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HVAC CONTROLS SYMBOLS	
SYMBOL	DESCRIPTION
ELECTRONIC CONTROLS	
	DDC CONTROL POINTS
	TRANSFORMER
	RELAY
	VARIABLE FREQUENCY DRIVE
	STARTER
	CURRENT TRANSDUCER
	PUMP
	FAN
AIR SIDE CONTROLS	
	HARDWIRE THERMOSTAT
	SPACE TEMPERATURE SENSOR
	SPACE HUMIDITY SENSOR
	DUCT MOUNTED TEMPERATURE SENSOR
	DUCT MOUNTED HUMIDITY SENSOR
	DUCT MOUNTED TEMPERATURE / HUMIDITY SENSOR
	DUCT MOUNTED DEW-POINT SENSOR
	DUCT MOUNTED AVERAGING TEMPERATURE SENSOR
	DUCT MOUNTED FREEZESTAT
	DIFFERENTIAL PRESSURE SENSOR
	DIFFERENTIAL PRESSURE SWITCH
	AIR FLOW MEASURING STATION / PROBE
	END SWITCH OR CONDENSATE FLOAT SWITCH
	DUCT MOUNTED SMOKE DETECTOR
	OCCUPANCY SENSOR
	OVERRIDE SWITCH
	EMERGENCY POWER OFF SWITCH (E-STOP)
	MANUAL MOTOR STARTER, FRACTIONAL HORSEPOWER (SEE STARTER SCHEDULE FOR SIZE, ETC.)
	DEVICE HARDWIRED CONNECTION FOR SHUTDOWN
	NETWORK POINT AND COMMUNICATION TYPE FOR BAS (BACnet, MODBUS, LON, ETC.)
HYDRONIC CONTROLS	
	CONTROL VALVE N.C. = NORMALLY CLOSED N.O. = NORMALLY OPEN
	3-WAY CONTROL VALVE
	FLOW METER, INDICATE RATE
	BTU UNIT METER, INDICATE RATE
	PIPE TEMPERATURE SENSOR
	PIPE PRESSURE SENSOR
	PIPE FLOW SWITCH
	PIPE DIFFERENTIAL PRESSURE SENSOR

FAN SCHEDULE															
MARK	SERVICE	TYPE	MANUFACTURER / MODEL	AIR FLOW (CFM)	ESP (IN WG)	EC MOTOR (Y or N)	DRIVE TYPE	SPEED (RPM)	BRAKE MOTOR (HP)	NOMINAL MOTOR (HP)	MAX. SOUND (SONES)	DAMPER TYPE	VOLTAGE/ PHASE	STARTER/ DISCONNECT MEANS	NOTES
EF-1	PREP 2224A	DOWNBLAST DOME	GREENHECK / G-080-D	175	0.50	YES	DIRECT	1496	0.05	0.10	7.3	MOTOR-OPERATED	120/1	MRS	1,2,3
EF-2	JANITOR	DOWNBLAST DOME	GREENHECK / G-097-B	100	0.50	YES	DIRECT	1044	0.05	0.10	3.9	MOTOR-OPERATED	120/1	MRS	1,2,3

- NOTES:
- REFER TO SECTION 233400 FOR ADDITIONAL REQUIREMENTS.
 - PROVIDE STARTING AND DISCONNECTING MEANS AS SCHEDULED. (MRS = MOTOR RATED SWITCH; M/S/D = COMBINATION MOTOR-STARTER AND DISCONNECT; VFD = VARIABLE FREQUENCY DRIVE; AND DISC = DISCONNECT)
 - PROVIDE FACTORY-FABRICATED ROOF CURB. COORDINATE EXACT LOCATION OF ROOF OPENINGS AND STRUCTURAL SUPPORT.

AIR DISTRIBUTION SCHEDULE												
MARK	SERVICE	TYPE	MANUFACTURER / SERIES	MATERIAL	COLOR	PATTERN	MAX. AIR FLOW (CFM)	FACE SIZE (IN x IN)	NECK SIZE (IN x IN)	APD (IN WG)	MAX. SOUND (NC)	NOTES
S1	SUPPLY	SQUARE LOUVER FACE	TITUS TMSA	STEEL	WHITE	360-DEG.	100	24 x 24	6	0.08	25	1,2,3,4,5
							200		8	0.08		1,2,3,4,5
							325		10	0.10		1,2,3,4,5
							500		12	0.10		1,2,3,4,5
							675		14	0.10		1,2,3,4,5
S2	SUPPLY	ROUND LOUVERED FACE	TITUS TMRA	ALUMINUM	WHITE	360-DEG.	100	18	6	0.08	20	1,2,3,4,5
							200	24	8	0.08		1,2,3,4,5
							300	29	10	0.08		1,2,3,4,5
							425	35	12	0.08		1,2,3,4,5
							575	41	14	0.08		1,2,3,4,5
R1 / E1	RETURN/EXHAUST	SQUARE PERFORATED FACE	TITUS PAR	STEEL	WHITE	N/A	200	24 x 24	8	0.10	25	1,2,3,4,5
							325	24 x 24	10	0.10		1,2,3,4,5
							450	24 x 24	12	0.10		1,2,3,4,5
							600	24 x 24	14	0.10		1,2,3,4,5
							800	24 x 12	22 x 10	0.10		1,2,3,4,5
R2 / E2	RETURN/EXHAUST	STANDARD BLADE GRILLE	TITUS 350RL	STEEL	WHITE	N/A	1,300	24 x 24	22 x 22	0.10		1,2,3,4,5
							200	12 x 8	10 x 6	0.10	25	1,2,3,4,5
							350	16 x 8	14 x 6	0.10		1,2,3,4,5
							500	16 x 10	16 x 8	0.10		1,2,3,4,5

- NOTES:
- REFER TO SECTION 233713 FOR ADDITIONAL REQUIREMENTS.
 - SOUND LEVELS SHALL BE BASED ON ASHRAE 70.
 - VERIFY MOUNTING FRAME STYLE WITH ARCHITECTURAL REFLECTED CEILING PLANS, FINISH SCHEDULES AND EXISTING CEILINGS.
 - DUCT BRANCH FROM MAIN TAKEOFF TO AIR INLET / OUTLET SHALL MATCH SCHEDULED NECK SIZE UNLESS OTHERWISE NOTED.
 - PROVIDE INTEGRAL DAMPERS ADJUSTABLE AT THE DEVICE FACE ONLY AT LOCATIONS NOTED ON PLANS.

TERMINAL UNIT SCHEDULE

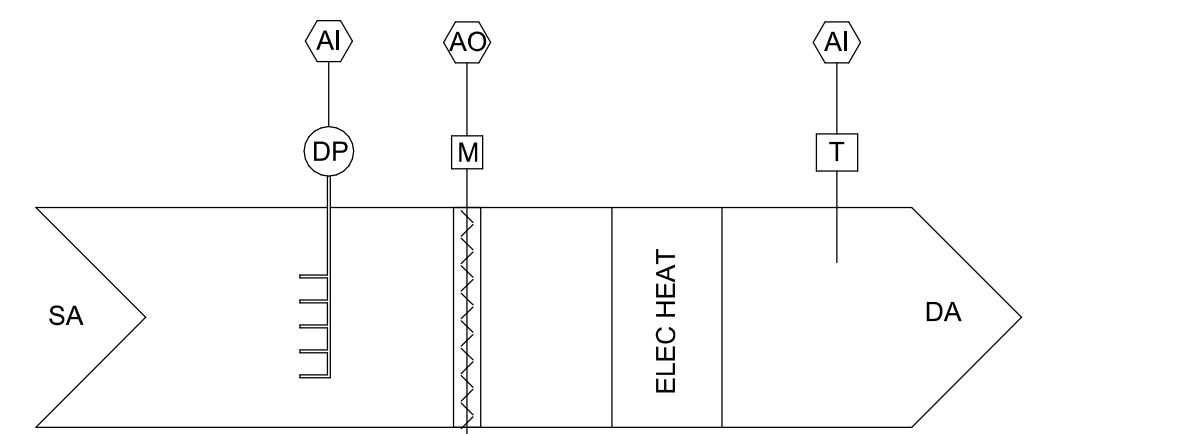
ROOM	PHASE	MARK	SOURCE	TYPE	MANUFACTURER / MODEL	MAX. DISC. SOUND (NC)	MAX. RADIATED SOUND (NC)	PRIMARY AIR VALVE			FAN			HEATING COIL			ELECTRIC			NOTES			
								INLET SIZE (INCHES)	MAX. CLG. AIRFLOW (CFM)	MIN. CLG. AIRFLOW (CFM)	HEATING AIRFLOW (CFM)	ESP (IN WG)	MOTOR SIZE (HP)	VOLTAGE/ PHASE	AIR COIL FLOW (CFM)	EAT (F)	LAT (F)	MAX. APD (IN WG)	MIN. CAP. (KW)		DESIGN (KW)	VOLTAGE/ PHASE	
CYBER LAB - 2221	2A	TU-7-1A	AHU-7	PARALLEL FAN-POWERED	TITUS / DTOP	27	40	12	1,500	450	450	1,050	1.5	1.0	480/3	1,500	66	85	0.50	9.3	10.0	480/3	1,2,3,4,5,6,7,8,10
CYBER LAB - 2221	2A	TU-7-1B	AHU-7	PARALLEL FAN-POWERED	TITUS / DTOP	27	40	12	1,500	450	450	1,050	1.5	1.0	480/3	1,500	66	85	0.50	9.3	10.0	480/3	1,2,3,4,5,6,7,8,10
CORRIDOR - 226	2A	TU-7-2	AHU-7	PARALLEL FAN-POWERED	TITUS / DTOP	28	40	10	1,500	300	300	1,200	1.5	1.0	480/3	1,500	66	85	0.50	9.3	10.0	480/3	1,2,3,4,5,6,7,8,10
CORRIDOR - 226	2A	TU-7-3	AHU-7	SINGLE-DUCT	TITUS / DESV	35	33	6	450	135	135	N/A	N/A	N/A	N/A	135	55	95	0.50	1.7	2.0	277/1	1,2,3,4,5,6,7,8,9
TOILET ROOMS - 2233 & 2243	2A	TU-7-4	AHU-7	SINGLE-DUCT	TITUS / DESV	31	24	8	600	180	180	N/A	N/A	N/A	N/A	180	55	95	0.50	2.3	2.5	277/1	1,2,3,4,5,6,7,8,9
ADDITIONAL	2A	TU-7-5	AHU-7	SINGLE-DUCT	TITUS / DESV	31	24	8	600	180	180	N/A	N/A	N/A	N/A	180	55	95	0.50	2.3	2.5	277/1	1,2,3,4,5,6,7,8,9
COMPUTER LAB - 2126	2A	TU-7-22	AHU-7	PARALLEL FAN-POWERED	TITUS / DTOP	29	42	12	1,800	540	540	1,200	1.5	1.0	480/3	1,800	66	85	0.50	11.2	12.0	480/3	1,2,3,4,5,6,7,8,10
GENERAL LAB1 - 2254	2A	TU-8-2	AHU-8	PARALLEL FAN-POWERED	TITUS / DTOP	28	41	12	1,600	480	480	1,120	1.5	1.0	480/3	1,600	66	85	0.50	9.9	10.0	480/3	1,2,3,4,5,6,7,8,10
ENTRY LOBBY - 2213	2A	TU-8-4	AHU-8	SINGLE-DUCT	TITUS / DESV	32	28	8	800	240	240	N/A	N/A	N/A	N/A	240	55	95	0.50	3.1	3.5	277/1	1,2,3,4,5,6,7,8,9

- NOTES:
- REFER TO SECTION 233600 FOR ADDITIONAL REQUIREMENTS.
 - SOUND LEVELS SHALL BE BASED ON ASHRAE 130, AHRI 880 AND AHRI 885.
 - SUPPLY AIR BRANCH DUCTS FROM MAIN TO TERMINAL UNIT INLETS AND DISCHARGE DUCT SIZES SHALL MATCH UNIT CONNECTION SIZES UNLESS OTHERWISE NOTED.
 - COORDINATE CONTROL POWER TRANSFORMER INPUT VOLTAGE WITH THE LINE VOLTAGE PROVISIONS.
 - PROVIDE SINGLE POINT CONNECTION AND FUSED DISCONNECT SWITCH FOR EACH TERMINAL UNIT WITH AN ELECTRIC REHEAT COIL.
 - PROVIDE SOR CONTROLLER FOR ELECTRIC HEATING COILS. COIL CAPACITIES SHALL BE NO LESS THAN MINIMUM AND NO MORE THAN THE ELECTRICAL DESIGN BASIS SCHEDULED.
 - COORDINATE UNBALANCED ELECTRICAL CONNECTION ACROSS PHASES WITH E.C. SO THAT EACH PHASE ON EACH PANEL IS DISTRIBUTED EQUALLY.
 - FOR UNITS WITH ELECTRIC REHEAT, CONTRACTOR SHALL ADJUST HEATING MINIMUM AIR FLOWS AS REQUIRED TO ENSURE PROPER OPERATION OF ELECTRIC HEAT.
 - SOUND LEVELS FOR SINGLE-DUCT UNITS ARE BASED ON 0.5-INCHES WG ACROSS UNIT INLET AND OUTLET.
 - SOUND LEVELS FOR PARALLEL FAN-POWERED UNITS ARE BASED ON FAN ONLY OPERATION.

DUCTLESS MINI-SPLIT UNIT SCHEDULE

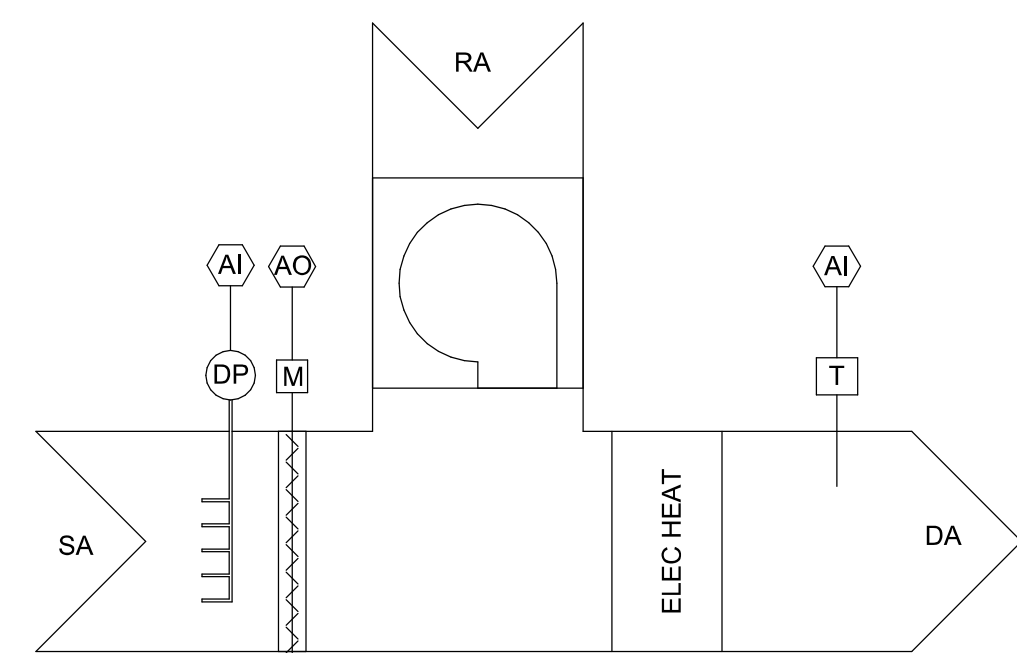
MARK (INDOOR UNIT)	MARK (OUTDOOR UNIT)	SERVICE	TYPE	MANUFACTURER / MODEL	REFRIG. TYPE	SUPPLY AIR FLOW (CFM)	COOLING TOT. CAP. (MBH)	SEER/EEER (BTU/WH)	AMB. (°F)	MAX. SOUND (dBA)	ELECTRICAL - INDOOR UNIT			ELECTRICAL - OUTDOOR UNIT			MAX. EQUIV. PIPE LENGTHS		DIMENSIONS AND WEIGHT - OUTDOOR		NOTES			
											MCA (A)	FLA (A)	VOLTAGE/ PHASE	MCA (A)	MOCP (A)	VOLTAGE/ PHASE	HEIGHT (FT)	LENGTH (FT)	FOOTPRINT (IN X IN)	HEIGHT (IN)		WEIGHT (LBS)		
DMSS-1	CU-1	SERVER ROOM	WALL MTD / COOLING ONLY	MTSUBISHI / MSY-GS24NA & MUY-GS24NA	R410A	424	22,400	16,800	20.5 / 12.6	95	47	53	1.0	0.50	208/1	18.0	20	208/1	50	100	34 X 13	35	118	1,2,3,4,5,6,7,8,9
DMSS-2	CU-2	SERVER ROOM	WALL MTD / COOLING ONLY	MTSUBISHI / MSY-GS24NA & MUY-GS24NA	R410A	424	22,400	16,800	20.5 / 12.6	95	47	53	1.0	0.50	208/1	18.0	20	208/1	50	100	34 X 13	35	118	1,2,3,4,5,6,7,8,9
DMSS-3	CU-3	CYBER LAB	CLG CASSETTE / COOLING ONLY	MTSUBISHI / SLZ-KF18NA & SUZ-KA18NAHZ	R410A	475	16,800	12,096	19 / 12.5	95	43	55	0.54	0.43	208/1	17.0	31	208/1	50	100	34 X 13	35	131	1,2,3,4,5,6,7,8,9,10
DMSS-4	CU-3	CYBER LAB	CLG CASSETTE / COOLING ONLY	MTSUBISHI / SLZ-KF18NA & SUZ-KA18NAHZ	R410A	475	16,800	12,096	19 / 12.5	95	43	55	0.54	0.43	208/1	17.0	31	208/1	50	100	34 X 13	35	131	1,2,3,4,5,6,7,8,9,10
DMSS-5	CU-4	CYBER LAB	CLG CASSETTE / COOLING ONLY	MTSUBISHI / SLZ-KF18NA & SUZ-KA18NAHZ	R410A	475	16,800	12,096	19 / 12.5	95	43	55	0.54	0.43	208/1	17.0	31	208/1	50	100	34 X 13	35	131	1,2,3,4,5,6,7,8,9,10
DMSS-6	CU-4	CYBER LAB	CLG CASSETTE / COOLING ONLY	MTSUBISHI / SLZ-KF18NA & SUZ-KA18NAHZ	R410A	475	16,800	12,096	19 / 12.5	95	43	55	0.54	0.43	208/1	17.0	31	208/1	50	100	34 X 13	35	131	1,2,3,4,5,6,7,8,9,10

- NOTES:
- REFER TO SECTION 238116 FOR ADDITIONAL REQUIREMENTS.
 - SOUND PERFORMANCE IS BASED ON SOUND PRESSURE LEVELS MEASURED AT 3 FEET FROM UNIT AT FULL CAPACITY IN ACCORDANCE WITH AHRI 270 AND 350.
 - ALL UNITS SHALL MEET OR EXCEED SEASONAL ENERGY EFFICIENCY RATIO (SEER) FOR NOMINAL COOLING SIZES LESS THAN 65,000 BTUH AND ENERGY EFFICIENCY RATIO (EER) FOR SIZES GREATER THAN OR EQUAL TO 65,000 BTUH.
 - SIZE REFRIGERANT PIPING PER MANUFACTURER'S RECOMMENDATIONS.
 - PROVIDE SINGLE-POINT POWER CONNECTION. PROVIDE FUSED-DISCONNECT SWITCH FOR OUTDOOR UNIT. PROVIDE MOTOR-RATED DISCONNECT SWITCH FOR INDOOR UNIT.
 - PROVIDE POWER CONNECTS AT EACH INDOOR AND OUTDOOR UNIT WHERE MULTIPLE INDOOR UNITS ARE FED BY A SINGLE CONDENSING UNIT.
 - PROVIDE LOW AMBIENT TEMPERATURE OPTION.
 - PROVIDE WIRED THERMOSTAT / TEMPERATURE SENSOR AS INDICATED. WIRELESS REMOTE CONTROLS ARE NOT ACCEPTABLE.
 - PROVIDE OPTIONAL CONDENSATE DRAIN PUMP WITH 3-FT LIFT AND INTEGRAL POWER CONNECTION.
 - ALTERNATE 3: REFER TO SECTION 012300 FOR MORE INFORMATION. ALTERNATE INCLUDES INDOOR/OUTDOOR UNITS, REFRIGERANT PIPING, CONDENSATE PIPING AND ELECTRICAL POWER.



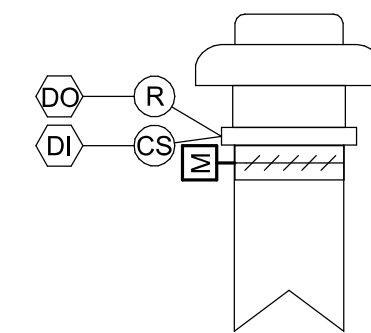
1 SINGLE DUCT AIR TEMINAL UNIT

Scale: N.T.S.



2 FAN-POWERED AIR TERMINAL UNIT

Scale: N.T.S.



3 EXHAUST FAN

Scale: 1/8" = 1'-0"

PREP. ROOM/STOR. ROOM EXHAUST FAN:
EXHAUST FAN SHALL BE HARDWIRED TO RUN CONTINUOUSLY ON AN OCCUPIED SCHEDULE.

DAMPER SHALL BE INTERLOCKED TO THE START/STOP OF THE EXHAUST FAN. BAS SHALL MONITOR STATUS. ALARM ON FAN FAILURE.

TERMINAL UNIT CONTROL

OPERATIONAL MODES: SWITCH TO OCCUPIED, UNOCCUPIED, PRE-OCCUPIED, OR SHUTDOWN MODE BASED ON SIGNAL FROM ASSOCIATED AHU, INCLUDING OVERRIDE COMMANDS.

AHU TEMPERATURE CONTROL MODES: SWITCH TO AHU COOLING OR AHU HEATING MODES BASED ON SIGNAL FROM ASSOCIATED AHU.

SINGLE DUCT VAV BOX WITH REHEAT CONTROL

OPERATIONAL MODES: SWITCH TO OPERATIONAL MODE BASED ON ASSOCIATED AHU STATUS. WHEN AHU IS OFF, OPEN PRIMARY AIR VALVE AND DE-ENERGIZE HEATING COIL.

PRIMARY AIR DAMPER CONTROL:

ZONE COOLING MODE: MODULATE PRIMARY AIR DAMPER BETWEEN MINIMUM AND MAXIMUM COOLING AIR FLOW SET POINTS AS MEASURED BY THE FLOW RING TO MAINTAIN ZONE TEMPERATURE COOLING SET POINT.

ZONE HEATING MODE: MODULATE PRIMARY AIR DAMPER TO MAINTAIN HEATING AIR FLOW SET POINT AS MEASURED BY THE FLOW RING.

ELECTRIC RESISTANCE COIL CONTROL:

ZONE COOLING MODE: HEATING COIL SHALL BE DE-ENERGIZED.

ZONE HEATING MODE: UPON PROOF OF AIR FLOW, HEATING COIL CONTROLLER SHALL ENERGIZE TO MAINTAIN ZONE TEMPERATURE HEATING SET POINT.

PARALLEL FAN-POWERED VAV BOX CONTROL

OPERATIONAL MODES: SWITCH TO OCCUPIED MODE BASED ON ASSOCIATED AHU STATUS. WHEN ASSOCIATED AHU IS OFF, OPEN TERMINAL UNITS PRIMARY AIR VALVE, DE-ENERGIZE HEATING COIL, AND STOP FAN. CYCLE THE TERMINAL UNIT FAN ON / OFF AND MODULATE OR ENERGIZE HEATING COIL TO MAINTAIN UNOCCUPIED ZONE TEMPERATURE HEATING SET POINT.

PRIMARY AIR DAMPER CONTROL: