

# Johnson Controls



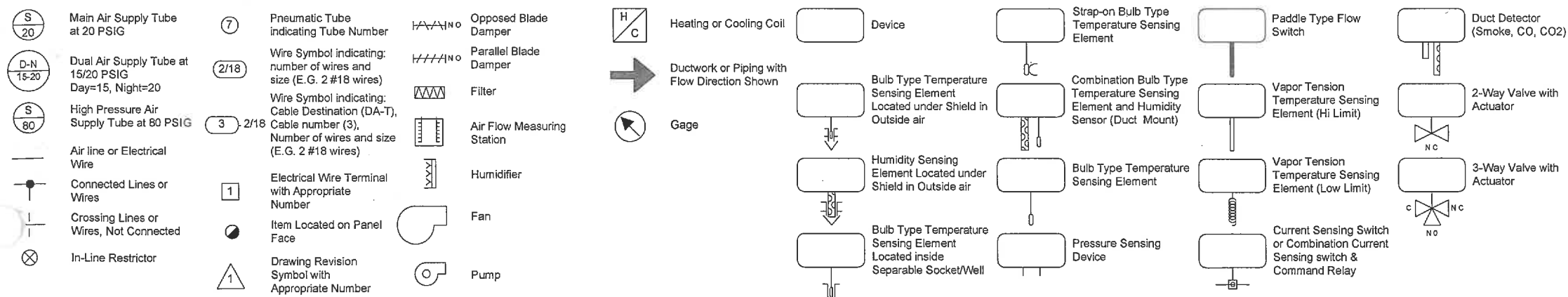
Creating a better climate for business.

- Environmental Control System
- Facility Management System
- Air and Water System Balancing
- Fire Management System
- Security System
- Lighting Services
- Instrumentation System Installation
- Building Operations Management
- Energy Conservation Control
- Training Programs
- Performance Contracting
- Planned Service Agreements

Air Conditioning  
 Heating  
 Diagnostic Services  
 Coil Cleaning  
 Refrigeration  
 Automatic Temperature Controls  
 Facility Management Systems  
 Fire Management  
 Security Management  
 Building Operations and Management  
 Water Treatment  
 Electrical Equipment  
 Emergency Generator / Lighting Equipment  
 Industrial Controls / Recording / Indication Equipment

## Charlottesville Airport Controls Upgrade

### LEGEND

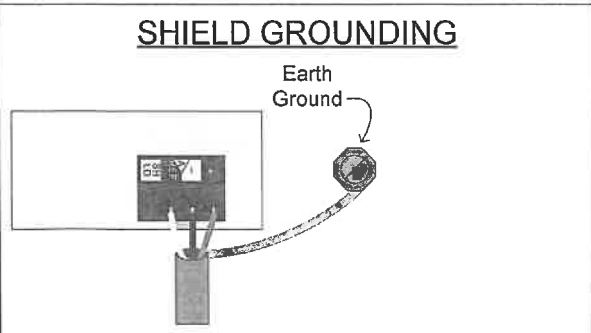
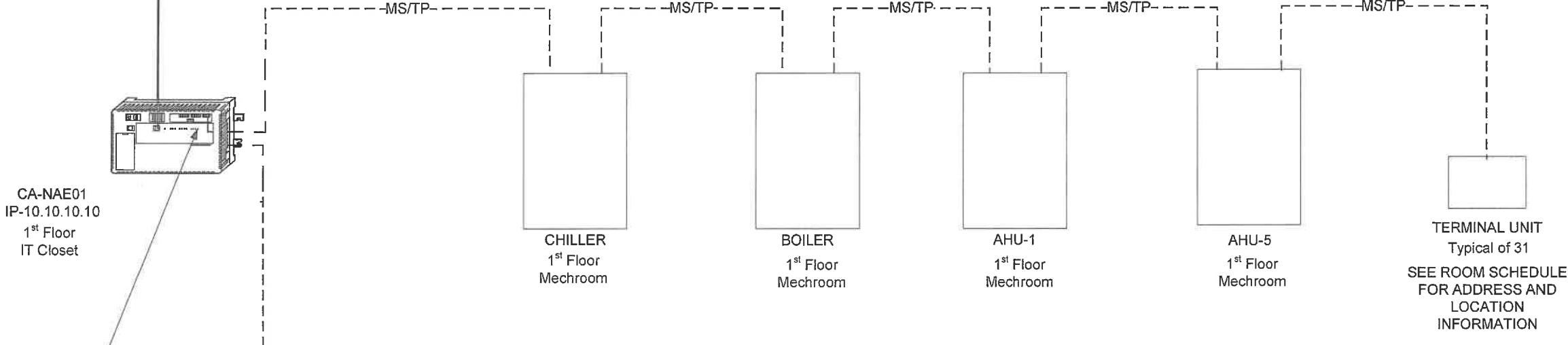
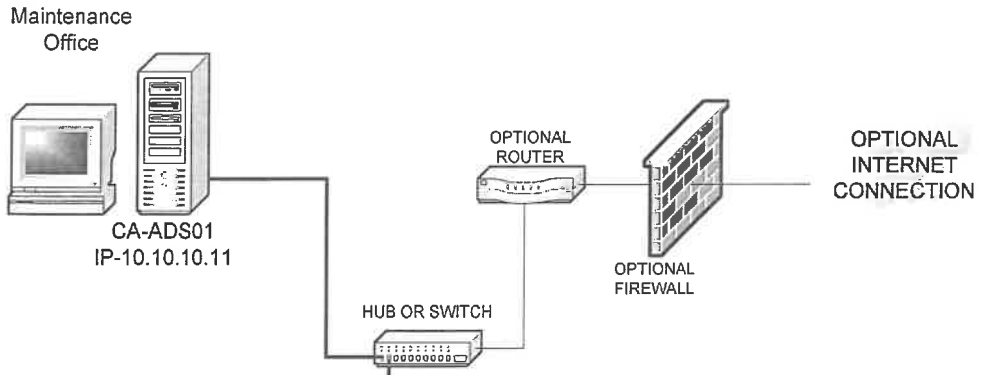


PROJECT TITLE					
<b>Charlottesville Airport Controls Upgrade</b>					
ARCHITECT			ENGINEER		
Phone:			Phone:		
MECHANICAL CONTRACTOR			ELECTRICAL CONTRACTOR		
Phone:			Phone:		
REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
			Branch Information 2315 Commerce Center Dr Suite D Rockville VA 23146 Phone: 1-866-272-6406		
SALES ENGINEER	PROJECT MANAGER	APPLICATION ENGINEER	DATE	CONTRACT NUMBER	
				1-2744395808	

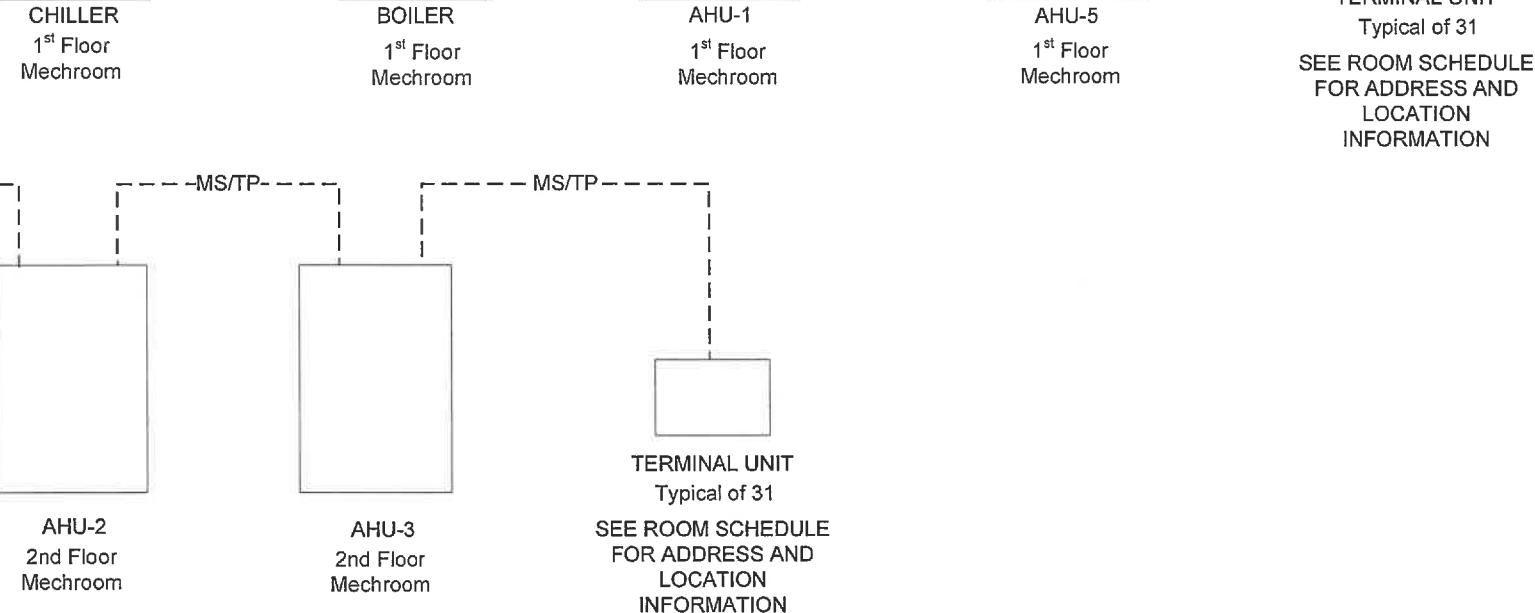
# Network Riser

**BILL OF MATERIALS**

Designation	Qty	Part Number	Description
CA-ADS01	1	ADSTK-0	Application Data Server Turnkey
CA-NAE01	1	MS-NAE5510-1	Network Automation Engine



If a shield is used, it should be earth grounded at one and only one point for the entire bus segment. (Preferably in the NAE panel.) The shield screws on the controllers are simply a convenient way to continue the daisy chain of the bus. They are not attached to earth ground.



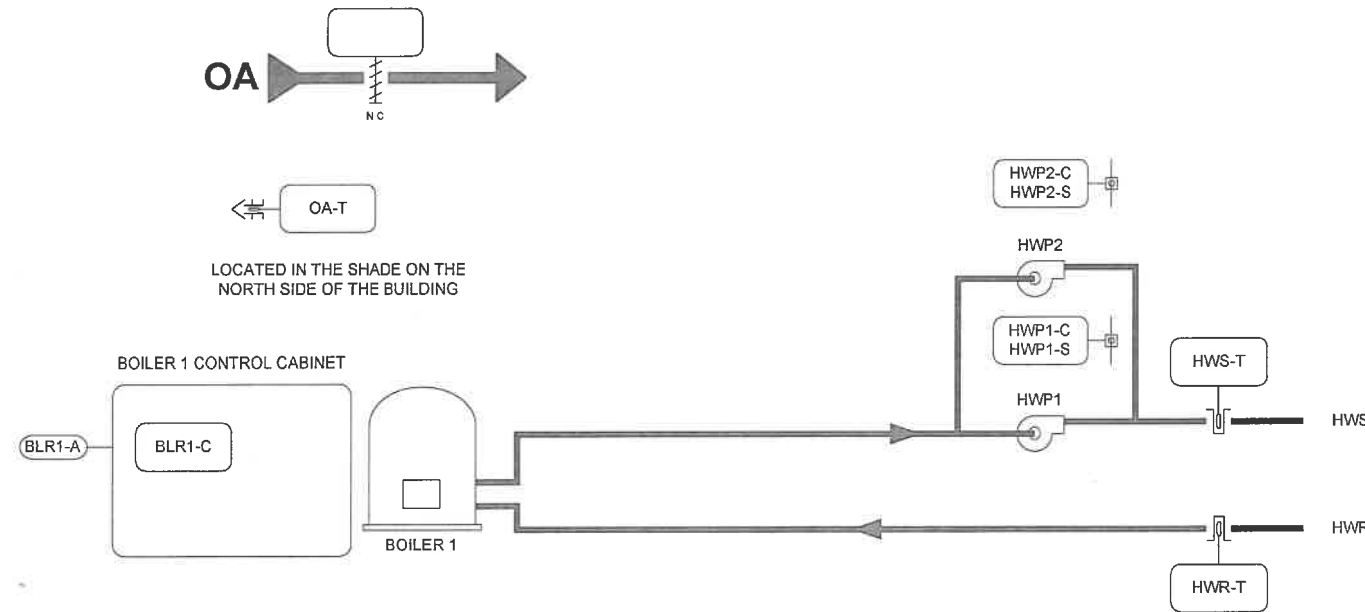
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Drawing Title <b>NET Network Riser</b>		Project Title <b>Charlottesville Airport Controls Upgrade</b>	
REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN
Sales Engineer	Project Manager	Application Engineer	DATE
BY	DATE	BY	DATE
Branch Information		CONTRACT NUMBER	
2315 Commerce Center Dr Suite D Rockville VA 23146		1-2744395808 DRAWING NUMBER NT-1	

# Boiler Plant

## BILL OF MATERIALS

Designation	Qty	Part Number	Description
HWS-T, HWR-T	2	TE-631AM-1	1000 OHM NICKEL SENSOR WELL INSERTION
BOILER	1	MS-FEC2621-0	17 PT FIELD EQUIPMENT CONTROLLER
	1	MS-IOM4711-0	17 PT IO MODULE



**HOT WATER PUMP CONTROL:** THE HOT WATER PUMP WITH THE LOWEST RUNTIME WILL AUTOMATICALLY START WHEN THE OUTSIDE AIR TEMPERATURE FALLS BELOW THE SYSTEM ENABLE SETPOINT. WHEN THE OUTSIDE AIR TEMPERATURE RISES ABOVE THIS SETPOINT, THE HOT WATER PUMPS WILL TURN OFF. WHEN ENABLED, THE LEAD PUMP WILL START AND RUN CONTINUOUSLY. IF FOR ANY REASON ITS STATUS DOES NOT MATCH ITS COMMANDED VALUE AN ALARM WILL BE GENERATED. THE LAG PUMP WILL START IF THE LEAD PUMP IS IN ALARM. WHENEVER THE SYSTEM IS COMMANDED OFF, THE LEAD HOT WATER PUMP WILL RUN FOR A PERIOD OF TIME TO DISPATE THE HEAT IN THE SYSTEM.

**BOILER CONTROL:** THE BOILER CONTROL SEQUENCE WILL BEGIN WHEN ONE OF THE HOT WATER PUMPS HAS A STATUS OF ON. WHEN A BOILER ENABLE COMMAND IS SENT, THE COMBUSTION DAMPERS SHALL OPEN AND THE BOILER WILL FIRE. THE BOILER WILL CYCLE TO MAINTAIN THE HOT WATER RETURN TEMPERATURE AT A SETPOINT AND IS RESET INVERSLY TO THE OUTSIDE AIR TEMPERATURE. THE BOILERS SAFETIES CIRCUIT WILL BE MONITORED AND THE SYSTEM WILL REPORT A GENERAL ALARM CONDITION IF A SAFETY IS TRIPPED. A MANUAL RESET OF THE BOILER SAFETY WILL BE REQUIRED BEFORE THE BOILER CAN BE RESTARTED.

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	HWS Flow Layout										
	REFERENCE DRAWING	NO.	REVISION:	OCATION	ECN	DATE	BY				
	Sales Engineer	Project Manager	Application Engineer	DRAWN	APPROVED						
Project Title		BY		DATE		BY		DATE		CONTRACT NUMBER	
Charlottesville Airport Controls Upgrade		Johnson Controls		2315 Commerce Center Dr Suite D Rockville VA 23146		1-2744395808		DRAWING NUMBER		BLR-1	

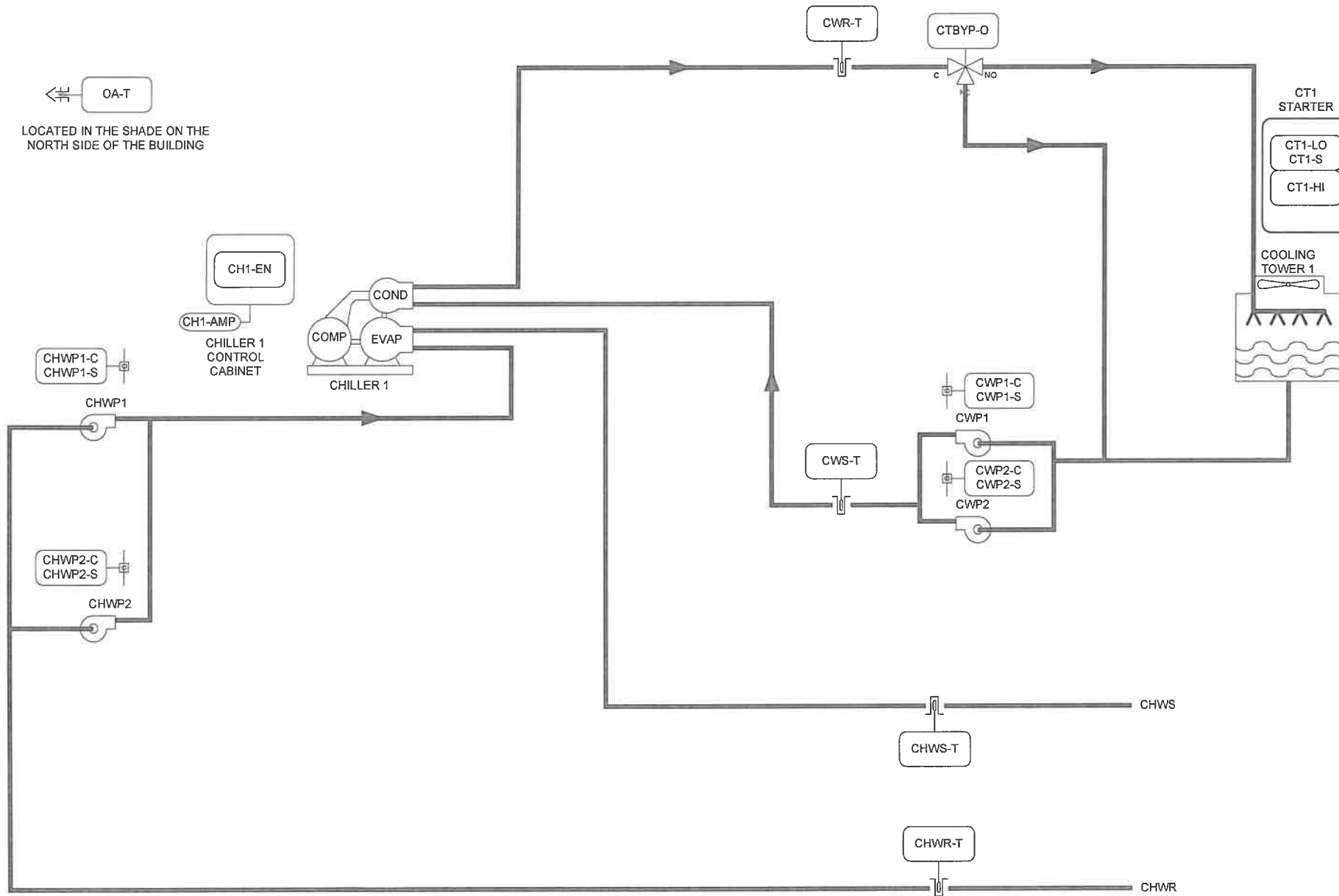
Electrician/Fitter		Point Information			Controller Information						Panel Information					Intermediate Device			
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device
					FEC 26xx														
					FEC 26xx	MS/TP	1	6							0				
	UI IN-1	AHU-3	DA-T	Discharge Air Temperature	FEC 26xx	MS/TP	1	6	UI IN-1						0	-6-UI IN-1			
	UI IN-2	AHU-3	DA1-P	Discharge Air Static Pressure	FEC 26xx	MS/TP	1	6	UI IN-2						0	-6-UI IN-2			
	UI IN-3	AHU-3	MA-T	Mixed Air Temperature	FEC 26xx	MS/TP	1	6	UI IN-3						0	-6-UI IN-3			
	UI IN-4	AHU-3	RA-T	Return Air Temperature	FEC 26xx	MS/TP	1	6	UI IN-4						0	-6-UI IN-4			
	UI IN-5	AHU-3	RA-H	Return Air Humidity	FEC 26xx	MS/TP	1	6	UI IN-5						0	-6-UI IN-5			
	UI IN-6	AHU-3			FEC 26xx	MS/TP	1	6	UI IN-6						0	-6-UI IN-6			
	BI IN-7	AHU-3	LT-A	Low Temperature Alarm	FEC 26xx	MS/TP	1	6	BI IN-7						0	-6-BI IN-7			
	BI IN-8	AHU-3	SF-S	Supply Fan Status	FEC 26xx	MS/TP	1	6	BI IN-8						0	-6-BI IN-8			
	BO OUT-1	AHU-3	EF2-C	Exhaust Fan 2 Command	FEC 26xx	MS/TP	1	6	BO OUT-1						0	-6-BO OUT-1			
	BO OUT-2	AHU-3	SF-C	Supply Fan Command	FEC 26xx	MS/TP	1	6	BO OUT-2						0	-6-BO OUT-2			
	BO OUT-3	AHU-3			FEC 26xx	MS/TP	1	6	BO OUT-3						0	-6-BO OUT-3			
	CO OUT-4	AHU-3	SF-O	Supply Fan Output	FEC 26xx	MS/TP	1	6	CO OUT-4						0	-6-CO OUT-4			
	CO OUT-5	AHU-3			FEC 26xx	MS/TP	1	6	CO OUT-5						0	-6-CO OUT-5			
	CO OUT-6	AHU-3			FEC 26xx	MS/TP	1	6	CO OUT-6						0	-6-CO OUT-6			
	CO OUT-7	AHU-3			FEC 26xx	MS/TP	1	6	CO OUT-7						0	-6-CO OUT-7			
	AO OUT-8	AHU-3	CLG-O	Cooling Output	FEC 26xx	MS/TP	1	6	AO OUT-8						0	-6-AO OUT-8			
	AO OUT-9	AHU-3	MAD-O	Mixed Air Damper Output	FEC 26xx	MS/TP	1	6	AO OUT-9						0	-6-AO OUT-9			

Electrician/Fitter		Point Information			Controller Information							Panel Information					Intermediate Device		
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device
					FEC 26xx														
					FEC 26xx	MS/TP	1	9							0				
	UI IN-1	BOILER	OA-H	Outdoor Air Humidity	FEC 26xx	MS/TP	1	9	UI IN-1						0				-9-UI IN-1
	UI IN-2	BOILER	PHWR-T	Primary HW Return Temp	FEC 26xx	MS/TP	1	9	UI IN-2						0				-9-UI IN-2
	UI IN-3	BOILER	PHWS-T	Primary HW Supply Temp	FEC 26xx	MS/TP	1	9	UI IN-3						0				-9-UI IN-3
	UI IN-4	BOILER	PHWP1-S	Primary HW Pump 1 Status	FEC 26xx	MS/TP	1	9	UI IN-4						0				-9-UI IN-4
	UI IN-5	BOILER	PHWP2-S	Primary HW Pump 2 Status	FEC 26xx	MS/TP	1	9	UI IN-5						0				-9-UI IN-5
	UI IN-6	BOILER			FEC 26xx	MS/TP	1	9	UI IN-6						0				-9-UI IN-6
	BI IN-7	BOILER	BLR1-A	Boiler 1 Alarm	FEC 26xx	MS/TP	1	9	BI IN-7						0				-9-BI IN-7
	BI IN-8	BOILER	BLR1-S	Boiler 1 Status	FEC 26xx	MS/TP	1	9	BI IN-8						0				-9-BI IN-8
	BO OUT-1	BOILER	BLR1-C	Boiler 1 Command	FEC 26xx	MS/TP	1	9	BO OUT-1						0				-9-BO OUT-1
	BO OUT-2	BOILER	PHWP1-C	Primary HW Pump 1 Command	FEC 26xx	MS/TP	1	9	BO OUT-2						0				-9-BO OUT-2
	BO OUT-3	BOILER	PHWP2-C	Primary HW Pump 2 Command	FEC 26xx	MS/TP	1	9	BO OUT-3						0				-9-BO OUT-3
	CO OUT-4	BOILER			FEC 26xx	MS/TP	1	9	CO OUT-4						0				-9-CO OUT-4
	CO OUT-5	BOILER			FEC 26xx	MS/TP	1	9	CO OUT-5						0				-9-CO OUT-5
	CO OUT-6	BOILER			FEC 26xx	MS/TP	1	9	CO OUT-6						0				-9-CO OUT-6
	CO OUT-7	BOILER			FEC 26xx	MS/TP	1	9	CO OUT-7						0				-9-CO OUT-7
	AO OUT-8	BOILER			FEC 26xx	MS/TP	1	9	AO OUT-8						0				-9-AO OUT-8
	AO OUT-9	BOILER			FEC 26xx	MS/TP	1	9	AO OUT-9						0				-9-AO OUT-9

# Chiller Plant

## BILL OF MATERIALS

Designation	Qty	Part Number	Description
CHWS-T,CHWR-T	4	TE-631AM-1	1000 OHM NICKEL SENSOR WELL INSERTION
CWS-T,CWR-T	1	MS-FEC2621-0	17 PT FIELD EQUIPMENT CONTROLLER
CHILLER	1	MS-IOM4711-0	17 PT IO MODULE



**CHILLER CONTROL:** THE CHILLER WILL BE ENABLED WHEN THE OUTSIDE AIR TEMPERATURE RISES ABOVE THE SYSTEM ENABLE SETPOINT. WHEN THE OUTSIDE AIR TEMPERATURE FALLS BELOW THIS SETPOINT, THE CHILLER WILL TURN OFF. WHEN ENABLED, THE CHILLER WILL, AND THE PUMP (S) WILL BE COMMANDED ON, SEE BELOW. ONCE THE CHILLER RECEIVES FLOW STATUS IT WILL, VIA ITS INTERNAL CONTROLS, MAINTAIN THE CHILLED WATER SUPPLY TEMPERATURE AT SETPOINT. IF ANY CHILLERS CHILLED WATER ISOLATION VALVE STATUS DOES NOT MATCH ITS COMMANDED VALUE AFTER A PERIOD OF TIME FOLLOWING BEING ENABLED, AN ALARM WILL BE GENERATED. IF THE CHILLER IS LEAD AT THE TIME OF THE ALARM THE LAG CHILLER WILL BE ENABLED.

**CHILLED WATER PUMP CONTROL:** THE CHILLED WATER PUMP WITH THE LOWEST RUNTIME WILL AUTOMATICALLY START WHEN EITHER CHILLED WATER ISOLATION VALVE HAS A STATUS OF OPEN. IF BOTH ISOLATION VALVES ARE OPEN THEN BOTH PUMPS WILL RUN. WHEN ENABLED, THE PUMPS WILL START AND RUN CONTINUOUSLY. IF FOR ANY REASON ITS STATUS DOES NOT MATCH ITS COMMANDED VALUE AN ALARM WILL BE GENERATED. THE LAG PUMP WILL START IF THE LEAD PUMP IS IN ALARM.

**CONDENSER WATER PUMP CONTROL:** THE CONDENSER WATER PUMP WITH THE LOWEST RUNTIME WILL AUTOMATICALLY START WHEN EITHER CONDENSER WATER ISOLATION VALVE HAS A STATUS OF OPEN. IF BOTH ISOLATION VALVES ARE OPEN THEN BOTH PUMPS WILL RUN. WHEN ENABLED, THE PUMPS WILL START AND RUN CONTINUOUSLY. IF FOR ANY REASON ITS STATUS DOES NOT MATCH ITS COMMANDED VALUE AN ALARM WILL BE GENERATED. THE LAG PUMP WILL START IF THE LEAD PUMP IS IN ALARM.

**CONDENSER WATER CONTROL:** WHEN EITHER CONDENSER WATER PUMP STATUS IS ON THE COOLING TOWER BYPASS, AND COOLING TOWER FANS WILL MODULATE OR CYCLE TO MAINTAIN THE CONDENSER WATER SUPPLY TO THE CHILLERS AT SETPOINT.

**COOLING TOWER CONTROL:** THE COOLING TOWER FAN WITH THE LOWEST RUNTIME WILL AUTOMATICALLY START WHEN THE COOLING BYPASS VALVE IS INDEXED FOR FLOW OVER THE TOWER AND MORE COOLING IS REQUIRED. THE COOLING TOWER FAN WILL CHANGE SPEEDS TO MAINTAIN CONDENSER WATER SETPOINT. IF FURTHER COOLING IS REQUIRED THE NEXT CELL WILL BE ENABLED AND OPERATE SIMILARLY WHILE, THIS CELL PROVIDES MAXIMUM COOLING. IF FOR ANY REASON ITS FAN STATUS DOES NOT MATCH ITS COMMANDED VALUE AN ALARM WILL BE GENERATED.

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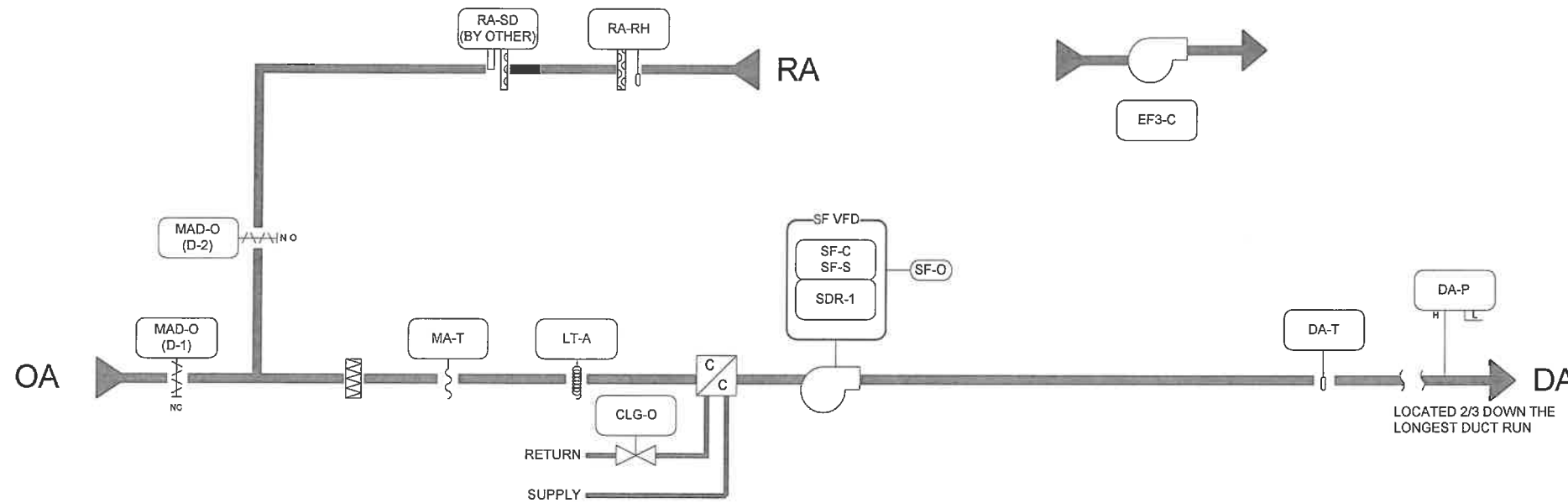
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Chiller Flow Layout									
Project Title		2315 Commerce Center Dr Suite D Rockville VA 23146		CONTRACT NUMBER		1-2744395808		DRAWING NUMBER	
Charlottesville Airport Controls Upgrade		Johnson Controls		CH-1					

Electrician/Fitter		Point Information			Controller Information						Panel Information						Intermediate Device		
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device
					FEC 26xx														
					FEC 26xx	MS/TP	1	8											
	UI IN-1	CHILLER	CWS-T	Condenser Water Supply Tem	FEC 26xx	MS/TP	1	8	UI IN-1										
	UI IN-2	CHILLER	PCHWR-T	Primary CHW Return Temp	FEC 26xx	MS/TP	1	8	UI IN-2										
	UI IN-3	CHILLER	PCHWS-T	Primary CHW Supply Temp	FEC 26xx	MS/TP	1	8	UI IN-3										
	UI IN-4	CHILLER	CWP2-S	Condenser Water Pump 2 Sta	FEC 26xx	MS/TP	1	8	UI IN-4										
	UI IN-5	CHILLER	PCHWP1-S	Primary CHW Pump 1 Status	FEC 26xx	MS/TP	1	8	UI IN-5										
	UI IN-6	CHILLER	PCHWP2-S	Primary CHW Pump 2 Status	FEC 26xx	MS/TP	1	8	UI IN-6										
	BI IN-7	CHILLER	CH1-S	Chiller 1 Status	FEC 26xx	MS/TP	1	8	BI IN-7										
	BI IN-8	CHILLER	CWP1-S	Condenser Water Pump 1 Sta	FEC 26xx	MS/TP	1	8	BI IN-8										
	BO OUT-1	CHILLER	CH1-EN	Chiller 1 Enable	FEC 26xx	MS/TP	1	8	BO OUT-1										
	BO OUT-2	CHILLER	CWP1-C	Condenser Water Pump 1 Cor	FEC 26xx	MS/TP	1	8	BO OUT-2										
	BO OUT-3	CHILLER	CWP2-C	Condenser Water Pump 2 Con	FEC 26xx	MS/TP	1	8	BO OUT-3										
	CO OUT-4	CHILLER	PCHWP1-C	Primary CHW Pump 1 Comma	FEC 26xx	MS/TP	1	8	CO OUT-4										
	CO OUT-5	CHILLER	PCHWP2-C	Primary CHW Pump 2 Comma	FEC 26xx	MS/TP	1	8	CO OUT-5										
	CO OUT-6	CHILLER	CT1L-C	Tower 1 LO Command	FEC 26xx	MS/TP	1	8	CO OUT-6										
	CO OUT-7	CHILLER	CT1H-C	Tower 1 HI Command	FEC 26xx	MS/TP	1	8	CO OUT-7										
	AO OUT-8	CHILLER	CTV-O	Tower Valve Output	FEC 26xx	MS/TP	1	8	AO OUT-8										
	AO OUT-9	CHILLER			FEC 26xx	MS/TP	1	8	AO OUT-9										
					IOM 4710														
					IOM 4710	SA Bus	1	4											
	UI IN-1	CHILLER			IOM 4710	SA Bus	1	4	UI IN-1										
	UI IN-2	CHILLER			IOM 4710	SA Bus	1	4	UI IN-2										
	UI IN-3	CHILLER			IOM 4710	SA Bus	1	4	UI IN-3										
	UI IN-4	CHILLER			IOM 4710	SA Bus	1	4	UI IN-4										
	UI IN-5	CHILLER			IOM 4710	SA Bus	1	4	UI IN-5										
	UI IN-6	CHILLER			IOM 4710	SA Bus	1	4	UI IN-6										
	BI IN-7	CHILLER	CT1-S	Tower 1 Status	IOM 4710	SA Bus	1	4	BI IN-7										
	BI IN-8	CHILLER			IOM 4710	SA Bus	1	4	BI IN-8										
	BO OUT-1	CHILLER			IOM 4710	SA Bus	1	4	BO OUT-1										
	BO OUT-2	CHILLER			IOM 4710	SA Bus	1	4	BO OUT-2										
	BO OUT-3	CHILLER			IOM 4710	SA Bus	1	4	BO OUT-3										
	CO OUT-4	CHILLER			IOM 4710	SA Bus	1	4	CO OUT-4										
	CO OUT-5	CHILLER			IOM 4710	SA Bus	1	4	CO OUT-5										
	CO OUT-6	CHILLER			IOM 4710	SA Bus	1	4	CO OUT-6										
	CO OUT-7	CHILLER			IOM 4710	SA Bus	1	4	CO OUT-7										
	AO OUT-8	CHILLER			IOM 4710	SA Bus	1	4	AO OUT-8										
	AO OUT-9	CHILLER			IOM 4710	SA Bus	1	4	AO OUT-9										

# AHU-1

## BILL OF MATERIALS

Designation	Qty	Part Number	Description
RA-T,DA-T	2	TE-6311M-1	1000 OHM NICKEL SENSOR
MA-T	1	TE-6316M-1	NICKEL DUCT AVERAGE SENSOR
AHU-1	1	MS-FEC2621-0	17 PT FIELD EQUIPMENT CONTROLLER



**SUPPLY FAN START/STOP:** THE SUPPLY FAN WILL BE STARTED ACCORDING TO THE SCHEDULE. IF THE SUPPLY FAN STATUS DOES NOT MATCH THE COMMANDED VALUE, AN ALARM WILL BE GENERATED. WHEN THE SUPPLY FAN STATUS INDICATES THE FAN STARTED, THE CONTROL SEQUENCE WILL BE ENABLED.

**STATIC PRESSURE CONTROL:** THE SUPPLY FAN WILL MODULATE TO MAINTAIN THE DISCHARGE STATIC PRESSURE AT SETPOINT 1.0 INWC (ADJUSTABLE).

**DISCHARGE AIR CONTROL:** THE MIXED AIR DAMPERS, AND THE COOLING VALVE WILL MODULATE IN SEQUENCE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE AT SETPOINT 55 DEGF (ADJUSTABLE).

**MIXED AIR LOW LIMIT OVERRIDE:** THE MIXED AIR TEMPERATURE WILL OVERRIDE THE MINIMUM POSITION AND CLOSE THE OUTSIDE AIR DAMPER IF A TEMPERATURE IS SENSED BELOW THE SETPOINT 50 DEGF (ADJUSTABLE).

**ECONOMIZER DRY BULB SWITCHOVER:** WHEN THE SHARED OUTSIDE AIR TEMPERATURE IS BELOW THE SWITCHOVER SETPOINT, THE ECONOMIZER WILL BE ENABLED. WHEN THE SHARED OUTSIDE AIR TEMPERATURE RISES ABOVE THE SWITCHOVER SETPOINT PLUS A DIFFERENTIAL, THE ECONOMIZER WILL BE DISABLED.

**EXHAUST FAN-3:** WHEN THE BUILDING IS OCCUPIED BY SCHEDULE THE EXHAUST FAN WILL BE STARTED.

**SAFETY:**

ALL OF THE SAFETY DEVICES ARE MANUAL RESET; THE DEVICE THAT HAS TRIPPED MUST BE MANUALLY RESET BEFORE RESTARTING THE AIR HANDLING UNIT.

IF A TEMPERATURE LOW LIMIT SWITCH SENSES A TEMPERATURE BELOW SETPOINT THE SUPPLY FAN WILL BE SHUTDOWN.

IF A FIRE ALARM SHUTDOWN CONTACT IS PROVIDED, THE SUPPLY FAN WILL BE SHUTDOWN WHEN TRIGGERED.

**SHUTDOWN:**

WHEN THE UNIT IS SHUTDOWN BY EITHER A STOP COMMAND OR SYSTEM SAFETY THE UNIT WILL BE SET AS FOLLOWS:

- SUPPLY FAN WILL BE OFF
- SUPPLY FAN VFD WILL BE COMMANDED TO 0%
- OUTSIDE AIR DAMPER WILL CLOSE
- RETURN AIR DAMPER WILL OPEN
- COOLING VALVE WILL CLOSE

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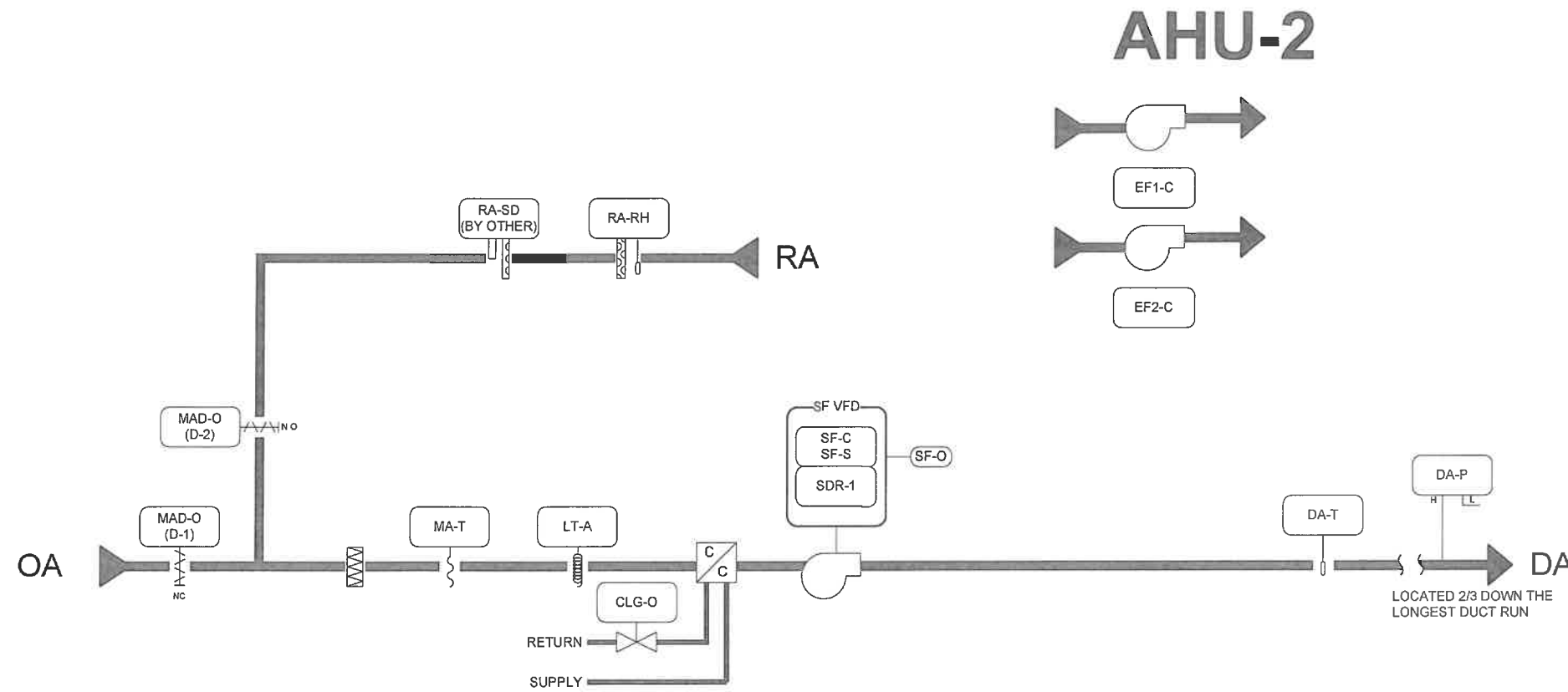
Drawing Title									
AHU 1 Flow Layout									
Project Title		NO.		REVISION-LOCATION		ECN		DATE	
Charlottesville Airport Controls Upgrade									
Sales Engineer		Project Manager		Application Engineer		DRAWN		APPROVED	
						BY		DATE	
						DATE		DATE	
						Branch Information		CONTRACT NUMBER	
						2315 Commerce Center Dr Suite D Rockville VA 23146		1-2744395808	
						DRAWING NUMBER		AH1-1	



Electrician/Fitter		Point Information			Controller Information						Panel Information						Intermediate Device		
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device
					FEC 26xx														
					FEC 26xx	MS/TP	1	4								0			
	UI IN-1	AHU-1	DA-T	Discharge Air Temperature	FEC 26xx	MS/TP	1	4	UI IN-1							0			
	UI IN-2	AHU-1	DA1-P	Discharge Air Static Pressure	FEC 26xx	MS/TP	1	4	UI IN-2							0			
	UI IN-3	AHU-1	MA-T	Mixed Air Temperature	FEC 26xx	MS/TP	1	4	UI IN-3							0			
	UI IN-4	AHU-1	RA-T	Return Air Temperature	FEC 26xx	MS/TP	1	4	UI IN-4							0			
	UI IN-5	AHU-1	RA-H	Return Air Humidity	FEC 26xx	MS/TP	1	4	UI IN-5							0			
	UI IN-6	AHU-1			FEC 26xx	MS/TP	1	4	UI IN-6							0			
	BI IN-7	AHU-1	LT-A	Low Temperature Alarm	FEC 26xx	MS/TP	1	4	BI IN-7							0			
	BI IN-8	AHU-1	SF-S	Supply Fan Status	FEC 26xx	MS/TP	1	4	BI IN-8							0			
	BO OUT-1	AHU-1	EF3-C	Exhaust Fan 3 Command	FEC 26xx	MS/TP	1	4	BO OUT-1							0			
	BO OUT-2	AHU-1	SF-C	Supply Fan Command	FEC 26xx	MS/TP	1	4	BO OUT-2							0			
	BO OUT-3	AHU-1			FEC 26xx	MS/TP	1	4	BO OUT-3							0			
	CO OUT-4	AHU-1	SF-O	Supply Fan Output	FEC 26xx	MS/TP	1	4	CO OUT-4							0			
	CO OUT-5	AHU-1			FEC 26xx	MS/TP	1	4	CO OUT-5							0			
	CO OUT-6	AHU-1			FEC 26xx	MS/TP	1	4	CO OUT-6							0			
	CO OUT-7	AHU-1			FEC 26xx	MS/TP	1	4	CO OUT-7							0			
	AO OUT-8	AHU-1	CLG-O	Cooling Output	FEC 26xx	MS/TP	1	4	AO OUT-8							0			
	AO OUT-9	AHU-1	MAD-O	Mixed Air Damper Output	FEC 26xx	MS/TP	1	4	AO OUT-9							0			

**BILL OF MATERIALS**

Designation	Qty	Part Number	Description
RA-T,DA-T	2	TE-6311M-1	1000 OHM NICKEL SENSOR
MA-T	1	TE-6316M-1	NICKEL DUCT AVERAGE SENSOR
AHU-2	1	MS-FEC2621-0	17 PT FIELD EQUIPMENT CONTROLLER



**SUPPLY FAN START/STOP:** THE SUPPLY FAN WILL BE STARTED ACCORDING TO THE SCHEDULE. IF THE SUPPLY FAN STATUS DOES NOT MATCH THE COMMANDED VALUE, AN ALARM WILL BE GENERATED. WHEN THE SUPPLY FAN STATUS INDICATES THE FAN STARTED, THE CONTROL SEQUENCE WILL BE ENABLED.

**STATIC PRESSURE CONTROL:** THE SUPPLY FAN WILL MODULATE TO MAINTAIN THE DISCHARGE STATIC PRESSURE AT SETPOINT 1.0 INWC (ADJUSTABLE).

**DISCHARGE AIR CONTROL:** THE MIXED AIR DAMPERS, AND THE COOLING VALVE WILL MODULATE IN SEQUENCE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE AT SETPOINT 55 DEGF (ADJUSTABLE).

**MIXED AIR LOW LIMIT OVERRIDE:** THE MIXED AIR TEMPERATURE WILL OVERRIDE THE MINIMUM POSITION AND CLOSE THE OUTSIDE AIR DAMPER IF A TEMPERATURE IS SENSED BELOW THE SETPOINT 50 DEGF (ADJUSTABLE).

**ECONOMIZER DRY BULB SWITCHOVER:** WHEN THE SHARED OUTSIDE AIR TEMPERATURE IS BELOW THE SWITCHOVER SETPOINT, THE ECONOMIZER WILL BE ENABLED. WHEN THE SHARED OUTSIDE AIR TEMPERATURE RISES ABOVE THE SWITCHOVER SETPOINT PLUS A DIFFERENTIAL, THE ECONOMIZER WILL BE DISABLED.

**EXHAUST FANS-1&2:** WHEN THE BUILDING IS OCCUPIED BY SCHEDULE THE EXHAUST FANS WILL BE STARTED.

**SAFETY:**  
 ALL OF THE SAFETY DEVICES ARE MANUAL RESET; THE DEVICE THAT HAS TRIPPED MUST BE MANUALLY RESET BEFORE RESTARTING THE AIR HANDLING UNIT.  
 IF A TEMPERATURE LOW LIMIT SWITCH SENSES A TEMPERATURE BELOW SETPOINT THE SUPPLY FAN WILL BE SHUTDOWN.  
 IF A FIRE ALARM SHUTDOWN CONTACT IS PROVIDED, THE SUPPLY FAN WILL BE SHUTDOWN WHEN TRIGGERED.

**SHUTDOWN:**  
 WHEN THE UNIT IS SHUTDOWN BY EITHER A STOP COMMAND OR SYSTEM SAFETY THE UNIT WILL BE SET AS FOLLOWS:  
 SUPPLY FAN WILL BE OFF  
 SUPPLY FAN VFD WILL BE COMMANDED TO 0%  
 OUTSIDE AIR DAMPER WILL CLOSE  
 RETURN AIR DAMPER WILL OPEN  
 COOLING VALVE WILL CLOSE

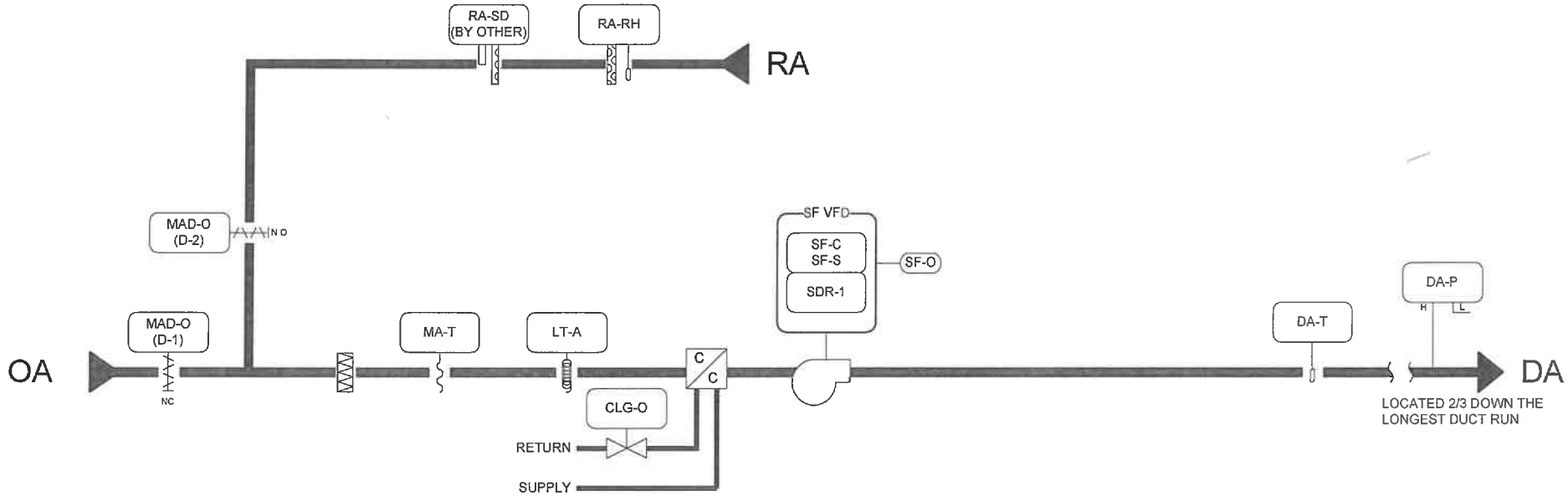
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	AHU-2 Flow Layout								
	Project Title	Branch Information		CONTRACT NUMBER					
	Charlottesville Airport Controls Upgrade	2315 Commerce Center Dr Suite D Rockville VA 23146		1-2744395808				DRAWING NUMBER AH2-1	

Electrician/Fitter		Point Information			Controller Information						Panel Information					Intermediate Device			
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device
					FEC 26xx														
					FEC 26xx	MS/TP	1	5											
	UI IN-1	AHU-2	DA-T	Discharge Air Temperature	FEC 26xx	MS/TP	1	5	UI IN-1					0					
	UI IN-2	AHU-2	DA1-P	Discharge Air Static Pressure	FEC 26xx	MS/TP	1	5	UI IN-2					0					
	UI IN-3	AHU-2	MA-T	Mixed Air Temperature	FEC 26xx	MS/TP	1	5	UI IN-3					0					
	UI IN-4	AHU-2	RA-T	Return Air Temperature	FEC 26xx	MS/TP	1	5	UI IN-4					0					
	UI IN-5	AHU-2	RA-H	Return Air Humidity	FEC 26xx	MS/TP	1	5	UI IN-5					0					
	UI IN-6	AHU-2			FEC 26xx	MS/TP	1	5	UI IN-6					0					
	BI IN-7	AHU-2	LT-A	Low Temperature Alarm	FEC 26xx	MS/TP	1	5	BI IN-7					0					
	BI IN-8	AHU-2	SF-S	Supply Fan Status	FEC 26xx	MS/TP	1	5	BI IN-8					0					
	BO OUT-1	AHU-2	EF2-C	Exhaust Fan 2 Command	FEC 26xx	MS/TP	1	5	BO OUT-1					0					
	BO OUT-2	AHU-2	EF1-C	Exhaust Fan 1 Command	FEC 26xx	MS/TP	1	5	BO OUT-2					0					
	BO OUT-3	AHU-2	SF-C	Supply Fan Command	FEC 26xx	MS/TP	1	5	BO OUT-3					0					
	CO OUT-4	AHU-2	SF-O	Supply Fan Output	FEC 26xx	MS/TP	1	5	CO OUT-4					0					
	CO OUT-5	AHU-2			FEC 26xx	MS/TP	1	5	CO OUT-5					0					
	CO OUT-6	AHU-2			FEC 26xx	MS/TP	1	5	CO OUT-6					0					
	CO OUT-7	AHU-2			FEC 26xx	MS/TP	1	5	CO OUT-7					0					
	AO OUT-8	AHU-2	CLG-O	Cooling Output	FEC 26xx	MS/TP	1	5	AO OUT-8					0					
	AO OUT-9	AHU-2	MAD-O	Mixed Air Damper Output	FEC 26xx	MS/TP	1	5	AO OUT-9					0					

# AHU-3

**BILL OF MATERIALS**

Designation	Qty	Part Number	Description
RA-T,DA-T	2	TE-6311M-1	1000 OHM NICKEL SENSOR
MA-T	1	TE-6316M-1	NICKEL DUCT AVERAGE SENSOR
AHU-3	1	MS-FEC2621-0	17 PT FIELD EQUIPMENT CONTROLLER



**SUPPLY FAN START/STOP:** THE SUPPLY FAN WILL BE STARTED ACCORDING TO THE SCHEDULE. IF THE SUPPLY FAN STATUS DOES NOT MATCH THE COMMANDED VALUE, AN ALARM WILL BE GENERATED. WHEN THE SUPPLY FAN STATUS INDICATES THE FAN STARTED, THE CONTROL SEQUENCE WILL BE ENABLED.

**STATIC PRESSURE CONTROL:** THE SUPPLY FAN WILL MODULATE TO MAINTAIN THE DISCHARGE STATIC PRESSURE AT SETPOINT 1.0 INWC (ADJUSTABLE).

**DISCHARGE AIR CONTROL:** THE MIXED AIR DAMPERS, AND THE COOLING VALVE WILL MODULATE IN SEQUENCE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE AT SETPOINT 55 DEGF (ADJUSTABLE).

**MIXED AIR LOW LIMIT OVERRIDE:** THE MIXED AIR TEMPERATURE WILL OVERRIDE THE MINIMUM POSITION AND CLOSE THE OUTSIDE AIR DAMPER IF A TEMPERATURE IS SENSED BELOW THE SETPOINT 50 DEGF (ADJUSTABLE).

**ECONOMIZER DRY BULB SWITCHOVER:** WHEN THE SHARED OUTSIDE AIR TEMPERATURE IS BELOW THE SWITCHOVER SETPOINT, THE ECONOMIZER WILL BE ENABLED. WHEN THE SHARED OUTSIDE AIR TEMPERATURE RISES ABOVE THE SWITCHOVER SETPOINT PLUS A DIFFERENTIAL, THE ECONOMIZER WILL BE DISABLED.

**SAFETY:**  
 ALL OF THE SAFETY DEVICES ARE MANUAL RESET; THE DEVICE THAT HAS TRIPPED MUST BE MANUALLY RESET BEFORE RESTARTING THE AIR HANDLING UNIT.  
 IF A TEMPERATURE LOW LIMIT SWITCH SENSES A TEMPERATURE BELOW SETPOINT THE SUPPLY FAN WILL BE SHUTDOWN.  
 IF A FIRE ALARM SHUTDOWN CONTACT IS PROVIDED, THE SUPPLY FAN WILL BE SHUTDOWN WHEN TRIGGERED.

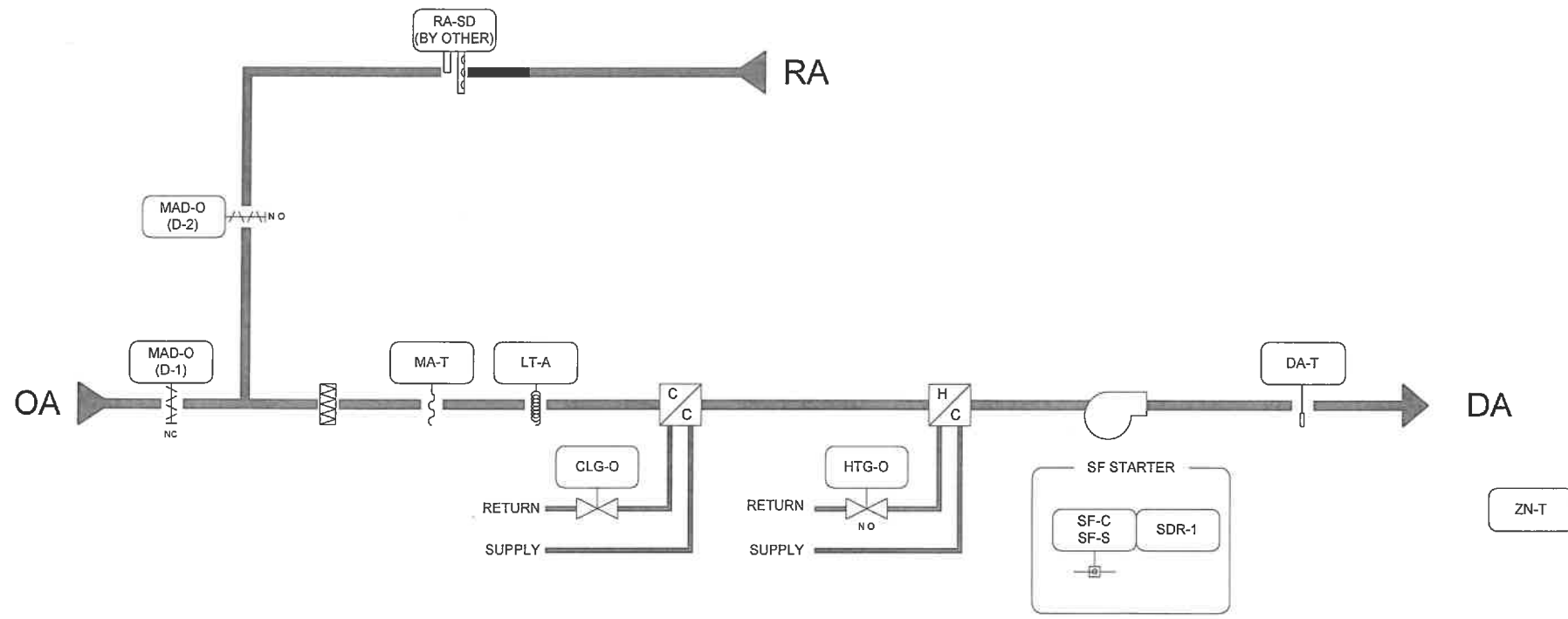
**SHUTDOWN:**  
 WHEN THE UNIT IS SHUTDOWN BY EITHER A STOP COMMAND OR SYSTEM SAFETY THE UNIT WILL BE SET AS FOLLOWS:  
 SUPPLY FAN WILL BE OFF  
 SUPPLY FAN VFD WILL BE COMMANDED TO 0%  
 OUTSIDE AIR DAMPER WILL CLOSE  
 RETURN AIR DAMPER WILL OPEN  
 COOLING VALVE WILL CLOSE

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	AHU-3 Flow Layout					
	Project Title					
	Charlottesville Airport Controls Upgrade					
	REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
	Sales Engineer	Project Manager	Application Engineer			
	BY	DATE	BY	DATE	BY	DATE
	Branch Information			CONTRACT NUMBER		
	Johnson Controls 2315 Commerce Center Dr Suite D Rockville VA 23146			1-2744395808		
				DRAWING NUMBER		
				AH3-1		

# AHU-5

## BILL OF MATERIALS

Designation	Qty	Part Number	Description
RA-T,DA-T	2	TE-6311M-1	1000 OHM NICKEL SENSOR
MA-T	1	TE-6316M-1	NICKEL DUCT AVERAGE SENSOR
AHU-5	1	MS-FEC2621-0	17 PT FIELD EQUIPMENT CONTROLLER



**SUPPLY FAN START/STOP:** THE SUPPLY FAN WILL BE STARTED ACCORDING TO THE SCHEDULE. IF THE SUPPLY FAN STATUS DOES NOT MATCH THE COMMANDED VALUE, AN ALARM WILL BE GENERATED. WHEN THE SUPPLY FAN STATUS INDICATES THE FAN STARTED, THE CONTROL SEQUENCE WILL BE ENABLED.

**DISCHARGE AIR CONTROL:** THE DISCHARGE AIR TEMPERATURE SETPOINT WILL RESET AS NECESSARY TO MAINTAIN THE RETURN TEMPERATURE SETPOINT AS SENSED BY THE RETURN TEMPERATURE SENSOR. THE MIXED AIR DAMPERS, HEATING VALVE, AND THE COOLING VALVE WILL MODULATE IN SEQUENCE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE AT SETPOINT.

**MIXED AIR LOW LIMIT OVERRIDE:** THE MIXED AIR TEMPERATURE WILL OVERRIDE THE MINIMUM POSITION AND CLOSE THE OUTSIDE AIR DAMPER IF A TEMPERATURE IS SENSED BELOW THE SETPOINT.

**ECONOMIZER DRY BULB SWITCHOVER:** WHEN THE SHARED OUTSIDE AIR TEMPERATURE IS BELOW THE SWITCHOVER SETPOINT, THE ECONOMIZER WILL BE ENABLED. WHEN THE SHARED OUTSIDE AIR TEMPERATURE RISES ABOVE THE SWITCHOVER SETPOINT PLUS A DIFFERENTIAL, THE ECONOMIZER WILL BE DISABLED.

**SAFETY:**

ALL OF THE SAFETY DEVICES ARE MANUAL RESET; THE DEVICE THAT HAS TRIPPED MUST BE MANUALLY RESET BEFORE RESTARTING THE AIR HANDLING UNIT.

IF A TEMPERATURE LOW LIMIT SWITCH SENSES A TEMPERATURE BELOW SETPOINT THE SUPPLY FAN WILL BE SHUTDOWN.

IF A FIRE ALARM SHUTDOWN CONTACT IS PROVIDED, THE SUPPLY FAN WILL BE SHUTDOWN WHEN TRIGGERED.

**SHUTDOWN:**

WHEN THE UNIT IS SHUTDOWN BY EITHER A STOP COMMAND OR SYSTEM SAFETY THE UNIT WILL BE SET AS FOLLOWS:

- SUPPLY FAN WILL BE OFF
- OUTSIDE AIR DAMPER WILL CLOSE
- RETURN AIR DAMPER WILL OPEN
- COOLING VALVE WILL CLOSE
- HEATING VALVE WILL CLOSE

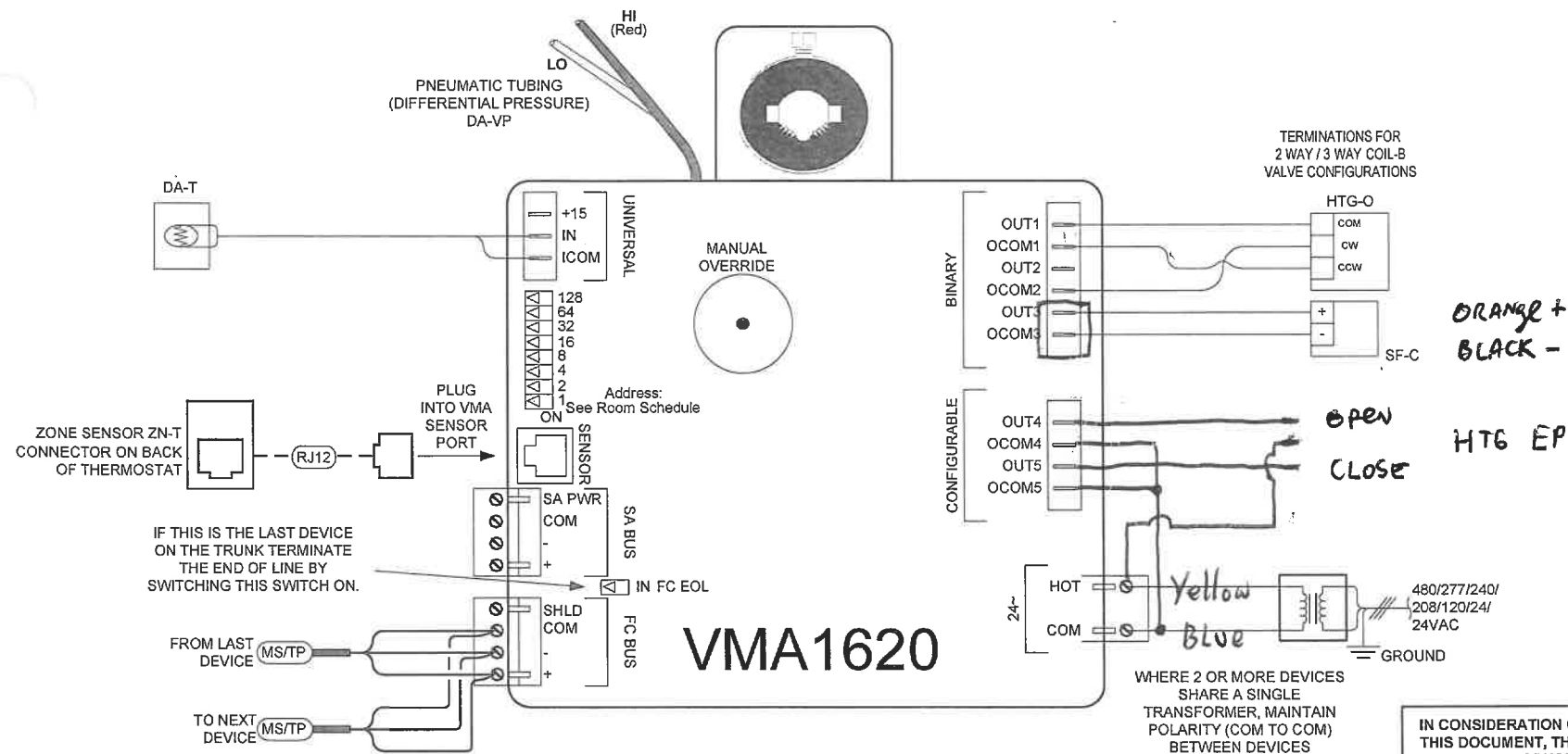
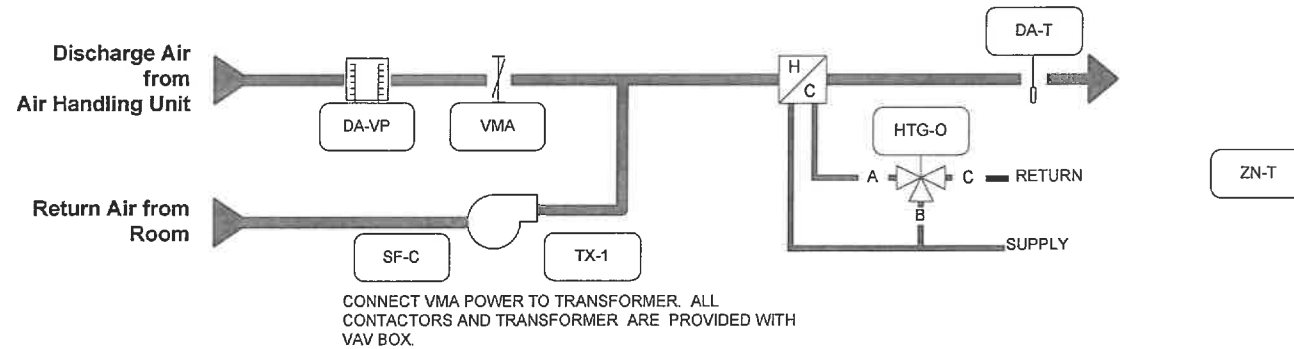
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	AHU 5 Flow Layout					
	Project Title					
	Charlotteville Airport Controls Upgrade					
	REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
	Sales Engineer	Project Manager	Application Engineer			
	BY	DATE	DRAWN	APPROVED		
			BY	DATE		
	Branch Information			CONTRACT NUMBER		
	2315 Commerce Center Dr Suite D Rockville VA 23146			1-2744395808		
	Johnson Controls			DRAWING NUMBER		
				AH5-1		

Electrician/Fitter		Point Information			Controller Information							Panel Information					Intermediate Device		
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device
					FEC 26xx														
					FEC 26xx	MS/TP	1	7											
	UI IN-1	AHU-5	DA-T	Discharge Air Temperature	FEC 26xx	MS/TP	1	7	UI IN-1										
	UI IN-2	AHU-5	MA-T	Mixed Air Temperature	FEC 26xx	MS/TP	1	7	UI IN-2										
	UI IN-3	AHU-5	RA-T	Return Air Temperature	FEC 26xx	MS/TP	1	7	UI IN-3										
	UI IN-4	AHU-5	RA-H	Return Air Humidity	FEC 26xx	MS/TP	1	7	UI IN-4										
	UI IN-5	AHU-5			FEC 26xx	MS/TP	1	7	UI IN-5										
	UI IN-6	AHU-5			FEC 26xx	MS/TP	1	7	UI IN-6										
	BI IN-7	AHU-5	LT-A	Low Temperature Alarm	FEC 26xx	MS/TP	1	7	BI IN-7										
	BI IN-8	AHU-5	SF-S	Supply Fan Status	FEC 26xx	MS/TP	1	7	BI IN-8										
	BO OUT-1	AHU-5	SF-C	Supply Fan Command	FEC 26xx	MS/TP	1	7	BO OUT-1										
	BO OUT-2	AHU-5			FEC 26xx	MS/TP	1	7	BO OUT-2										
	BO OUT-3	AHU-5			FEC 26xx	MS/TP	1	7	BO OUT-3										
	CO OUT-4	AHU-5	RH-O	Reheat Output	FEC 26xx	MS/TP	1	7	CO OUT-4										
	CO OUT-5	AHU-5			FEC 26xx	MS/TP	1	7	CO OUT-5										
	CO OUT-6	AHU-5			FEC 26xx	MS/TP	1	7	CO OUT-6										
	CO OUT-7	AHU-5			FEC 26xx	MS/TP	1	7	CO OUT-7										
	AO OUT-8	AHU-5	CLG-O	Cooling Output	FEC 26xx	MS/TP	1	7	AO OUT-8										
	AO OUT-9	AHU-5	MAD-O	Mixed Air Damper Output	FEC 26xx	MS/TP	1	7	AO OUT-9										

# VAV System

## BILL OF MATERIALS

Designation	Qty	Part Number	Description
ZN-T	62	NS-BTN7001-0	NETWORK SENSOR
DA-T	62	TE-631GV-2	4 INCH NICKEL DUCT SENSOR
VAV	62	MS-VMA1620-0	BACNET MS/TP VAV CONTROLLER



**DISCHARGE AIR TEMP SENSOR:** A DISCHARGE AIR TEMP SENSOR IS PROVIDED ON EACH BOX FOR MONITORING PURPOSES.

**OCCUPIED MODE:** WHEN THE ZONE TEMPERATURE IS BETWEEN THE OCCUPIED HEATING AND COOLING SETPOINTS (INSIDE OF THE BIAS), THE PRIMARY AIR DAMPER WILL BE AT THE MINIMUM CFM AND THE REHEAT VALVE WILL BE FULLY CLOSED. ON A RISE IN ZONE TEMPERATURE ABOVE THE COOLING SETPOINT, THE PRIMARY AIR DAMPER WILL INCREASE THE CFM AND THE REHEAT VALVE REMAINS FULLY CLOSED. ON A DROP IN ZONE TEMPERATURE BELOW THE HEATING SETPOINT, THE FAN WILL CYCLE ON, THE REHEAT VALVE MODULATES OPEN AND THE DAMPER IS CONTROLLED TO PROVIDE A MINIMUM CFM.

**UNOCCUPIED (NIGHT SETBACK) MODE:** WHEN THE AIR HANDLING UNIT SHUTS DOWN, ALL OF THE FAN-POWERED BOX CONTROLLERS ARE INDEXED TO UNOCCUPIED MODE. WHEN THE ZONE TEMPERATURE IS BETWEEN THE UNOCCUPIED HEATING AND COOLING SETPOINTS (INSIDE OF THE BIAS), THE PRIMARY AIR DAMPER WILL BE AT THE MINIMUM CFM AND THE REHEAT VALVE WILL BE FULLY CLOSED. ON A RISE IN ZONE TEMPERATURE ABOVE THE UNOCCUPIED COOLING SETPOINT, THE PRIMARY AIR DAMPER WILL INCREASE THE CFM (IF AVAILABLE) AND THE REHEAT VALVE REMAINS FULLY CLOSED. ON A DROP IN ZONE TEMPERATURE BELOW THE UNOCCUPIED HEATING SETPOINT, THE FAN WILL CYCLE ON, THE REHEAT VALVE MODULATES OPEN AND THE DAMPER REMAINS FULLY CLOSED.

FOR BOX PARAMETERS AND SETTINGS SEE THE ROOM SCHEDULE

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Drawing Title									
VAV Flow Layout									
Project Title		Charlottesville Airport Controls Upgrade		Branch Information		2315 Commerce Center Dr Suite D Rockville VA 23146		CONTRACT NUMBER 1-2744395808	
Sales Engineer		Project Manager		Application Engineer		DATE		DATE	
BY		DATE		BY		DATE		DRAWING NUMBER VAV-1	



Electrician/Fitter		Point Information			Controller Information						Panel Information					Intermediate Device			
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device
					VMA 1620														
					VMA 1620	MS/TP	1	10							0				
UI IN-1	VAV-00	DA-T	Discharge Air Temperature		VMA 1620	MS/TP	1	10	UI IN-1						0	-10-UI IN-1			
BO OUT-1	VAV-00	HTG-O	Heating Output		VMA 1620	MS/TP	1	10	BO OUT-1						0	-10-BO OUT-1			
BO OUT-2	VAV-00	HTG-O	Heating Output		VMA 1620	MS/TP	1	10	BO OUT-2						0	-10-BO OUT-2			
BO OUT-3	VAV-00	SF-C	Supply Fan Command		VMA 1620	MS/TP	1	10	BO OUT-3						0	-10-BO OUT-3			
CO OUT-4	VAV-00				VMA 1620	MS/TP	1	10	CO OUT-4						0	-10-CO OUT-4			
CO OUT-5	VAV-00				VMA 1620	MS/TP	1	10	CO OUT-5						0	-10-CO OUT-5			
					VAV-00														
					NET STAT														
					NET STAT	SA Bus	1	199							0				
STAT	VAV-00	ZN-T	Zone Temperature		NET STAT	SA Bus	1	199	STAT						0	10--199-STAT			



Room Schedule

Box Location								Controller Information					Box Information							Comments	Generate Flag			
Room		System Name	Mech. Dwg.	System Serving this Box	Box Mfr.	Mfr Box Type	JCI Ctrl Dwg No.	Controller Required				CSModel or Template	Box Heat	Supplemental Heat	Box Config Required							Required (N2)		
Bldg./Flr.	No.							Name	Controller Part No.	NC/NAE Addr	Trunk ID				Device Addr	Config File Name	Inlet Size (Inches)	Inlet Area (Sq. Ft.)	K Factor			Clg Min Flow	Clg Max Flow	VMA Box Config
									1	1	10													
									1	1	11													
									1	1	12													
									1	1	13													
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									1	2	19													
									1	2	20													
									1	2	21													

Room Schedule

Box Location								Controller Information					Box Information								Generate Flag		
Room		System Name	Mech. Dwg.	System Serving this Box	Box Mfgr.	Mfgr Box Type	JCI Ctrl Dwg No.	Controller Required				Box Heat	Supplemental Heat	Box Config Required					Required (N2)	Comments			
Bldg./Flr.	No.							Name	Controller Part No.	NC/NAE Addr	Trunk ID			Device Addr	CSModel or Template	Config File Name	Inlet Size (Inches)	Inlet Area (Sq. Ft.)	K Factor			Clg Min Flow	Clg Max Flow
										1	2	22											
										1	2	23											
										1	2	24											
										1	2	25											
										1	2	26											
										1	2	27											
										1	2	28											
										1	2	29											
										1	2	30											
										1	2	31											
										1	2	32											