

ABBREVIATIONS AND DEFINITIONS		ENGINEERING ABBREVIATIONS	
		ABBREVIATION LIST TO BE AMENDED AS NECESSARY	
AFS/AFMS/AMS	AIR FLOW STATION	INT	INTERFACE
AHU	AIR HANDLER UNIT	IP	INTERNET PROTOCOL
AI	ANALOG INPUT	IRH	INFRARED HEATER
ALR/ALRM	ALARM	ISO	ISOLATE /ISOLATION
AO	ANALOG OUTPUT	ITS	IMMERSION TEMPERATURE SENSOR
ATS	AVERAGING TEMPERATURE SENSOR	LAN	LOCAL AREA NETWORK
AUX	AUXILIARY	LCA	LOW CONTROL AIR
AUX-FLOW	AUXILIARY FLOW	LD	LOAD
AVG	AVERAGE / AVERAGING	LDDR	LADDER
BCU	BLOWER COIL UNIT	LL	LOW LIMIT
BLDG/BLD	BUILDING	LLS	LOW LIMIT SWITCH (FREZESTAT)
BLR	BOILER	LS	LIGHT SWITCH
BLDSP	BUILDING STATIC PRESSURE	MAG	MAGNETIC GAUGE
BLDSP-SP	BUILDING STATIC PRESSURE SET POINT	MAT	MIXED AIR TEMPERATURE
CAV	CONSTANT AIR VOLUME	MAU	MAKE UP AIR UNIT
CBL	CABLE	MAX	MAXIMUM
CCWCLOSE	COUNTER CLOCKWISE TO CLOSE	MID	MIDDLE / MIDPOINT
CH/CLR	CHILLER	MIN	MINIMUM
CHP	CHILLED WATER PUMP	MON	MONITOR
CHWR	CHILLED WATER RETURN	MR	MANUAL RESET
CHWS	CHILLED WATER SUPPLY	MZ	MULTI-ZONE
CLG	COOLING	OA/OSA	OUTSIDE AIR
SMR	CURRENT TRANSDUCER SWITCH RELAY W/COMMAND RELAY	OAH	OUTSIDE AIR HUMIDITY
COM/COMM	COMMUNICATION	OAT	OUTSIDE AIR TEMPERATURE
COMP	COMPRESSOR	OAU	OUTSIDE AIR UNIT
COMP/CMP	COMPRESSOR	OR	OPERATING ROOM (TYPICALLY)
COND	CONDENSER	OTS	OUTSIDE AIR TEMPERATURE SENSOR
CO	CARBON MONOXIDE	PCHP	PRIMARY CHILLED WATER PUMP
CO2	CARBON DIOXIDE	PE	PNEUMATIC TO ELECTRIC RELAY
COOL	COOLING	PGS	PROPYLENE GLYCOL SOLUTION
COOLSTG#	COOLING COOLING STAGE (# - PARTICULAR STAGE NUMBER)	PHC	PREHEAT COIL
COOL\$SPT	ACTIVE COOLING SET POINT (CALCULATED)	PID	PROPORTIONAL, INTEGRAL, DERIVATIVE LOOP ALGORITHM
COOL-SP	COOLING SET POINT	PMP	PUMP
CP	CENTRAL PLANT	PNEU	PNEUMATIC
CR	CONTROL RELAY	PNL	PANEL
CSR	CURRENT TRANSDUCER SWITCH RELAY	PRS	PRESSURE
CT/CTWR	COOLING TOWER	R	RELAY
CT	CURRENT TRANSDUCER	RAH	RETURN AIR HUMIDITY
CWP	CONDENSER WATER PUMP	RAT	RETURN AIR TEMPERATURE
CWR	CONDENSER WATER RETURN	RF	RETURN FAN
CWS	CONDENSER WATER SUPPLY	RFRG	REFRIGERANT
CW-CLOSE	CLOCKWISE TO CLOSE	RH	ROOM HUMIDITY; RE HEAT
C&SETBK	COOLING SET BACK SET POINT	%RH	PERCENT OF RELATIVE HUMIDITY
DB	DEADBAND / DRY BULB	RHC	RE-HEAT COIL
DAH	DISCHARGE AIR HUMIDITY	RH-SP	ROOM HUMIDITY SET POINT
DAT	DISCHARGE AIR TEMPERATURE	RM	ROOM
DD	DUAL DUCT / DUCT DAMPER	RPT	REPEATER
DHS	DISCHARGE AIR HUMIDITY SENSOR	RT-SP	ROOM TEMPERATURE SET POINT
DI	DIGITAL INPUT	RTS	ROOM TEMPERATURE SENSOR
DMP/DMPR	DAMPER / DAMPER ACTUATOR (OR BOTH)	SAT	SUPPLY AIR TEMPERATURE
DMPR-POS	DAMPER POSITION	SCH/SCHD	SCHEDULE
DN	DOWN	SCHP	SECONDARY CHILLED WATER PUMP
DO	DIGITAL OUTPUT	SD/SMK	SMOKE DETECTOR
DOM	DOMESTIC	SF	SUPPLY FAN
DPS	DIFFERENTIAL PRESSURE SWITCH	SFT	STEAM FLOW TRANSDUCER
DPT	DIFFERENTIAL PRESSURE TRANSDUCER	SP	SET POINT
DRV-TIME	ACTUATOR DRIVE TIME	SPL	SPLIT
DSP	DISCHARGE STATIC PRESSURE	ST	SUPPLY AIR TERMINAL UNIT
DTS	DISCHARGE TEMPERATURE SENSOR	STAT	THERMOSTAT
EF	EXHAUST FAN	STM	STEAM
EH	ELECTRIC HEAT	STS	SPACE TEMPERATURE SENSOR
EP	ELECTRIC TO PNEUMATIC RELAY	SZ	SINGLE ZINE
ERV	ENERGY RECOVERY UNIT	TEMP/TMP	TEMPERATURE
ES	END SWITCH	TOX	TOXIC
ET	EXHAUST AIR TERMINAL UNIT	TT	TEMPERATURE TRANSMITTER (SENSOR TRANSMITTER)
FCU	FAN COIL UNIT	TWR	TOWER
FH	FUME HOOD	UH	UNIT HEATER
FLW	FLOW	UNC	UNITARY CONTROLLER
FP-VAV	FAN POWERED VARIABLE AIR VOLUME	UNT	UNIT / UNITARY
FPP-VAV	PARALLEL FAN POWERED VARIABLE AIR VOLUME	VAV	VARIABLE AIR VOLUME
FPS-VAV	SERIES FAN POWER VARIABLE AIR VOLUME	VENT	VENTILATION / VENTILATOR
FS	FIRESTAT / FLOW SWITCH	VFD	VARIABLE FREQUENCY DRIVE
FTH	FIN TUBE HEATER	VLV	VALVE
H/C-MODE	HEATING OR COOLING MODE	VSD	VARIABLE SPEED DRIVE
HEAT	HEATING	WAN	WIDE AREA NETWORK
HEATSTG#	HEATING STAGE (# - PARTICULAR STAGE NUMBER)	WFT	WATER FLOW TRANSDUCER
HEAT\$SPT	ACTIVE HEATING SET POINT (CALCULATED)	XFR	TRANSFORMER
HL	HIGH LIMIT	ZH	ZONE HUMIDITY
HLS	HIGH LIMIT SWITCH	ZHS	ZONE HUMIDITY SENSOR
HOA	HAND-OFF-AUTO	ZH-SP	ZONE HUMIDITY SET POINT
HRU	HEAT RECOVERY UNIT	ZT	ZONE TEMPERATURE
HUM	HUMIDITY / HUMIDIFIER	ZTS	ZONE TEMPERATURE SENSOR
HW	HOT WATER	ZT-SP	ZONE TEMPERATURE SET POINT
HX	HEAT EXCHANGER		
H\$SETBK	HEATING SET BACK SET POINT		

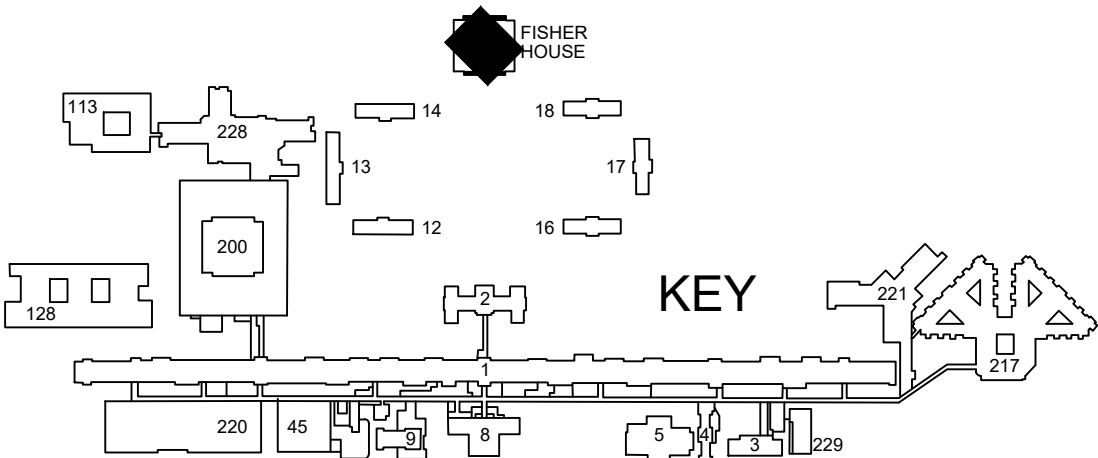
DEPARTMENT OF VETERANS AFFAIRS

Edward Hines Jr. Veteran's Hsopital

5000 S 5th Ave, Hines, IL

DRAWING LIST

SHEET #	LABEL	DESCRIPTION
1	TITLE PAGE	Title Page with Abbreviations and Table of Contents
2	SYMBOLS	Detail drawings for typical applications for components, wire, and conduit
3	SCHEDULES	Material lists and schedules
4	AHU-1 FFN	First Floor North Air Handler AHU-1
5	AHU-1 CONT	Controller wiring Details AHU-1
6	AHU-1 PANEL	Panel Layout AHU-1
7	AHU-2 FFS	First Floor South Air Handler AHU-2
8	AHU-2 CONT	Controller wiring Details AHU-2
9	AHU-2 PANEL	Panel Layout AHU-2
10	AHU-3 SF	Second Floor Air Handler AHU-3
11	AHU-3 CONT	Controller wiring Details AHU-3
12	AHU-3 PANEL	Panel Layout AHU-3
13	AHU-4 FFCOM	First Floor Commons Air Handler AHU-4
14	AHU-4 PANEL	Panel Layout AHU-4
15	BOILER FF	First Floor Boiler
16	BOILER CONT	First Floor Boiler Controller Wiring Details
17	BOILER PANEL	First Floor Boiler Panel
18	VAV	Variable Air Volume Terminal Unit
19	SEQ	Sequence of Operation
20	OSADMP	Outside Air Damper box construction



NO.	Revision	ECN	Date	By

TITLE PAGE

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TL SERVICES, INC
ENGINEERING GROUP



FISHER HOUSE - CONTROLS
REPLACEMENT

Location
EDWARD HINES JR VETERAN'S HOSPITAL
5000 5TH AVE, HINES, IL

Date
6/20/2017

Drawn By
JNS

Contract Number

Office Information:
TL Services, Inc.
4733 Kibler Rd.
Van Buren, AR 72956
PH: 479-474-7222
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Project Number

Building Number
FISHER HOUSE

Drawing Number

TITLE PAGE

Dwg. 1 of 20

EDWARD
HINES JR
VETERAN'S
HOSPITAL



Department of
Veterans Affairs

COMMON SYMBOL LEDGEND

PNL#-DI-1

CABLE ID

I/O NUMBER

THE I/O NUMBER IN SEQUENCE OF THE I/O COUNT OF THAT TYPE OF I/O

I/O TYPE

DI - DIGITAL INPUT

DO - DIGITAL OUTPUT

AI - ANALOG INPUT

AO - ANALOG OUTPUT

BLDG. PRESSURE

DPT

DIFFERENTIAL PRESSURE TRANSDUCER

FAN

EXHAUST FAN

PUMP

DTS

TEMPERATURE PROBE

DHS

HUMIDITY PROBE

ITS

IMMERSION WELL TEMPERATURE PROBE

AIR FLOW STATION

DUCT SMOKE DETECTOR

AVERAGING TEMPERATURE SENSOR

ATS

FREEZE STAT

LOW LIMIT

DAMPER ACTUATOR

DPS

DIFFERENTIAL PRESSURE SWITCH

PNEUMATIC GAUGE

OUTSIDE AIR TEMPERATURE

OSA

OTS

MOUNTED ON NORTH WALL OF NORTH SIDE OF BUILDING.

TRANSFORMER

DAMPER END SWITCH

FILTER

WATER (HOT/COLD) DX ; STEAM

#

C

TEMPERATURE INTERFACE COIL

BUTTERFLY VALVE 3-WAY

COM

N/C

N/O

FAIL TO COIL PIPING CONFIGURATION MIXING VALVES TYPICAL FOR HEATING

H

C

VALVE BODIES 2-WAY

BUTTERFLY VALVE

COM

N/C

N/O

FAIL TO BYPASS PIPING CONFIGURATION MIXING VALVES TYPICAL FOR COOLING

C

C

3-WAY

DAMPER END SWITCH

VARIABLE FREQUENCY DRIVE CONTROL PANEL

TERMINAL BLOCK COMPONENT SYMBOLS

SPECIALTY SENSOR (ie. PRESSURE)

TEMPERATURE SENSOR

VOLTAGE INPUT/OUTPUT ANALOG VALUE

SPECIALTY SENSOR (ie. HUMIDITY)

CONTACT (SWITCH) INPUT/OUTPUT DIGITAL VALUE

OPEN I/O BUBBLE TO BE DEFINED

LOGIC SYMBOLS

OUTPUT MODULE

COMPARATOR MODULE

SWITCH MODULE

LOGIC 'AND' MODULE

LOGIC 'OR' MODULE

LOGIC 'EXCLUSIVE OR' MODULE

LOGIC 'NOT' INVERTER MODULE

LOGIC 'AND' MULTI-INPUT MODULE

EXCLUSIVE 2 STAGE SEQUENCE MODULE

COMMAND MODULE WITH COMPARATOR AND OVERRIDE

RELAY TYPES

12 VDC 10 AMP CONTACT

12 VDC 1 AMP TRIAC

10 AMP CONTACT DOUBLE POLE / DOUBLE THROW

10 AMP CONTACT SINGLE POLE / DOUBLE THROW

DUCT/PIPE CONTINUATION

DUCT AND AIR HANDLER CASING

DAMPER

PARALLEL BLADE

OPPOSED BLADE

LADDER LOGIC SYMBOLS

RELAY COIL

NORMALLY OPEN CONTACT

NORMALLY CLOSED CONTACT

CONTACTOR COIL

PANEL LAMP

MOTOR

MOTOR STARTER

THERMOSTAT CLOSE ON FALL

THERMOSTAT CLOSE ON RISE

THERMOSTAT OPEN ON RISE

THERMOSTAT OPEN ON FALL

SWITCH NORMALLY OPEN

SWITCH NORMALLY CLOSED

PUSHBUTTON NORMALLY CLOSED

PUSHBUTTON NORMALLY OPEN

PRESSURE SWITCH CLOSE ON RISE

PRESSURE SWITCH OPEN ON RISE

TWIST TIMER NORMALLY OPEN

POWER FUSE 120 V 2 TO 5 AMP

WIRE TABLE

CABLE TYPE	PART NUMBER	NUMB OF COND.	DESCRIPTION					NOTES:
			GAUGE	JACKET COLOR	PLENUM	SHIELD		
A-1	4360PL	2	18	WHITE	YES	YES	SENSOR	
A-2	4570PL	4	18	WHITE	YES	YES		
A-3	4580PL	6	18	WHITE	YES	YES		
B-1	4050PL	2	16	WHITE	YES		24 VAC POWER	
C-1	8120-3	3-PAIR	24	WHITE	YES		SPACE SENSOR	
D-1	2W285 *	1	12	BLACK	NO	NO		
D-2	4W014 *	1	12	BLUE	NO	NO		
D-3	5C985 *	1	12	BROWN	NO	NO		
D-4	5C987 *	1	12	GREY	NO	NO	THHN SINGLE STRANDED WIRE	
D-5	2W406 *	1	12	GREEN	NO	NO	THHN SINGLE STRANDED WIRE	
D-6	5C986 *	1	12	ORANGE	NO	NO	THHN SINGLE STRANDED WIRE	
D-7	4WZE9 *	1	12	PINK	NO	NO	THHN SINGLE STRANDED WIRE	
D-8	4WZF1 *	1	12	PURPLE	NO	NO	THHN SINGLE STRANDED WIRE	
D-9	22286 *	1	12	RED	NO	NO	THHN SINGLE STRANDED WIRE	
D-10	4WZF2 *	1	12	TAN	NO	NO	THHN SINGLE STRANDED WIRE	
D-11	2W284 *	1	12	WHITE	NO	NO	THHN SINGLE STRANDED WIRE	
D-12	4W013 *	1	12	YELLOW	NO	NO	THHN SINGLE STRANDED WIRE	
E-1	8130PL-5E	8	24	BLUE	YES	NO	CAT 5e DATA CABLE	
E-2	8130PL-6	8	24	BLUE	YES	NO	CAT 6 DATA CABLE	
F-1	H-F-1.5TSP24LC-CMP	3	24	WHITE	YES	YES	1 TWISTED PAIR, 1 GROUND, SHIELD BRAID DRAIN	

* GRAINGER PART NUMBERS AS COMMON REFERENCE. OTHER EQUAL VENDERS MAY BE USED.

NOTE: NOT ALL SYMBOLS USED. LEDGEND IS FOR REFERENCE.

MIXING DIFFERENT SIZE CABLES. CABLE COMPARISON:

TWO 2 CONDUCTOR CABLES FOR EVERY ONE 4 CONDUCTOR CABLE

TWO 4 CONDUCTOR CABLES FOR EVERY ONE 6 CONDUCTOR CABLE

IN 3/4" EMT CONDUIT, RUN A MAXIMUM OF "8" 2-CONDUCTOR CABLES FOR ANY STRAIGHT LINE BETWEEN PULL BOXES. FOR EVERY 180° OF BENDS SUBTRACT 1 CABLE. A MAXIMUM OF 270° OF BENDS PER ANY LENGTH OF CONDUIT BETWEEN PULL BOXES.

IN 3/4" EMT CONDUIT, RUN A MAXIMUM OF "6" 4-CONDUCTOR CABLES FOR ANY STRAIGHT LINE BETWEEN PULL BOXES. FOR EVERY 180° OF BENDS SUBTRACT 1 CABLE. A MAXIMUM OF 270° OF BENDS PER ANY LENGTH OF CONDUIT BETWEEN PULL BOXES.

IN 3/4" EMT CONDUIT, RUN A MAXIMUM OF "5" 6-CONDUCTOR CABLES FOR ANY STRAIGHT LINE BETWEEN PULL BOXES. FOR EVERY 180° OF BENDS SUBTRACT 1 CABLE. A MAXIMUM OF 270° OF BENDS PER ANY LENGTH OF CONDUIT BETWEEN PULL BOXES.

IN 1" EMT CONDUIT, RUN A MAXIMUM OF "12" 2-CONDUCTOR CABLES FOR ANY STRAIGHT LINE BETWEEN PULL BOXES. FOR EVERY 180° OF BENDS SUBTRACT 1 CABLE. A MAXIMUM OF 270° OF BENDS PER ANY LENGTH OF CONDUIT BETWEEN PULL BOXES.

NOTES:

1: APPROXIMATELY 40% OF THE CONDUIT SHOULD BE LEFT FOR FUTURE USE.

2: (2) OFFSETS = (1) 90° BEND

3: (1) SADDLE = (2) 90° BEND

4: NO MORE THAN 4 COUPLING BETWEEN PULL BOXES - ABOUT 100' (OR 5 STICKS OF CONDUIT)

5: NO MORE THAN 1 SADDLE BETWEEN PULL BOXES.

6: NO MORE THAN 270° OF BENDS BETWEEN PULL BOXES.

(i.e. 2 - 90° and 2 - Offsets; 3 - 90°; and 1 - 90 and 3 - Offsets)

FISHER HOUSE

113

228

14

18

13

17

12

16

200

128

220

45

9

8

5

4

3

229

221

217

KEY

NO.Revision

ECN

Date

By

SYMBOLS

TYPICAL DRAWING SYMBOLS

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TL SERVICES, INC

ENGINEERING GROUP

TL SERVICES, INCORPORATED

A SERVICE DISABLED VETERAN OWNED SMALL BUSINESS

SDVOSB

FISHER HOUSE - CONTROLS REPLACEMENT

Location

5000 5TH AVE, HINES, IL

Date

6/20/2017

Drawn By

JNS

Contract Number

Office Information:

TL Services, Inc.

4733 Kibler Rd.

Van Buren, AR 72956

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Project Number

Building Number

FISHER HOUSE

Drawing Number

Dwg. 2 of 20

EDWARD HINES JR VETERAN'S HOSPITAL

Department of Veterans Affairs

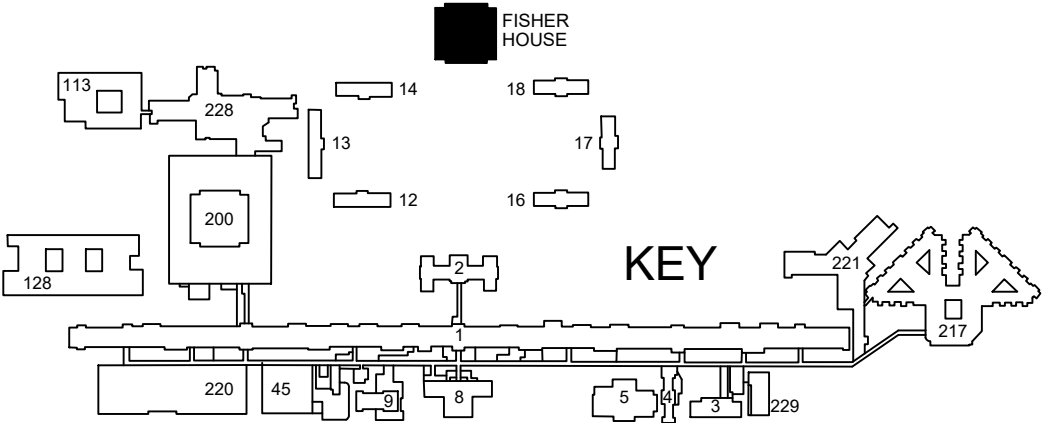
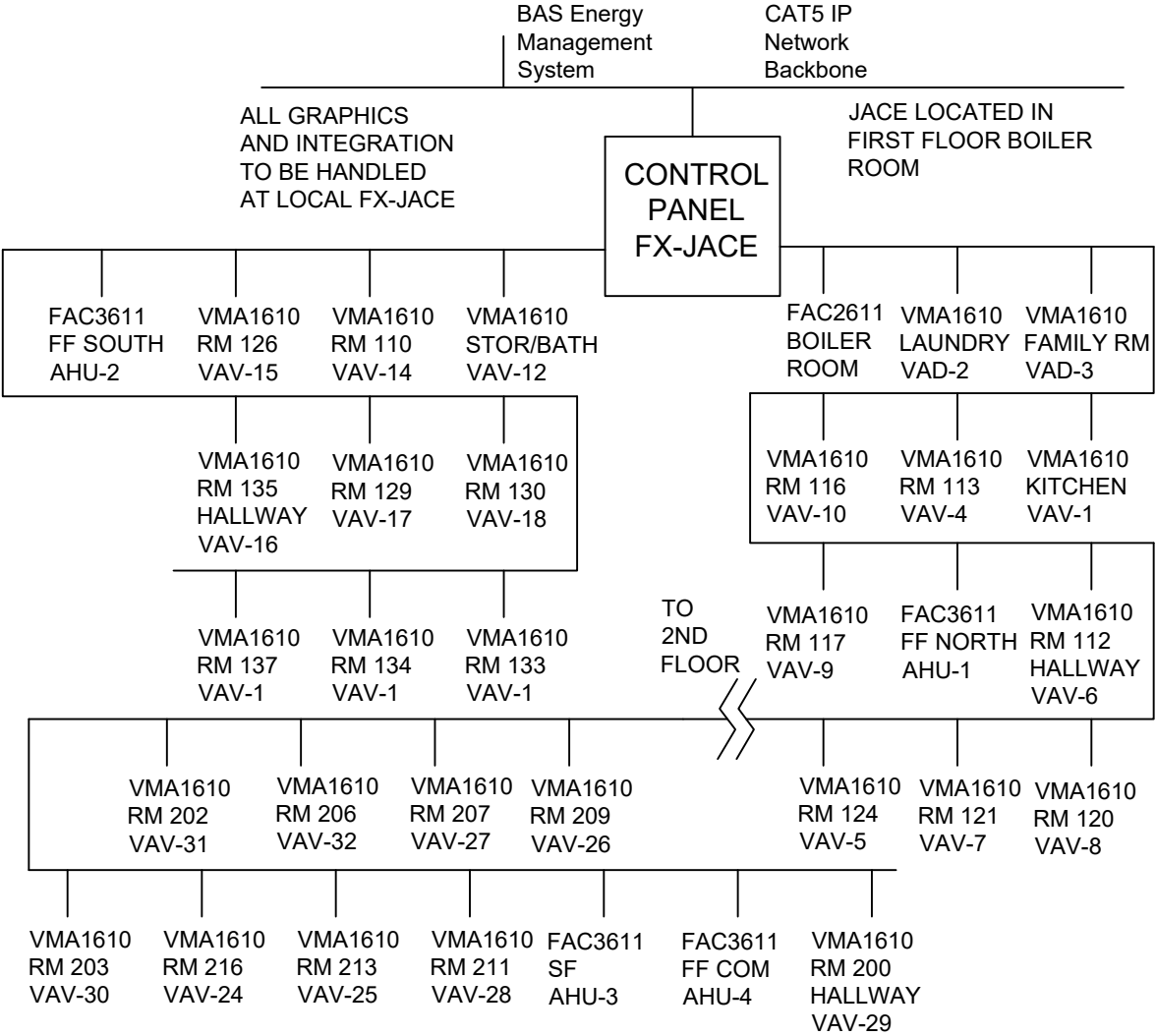
DEVICE ID	QTY	SUPPLIER (VENDOR)	PART (DEVICE) MFG NUMBER	DESCRIPTION
JACE	1	JCI	MS-FX80	N4 Facility Explorer Jace
AHU-1,2,3,4	4	JCI	MS-FAC3611	FX-PCA 3611; Application Field Equipment Controller ; 8AI6DI6DO6AO
BOILER	1	JCI	MS-FAC2612-1	FAC2611; Application Field Equipment Controller; 5AI4BI5BO4AO
VAV	29	JCI	MS-VMA1610-0U	VAV Box Controller
STS (ROOMS)	26	JCI	NS-MTB7001-0	Room Sensor Temperature only.
STS (HALLWAYS)	3	JCI	NS-AHR7101-0	Room Sensor Temperature and Humidity
STS (LR & DR)	2	JCI	NS-MTB7004-2	Room Sensor Temperature only, addressable for multi-sensor
DTS-#	12	JCI	TE-6311P-1	Duct Temperature Sensor, 1K Ohm Nickel
ITS-#	8	JCI	TE-6300-603	Strap-on Pipe Temperature Sensor, 1K Ohm Nickel
	1	JCI	TCC-111	Thermal Compound for pipe mounting contact
	8	JCI	APB-28	Strap-on Pipe Sensor mounting bracket
DPS-#	8	Cleveland	AFS-222	Differential Pressure Switch (Filter & Fan Status)
DPT-#	3	MAMAC	PR274-R2-VDC	Differential Pressure Sensor; Low Pressure OSA Pitot array, 0-0.25"WC
DPT-#	3	MAMAC	PR274-R3-VDC	Differential Pressure Sensor; Med Pressure Supply Duct 0-5"WC
PANEL	1	KELE	RET2018ULPGY	18"WX20"H Control Panel Enclosure with perf panel back plane
OAD	3	BELIMO	LMCB24-SR	45 IN-LB Non-Spring Return, 2-10VDC Proportional Damper Actuator

Suppliers and Vendors shown here are recommendation. Equivalent devices are acceptable.

DAMPER ID	DAMPER TYPE	UNIT ASSOC.	DAMPER SIZE	BLADE ORENTATION	ACTUATOR TYPE	ACTUATOR SPRING / TORQUE	FAIL POSITION	ACTUATOR PART NO.	LOCATION
D-1	OPPOSED	AHU-1	12" X 12"	HORZ	ELECT	45 IN-LB	CLOSE	LMCB24-SR	OUTSIDE AIR
D-1	OPPOSED	AHU-2	12" X 12"	HORZ	ELECT	45 IN-LB	CLOSE	LMCB24-SR	OUTSIDE AIR
D-1	OPPOSED	AHU-3	12" X 12"	HORZ	ELECT	45 IN-LB	CLOSE	LMCB24-SR	OUTSIDE AIR

DATA IS NOT READILY AVAILABLE. ADJUSTMENTS SHALL BE DONE AT PROGRAMMING TIME. IF ORIGINAL DOCUMENTATION CAN BE FOUND, THIS DATA TABLE SHALL BE UPDATED WITH THE NEW INFORMATION.

NETWORK ON-LINE DIAGRAM



NO.	Revision	ECN	Date	By

SCHEDULES
BILL OF MATERIAL

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TL SERVICES, INC
ENGINEERING GROUP



FISHER HOUSE - CONTROLS
REPLACEMENT

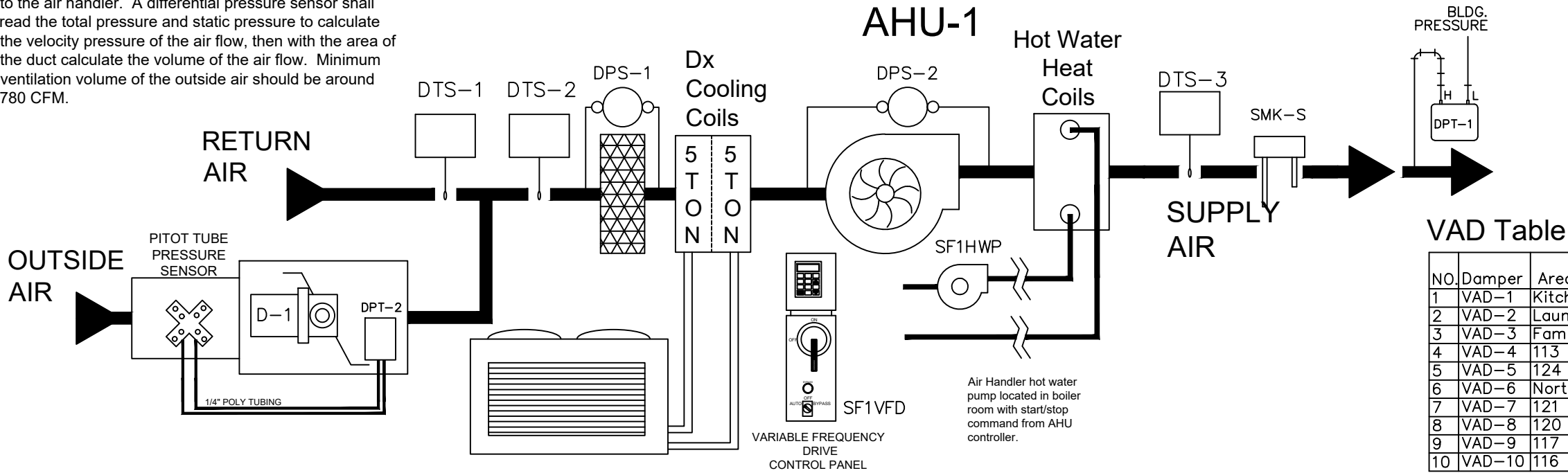
Location 5000 5TH AVE, HINES, IL			Office Information: TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 FAX: 479-474-8839
Date 6/20/2017	Drawn By JNS	Contract Number	

Project Number
Building Number FISHER HOUSE
Drawing Number Dwg. 3 of 17

EDWARD
HINES JR
VETERAN'S
HOSPITAL



A damper should be installed in the outside air feed duct to the air handler. A differential pressure sensor shall read the total pressure and static pressure to calculate the velocity pressure of the air flow, then with the area of the duct calculate the volume of the air flow. Minimum ventilation volume of the outside air should be around 780 CFM.



FIRST FLOOR NORTH

VAD Table

NO.	Damper	Area Description	Auxillary	FLOOR	AHU #
1	VAD-1	Kitchen		1st North	AHU-1
2	VAD-2	Laundry		1st North	AHU-1
3	VAD-3	Family Room		1st North	AHU-1
4	VAD-4	113		1st North	AHU-1
5	VAD-5	124		1st North	AHU-1
6	VAD-6	North Hall	Humidity Sensor	1st North	AHU-1
7	VAD-7	121		1st North	AHU-1
8	VAD-8	120		1st North	AHU-1
9	VAD-9	117		1st North	AHU-1
10	VAD-10	116		1st North	AHU-1

Input/Output Table

NO.	Description	I/O	Type	Label	Descriptor	Exist/New
1	Discharge Static Pressure	In	Analog	DPT-1	SF1DPT	NEW
2	Duct Differential Flow Pressure	In	Analog	DPT-2	SF1OAF	NEW
3	Return Air Temperature	In	Analog	DTS-1	SF1RAT	NEW
4	Mixed Air Temperature	In	Analog	DTS-2	SF1MAT	NEW
5	Discharge Air Temperature	In	Analog	DTS-2	SF1DAT	EXISTING
6	Outside Air Temperature	In	Analog	OTS-1	SF1OAT	EXISTING
7	Smoke Detector Status	In	Digital	SMK-2	SF1SMK	EXISTING
8	Supply Fan Status	In	Digital	DPS-2	SF1STAT	NEW
9	Filter Status	In	Digital	DPS-1	SF1F1	NEW
10	VFD Status	In	Digital	SF1VFD	SF1VFDS	NEW
11	VFD Fault Status	In	Digital	SF1VFD	SF1VFDF	NEW
12	Supply Fan Start/Stop Command	Out	Digital	SF1VFD	SF1SS	Exist/New
13	Cooling Condenser Stage 1	Out	Digital	CR-1	SF1CLG1	EXISTING
14	Cooling Condenser Stage 2	Out	Digital	CR-2	SF1CLG2	EXISTING
15	Heating Water Pump	Out	Digital	CR-3	SF1HTG1	EXISTING
16	Supply Fan Speed Control	Out	Analog	SF1VFD	SF1SPEED	NEW
17	OS Air Damper	Out	Analog	D-1	SF1OAD	NEW

Set Point Table

NO.	Description	Type	Descriptor	Value	Units
1	Seasonal Set Point	Analog	SF1SEACP	55	°F
2	Summer Set Point	Analog	SF1SUMCP	55	°F
3	Winter Set Point	Analog	SF1WINCP	80	°F
4	Heat/Cool Changeover Setpoint (SeasonMode)	Analog	CHANGEOVER	65	°F
5	Outside Air Damper Flow Set Point	Analog	SF1MOADCP	780	CFM
6	Discharge Static Pressure Set Point	Analog	SF1DPSCP	1.2	"wc
7	Minimum Air Flow for 1stg Cooling	Analog	SF1AF1CP	1800	CFM
8	Minimum Air Flow for 2stg Cooling	Analog	SF1AF1CP	3400	CFM
9	De-Humidify Set Point	Analog	SF1HUMCP	70	%RH
10	Scheduled Start Time	Time	SF1SCHED-STR	0.0	HOURS
11	Scheduled Stop Time	Time	SF1SCHED-STP	23.59	HOURS

Note 1

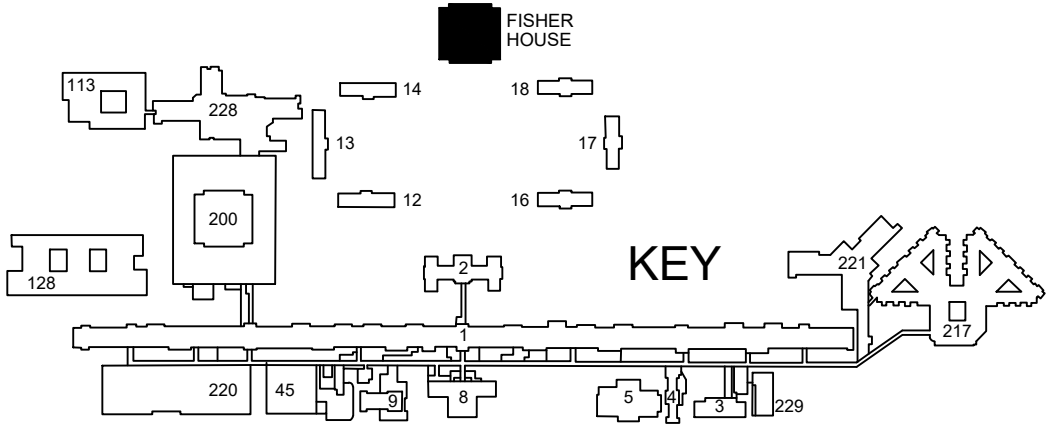
This drawing is a redesign of the existing system. Some items are existing. Others will be new additions to create a robust sensed air system.

Note 2

As this system is not a true VAV system, but an approximation, some conditions shall be noted. First of all, for a Direct Expansion (Dx) condenser unit to function properly there is a required minimum air flow. The system will need to monitor the Variable Air Dampers for position and flow values to verify the correct amount of air flow in the air handler is proper for Dx operation. If the air flow drops below the minimum flow for the Dx coils, the Dx cooling shall be disabled. Second, it will be necessary to average the temperatures across the space. By monitoring the space sensor for each space, the average temperature can be calculated for the area. Also, damper position and/or air flow will be monitored as to the space that requires the most need for cooling or heating. The average temperature and space demand will compete with the minimum stage air flow requirements. But these conditions are required for the proper operation of the system.

Note 3

To affect some humidity control, a temperature/humidity sensor shall be placed in the hallway. When the humidity level is too high, the unit shall run the first stage cooling for a longer period of time for dehumidification purposes.



NO.	Revision	ECN	Date	By

AHU 1 FIRST FLOOR NORTH

Air Handler Layout Diagram

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TL SERVICES, INC
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FISHER HOUSE - CONTROLS REPLACEMENT

Location
5000 5TH AVE, HINES, IL

Date
6/20/2017

Drawn By
JNS

Contract Number

Office Information:
TL Services, Inc.
4733 Kibler Rd.
Van Buren, AR 72956
PH: 479-474-7222
FAX: 479-474-8839

Project Number

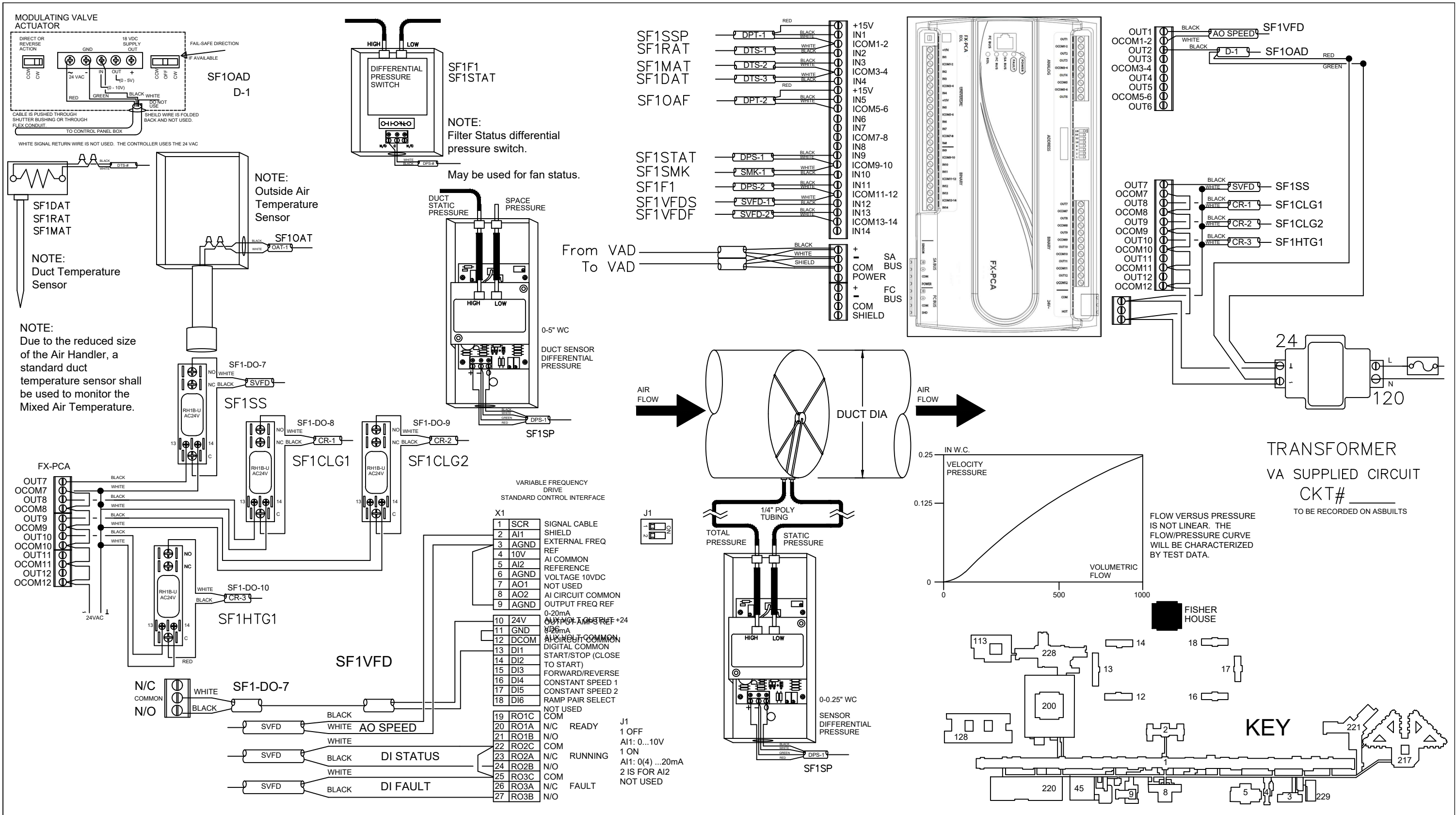
Building Number
FISHER HOUSE

Drawing Number

Dwg. 4 of 20

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NO.	Revision	ECN	Date	By

AHU-1 FIRST FLOOR

Air Handler Controller Wiring Diagram

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FISHER HOUSE - CONTROLS REPLACEMENT

Location: 5000 5TH AVE, HINES, IL

Date: 6/20/2017

Drawn By: JNS

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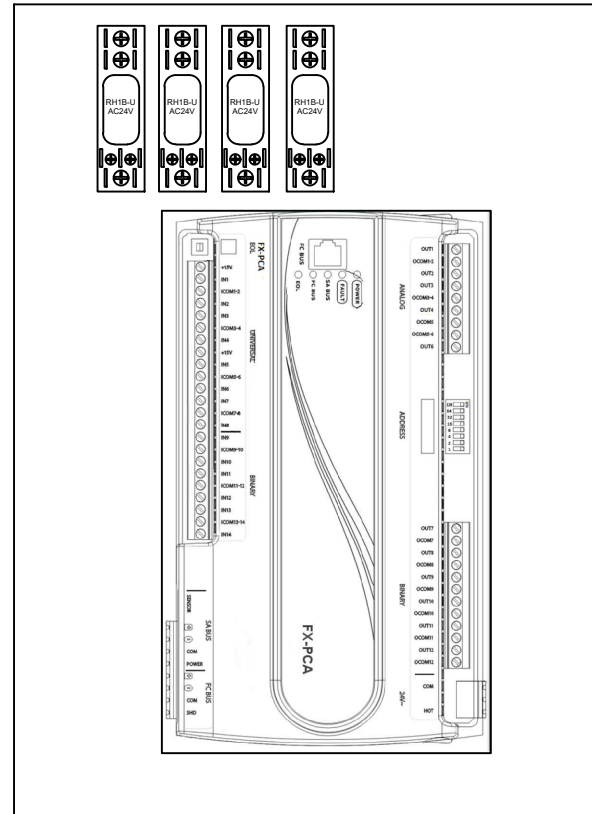
Building Number: FISHER HOUSE

Drawing Number: Dwg. 5 of 20

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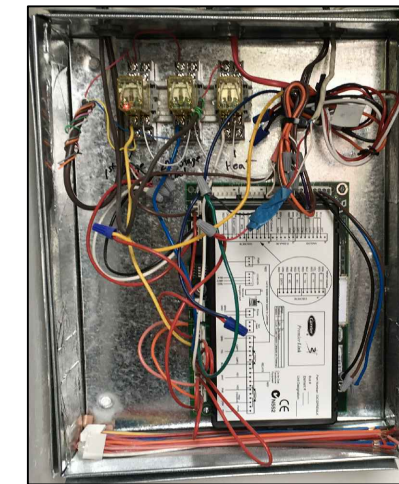
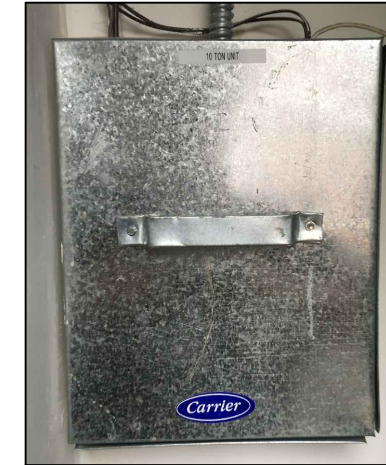
AHU-1 Main Controller



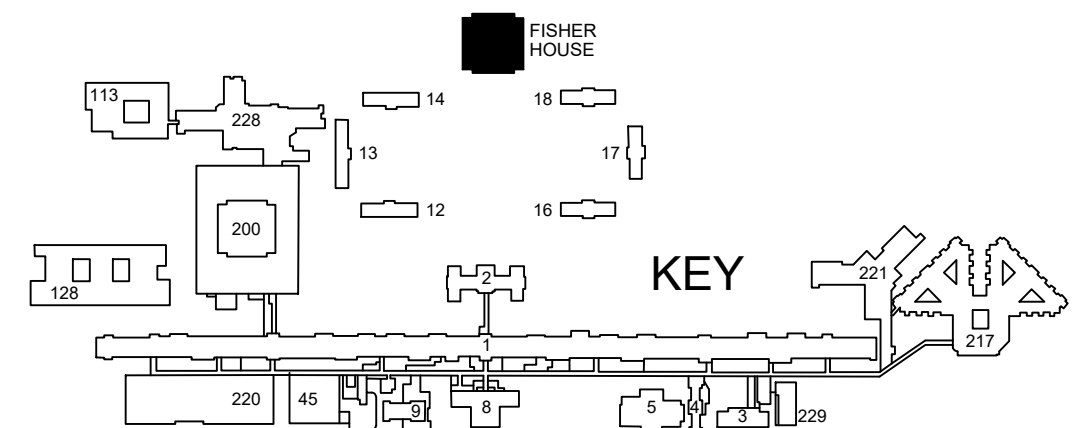
NOTE:

Plan is to reuse panel and wiring from sensors that are existing. The Boiler Room panel will house the new JACE controller. It will need a VA IT Drop brought to the panel.

The other controllers in the building shall be wired with an RS-485 connection between AHU controllers and the VAD controllers.



EXISTING CARRIER SYSTEM

[illegible]

AHU-1 PANEL DIAGRAM

CONTROL PANEL LAYOUT

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TL SERVICES, INC
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FISHER HOUSE - CONTROLS REPLACEMENT

Location	5000 5TH AVE, HINES, IL
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Building Number
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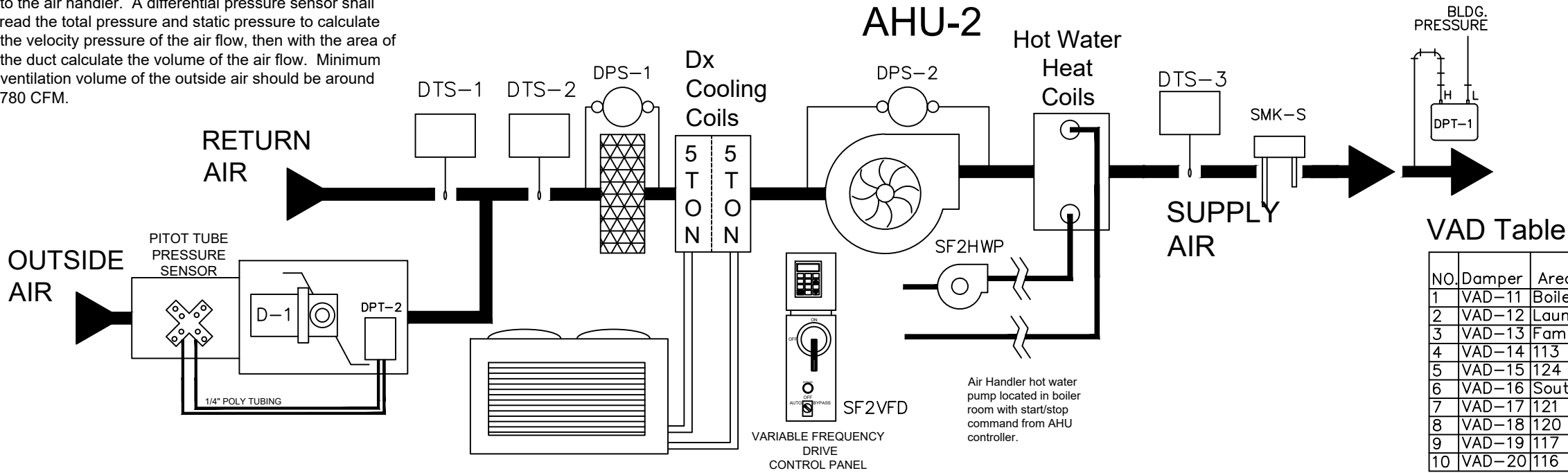
	Drawing Number

956 Dwg. 6 of 20

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VETERAN'S
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Department of
Veterans Affairs

A damper should be installed in the outside air feed duct to the air handler. A differential pressure sensor shall read the total pressure and static pressure to calculate the velocity pressure of the air flow, then with the area of the duct calculate the volume of the air flow. Minimum ventilation volume of the outside air should be around 780 CFM.



FIRST FLOOR SOUTH

VAD Table

NO.	Damper	Area Description	Auxillary	FLOOR	AHU #
1	VAD-11	Boiler/Elevator		1st South	AHU-2
2	VAD-12	Laundry		1st South	AHU-2
3	VAD-13	Family Room		1st South	AHU-2
4	VAD-14	113		1st South	AHU-2
5	VAD-15	124		1st South	AHU-2
6	VAD-16	South Hall	Humidity Sensor	1st South	AHU-2
7	VAD-17	121		1st South	AHU-2
8	VAD-18	120		1st South	AHU-2
9	VAD-19	117		1st South	AHU-2
10	VAD-20	116		1st South	AHU-2

Input/Output Table

NO.	Description	I/O	Type	Label	Descriptor	Exist/New
1	Discharge Static Pressure	In	Analog	DPT-1	SF2DPT	NEW
2	Duct Differential Flow Pressure	In	Analog	DPT-2	SF2OAF	NEW
3	Return Air Temperature	In	Analog	DTS-1	SF2RAT	NEW
4	Mixed Air Temperature	In	Analog	DTS-2	SF2MAT	NEW
5	Discharge Air Temperature	In	Analog	DTS-2	SF2DAT	EXISTING
6	Outside Air Temperature	In	Analog	OTS-1	SF2OAT	EXISTING
7	Smoke Detector Status	In	Digital	SMK-2	SF2SMK	EXISTING
8	Supply Fan Status	In	Digital	DPS-2	SF2STAT	NEW
9	Filter Status	In	Digital	DPS-1	SF2F1	NEW
10	VFD Status	In	Digital	SF2VFD	SF2VFDS	NEW
11	VFD Fault Status	In	Digital	SF2VFD	SF2VFDF	NEW
12	Supply Fan Start/Stop Command	Out	Digital	SF2VFD	SF2SS	Exist/New
13	Cooling Condenser Stage 1	Out	Digital	CR-1	SF2CLG1	EXISTING
14	Cooling Condenser Stage 2	Out	Digital	CR-2	SF2CLG2	EXISTING
15	Heating Water Pump	Out	Digital	CR-3	SF2HTG1	EXISTING
16	Supply Fan Speed Control	Out	Analog	SF2VFD	SF2SPEED	NEW
17	OS Air Damper	Out	Analog	D-1	SF2OAD	NEW

Set Point Table

NO.	Description	Type	Descriptor	Value	Units
1	Seasonal Set Point	Analog	SF2SEACP	55	°F
2	Summer Set Point	Analog	SF2SUMCP	55	°F
3	Winter Set Point	Analog	SF2WINCP	80	°F
4	Heat/Cool Changeover Setpoint (SeasonMode)	Analog	CHANGEOVER	65	°F
5	Outside Air Damper Flow Set Point	Analog	SF2MOADCP	780	CFM
6	Discharge Static Pressure Set Point	Analog	SF2DPSCP	1.2	"wc
7	Minimum Air Flow for 1stg Cooling	Analog	SF2AF1CP	2000	CFM
8	Minimum Air Flow for 2stg Cooling	Analog	SF2AF1CP	4000	CFM
9	De-Humidify Set Point	Analog	SF2HUMCP	70	%RH
10	Scheduled Start Time	Time	SF2SCHED-STR	0.0	HOURS
11	Scheduled Stop Time	Time	SF2SCHED-STP	23.59	HOURS

Note 1

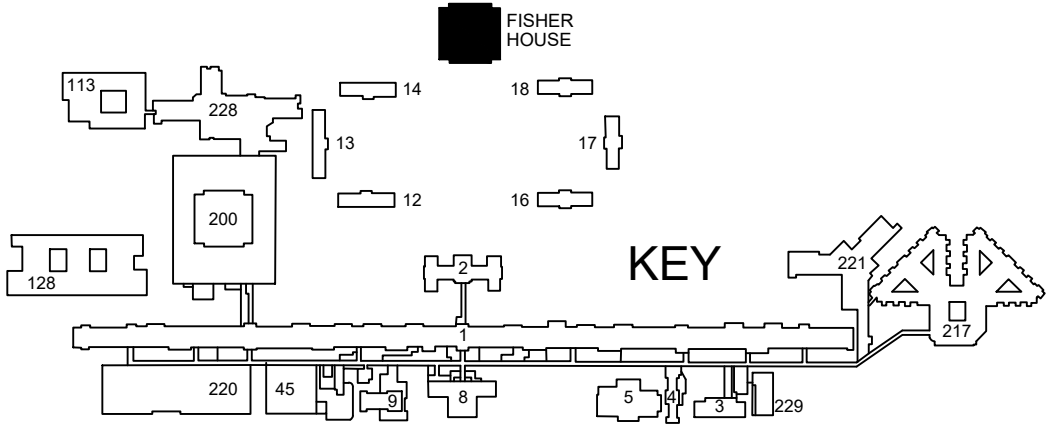
This drawing is a redesign of the existing system. Some items are existing. Others will be new additions to create a robust sensed air system.

Note 2

As this system is not a true VAV system, but an approximation, some conditions shall be noted. First of all, for a Direct Expansion (Dx) condenser unit to function properly there is a required minimum air flow. The system will need to monitor the Variable Air Dampers for position and flow values to verify the correct amount of air flow in the air handler is proper for Dx operation. If the air flow drops below the minimum flow for the Dx coils, the Dx cooling shall be disabled. Second, it will be necessary to average the temperatures across the space. By monitoring the space sensor for each space, the average temperature can be calculated for the area. Also, damper position and/or air flow will be monitored as to the space that requires the most need for cooling or heating. The average temperature and space demand will compete with the minimum stage air flow requirements. But these conditions are required for the proper operation of the system.

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To affect some humidity control, a temperature/humidity sensor shall be placed in the hallway. When the humidity level is too high, the unit shall run the first stage cooling for a longer period of time for dehumidification purposes.



NO.	Revision	ECN	Date	By

AHU 2 FIRST FLOOR SOUTH

Air Handler Layout Diagram

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FISHER HOUSE - CONTROLS REPLACEMENT

Location
5000 5TH AVE, HINES, IL

Date
6/20/2017

Drawn By
JNS

Contract Number

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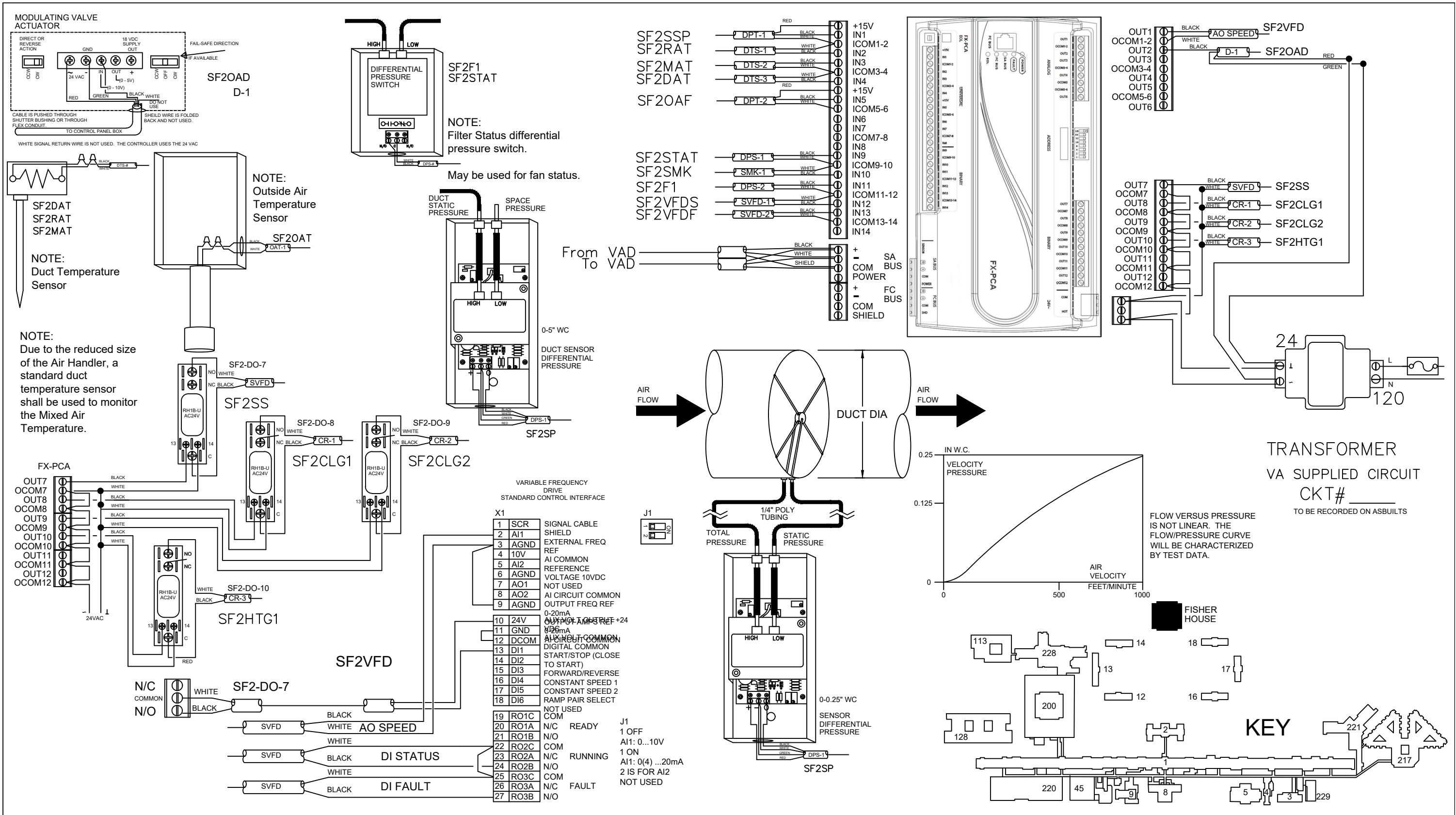
Project Number

Building Number
FISHER HOUSE

Drawing Number
Dwg. 7 of 17

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AHU-2 FIRST FLOOR

Air Handler Controller Wiring Diagram

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FISHER HOUSE - CONTROLS REPLACEMENT

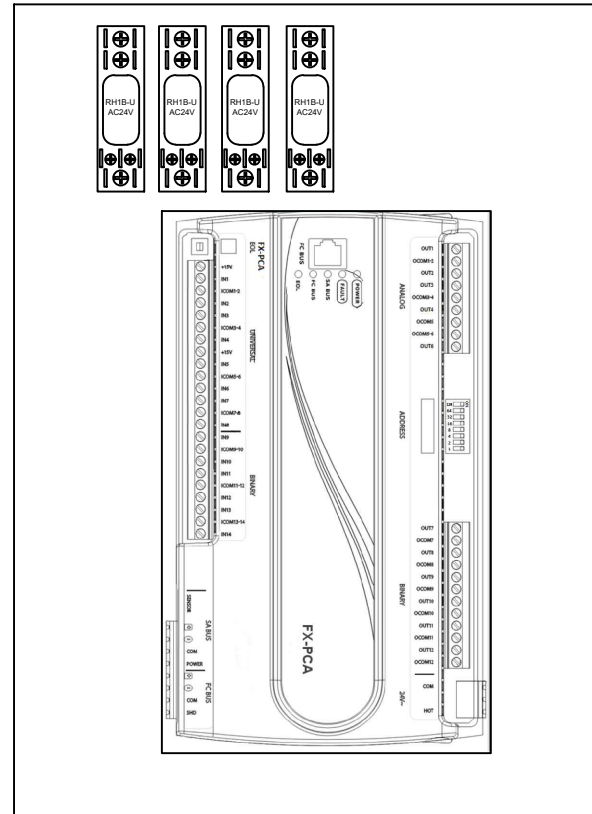
Location 5000 5TH AVE, HINES, IL		Office Information: TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 FAX: 479-474-8839
Date 6/20/2017	Contract Number	

Project Number	Dwg. 8 of 17
Building Number FISHER HOUSE	
Drawing Number	

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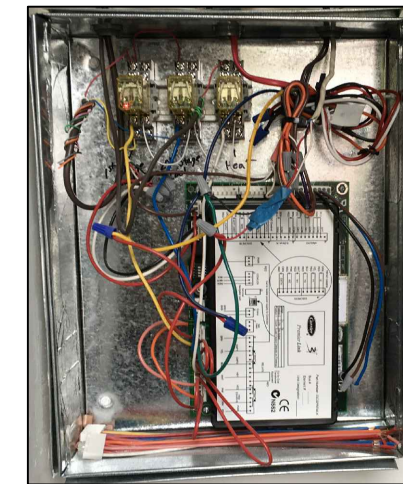
AHU-1 Main Controller



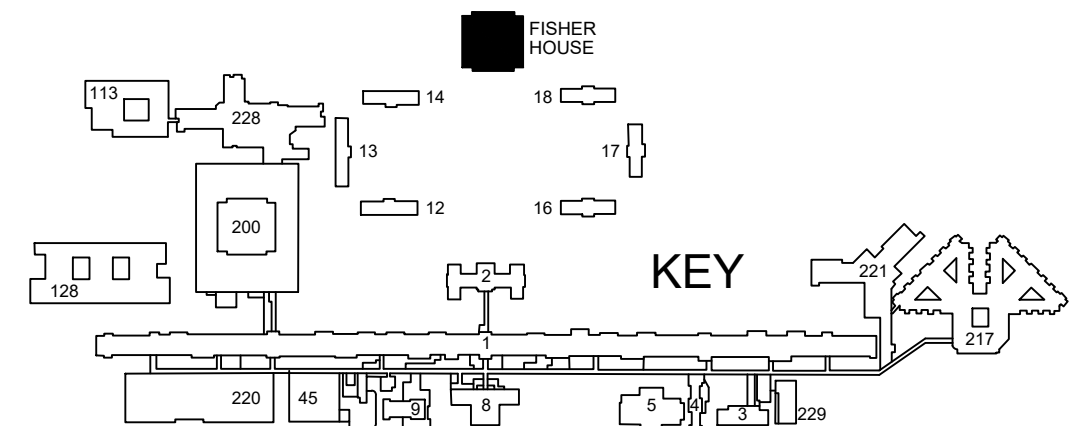
NOTE:

Plan is to reuse panel and wiring from sensors that are existing. The Boiler Room panel will house the new JACE controller. It will need a VA IT Drop brought to the panel.

The other controllers in the building shall be wired with an RS-485 connection between AHU controllers and the VAD controllers.



EXISTING CARRIER SYSTEM

[illegible]

AHU-2 PANEL DIAGRAM

CONTROL PANEL LAYOUT

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FISHER HOUSE - CONTROLS REPLACEMENT

Location	5000 5TH AVE, HINES, IL
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Project Number

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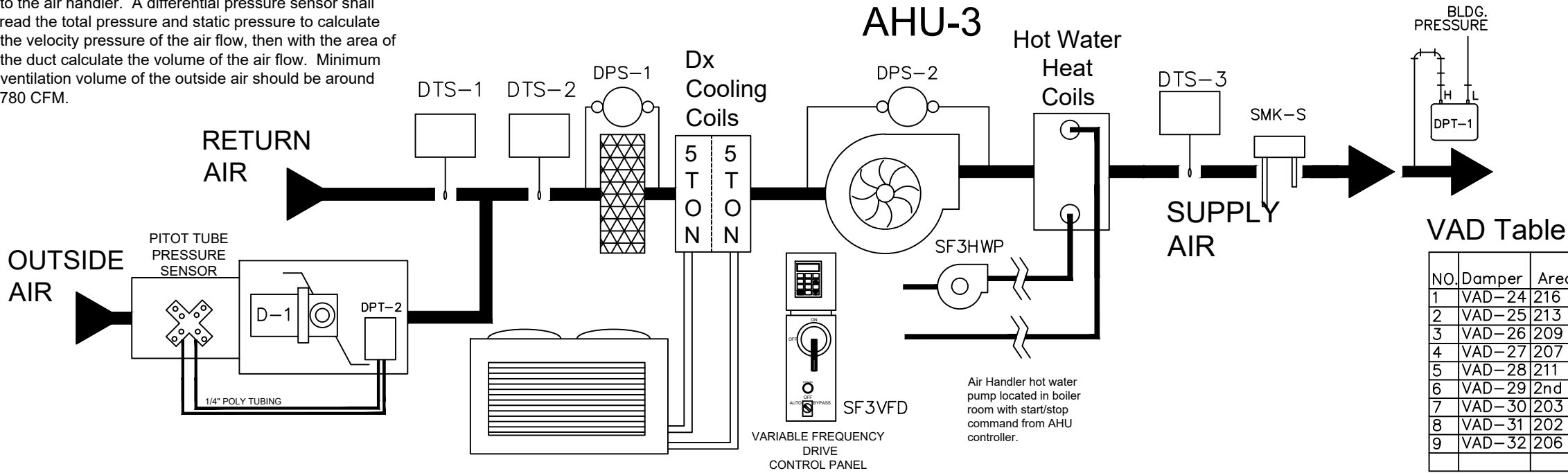
956 Dwg. 9 of 20

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SECOND FLOOR

VAD Table					
NO.	Damper	Area Description	Auxillary	FLOOR	AHU #
1	VAD-24	216		2nd Floor	AHU-3
2	VAD-25	213		2nd Floor	AHU-3
3	VAD-26	209		2nd Floor	AHU-3
4	VAD-27	207		2nd Floor	AHU-3
5	VAD-28	211		2nd Floor	AHU-3
6	VAD-29	2nd Floor Hall	Humidity Sensor	2nd Floor	AHU-3
7	VAD-30	203		2nd Floor	AHU-3
8	VAD-31	202		2nd Floor	AHU-3
9	VAD-32	206		2nd Floor	AHU-3

Input/Output Table

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3	Return Air Temperature	In	Analog	DTS-1	SF3RAT	NEW
4	Mixed Air Temperature	In	Analog	DTS-2	SF3MAT	NEW
5	Discharge Air Temperature	In	Analog	DTS-2	SF3DAT	EXISTING
6	Outside Air Temperature	In	Analog	OTS-1	SF3OAT	EXISTING
7	Smoke Detector Status	In	Digital	SMK-2	SF3SMK	EXISTING
8	Supply Fan Status	In	Digital	DPS-2	SF3STAT	NEW
9	Filter Status	In	Digital	DPS-1	SF3F1	NEW
10	VFD Status	In	Digital	SF3VFD	SF3VFDS	NEW
11	VFD Fault Status	In	Digital	SF3VFD	SF3VFDF	NEW
12	Supply Fan Start/Stop Command	Out	Digital	SF3VFD	SF3SS	Exist/New
13	Cooling Condenser Stage 1	Out	Digital	CR-1	SF3CLG1	EXISTING
14	Cooling Condenser Stage 2	Out	Digital	CR-2	SF3CLG2	EXISTING
15	Heating Water Pump	Out	Digital	CR-3	SF3HTG1	EXISTING
16	Supply Fan Speed Control	Out	Analog	SF3VFD	SF3SPEED	NEW
17	OS Air Damper	Out	Analog	D-1	SF3OAD	NEW

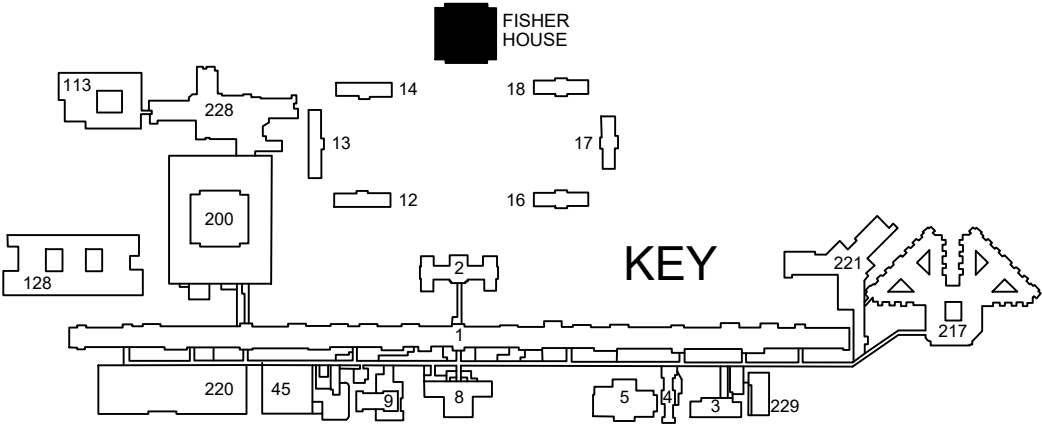
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NO.	Revision	ECN	Date	By

AHU 3 SECOND FLOOR
Air Handler Layout Diagram

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FISHER HOUSE - CONTROLS REPLACEMENT

Location
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Date
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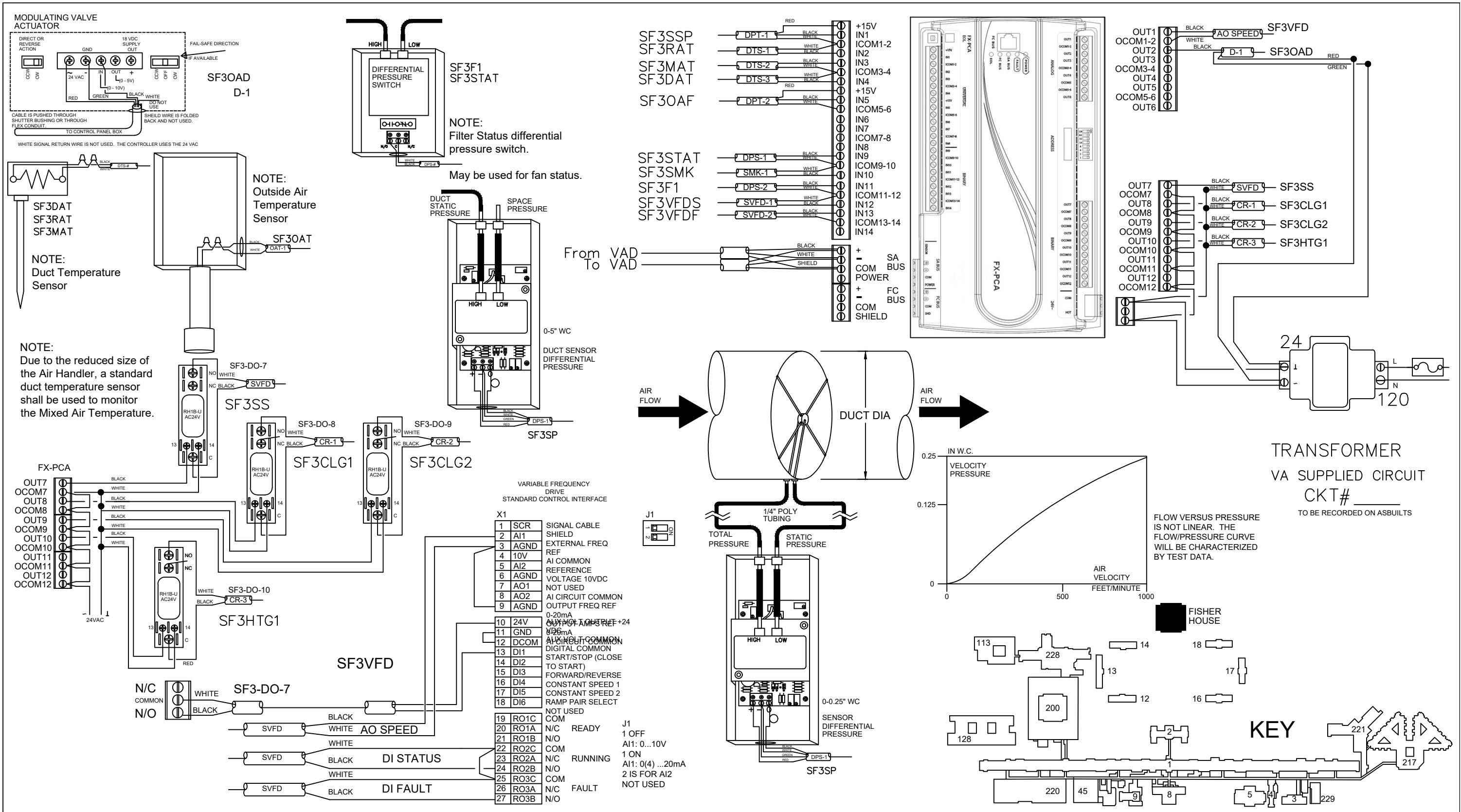
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AHU-3 SECOND FLOOR

Air Handler Controller Wiring Diagram

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FISHER HOUSE - CONTROLS REPLACEMENT

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Dwg. 11 of 17

Project Number

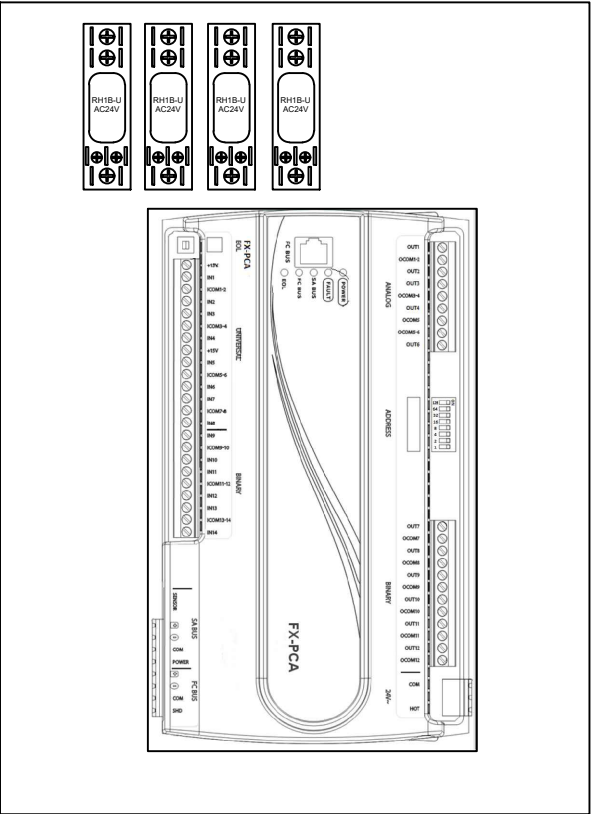
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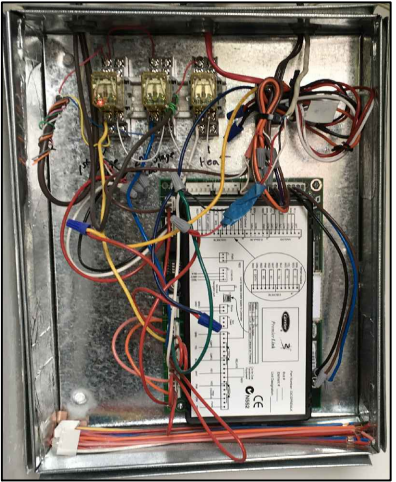
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AHU-1 Main Controller

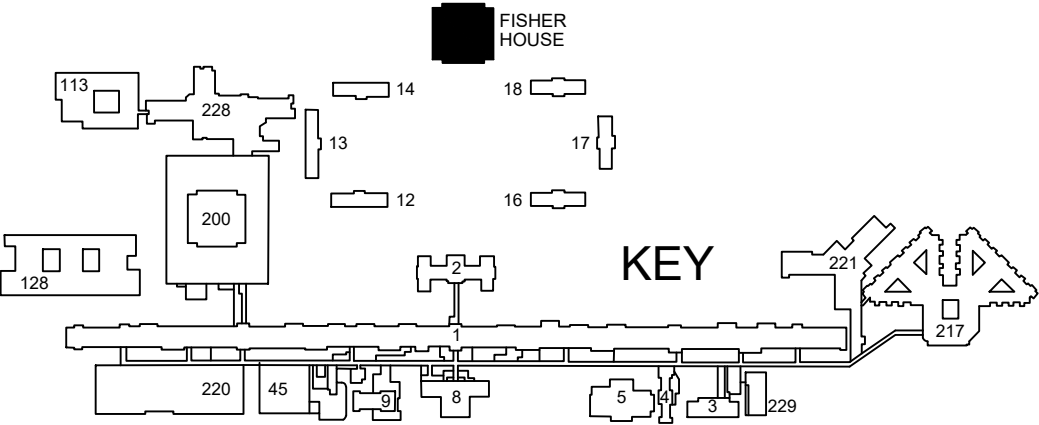


NOTE:
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EXISTING CARRIER SYSTEM



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AHU-3 PANEL DIAGRAM
CONTROL PANEL LAYOUT

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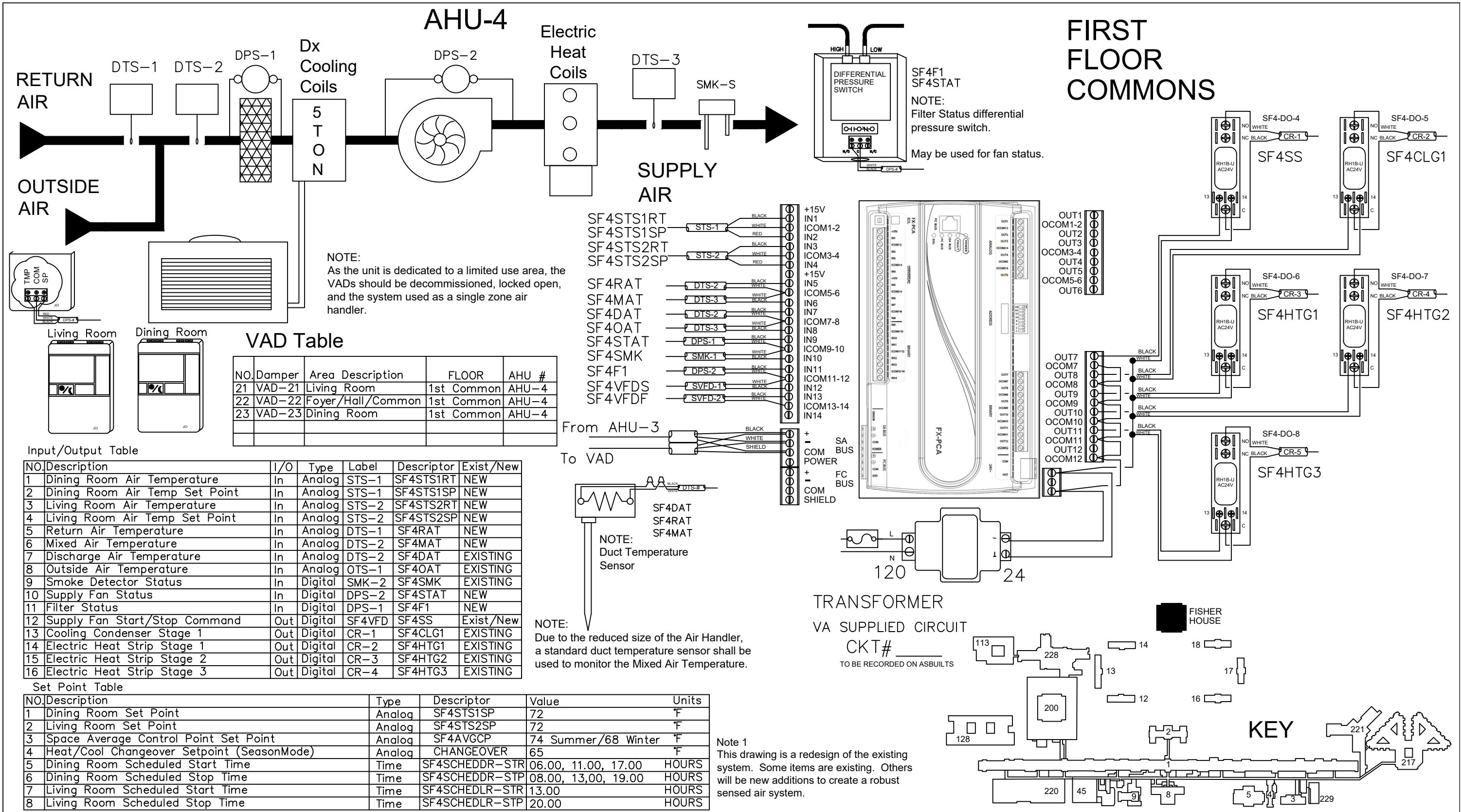
FISHER HOUSE - CONTROLS
REPLACEMENT

Location 5000 5TH AVE, HINES, IL			Office Information: TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 FAX: 479-474-8839
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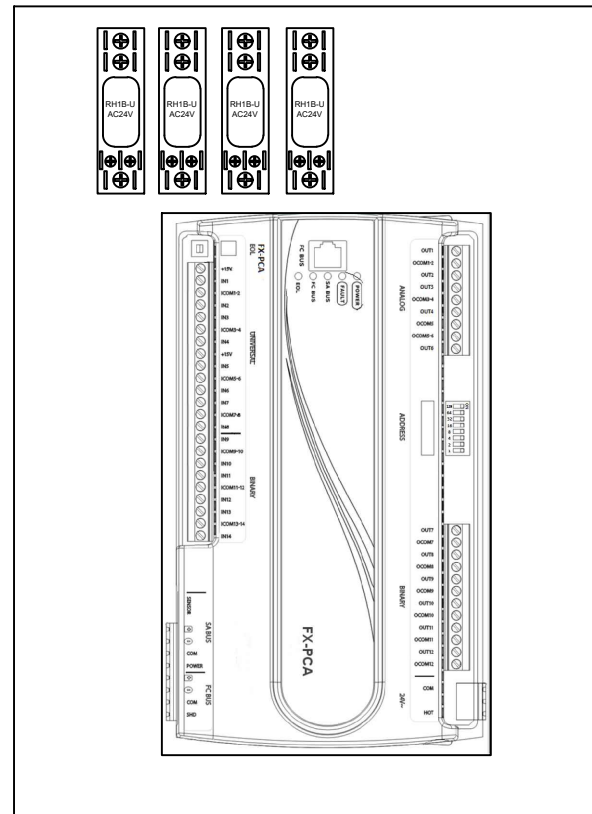
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Building Number FISHER HOUSE
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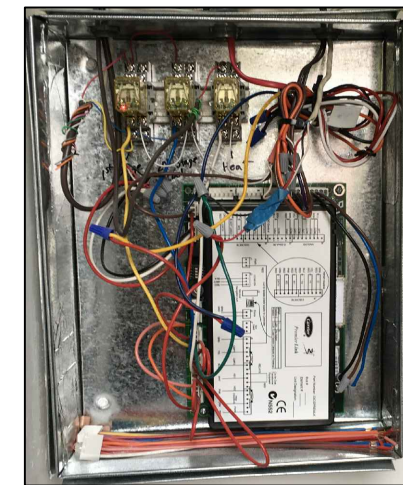
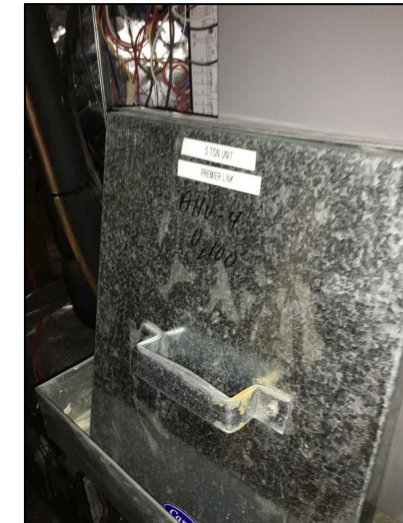
AHU-1 Main Controller



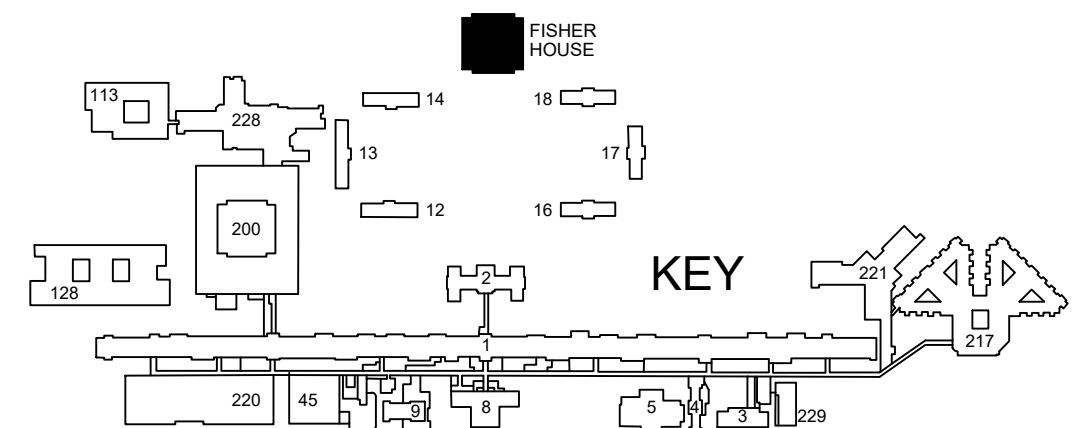
NOTE:

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EXISTING CARRIER SYSTEM

[illegible]

AHU-4 PANEL DIAGRAM

CONTROL PANEL LAYOUT

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FISHER HOUSE - CONTROLS REPLACEMENT

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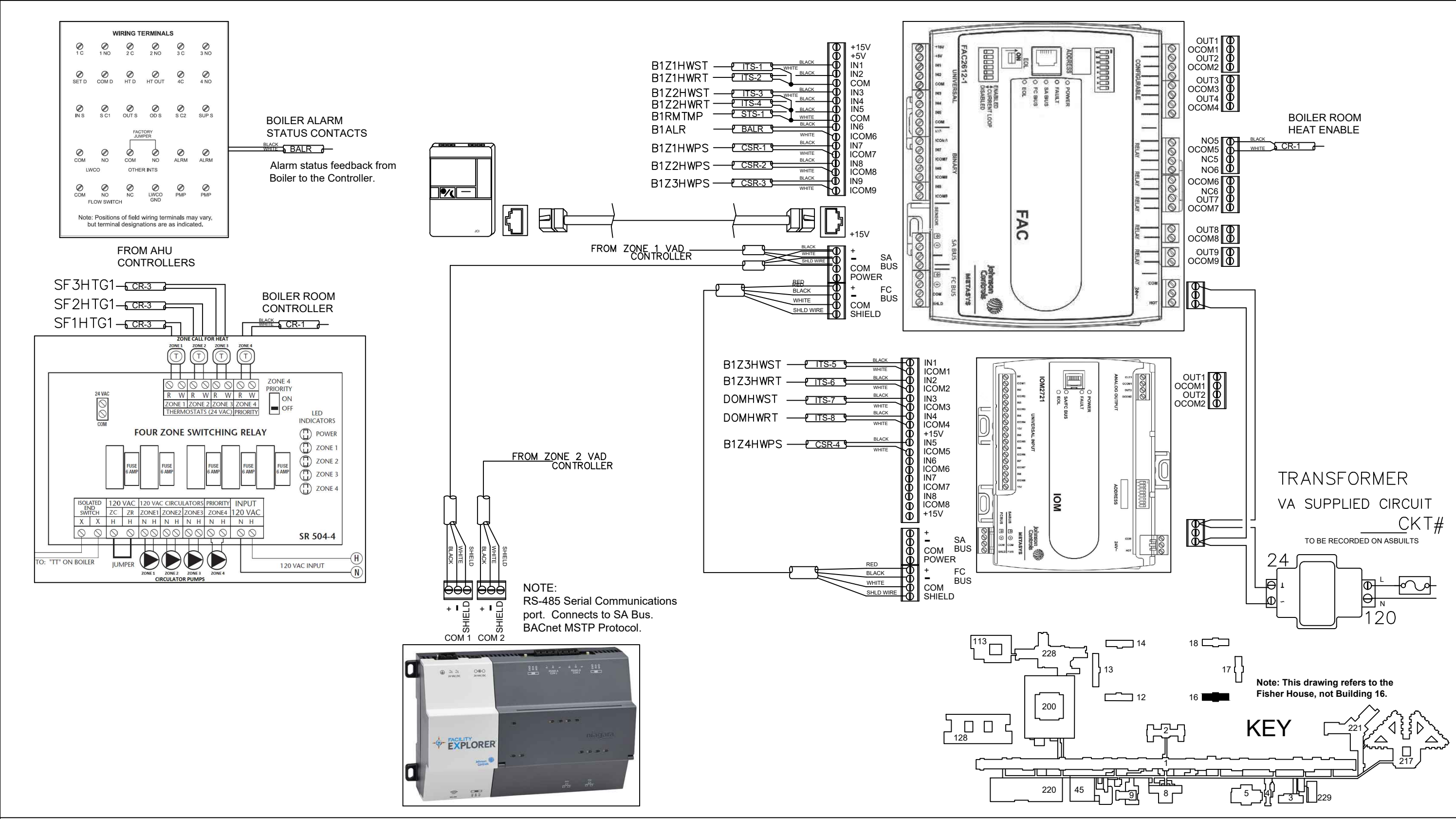
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Department of
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NO.	Revision	ECN	Date	By

BOILER ROOM

Heating Controller Wiring Diagram

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TL SERVICES
INCORPORATED
A SERVICE DISABLED VETERAN OWNED SMALL BUSINESS



TL SERVICES, INC
ENGINEERING GROUP

FISHER HOUSE - CONTROLS REPLACEMENT

Location
5000 5TH AVE, HINES, IL

Office Information:
TL Services, Inc.
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Van Buren, AR 72956
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Date
6/20/2017

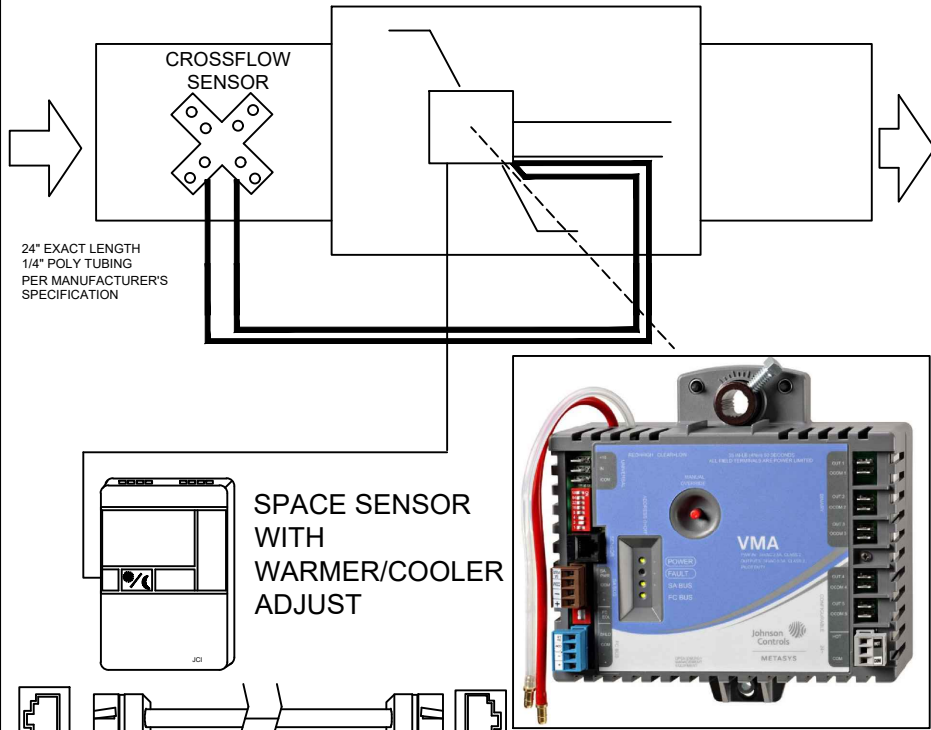
Drawn By
JNS

Contract Number

Project Number
Building Number FISHER HOUSE
Drawing Number Dwg. 16 of 20

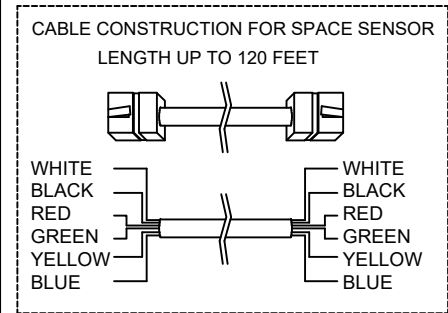
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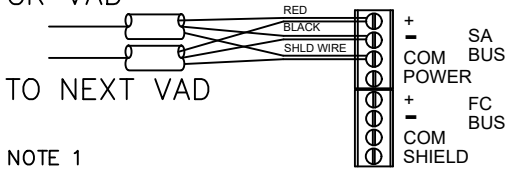


In the 3 hallways, North, South, and 2nd Floor, the space sensor shall also monitor the humidity of the space. This will allow the air handlers in the 3 zones to operate in a de-humidification mode where the first stage of cooling shall operate for a longer period of time to dehumidify the space.

VAD-6
VAD-16
VAD-29



FROM AHU CONTROLLER
OR BOILER CONTROLLER
OR VAD



NOTE 1
It is suggested that the VADs associated with AHU-4 be locked open and the unit ran as a simple split-system.

Input/Output Table

NO.	Description	I/O	Type	Label	Descriptor
1	Space Temperature	In	Analog	STS-1	VADTMP
2	Space Temperature Set Point	In	Analog	STS-1	VADSTPT
for VADs, VAD-6, VAD-16, AND VAD-29 ONLY					
3	Space Humidity	In	Analog	STS-1	VADHUM

Set Point Table

NO.	Description	Type	Descriptor	Value	Units
1	Space Temperature Set Point Minimum	Analog	VADTMPMINCP	68	°F
2	Space Temperature Set Point Maximum	Analog	VADTMPMAXCP	74	°F
3	Minimum Air Flow	Analog	VADFLWMINCP	TABLE	CFM
4	Maximum Air Flow	Analog	VADFLWMAXCP	TABLE	CFM
5	Unoccupied Temp Set Point Summer	Analog	VADUNOCCSCP	78	°F
6	Unoccupied Temp Set Point Winter	Analog	VADUNOCCWCP	65	°F
7	Scheduled Start Time	Time	VADSCHD-STR	0.0	HOURS
8	Scheduled Stop Time	Time	VADSCHD-STP	23.59	HOURS
9	Heat/Cool Change-Over	Binary	VAD-H-C	COOL	H/C

SEQUENCE OF OPERATION

TERMINAL UNIT CONTROLLERS SHALL BE IN OCCUPIED MODE WHEN THE FACILITY SCHEDULE REQUIRES OCCUPANCY.

EACH CONTROLLED SPACE EQUIPPED WITH A TERMINAL UNIT SHALL BE CONTROLLED BY A MICROPROCESSOR BASED CONTROLLER. THE CONTROLLER SHALL RECEIVE TEMPERATURE SIGNALS FROM A TEMPERATURE SENSOR AS INDICATED AND FROM A FLOW SIGNAL FROM THE TERMINAL UNIT FLOW SENSOR.

COOLING MODE:

AIR HANDLER IS INDEXED TO COOLING BASED ON OUTSIDE AIR AND BUILDING CONDITIONS. ON A RISE IN SPACE TEMPERATURE, THE CONTROLLER MODULATES THE DAMPER TOWARD THE MAXIMUM POSITION, TO MAINTAIN THE COOLING MODE SET POINT. ON A FALL IN SPACE TEMPERATURE, THE CONTROLLER MODULATES THE DAMPER TOWARD THE MINIMUM POSITION.

HEATING MODE:

AIR HANDLER IS INDEXED TO HEATING BASED ON OUTSIDE AIR AND BUILDING CONDITIONS. IF THE SPACE TEMPERATURE BEGINS TO FALL, THE CONTROLLER MODULATES THE DAMPER TOWARD THE MAXIMUM POSITION, TO MAINTAIN THE HEATING MODE SET POINT. ON A RISE IN SPACE TEMPERATURE, THE CONTROLLER MODULATES THE DAMPER TOWARD THE MINIMUM POSITION.

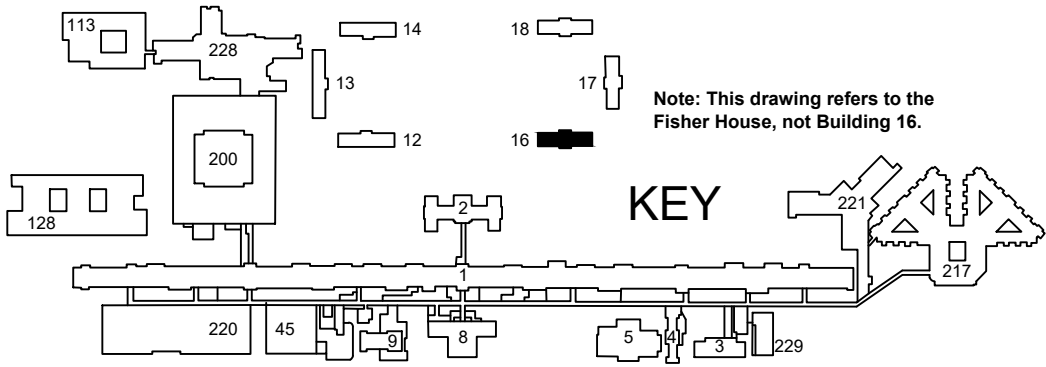
SET POINT SHALL BE DETERMINED BY FACILITIES. SET POINT ADJUST SHALL BE SET WITH A LIMITED WARMER/COOLER ADJUSTMENT FROM SET POINT (ADJUSTABLE) BASED UPON FACILITY REQUIREMENTS.

UNOCCUPIED MODE THE SPACE SET POINT SHALL BE ALTERED FROM THE DAY SPACE SET POINT BASED UPON TIME OF YEAR AND TEMPERATURE. SUMMER SET UP AND WINTER SET BACK.

VAD Flow Set Point Table

NO.	Damper	Area Description	FLOOR	AHU #	Air Changes per Hour			Ventilation		COOLING/HEATING			
					Cubic Ft	Minimum	Maximum	Minimum	Flow	Minimum	Flow	Maximum	Flow
1	VAD-1	Kitchen	1st North	AHU-1	1944	3.08	15.43	100	CFM	250	CFM	500	CFM
2	VAD-2	Laundry	1st North	AHU-1	768	3.91	29.69	50	CFM	190	CFM	380	CFM
3	VAD-3	Family Room	1st North	AHU-1	1944	3.08	30.25	100	CFM	490	CFM	980	CFM
4	VAD-4	113	1st North	AHU-1	1458	3.08	14.81	75	CFM	180	CFM	360	CFM
5	VAD-5	124	1st North	AHU-1	1458	3.08	11.93	75	CFM	146	CFM	290	CFM
6	VAD-6	North Hall	1st North	AHU-1	1296	3.01	4.63	65	CFM	65	CFM	100	CFM
7	VAD-7	121	1st North	AHU-1	1458	3.08	8.40	75	CFM	120	CFM	240	CFM
8	VAD-8	120	1st North	AHU-1	1377	3.05	19.75	70	CFM	240	CFM	480	CFM
9	VAD-9	117	1st North	AHU-1	1377	3.05	21.40	70	CFM	260	CFM	520	CFM
10	VAD-10	116	1st North	AHU-1	1458	3.08	15.63	75	CFM	190	CFM	380	CFM
11	VAD-11	Boiler Room	1st South	AHU-2	1782	3.03	10.10	90	CFM	150	CFM	300	CFM
12	VAD-12	Storage/Bath	1st South	AHU-2	2241	3.08	8.57	115	CFM	160	CFM	320	CFM
13	VAD-13	137	1st South	AHU-2	1458	3.08	12.96	75	CFM	160	CFM	315	CFM
14	VAD-14	110	1st South	AHU-2	2106	3.13	15.10	110	CFM	265	CFM	530	CFM
15	VAD-15	126	1st South	AHU-2	1458	3.08	15.02	75	CFM	180	CFM	365	CFM
16	VAD-16	South Hall	1st South	AHU-2	1296	3.08	4.63	65	CFM	65	CFM	100	CFM
17	VAD-17	129	1st South	AHU-2	1458	3.08	15.02	75	CFM	190	CFM	385	CFM
18	VAD-18	130	1st South	AHU-2	1377	3.05	21.35	70	CFM	245	CFM	490	CFM
19	VAD-19	133	1st South	AHU-2	1377	3.05	21.35	70	CFM	245	CFM	490	CFM
20	VAD-20	134	1st South	AHU-2	1458	3.08	13.99	75	CFM	170	CFM	340	CFM
21	VAD-24	216	2nd Floor	AHU-3	1200	3.25	12.00	65	CFM	135	CFM	270	CFM
22	VAD-25	213	2nd Floor	AHU-3	1392	3.02	16.83	70	CFM	190	CFM	380	CFM
23	VAD-26	209	2nd Floor	AHU-3	1480	3.04	18.24	75	CFM	225	CFM	450	CFM
24	VAD-27	207	2nd Floor	AHU-3	1608	2.99	19.78	80	CFM	265	CFM	530	CFM
25	VAD-28	211	2nd Floor	AHU-3	1056	3.13	12.50	55	CFM	125	CFM	250	CFM
26	VAD-29	2nd Floor Hall	2nd Floor	AHU-3	3176	3.02	16.06	160	CFM	425	CFM	850	CFM
27	VAD-30	203	2nd Floor	AHU-3	1696	3.01	19.46	85	CFM	275	CFM	550	CFM
28	VAD-31	202	2nd Floor	AHU-3	1344	3.13	16.07	70	CFM	180	CFM	360	CFM
29	VAD-32	206	2nd Floor	AHU-3	1304	2.99	16.10	60	CFM	175	CFM	350	CFM
	VAD-21	Living Room	1st Common	AHU-4	2090		20.10					700	CFM
	VAD-22	Common Area	1st Common	AHU-4	2890		8.30					400	CFM
	VAD-23	Dining Room	1st Common	AHU-4	3600		15.00					900	CFM

Per documentation on the Air Handler, Carrier Model 40RM-012--A611HC, the unit has a 2.4 HP motor, and 10 tons of cooling. The fan is rated for 3000 to 5000 CFM in standard operating modes. The above table shall show an approximated maximum air flow to the total of the unit at 4000 CFM. The system shall run in 4 modes. Mode 1 is ventilation. Mode 2 is the minimum flow to maintain the minimum required air flow for 1 stage of cooling to prevent freezing up the coil, (2000 CFM). Mode 3 is full cool where both stages are in operation, (4000 CFM). In Mode 4, Heating, the air flow shall be set to 2000 CFM (adjustable).



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VARIABLE AIR DAMPER VAD Layout Diagram

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Dwg. 18 of 20

EDWARD HINES JR VETERAN'S HOSPITAL

Department of Veterans Affairs

AHU—1, 2, & 3

SCHEDULE

The system is schedule for a 24 hour 7 day operation. The space has active occupancy, and is required to maintain space conditioning. Unless otherwise noted by the facilities staff.

When the Air Handler fan is off, the Outside Air (D—1) damper shall be closed.

When the Air Handler fan is commanded on, Outside Air Damper (D—1) shall be commanded open to the minimum Outside Air position Start—Up set point (20% Adjustable).

The supply fan VFD shall be started and modulated to maintain the supply duct static pressure set point.

The outside air damper shall be modulated to maintain the minimum air flow requirements for ventilation. The outside air flow shall be set to a 785 CFM flow based on space volume.

The Air Handler shall operate to maintain the temperature of the building zone. The Dx Cooling Stages shall be indexed to maintain the average temperature of the building zone. The unit shall index from cooling and heating as determined by the space requirements. If the majority of the VADs are at minimum position and the space temperature is 2°F below the individual space set points, the heating stage shall be initiated to bring the Boiler on—line. When the majority of the space temperatures are at set point or 1°F above set point, the heating stage shall be disabled. If the majority of the VADs are more than 50% open and the space temperature is 2°F above the individual space set points, the first stage of cooling shall be started. If the VADs are more than 90% open, the second stage of cooling shall be started.

The cooling stages shall run for a minimum of 15 minutes before being

disabled. There shall be a 15 minute on—delay before a previously running cooling stage may restart.

The hot water pump for the stage of heating shall run for a minimum of 15 minutes before being disabled. There shall be a 15 minute on—delay before the heating stage may restart.

The humidity of the zone rises above 75% RH measured at the hallway VAD zone sensor, the VADs of the zone shall be overridden to 50% open and the cooling stage shall be initiated. The cooling stage shall operate until the humidity of the zone falls below 55% RH. If the average temperature of the space falls 3°F below the average set point for the zone, the heating stage shall start and run until the average zone temperature reaches the average zone set point. (all set points adjustable).

Filters shall be monitored by a differential pressure switch. When the pressure drop increases above set point (.25 "WC), the BAS system shall be alarmed.

Safeties:

If a smoke detector trips, the VFD is shutdown by the Fire Alarm System or via a relay contact from the smoke detector. The Outside Air damper shall close. The Dx Cooling or Hot Water heating shall be shutdown during the Fire Alarm event. When the system returns to normal and the Fire Alarm is reset, the system shall re—initiate start up in normal mode.

AHU—4

SCHEDULE

The system is schedule for day operations when there are occupants. The system shall operate to maintain the space temperatures of the Dining Room and Living Room at scheduled times. The Dining Room shall have priority control at meal times. 6am to 9am, 11am to 1pm, and 4:30pm to

7:30pm (adjustable). The living room shall have control from 1pm to 10pm. As the spaces are overlapping, the control sequence shall consider each space as the same. During simultaneous scheduling (Dinner times) the control shall be an average of both spaces.

The Air Handler shall operate to maintain the temperature of the building zone. The Dx Cooling Stage or the Electric Heat strips shall be indexed to maintain the command temperature of the building zone. The unit shall index from cooling and heating as determined by the space requirements. Cooling and Heating may not be operated simultaneously. The Air Handler Fan shall only run during call for heating or cooling. On a call for heating or cooling, the system shall operate for a minimum of 15 minutes. Once the system has been disabled, a minimum on—delay of 15 minutes shall be set before the system can re—enable heating or cooling.

Safeties:

If a smoke detector trips, the Fan is shutdown by the Fire Alarm System or via a relay contact from the smoke detector. When the system returns to normal and the Fire Alarm is reset, the system shall re—initiate start up in normal mode.

Hot Water Boiler

The Hot Water Boiler shall operate under factory supplied and installed controls.

The Hot Water Boiler shall be enabled on a call for heat from the AHU controllers to the circulator pump relay panel. On call for heat, the zone circulator pump shall be commanded to start. The Relay panel shall send an enable signal to the Boiler. The Boiler shall initiate its

start up sequence and operate under factory controls.

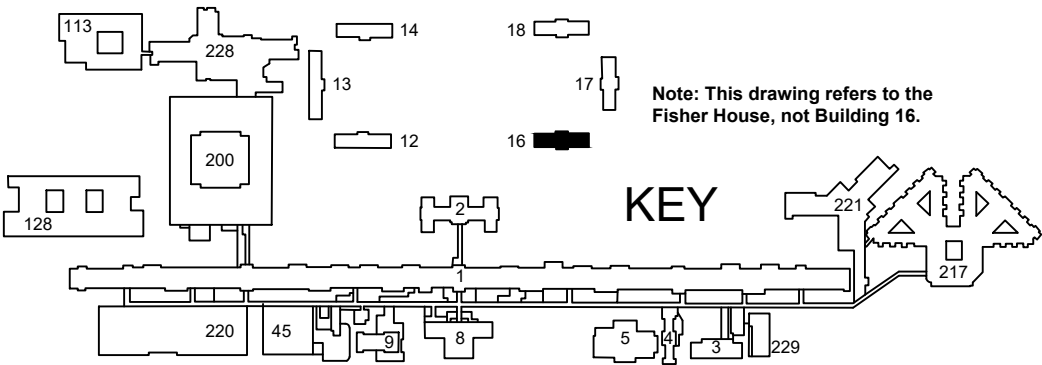
The BMS system does not control the Boiler system. Only monitors the temperatures of the systems.

Safeties

If the pump does not return a "Run" status within 3 minutes of a command to start, the front end shall be alarmed.

VAVs

See drawing sheet 16 for VAV sequence.



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Sequence of Opetations

Fisher House AHUs and Mechanical Equipment

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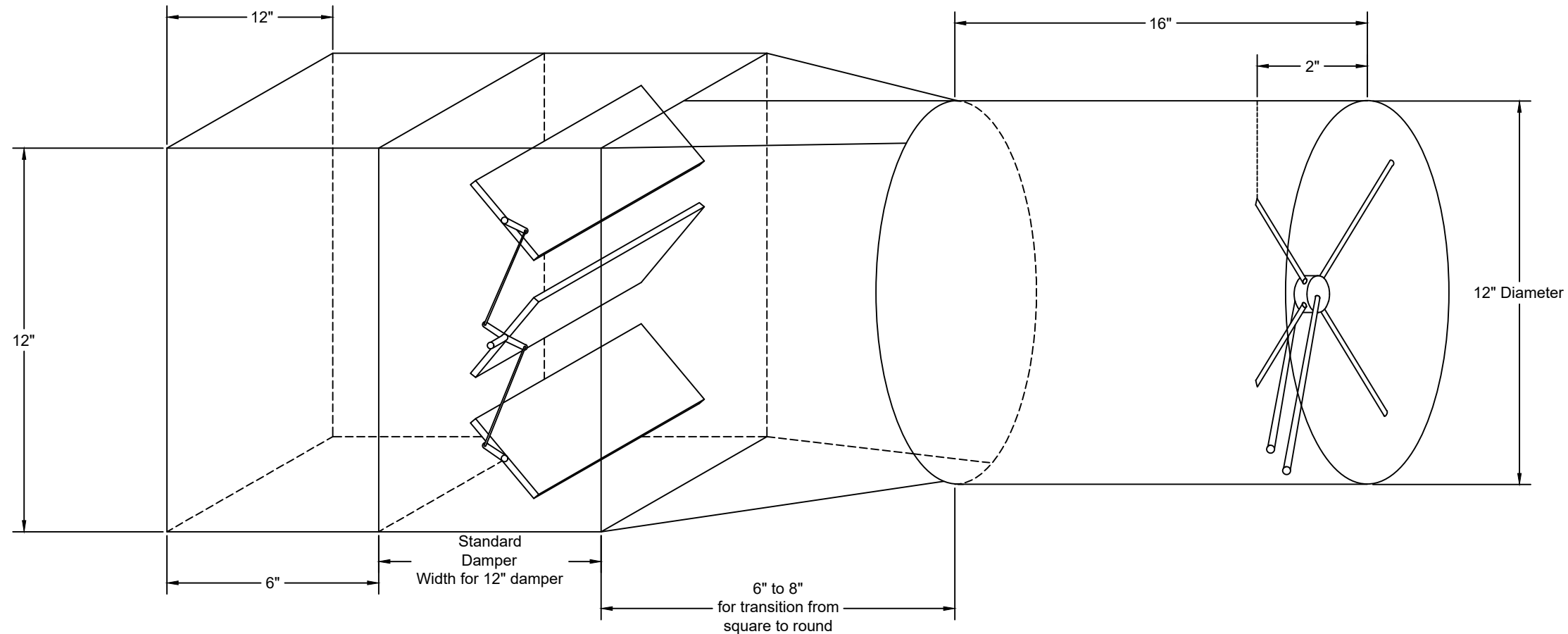
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NORTH AHU



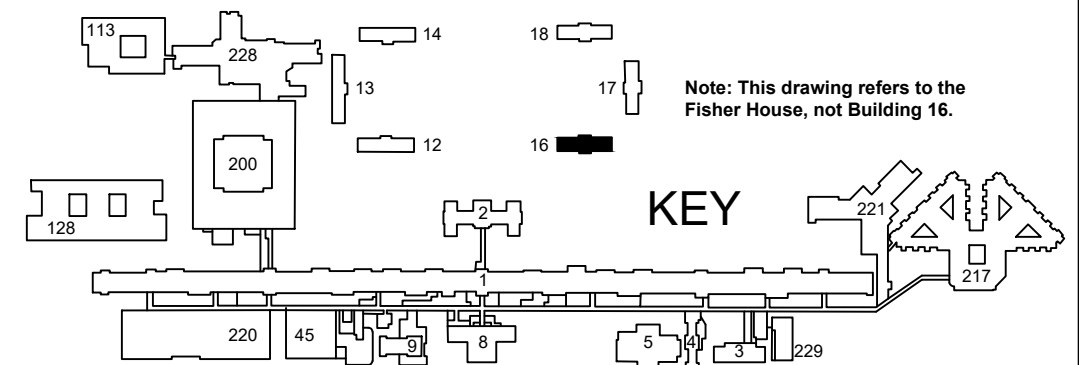
SOUTH AHU



The purpose of the air damper addition is to provide a means to measure and meter the amount of Outside Air being supplied into the building. An opposed blade damper is to be installed at the louvered OSA face. This damper shall be controlled to maintain the desired air flow. A transition shall be constructed to allow for the installation of a cross flow pitot tube array to measure the air velocity. Then the regular flex duct to the AHU shall be connected to the new construction.

The same construction for a OSA Damper box for the attic and AHU-3.

EXTERIOR FACE



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Outside Air Damper

Construction Diagram for Controlled OSA Flow

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