature heating setpoint error for air terminal boxes served by the unit at 0°F. In cooling operation, the Supply Air Temperature heating setpoint shall be at least 2°F (adjustable) below the Supply Air Temperature cooling setpoint.

Supply Fan Status: In order for fan status to be proven, the VFD feedback must exceed a threshold of 5% of full speed.

Return Fan Speed: The supply fan status is proven, the Return Fan speed shall be set to the Supply Fan Speed plus an offset. The offset may be a positive or negative value.

Minimum Economizer Signal Setpoint: The Minimum Economizer Signal setpoint shall be reset based on the supply fan VFD speed to meet the minimum outside air requirement according to the TAB operating parameters.

Supply Air Static Pressure Setpoint: The Supply Air Static Pressure setpoint shall modulate to maintain the highest damper position for air terminal boxes served by the unit at 90% open (adjustable).

Cooling Request: A request for cooling shall be generated when the chilled water valve position is greater than 25% open (adjustable) and shall remain active until the chilled water valve is less than 1% open (adjustable).

Heating Request: A request for heating shall be generated when the hot water valve position is greater than 25% open (adjustable) and shall remain active until the hot water valve is less than 1% open (adjustable).

Interlocks

Exhaust Fans: All exhaust fans, as noted in the exhaust fan narrative, in the zone this unit serves shall operate when the unit is in the occupied mode and the supply fan status is proven.

AHU2 Sequence of Operation - Cont'd

Alarms

Supply Air Temperature Alarm: An alarm shall be sent if the supply fan status is proven and the supply air temperature is above 120°F or below 45°F for a period of 5 minutes (adjustable).

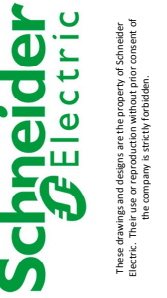
Sensor Fail Alarm: An alarm shall be sent upon detection of a failed temperature sensor.

Supply Fan Alarm: An alarm shall be sent if the fan is commanded to operate and status is not proven or if the fan is commanded to stop and status remains proven for 3 minutes.

Filter Alarm: An alarm shall be sent if the filter pressure switch indicates that a high differential pressure has been detected while the unit is running for 15 minutes.

Low Temperature Alarm: An alarm shall be sent if the low temperature thermostat indicates a low temperature condition has been detected.

Unoccupied Room Temperature Alarm: An alarm shall be sent per air terminal box if, in unoccupied mode, the room temperature is above the Unoccupied Room Temperature cooling setpoint by 10°F (adjustable) for a period of 60 minutes (adjustable). An alarm shall be sent per fanless air terminal box if, in unoccupied mode, the room temperature is below the Unoccupied Room Temperature heating setpoint by 5°F (adjustable) for a period of 60 minutes (adjustable).



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AHU2 System Sequence - 2
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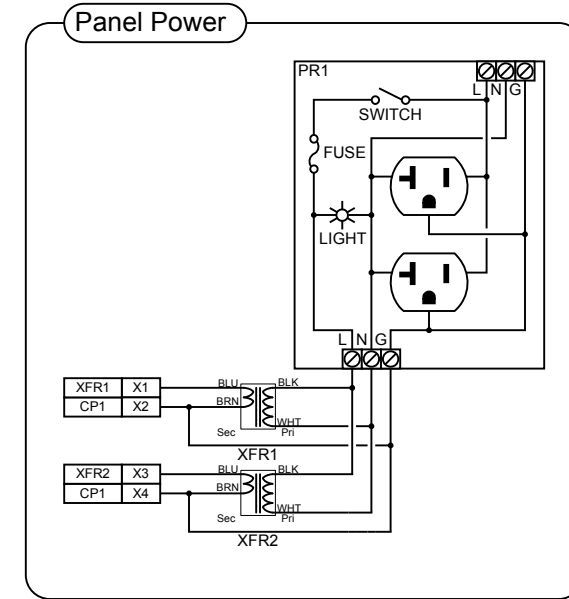
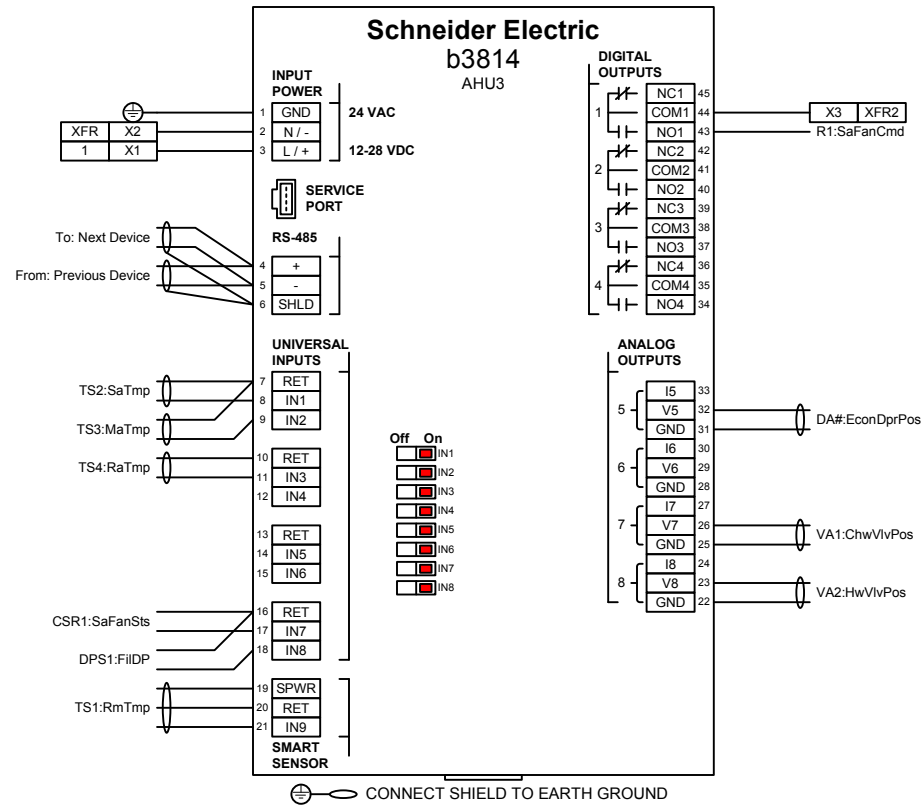
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Floor.vsd

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Device	Qty	Part Number	Description	Manufacturer
AHU3	1	b3814	b3814, 8 UI, 4 DO, 4 AO w/over	Schneider Electric [b3814]
PR1	1	KEL-PRK-FLS	PRK-S W/ FUSE HOLDER GREEN LT	Kele [PRK-FLS]
XFR1-2	2	VER-X050BAB	TRANSFORMER CONTROL 50VA 120V	Veris Industries

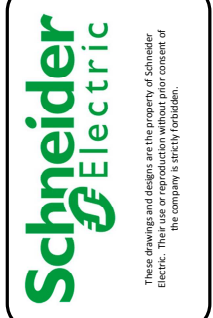
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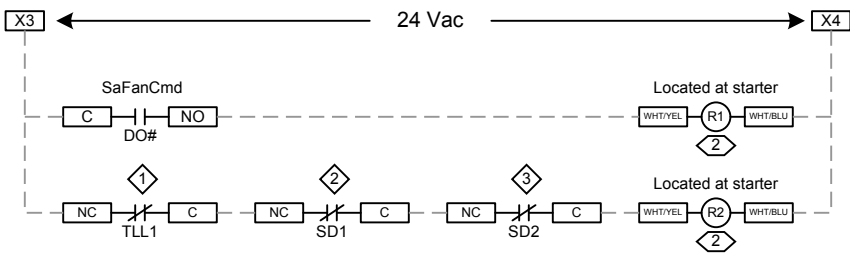
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 AHU3 Panel / IO Detail

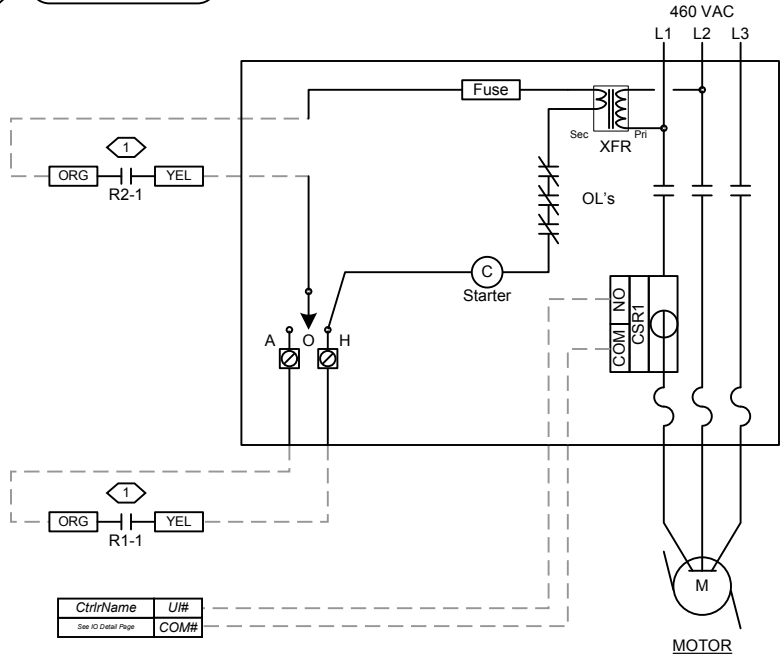
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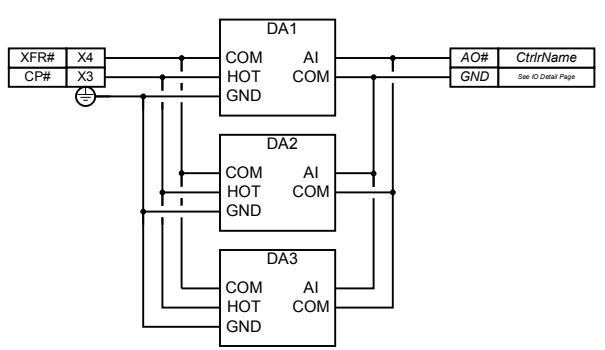
1 Starter Control Circuit



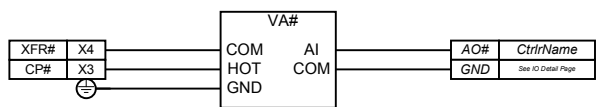
2 Starter Detail



3 Economizer Damper Detail



4 Valve Actuator Detail



There are no Parts in the Bill of Material



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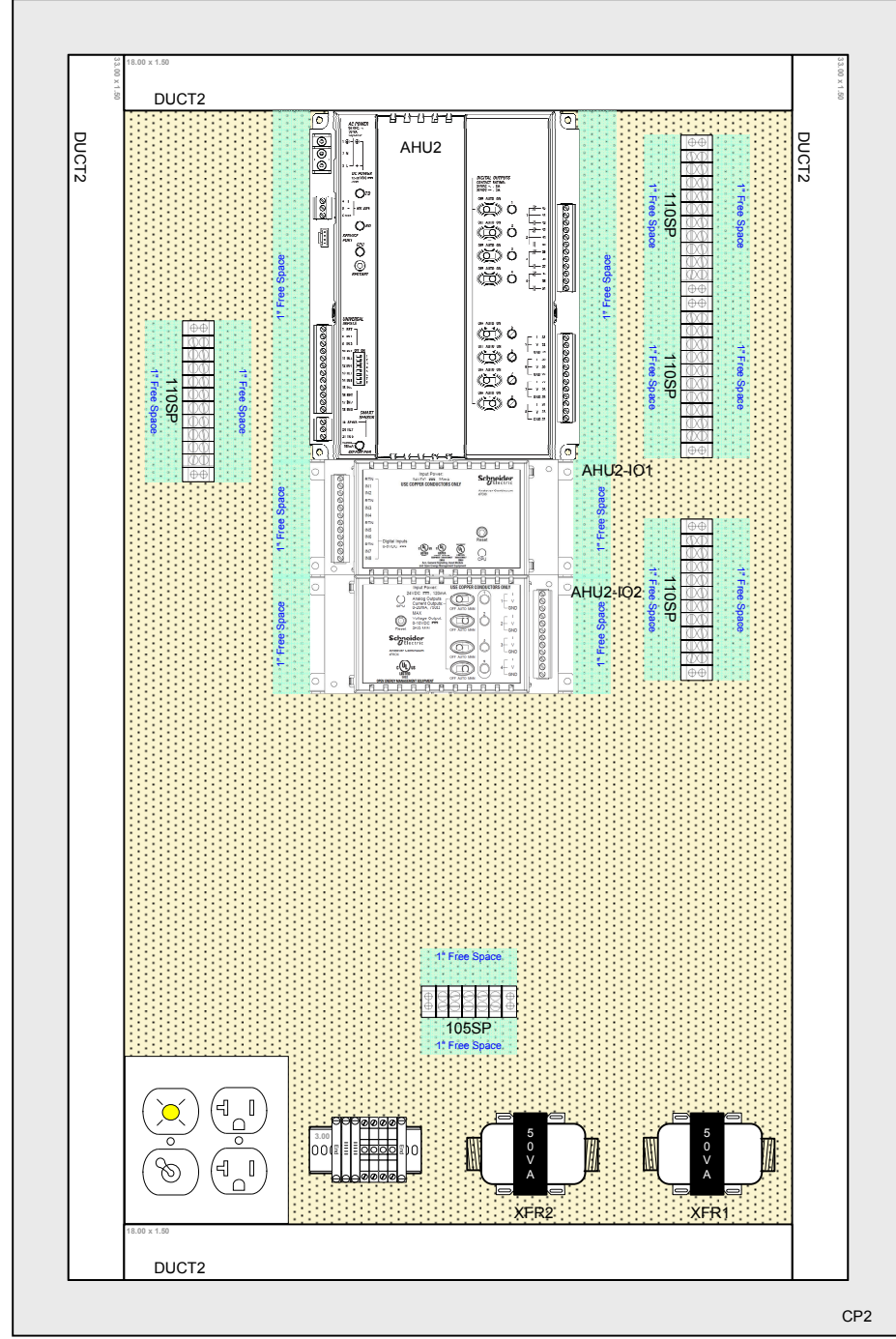
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AHU3 System Detail

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Device	Qty	Part Number	Description	Manufacturer
105SP	1	KEL-105SP	5 PL DOUBLE ROW TERMINAL BLKS	Marathon Special Products [105SP]
110SP	4	KEL-110SP	Double Row 10 Terminal	Kele
110SP_1	4	KEL-JSPS	10 POLE JUMPER STRIP	Kele
CP2	1	UNM-SCH243610RC	ENCL 24X36X10 RECS GRY CVR	Unity Manufacturing
DIN1	1	KEL-DIN-3F	1 METER LONG DIN RAIL STEEL	Iboco [DIN-3F]
DUCT2	4	KEL-T1-1530W	WIRE DUCT 1.5"X3" W/CVR WHT	Iboco [T1-1530W]
EST1	2	KEL-BAM-2	BAM-2	Kele
T1	4	KEL-M4/6	6MM (.238IN) TERMINAL BLOCK	ABB [M4/6]
TSW1	2	KEL-M4/6SNBT	SWITCH TERM. GRAY/ORANGE HNDL	ABB [M4/6SNBT]

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AHU3 Panel Layout

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AHU3 Sequence of Operation

Unit Description

Name: AHU##

- SZCV-mCHW-mHW-EOA
- Constant volume supply fan
- Chilled water coil with two or three way valve
- Hot water coil with two or three way valve
- Full economizer damper with modulating actuator

Setpoints (All Adjustable)

Occupied Room Temperature	69°F Heating	74°F Cooling
Unoccupied Room Temperature	50°F, 4°F Diff Heating	90°F, 4°F Diff Cooling
Supply Air Temperature	110°F Maximum Heating	52°F Minimum Cooling
Economizer Dry Bulb Limit	75°F, 2°F Diff	
Economizer Lockout	40°F, 4°F Diff	
Low Ambient Temperature	35°F, 2°F Diff	
Low Ambient Valve Position	100% Hot Water Valve	50% Chilled Water Valve
Minimum Economizer Damper Position	See TAB Report	
Maximum Recovery Time Period	2 Hours	
Override Period	1 Hour	
Local User Setpoint Adjust	+/- 2°F	

TAB Operating Parameters

Minimum Outside Air CFM	See Unit Schedule
Minimum Economizer Damper Position	TAB Requirements during Initial Unit Setup

Sequence of Operation

Normal Operating Modes:

- Occupied Mode:** When unit's associated time chart is scheduled occupied based on time of day and calendar while not overridden by master holiday chart.
- Unoccupied Mode:** When unit's associated time chart is scheduled unoccupied, or when master holiday chart is scheduled unoccupied.

Occupied Mode:

The supply fan shall be commanded to operate continuously. When the supply fan status is proven, the economizer damper, chilled water valve, and hot water valve shall operate as below. Otherwise, the economizer damper shall remain in the full return air position, and the valves shall remain closed.

The economizer damper shall have a low limit position equal to the Minimum Economizer Damper Position setpoint to provide ventilation. The economizer damper shall modulate between the low limit position and the full outside air position to provide free cooling when all of the following conditions are met:

- The outside air temperature is below the room temperature minus 1°F (adjustable) with 2°F differential (adjustable)
- The outside air temperature is above the Economizer Lockout setpoint.

Otherwise, the economizer damper shall return to the low limit position.

AHU3 Sequence of Operation - Cont'd

In cooling operation, the economizer damper and chilled water valve shall modulate in sequence to maintain the Supply Air Temperature setpoint. The chilled water valve shall be closed when not in cooling operation.

In heating operation, the hot water valve shall modulate to maintain the Supply Air Temperature setpoint. The economizer damper shall remain at the low limit position. The hot water valve shall be closed when not in heating operation.

Unoccupied Mode:

The supply fan shall be off except under the following conditions:

Setback: When the room temperature is below the Unoccupied Room Temperature heating setpoint, the unit shall operate as in occupied mode except the economizer damper shall be in the full return air position.

Setup: When the room temperature is above the Unoccupied Room Temperature cooling setpoint, the unit shall operate as in occupied mode except the economizer damper shall have a low limit position equal to the full return air position.

Recovery: Recovery operation shall be initiated to bring the space to Occupied Room Temperature setpoints by the scheduled occupied period in the minimum time required. Recovery shall be allowed to operate for no longer than the Maximum Recovery Time Period. The unit shall operate as in occupied mode except the economizer damper shall have a low limit position equal to the full return air position.

Bypass: Bypass operation shall be active for the Override Period upon activation of the override pushbutton. The unit shall operate as in occupied mode except the economizer damper shall have a low limit position equal to the full return air position.

Base Load Operation: The unit is in cooling operation and has received a cooling base load trigger, the unit shall operate as in occupied mode except the economizer damper shall be in the full return air position.

Safeties

Low Ambient Safety: If the supply fan status is not proven and the outside air temperature is below the Low Ambient Temperature setpoint, the hot water and chilled water valves shall open to the Low Ambient Valve Position setpoint.

Smoke Detection: The supply fan and interlocked exhaust fans shall stop upon receipt of a hardwired signal from the unit duct smoke detector.

Fire Alarm Shutdown: The supply fan and interlocked exhaust fans shall stop upon receipt of a hardwired signal from the fire alarm system.

Low Temperature Detection: On a fall in temperature to its setpoint, the hardwired Low Temperature Protection Thermostat shall stop the supply fan.

Emergency Shutdown: Upon receipt of an Emergency Shutdown Trigger, the supply fan shall stop, and the economizer damper shall return to the full return air position.



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AHU3 Sequence of Operation - Cont'd

Calculations

Cooling Operation: Cooling operation shall be active while the room temperature is above the Occupied Room Temperature cooling setpoint and shall remain active until the room temperature drops below the Occupied Room Temperature heating setpoint.

Heating Operation: Heating operation shall be active while the room temperature is below the Occupied Room Temperature heating setpoint and shall remain active until the room temperature rises above the Occupied Room Temperature cooling setpoint.

Supply Air Temperature Setpoint: In cooling operation, the maximum Supply Air Temperature setpoint shall be equal to the Occupied Room Temperature cooling setpoint. When the supply fan status is proven, the Supply Air Temperature setpoint, initially at maximum, shall modulate to maintain the Occupied Room Temperature cooling setpoint. In heating operation, the minimum Supply Air Temperature setpoint shall be equal to the Occupied Room Temperature heating setpoint. When the supply fan status is proven, the Supply Air Temperature setpoint, initially at minimum, shall modulate to maintain the Occupied Room Temperature heating setpoint.

Cooling Request: A request for cooling shall be generated when the chilled water valve position is greater than 25% open (adjustable) and shall remain active until the chilled water valve is less than 1% open (adjustable).

Heating Request: A request for heating shall be generated when the hot water valve position is greater than 25% open (adjustable) and shall remain active until the hot water valve is less than 1% open (adjustable).

Interlocks

Exhaust Fans: All exhaust fans, as noted in the exhaust fan narrative, in the zone this unit serves shall operate when the unit is in the occupied mode and the supply fan status is proven.

Alarms

Supply Air Temperature Alarm: An alarm shall be sent if the supply fan status is proven and the supply air temperature is above 120F or below 45F for a period of 5 minutes (adjustable).

Sensor Fail Alarm: An alarm shall be sent upon detection of a failed temperature sensor.

Supply Fan Alarm: An alarm shall be sent if the fan is commanded to operate and status is not proven or if the fan is commanded to stop and status remains proven for 3 minutes.

Occupied Room Temperature Alarm: An alarm shall be sent after having been in the occupied mode for at least 60 minutes (adjustable) if the room temperature is below the Occupied Room Temperature heating setpoint by 5F (adjustable) or above the Occupied Room Temperature cooling setpoint by 10F (adjustable).

Unoccupied Room Temperature Alarm: An alarm shall be sent if, in unoccupied mode, the room temperature is below the Unoccupied Room Temperature heating setpoint by 5F (adjustable) or above the Unoccupied Room Temperature cooling setpoint by 10F (adjustable) for a period of 60 minutes (adjustable).

TAB Requirements during Initial Unit Setup

Refer to included document titled "TAB Requirements for Constant Volume Unit with Economizer."



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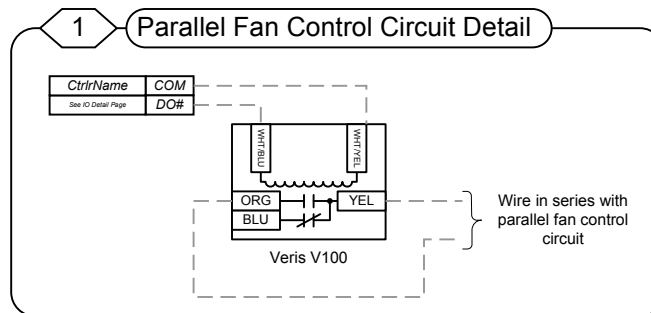
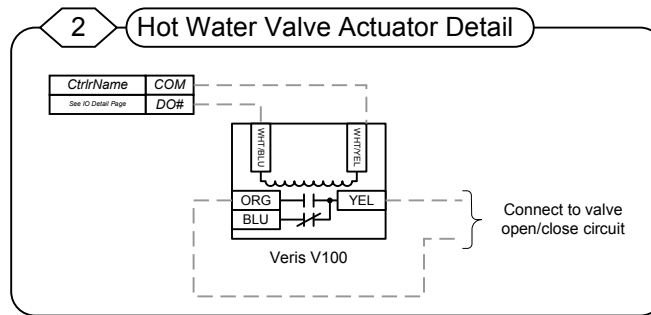
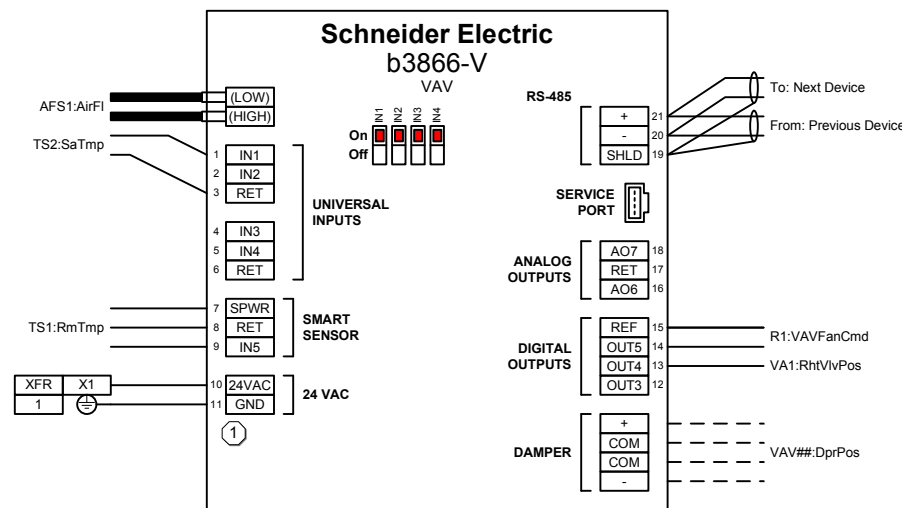
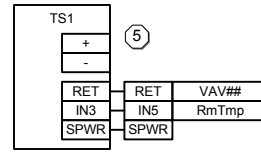
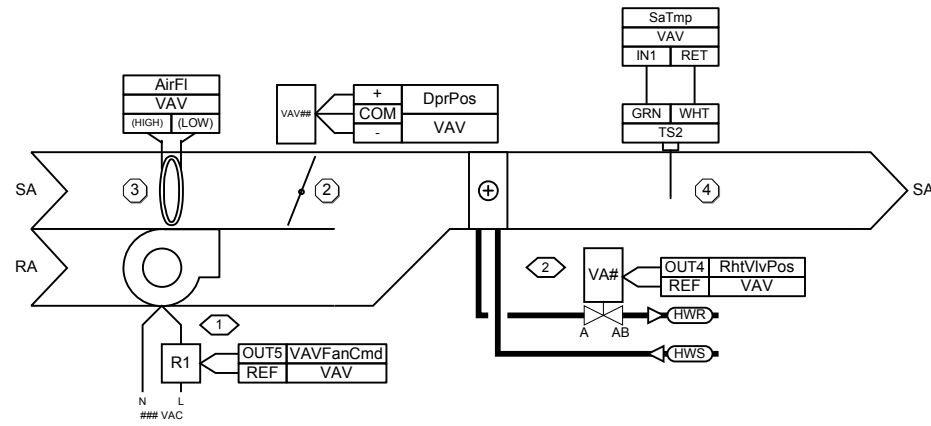
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VAV System Diagram



Notes

- 1 The transformer secondary must be grounded to true earth ground as shown on the wiring diagram.
- 2 Mount controller with integrated damper actuator directly on VAV damper shaft.
- 3 For accurate airflow measurement, mechanical contractor to install terminal box with straight duct at inlet of at least 3 duct diameters
- 4 Sensor shall be mounted at discharge of unit. Do not mount into flex duct!
- 5 Mount room temperature sensor 42-48" above finished floor in locations indicate

Device	Qty	Part Number	Description	Manufacturer
R1	1	VER-V100	RELAY ENC SPDT 10-30AC/DC, 120	Veris Industries [V100]
TS2	1	ETD500-NE-4	TEMP SENSOR DUCT FLNG 10KT3 4"	Schneider Electric [ETD500-NE-4]
TS1	1	TTS-SD-LCD-B-1	SMART SENSOR, LCD DISPLAY, 10K	Schneider Electric
VAV	1	b3866-V	b3866, 4 UI, 1 Airflow, 1 IBS	Schneider Electric



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VAV Sequence of Operation

Unit Description

Name: VAV##

- ATB-CLG-PF-dHWRH-PI
- Variable volume supply air damper with modulating actuator
- Parallel supply air fan
- Primary cooling available from primary unit
- 2-position hot water reheat coil with two or three way valve
- Airflow sensing device for pressure-independent airflow control

Setpoints (All Adjustable)

Occupied Room Temperature	69°F Heating	74°F Cooling
Cooling CFM	See Unit Schedule - Min	See Unit Schedule - Max
Reheat CFM	See Unit Schedule	
Low Ambient Temperature	35°F, 2°F Diff	
Override Period	1 Hour	
Local User Setpoint Adjust	+/- 2°F	

Sequence of Operation

Normal Operating Modes:

- Occupied Mode:** When air terminal box group time chart is scheduled occupied based on time of day and calendar while not overridden by master holiday chart.
- Unoccupied Mode:** When air terminal box group time chart is scheduled unoccupied, or when master holiday chart is scheduled unoccupied.

Occupied Mode:

The volume damper, parallel fan, and hot water valve shall operate as below.

In cooling operation, the volume damper shall modulate to maintain the Cooling CFM setpoint.

In heating operation, the volume damper shall modulate to maintain the Reheat CFM setpoint and both the parallel supply air fan and the hot water valve shall cycle with the calculated Heating Load as defined in Table 1.0. The electric heating equipment shall not operate when not in heating operation.

Table 1.0

Heating Load (%)	Parallel Supply Air Fan	Hot water valve position
5	Off	0% open
50	On	100% open
95	On	100% open

Unoccupied Mode:

The volume damper and hot water valve shall be fully closed and parallel supply air fan shall be off, except under the following conditions:

Setback: When the room temperature is below the Unoccupied Room Temperature heating setpoint, the unit shall operate as in occupied mode heating operation except the Reheat CFM setpoint shall be 0 CFM.

VAV Sequence of Operation - Cont'd

Setup: When the primary air unit is operating in Setup, the air terminal box shall operate as in occupied mode.

Recovery: When the primary air unit is operating in Recovery, the air terminal box shall operate as in occupied mode except the Reheat CFM setpoint shall be 0 CFM..

Bypass: Bypass operation shall be active for the Override Period upon activation of the override pushbutton. All boxes in the associated air terminal box group shall operate as in occupied mode except the Reheat CFM setpoint shall be 0 CFM.

Base Load Operation: Upon receipt of a cooling base load trigger, the air terminal box shall operate as in occupied mode.

Safeties

Low Ambient Safety: If the primary unit supply fan status is not proven and the outside air temperature is below the Low Ambient Temperature setpoint, the hot water valve shall open.

Calculations

Cooling Operation: Cooling operation shall be active while the room temperature is above the Occupied Room Cooling setpoint and shall remain active until the room temperature drops below the Occupied Room Heating setpoint.

Heating Operation: Heating operation shall be active while the room temperature is below the Occupied Room Heating Setpoint and shall remain active until the room temperature rises above the Occupied Room Cooling Setpoint.

Heating Load: When heating operation is active, the Heating Load, initially at 0%, shall modulate between 0 and 100% to maintain the Occupied Room Temperature heating setpoint.

Central Heat Operation: Central heat operation shall be active when the primary air unit's supply air temperature is above the room temperature.

Hot Water Available: Hot water available shall be active when the hot water supply temperature is above 90°F with a 20°F differential and hot water flow has been proven.

Cooling CFM Setpoint: In cooling operation, the Cooling CFM setpoint shall modulate to maintain the Occupied Room Temperature cooling setpoint. The Cooling CFM setpoint shall be at minimum when in central heat operation or not in cooling operation.

Heating Request: A request for heating shall be generated when the hot water valve position open and shall remain active until the hot water valve is closed.

Alarms

Sensor Fail Alarm: An alarm shall be sent upon detection of a failed temperature sensor.

Occupied Room Temperature Alarm: An alarm shall be sent after having been in the occupied mode for at least 60 minutes (adjustable) if the room temperature is below the Occupied Room Temperature heating setpoint by 5°F (adjustable) or above the Occupied Room Temperature cooling setpoint by 10°F (adjustable).



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