SEQUENCE OF OPERATION - HEATING ONLY :

SUMMER AND WINTER MODE CONTROL IS DETERMINED BY THE LOCAL UNIT CONTROLLER AT THE UNIT. THE UNIT CONTROLLER WILL DETERMINE THE HEATING/COOLING MODE OF THE SPACE. PRODUCTION MODE HEATING SPACE TEMPERATURE SETPOINT (65 DEG. F, ADJUSTABLE) AND NON-PRODUCTION MODE HEATING SPACE TEMPERATURE SETPOINT SHALL BE 60 DEG. F (ADJUSTABLE).

SPACE CONDITION MONITORING:
THE SPACE TEMPERATURE IS MONITORED USING SPACE THERMOSTAT.

OPTIMAL START/WARMUP/COOLDOWN:
LOCAL CONTROLLER IS NEEDED TO TRACK THE TIME REQUIRED TO BRING THE SPACE TO PRODUCTION MODE TEMPERATURE SETPOINT BASED UPON THE OUTDOOR AIR TEMPERATURE, AND WILL USE THIS INFORMATION TO DETERMINE THE LENGTH OF TIME BEFORE SCHEDULED PRODUCTION MODE THAT THE UNIT NEEDS TO WARMUP THE SPACE. DURING WARMUP MODE, THE UNIT SHALL OPERATE WITH DISCHARGE AIR TEMPERATURE SETPOINT AT ITS UPPER SETPOINT LIMIT.

SUPPLY FAN:
WHEN THE UNIT IS COMMANDED TO START, THE OUTSIDE AIR DAMPER WILL BE OPENED FIRST AND FOLLOWING PROOF OF DAMPER OPEN POSITION, THE SUPPLY FAN WILL START, RAMP UP TO OPERATING SPEED, AND OPERATE CONTINUOUSLY. THE UNIT SHALL OPERATE CONTINUOUSLY DURING PRODUCTION MODE AND NON-PRODUCTION MODE. IF THE SUPPLY FAN FAILS TO PROVE ON STATUS FOR 30 SECONDS (ADJ.), AN ALARM WILL BE ANNUNCIATED. SUPPLY FAN OPERATING SPEED SHALL BE SET FOR THE DESIGN UNIT FLOW RATE.

OUTSIDE AIR / RETURN AIR DAMPERS:
RETURN AIR IS NOT USED DURING SUMMER MODE. OUTSIDE AIR DAMPER IS FULLY OPENED WHEN SUPPLY FAN IS CALLED TO OPERATE, AND OUTSIDE AIR DAMPER IS FULLY CLOSED WHEN SUPPLY FAN IS STOPPED. THE RETURN AIR DAMPER SHALL ALWAYS BE IN THE OPPOSITE POSITION AS THE OUTSIDE AIR DAMPER.

RETURN AIR DAMPER SHALL BE USED DURING WINTER MODE AND ADJUST DAMPERS TO PROVIDE AIRFLOWS PER MECHANICAL SCHEDULE.

DISCHARGE AIR TEMPERATURE RESET:
AS THE SPACE TEMPERATURE DROPS BELOW THE SPACE HEATING SETPOINT, THE DISCHARGE AIR TEMPERATURE SETPOINT SHALL REMAIN AT THE UPPER SETPOINT LIMIT (90 DEGREES F, ADJUSTABLE). AS SPACE TEMPERATURE RISES ABOVE THE SPACE HEATING SETPOINT, THE DISCHARGE AIR TEMPERATURE SETPOINT SHALL BE RESET PROPORTIONALLY BETWEEN ITS UPPER SETPOINT LIMIT AND LOWER SETPOINT LIMITS (55 DEGREES F, ADJUSTABLE) BASED UPON THE SPACE TEMPERATURE.

GAS-FIRED HEATING:
THE GAS-FIRED HEATING EQUIPMENT SHALL BE PROVIDED WITH MANUFACTURER CONTROLS AND SAFETY DEVICES. WHEN UNIT IS IN HEATING MODE AND THE SUPPLY FAN OPERATING STATUS IS PROVEN, THE GAS-FIRED HEATING SHALL BE MODULATED THROUGH ITS MANUFACTURER CONTROLS TO MAINTAIN THE FINAL DISCHARGE AIR TEMPERATURE SETPOINT.

FILTER STATUS:
A DIFFERENTIAL PRESSURE SWITCH WILL MONITOR THE DIFFERENTIAL PRESSURE ACROSS EACH FILTER WHEN THE FAN IS RUNNING. IF THE SWITCH CLOSES DURING NORMAL OPERATION, A DIRTY FILTER ALARM WILL BE ANNUNCIATED.

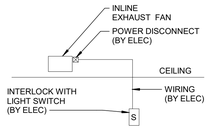
SHUTDOWN CONDITIONS:
WHEN SUPPLY FAN IS STOPPED, THE UNIT COMPONENTS SHALL MAINTAIN THESE CONDITIONS UNTIL THE UNIT IS RE-STARTED. OUTSIDE AIR DAMPER IS CLOSED, HEATING IS DISABLED, ASSOCIATED EXHAUST FANS ARE STOPPED.

ALARMS:
AN ALARM WILL BE ANNUNCIATED FOR THE FOLLOWING CONDITIONS:
FAN FAILURE IF THE SUPPLY FAILS TO OPERATE WHEN COMMANDED TO START. DAMPER FAILURE IF THE OUTSIDE AIR DAMPER FAILS TO FOLLOW COMMAND TO OPEN OR CLOSE. SENSOR FAILURE FOR ALL ANALOG INPUTS. HIGH OR LOW ALARM LIMITS FOR ALL ANALOG INPUTS. FAILURE ALARMS FOR HEATING EQUIPMENT, INCLUDING FLAME FAILURE ALARM, AND TROUBLE ALARMS FOR VARIABLE FREQUENCY DRIVES.

EXHAUST FANS:
EXHAUST FANS SHALL OPERATE CONTINUOUSLY WHEN ASSOCIATED HV SUPPLY FAN SERVING SAME AREA IS OPERATING. EXACT COUNT AND NECESSARY TAGS WILL BE PROVIDED IN THE DETAILED DESIGN

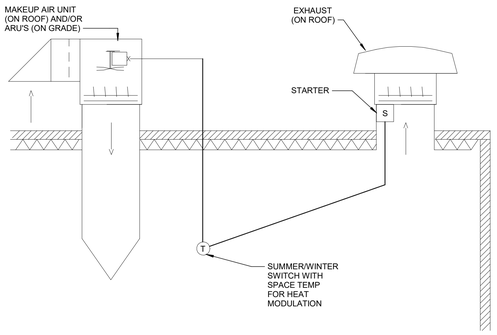
1 TYP. SEQUENCE OF OPERATIONS FOR ARU-1, ARU-2, RTU-1 THRU RTU-4

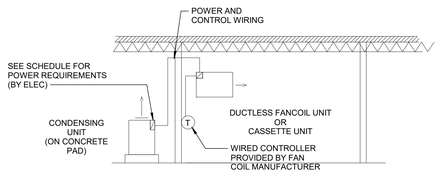
SCALE: NOT TO SCALE



3 TYP. CONTROL WIRING DIAGRAM - TOILET EXHAUST FAN

SCALE: NOT TO SCALE



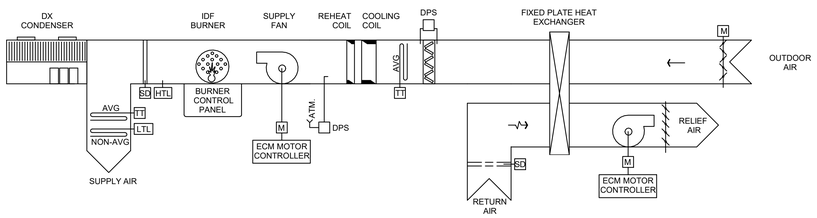


4 TYP. CONTROL WIRING DIAGRAM - SPLIT SYSTEM

SCALE: NOT TO SCALE

5 TYP. CONTROL WIRING DIAGRAM - MAKEUP AIR UNIT VENTILATION

SCALE: NOT TO SCALE



DAY OPERATING MODE OR OCCUPIED CYCLE
WHILE SCHEDULED IN OCCUPIED MODE, THE OA DAMPER SHALL FULLY OPEN AND THE SUPPLY FAN SHALL RUN CONTINUOUS AS SET BY THE VFD TO MAINTAIN REQUIRED DESIGN AIRFLOW. UNIT SHALL BE SET TO HEATING MODE OR COOLING MODE BASED ON THE OUTSIDE AIR TEMP COMPARED TO HEATING (65°F, ADJ) AND COOLING SETPOINTS (75°F, ADJ). UNIT SHALL MAINTAIN A CONSTANT DISCHARGE AIR TEMPERATURE, WHICH IS RESET HIGHER AND LOWER BASED ON THE SPACE TEMPERATURE COMPARED TO THE SPACE TEMPERATURE SETPOINT OF THE MEN'S LOCKER ROOM (72ºF, ADJ)

COOLING MODE
WHEN OA TEMP RISES ABOVE COOLING SETPOINT, THE UNIT SHALL SWITCH TO COOLING MODE. THE UNIT SHALL REMAIN IN COOLING MODE UNTIL THE OATEMP FALLS BELOW HEATING SETPOINT. WHILE IN COOLING MODE, THE UNIT SHALL USE MECHANICAL COOLING TO CONTROL THE DISCHARGE TEMPERATURE.

MECHANICAL COOLING SHALL BE ENABLED WHEN THE OUTSIDE AIR TEMP IS ABOVE THE MECHANICAL COOLING LOCKOUT SETPOINT (60ºF, ADJ). WHILE MECHANICAL COOLING IS ENABLED, THE UNIT SHALL BE CAPABLE OF STAGING AND CYCLING COMPRESSORS TO MEET THE DISCHARGE TEMP SETPOINT.

HEATING MODE
WHEN OA TEMP FALLS BELOW HEATING SETPOINT, THE UNIT SHALL SWITCH TO HEATING MODE. THE UNIT SHALL REMAIN IN HEATING MODE UNTIL THE ZONE TEMP RISES ABOVE COOLING SETPOINT. WHILE IN HEATING MODE, THE UNIT SHALL USE MODULATING GAS HEAT TO CONTROL THE DISCHARGE TEMP TO MAINTAIN THE SPACE SETPOINT.

MODULATING GAS HEATING SHALL BE ENABLED WHEN THE OUTSIDE AIR TEMP IS BELOW THE GAS HEATING LOCKOUT SETPOINT (55ºF, ADJ). WHILE GAS HEATING IS ENABLED, THE UNIT SHALL BE CAPABLE OF ENABLING THE GAS BURNER AND MODULATING THE GAS VALVE TO MEET THE DISCHARGE TEMP SETPOINT.

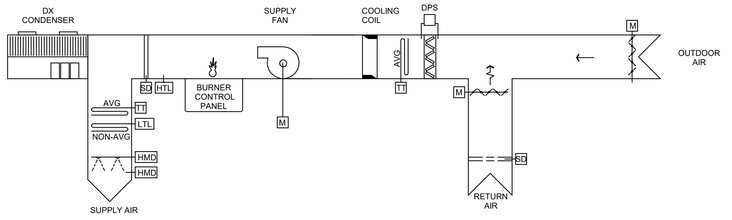
BUILDING PRESSURIZATION
DOAS SHALL MONITOR THE STATIC PRESSURE IN THE SPACE WHEN COMPARED TO THE AMBIENT PRESSURE. THE UNIT SHALL MODULATE THE EXHAUST RELIEF FAN TO MAINTAIN THE BUILDING STATIC PRESSURE SETPOINT (0.05 INWC, ADJ).

NIGHT OPERATING MODE OR UNOCCUPIED CYCLE
WHILE SCHEDULED IN UNOCCUPIED MODE, THE OA DAMPER SHALL CLOSE AND THE SUPPLY FAN SHALL SHUT OFF.

ALARM MONITORING
ANY UNIT ALARM WHICH IS GENERATED BY THE FACTORY INSTALLED CONTROLLER SHALL GENERATE AND ALARM IN THE BMS SYSTEM FOR CONNECTED UNITS.

7 TYP. CONTROL DIAGRAM FOR DOA-01

SCALE: NOT TO SCALE



DAY OPERATING MODE OR OCCUPIED CYCLE
WHILE SCHEDULED IN OCCUPIED MODE, THE OA DAMPER SET TO MINIMUM SETPOINT (ADJ) AND THE SUPPLY FAN SHALL RUN CONTINUOUS TO MAINTAIN REQUIRED DESIGN AIRFLOW WHEN THE UNIT IS IN COOLING MODE. UNIT SHALL RUN IN COOLING MODE OR SHUT DOWN BASED ON THE OUTSIDE AIR TEMP CPOMPARED TO COOLING SETPOINT (75F, ADJ). UNIT SHALL MAINTAIN A CONSTANT DISCHARGE AIR TEMPERATURE

COOLING MODE
WHEN OA TEMP RISES ABOVE COOLING SETPOINT, THE UNIT SHALL SWITCH TO COOLING MODE. THE UNIT SHALL REMAIN IN COOLING MODE UNTIL THE OA TEMP FALLS 4ºF BELOW COOLING SETPOINT. WHILE IN COOLING MODE, THE UNIT SHALL USE MECHANICAL COOLING TO CONTROL THE DISCHARGE TEMPERATURE.

MECHANICAL COOLING SHALL BE ENABLED WHEN THE OUTSIDE AIR TEMP IS ABOVE THE MECHANICAL COOLING LOCKOUT SETPOINT (60ºF, ADJ). WHILE MECHANICAL COOLING IS ENABLED, THE UNIT SHALL BE CAPABLE OF MEETING THE DISCHARGE TEMP SETPOINT.

HEATING MODE
WHEN SPACE TEMP FALLS BELOW HEATING SETPOINT, THE UNIT SHALL SWITCH TO HEATING MODE. THE UNIT SHALL REMAIN IN HEATING MODE UNTIL THE SPACE TEMP RISES ABOVE HEATING SETPOINT. WHILE IN HEATING MODE, THE UNIT SHALL USE MODULATING GAS HEAT TO CONTROL THE DISCHARGE TEMP TO MAINTAIN THE SPACE SETPOINT.

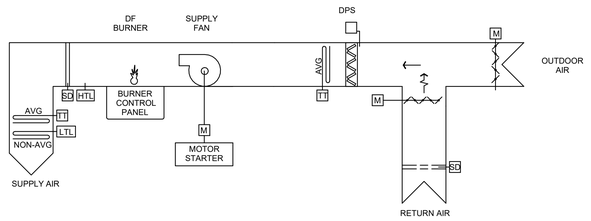
MODULATING GAS HEATING SHALL BE ENABLED WHEN THE OUTSIDE AIR TEMP IS BELOW THE GAS HEATING LOCKOUT SETPOINT (55ºF, ADJ). WHILE GAS HEATING IS ENABLED, THE UNIT SHALL BE CAPABLE OF ENABLING THE GAS BURNER AND MODULATING THE GAS VALVE TO MEET THE DISCHARGE TEMP SETPOINT.

NIGHT OPERATING MODE OR UNOCCUPIED CYCLE
WHILE SCHEDULED IN UNOCCUPIED MODE, THE OA DAMPER SHALL CLOSE AND THE SUPPLY FAN SHALL SHUT OFF.

ALARM MONITORING
ANY UNIT ALARM WHICH IS GENERATED BY THE FACTORY INSTALLED CONTROLLER SHALL GENERATE AND ALARM AT THE UNIT.

2 TYP. CONTROL DIAGRAM TYPICAL FOR AHU-1

SCALE: NOT TO SCALE



DAY OPERATING MODE OR OCCUPIED CYCLE
WHILE SCHEDULED IN OCCUPIED MODE, THE OA DAMPER SHALL OPEN PER SCHEDULED CFM AND THE SUPPLY FAN SHALL RUN CONTINUOUS TO MAINTAIN REQUIRED DESIGN AIRFLOW. UNIT SHALL BE SET TO HEATING MODE OR VENTILATION MODE BASED ON THE SPACE AIR TEMP COMPARED TO HEATING (65ºF, ADJ) SETPOINT. UNIT SHALL MAINTAIN A CONSTANT DISCHARGE AIR TEMPERATURE WHEN IN HEATING MODE.

VENTILATION MODE
WHEN SPACE TEMP RISES ABOVE HEATING SETPOINT, THE UNIT SHALL SWITCH TO VENTILATION MODE. THE UNIT SHALL REMAIN IN VENTILATION MODE UNTIL THE SPACE TEMP FALLS BELOW HEATING SETPOINT. WHILE IN VENTILATION MODE, THE UNIT SHALL PROVIDE VENTILATION ONLY WITHOUT CONTROLLING TEMPERATURE. RETURN AIR DAMPER SHALL BE CLOSED DURING VENTILATION MODE.

HEATING MODE
WHEN SPACE TEMP FALLS BELOW HEATING SETPOINT, THE UNIT SHALL SWITCH TO HEATING MODE. THE UNIT SHALL REMAIN IN HEATING MODE UNTIL THE SPACE TEMP RISES ABOVE HEATING SETPOINT. WHILE IN HEATING MODE, THE UNIT SHALL USE MODULATING GAS HEAT TO CONTROL THE DISCHARGE TEMP TO MAINTAIN THE SPACE SETPOINT.

MODULATING GAS HEATING SHALL BE ENABLED WHEN THE OUTSIDE AIR TEMP IS BELOW THE GAS HEATING LOCKOUT SETPOINT (55ºF, ADJ). WHILE GAS HEATING IS ENABLED, THE UNIT SHALL BE CAPABLE OF ENABLING THE GAS BURNER AND MODULATING THE GAS VALVE TO MEET THE DISCHARGE TEMP SETPOINT.

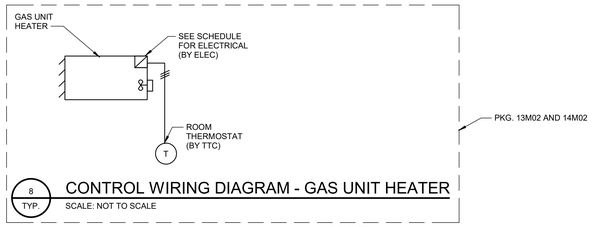
ECONOMIZER MODE SHALL BE ENABLED WHEN THE SPACE TEMPERATURE IS ABOVE THE ECONOMIZER ENABLE SETPOINT(70ºF, ADJ). WHILE ECONOMIZING, THE UNIT WILL TURN DOWN THE HEAT TO KEEP THE SPACE AT A DESIRED SETPOINT TEMPERATURE

NIGHT OPERATING MODE OR UNOCCUPIED CYCLE
WHILE SCHEDULED IN UNOCCUPIED MODE, THE OA DAMPER SHALL CLOSE AND THE SUPPLY FAN SHALL SHUT OFF.

ALARM MONITORING
ANY UNIT ALARM WHICH IS GENERATED BY THE FACTORY INSTALLED CONTROLLER SHALL GENERATE AN ALARM IN THE BMS SYSTEM FOR CONNECTED UNITS.

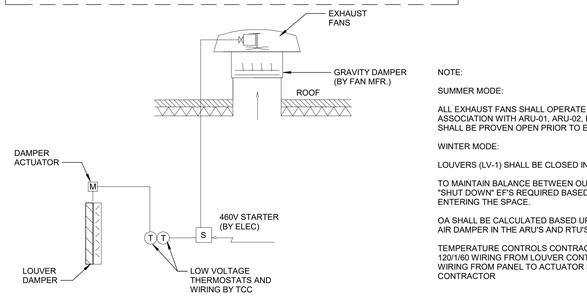
6 TYP. CONTROL DIAGRAM FOR ARU-1, ARU-2 AND RTU-1 THRU RTU-4

SCALE: NOT TO SCALE



8 TYP. CONTROL WIRING DIAGRAM - GAS UNIT HEATER

SCALE: NOT TO SCALE



NOTE:

SUMMER MODE:

ALL EXHAUST FANS SHALL OPERATE CONTINUOUSLY IN ASSOCIATION WITH ARU-01, ARU-02, RTU-01 AND LV-1. DAMPERS SHALL BE PROVEN OPEN PRIOR TO EXHAUST FAN'S RUNNING.

WINTER MODE:

LOUVERS (LV-1) SHALL BE CLOSED IN WINTER MODE.

TO MAINTAIN BALANCE BETWEEN OUTSIDE AIR AND EXHAUST AIR, "SHUT DOWN" EF'S REQUIRED BASED ON THE OUTSIDE AIR ENTERING THE SPACE.

OA SHALL BE CALCULATED BASED UPON POSITION OF OUTSIDE AIR DAMPER IN THE ARU'S AND RTU'S.

TEMPERATURE CONTROLS CONTRACTOR SHALL PROVIDE 120/1/60 WIRING FROM LOUVER CONTROL PANELS AND 120V WIRING FROM PANEL TO ACTUATOR IS BY MECHANICAL CONTRACTOR

*THIS SHEET IS APPLICABLE TO 11M01, 13M02 AND 14M02 SCOPE

*DASHED AREAS ARE NOT IN SCOPE FOR THIS PACKAGE.

9 TYP. CONTROL WIRING DIAGRAM - PLANT VENTILATION

SCALE: 12" = 1'-0"

TB_REV1.0

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CONSULTANTS:

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CONSTRUCTION
04/28/2022
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SEAL ON THIS DOCUMENT AUTHORIZED BY:

GEORGIA REGISTERED No. 32331 PROFESSIONAL ENGINEER BARRY W. [illegible] 04-28-22

PROJECT INFORMATION:

BROWNFIELD MODIFICATIONS

CLIENT INFORMATION:

ASCEND ELEMENTS

ASCEND ELEMENTS
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COVINGTON, GA
30014

CLIENT PROJECT NO: XXX-XXXXX-XX

NO.	DATE	SUBJECT
A	04/28/22	FOR CONSTRUCTION - PKG 11M01

REVISION OR ISSUE

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CHECKED:	B. WHITEHEAD

DRAWING TITLE:
CONTROL DIAGRAMS

DRAWING NO:
MH-701

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