

251500 Building Automation Graphics

1.1 Graphics General

- A. The graphics application program shall be supplied as an integral part of the user interface.
- B. The graphics shall be able to display and provide animation based on real-time data that is acquired, derived, or entered.
- C. Graphics runtime functions –Each graphic application shall be capable of the following functions:
 - 1. All graphics shall be fully scalable
 - 2. The graphics shall support a maintained aspect ratio.
 - 3. Multiple fonts shall be supported.
 - 4. The color of all animations and values on displays shall indicate the status of the object attribute.
 - 5. Graphics that represent buildings or systems shall allow natural links and transitions between related detailed tabular views of data or source equipment that complement the system.
- D. Operation from graphics – It shall be possible to change values (setpoints) and states in system controlled equipment directly from the graphic with the option to limit users to view only modes for specific systems.
- E. Floor Plan graphics – The user interface shall provide graphic applications that summarize conditions on a floor. Floor plan graphics shall indicate, room temperature, humidity, CO2 and use dynamic colors to represent zone temperature deviations from established zone setpoint(s).
- F. When working in an existing building graphics all new graphics shall match existing formatting and structure.

1.2 Graphic Displays General:

- A. Provide a color graphic system flow diagram display for each system with all physical and virtual points as applicable. Provide a color graphic display for each floor in the facility. Indicate each terminal zone boundary, includes all installed space sensor info (i.e. temperature, humidity, CO2).
- B. Create color graphic system schematics for each piece of mechanical equipment, including, but not limited to, air handling units, chilled water systems, hot water systems, and room level terminal units individually. Each system graphic shall be configured to show all system parameters. All systems shall be linked within floor plan graphic and grouped in main building (home screen) graphic category blocks.
- C. The operator interface shall allow users to access the various system schematics and floor plans via a graphical drill down navigation scheme, menu selection, point alarm association, or text-based commands.
- D. Dynamic temperature values, humidity values, flow values and status indication shall be shown in their actual respective locations within the system schematics or graphic floor plan displays, and shall automatically update to represent current conditions without operator intervention and without pre-defined screen refresh rates. When associated with a control loop the respective setpoint shall be located adjacent to controlled variable point.
- E. Display real-time point values by animated motion or custom picture control visual representation wherever possible. Animation shall depict movement of mechanical equipment, or air or fluid flow only based on actual equipment feedback status. Animation shall reflect, ON or OFF conditions, position changes, and, when applicable, shall also be configured for up to five rates of animation speed.

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- F. Establish linked blocks of miscellaneous program point data by defined point groups; alarm conditions shall be displayed by color indication.
- G. Equipment state or values shall be changed by clicking on the associated point block or graphic symbol and selecting the new state (on/off) or setpoint.
- H. Colors shall be used to indicate status and change as the status of the equipment changes. The state colors shall be user definable and indicate things such as normal/alarm status, point condition, override status, etc.
- I. Advanced linking within the Graphics application shall provide the ability to navigate to outside documents (e.g., .doc, .pdf, .xls, etc.), Internet web addresses, e-mail, external programs, and other workstation applications, directly from the Graphics application window with a mouse-click on a customizable link symbol.
- J. Install all as-built control drawings (and associated sequence of operation) in electronic format on specific server, and provide means to access this data using intuitive interaction by end users. Each system web page shall allow for an automatic link to the associated control diagram, wiring diagrams, and sequence of operation. Product O&M data shall be linked to the home page. Mark specific products and options used on project when posting product data sheets. Provide operator a way to access product and as-built control information from the graphic interface (e.g. AHU system, chilled water system, hot water system, VAV system, etc.).
- K. Install all record drawing mechanical duct plans and electrical power plans on server and include link from associate floor plan graphics.

1.3 Graphical Page Guidelines:

- A. Legend: The legend screen will show the user the color coding intent of the graphics and instructions to help the operator understand and interpret the graphics package.
- B. Site Map: After initiating the building automation graphics the first screen to appear will be the University of Florida Site Map. The site map will display a portion of the UF map with non-integrated buildings colored gray. The UF buildings connected to the vendor specific BAS will be colored with one of two colors – red or green. The green colored buildings will show the user that there are no alarms active in the building, while red color will indicate that one or more of building systems are in an alarm state. The user will have the ability to adjust building alarm activation trigger based on alarm priority. In order to see the name of each building the user will be able to hover the cursor over the building icon, this feature will only be assigned to the integrated buildings. Each building icon will act as an active link to transfer the user to the buildings home screen graphic page.
- C. Home Screen: The building home screen will provide the user with an overview of the building energy consumption, building pressurization, and overall system condition.
 - 1. Home page to include building system links; floor plan links, link to specific air systems, water systems, miscellaneous systems and energy reports. Air Systems may include AHUs or EFs. Floor plan links to individual floors or, depending on size of building general area floor plans. The Water Systems may include heating hot water system and/or chilled water system. The Energy report link will show current building energy data: Building kW, kWh, CHW tons, CHW kton-hr, HHW Btu/h HHW kBtu, or as installed. Miscellaneous Systems may include remaining systems having graphics which were not covered by previous links (i.e. compressed air, vacuum, equipment alarms, etc...)
 - 2. Home screen will include building pressurization feedback
 - 3. The home screen shall include general status of all major equipment also indicating equipment alarm state.

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4. The home screen shall include the current outdoor weather information displayed on the top or bottom of the screen. Outdoor weather information shall be obtained from a designated UF weather station.
- D. Floor plans: The graphics package shall contain overall floor plans. The size of the building will indicate the levels of floor plan graphics.
1. Large Area Floor Plan Graphic: When a link to a particular floor is selected, the screen will show an overall floor plan view divided into sections. This intermediate screen may be necessary for large buildings where detailed floor plan view with room numbers and sensors displaying room air conditions are not feasible. In the case of a smaller building with floor plans containing few rooms per floor, the intermediate plan can be omitted. The floor plan will accurately represent the as-built layout of rooms in the building. See below general guidelines for large area floor plans.
 - i. The divisions of the partial floor plan sections should be based on the zones served by different air handling equipment. If that strategy does not produce the desired effects, the second best option is to divide the floor plan in equal parts.
 - ii. Each section will have a link to take the user to a more detailed floor plan screen. In the bottom left hand corner of the screen shall be links to other floors.
 2. Detail Floor Plan Graphic: When a link to a particular floor is selected, the screen will show the actual floor plan layout with displayed space conditions (temperature, humidity, and/or CO2). See below general guidelines for detail floor plans.
 - i. The floor plan section screen shall show the floor plan layout in more detail with room numbers and sensors displaying room environmental conditions. Each sensor and room number shall act as a link to the corresponding room system graphic, room background color shall be reflective of space conditions. Normal- green, Warm-red, Cold-blue.
- E. Zone terminal unit graphic:
1. When user selects a link to zone (by clicking on a room sensor) the graphics screen shall bring up a detailed view of the room air terminal and associated sensors. The screen title block shall include all room numbers associated with the zone and clearly identify the room with the thermostat. Title block shall also include the terminal equipment name in parentheses.
 2. Airflow sensor shall include actual airflow, airflow set-point, min and max range and velocity pressure.
 3. Zone temperature shall be listed with the effective/actual (accounting for local adjustments) heating and cooling set-points.
 4. A secondary parameter screen that includes all relevant control parameters shall be available to view detailed program settings.
 5. The user will have the ability to change all set-points and settings.
 6. Bottom of the page will have links to associated as-built reference material. A link to the source AHU shall also be included.

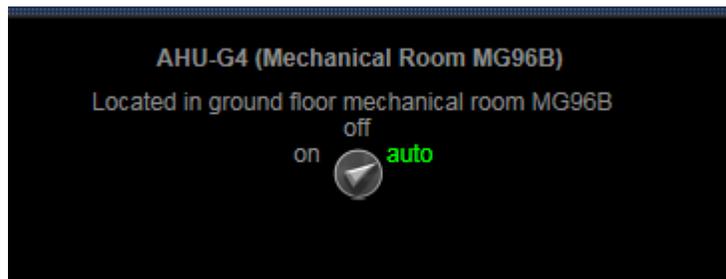
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- F. General Lab: When user selects a link to general lab space the graphics link shall bring up a room with relevant air valves and their associated control points. Air valves shall include their respective equipment tags, (per as-built drawings). The air valve command position and air valve flow feedback will be listed next to each air valve.
1. The screen title block will list the room number with the air valves listed in the parentheses.
 2. The air change rate information shall be calculated and be based on the room volume and total lab airflow. Air change per hour calculation shall be based on either the total supply or exhaust, whichever is greater.
 3. Zone temperature shall be displayed along with the effective/actual (accounting for local adjustments) heating and cooling set-points.
 4. Total supply air, total exhaust air, actual lab air flow differential and air flow differential setpoint shall be included for all labs with tracking.
 5. Include alarming to indicate abnormal pressures or offsets.
- G. Air Handling Systems: Screen title shall reflect the equipment names.
1. Fan status shall include color coding of the fan wheel. Green and dynamically spinning the fan wheel when the fan is ON. Blue and wheel not spinning when fan is OFF. Red when there is a fan feedback failure. When AHU is equipped with fan array, all fans shall be shown with individual status indication.
 2. VFD box above the fan will provide the user with active links to variable frequency drive integrated information. Supply fan VFD speed command cell will display the speed of the drive in 0-100%. In the event the VFD is allowed to exceed 60Hz during normal operation, 100% will correspond to the maximum speed the VFD is allowed to achieve. Include the following VFD points within the graphic: start/stop point, fan status, % speed command, actual Hz, and actual kW.
 3. Filter status will be indicated in the cell and shall show red when in an alarm state. Filter DP device settings shall be included in graphic when pressure settings are set locally.
 4. Low temperature alarm and high/low static alarm indicator cells will have a green background and display "Normal" when in normal mode, during alarm mode the cell background color will change to red and display will read "Alarm"
 5. Information used in temperature/pressure reset strategies shall be included in the graphic page.
- H. Chilled Water and Hot Water System: Screen title shall reflect the equipment names.
1. Pump status shall include color coding of the pump impeller. Green and dynamically spinning the pump impeller when the pump is ON. Blue and impeller not spinning when pump is OFF. Red when there is a pump feedback failure.
 2. VFD box above the pump will provide the user with active links to variable frequency drive integrated information. Pump VFD speed command cell will display the speed of the drive in 0-100%. In the event the VFD is allowed to exceed 60Hz during normal operation, 100%

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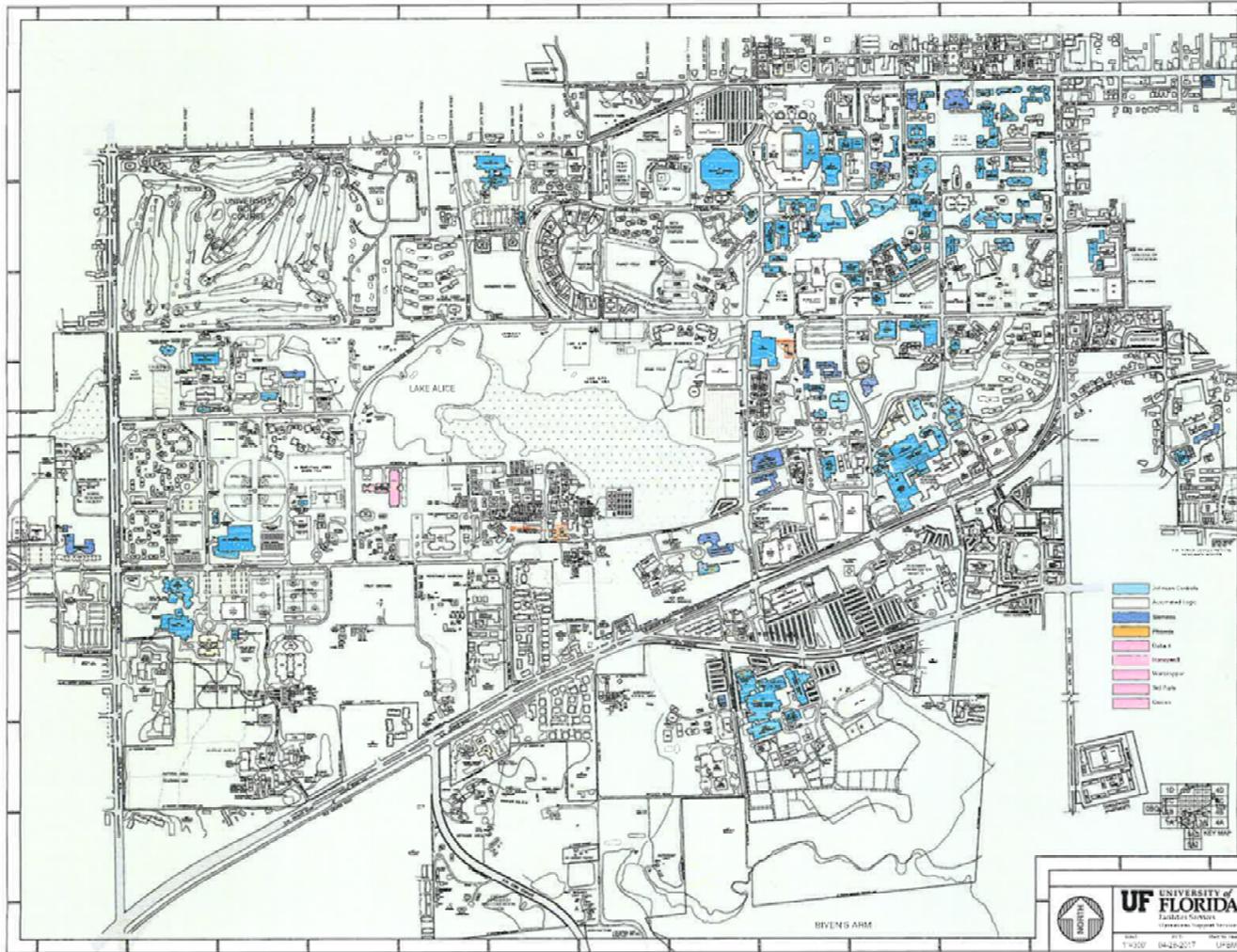
will correspond to the maximum speed the VFD is allowed to achieve. Actual pump hz maximum shall be displayed as a note.

3. High/Low temperature alarm and high/low pressure alarm indicator cells will have a green background and display "Normal" when in normal mode, during alarm mode the cell background color will change to red and display will read "Alarm"
 4. Information used in temperature/pressure reset strategies shall be included in the graphic page.
- I. HOA software switch graphic shall allow the operator to control associated equipment at the graphic level. See sample below



1.4 Graphical Page Samples:

A. Site Plan:



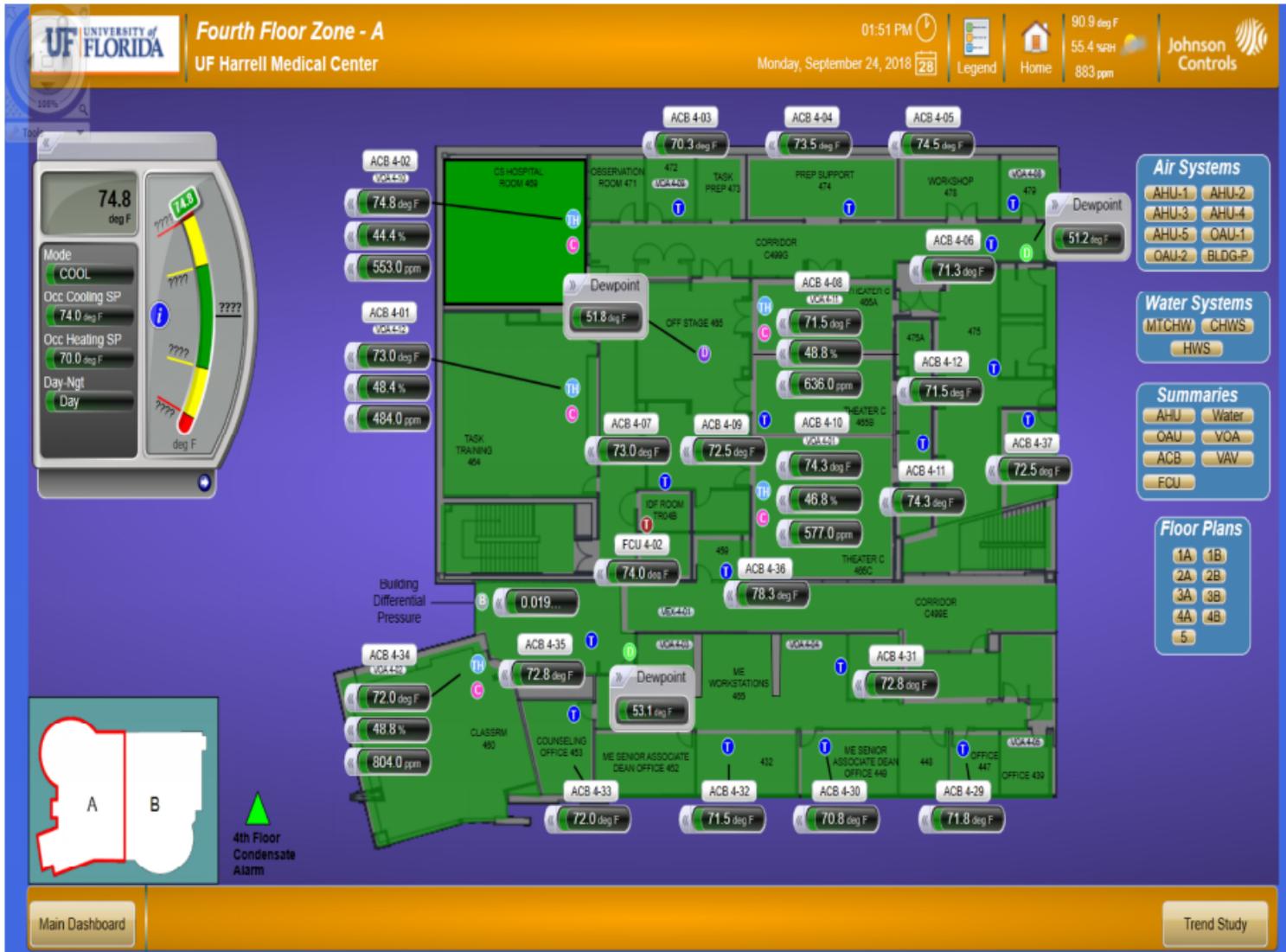
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B. Typical home screen graphic:



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C. Typical detailed Floor Plan Graphic type #1



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D. Typical detailed Floor Plan Graphic type #2



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E. Air Handling Unit



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F. Typical Exhaust System



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G. Office Zone – With Chilled Beam



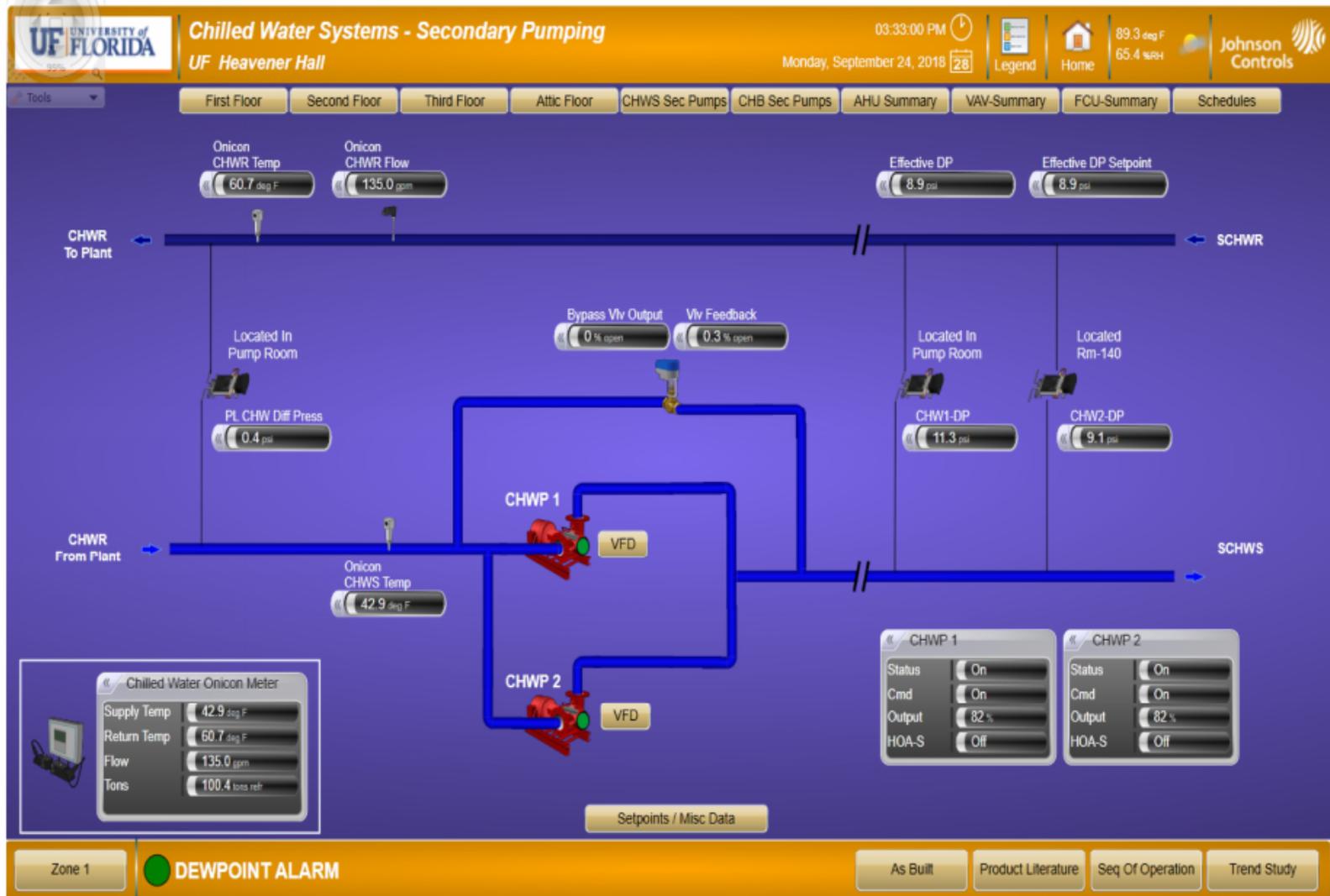
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H. Laboratory Zone – Tracking Pair

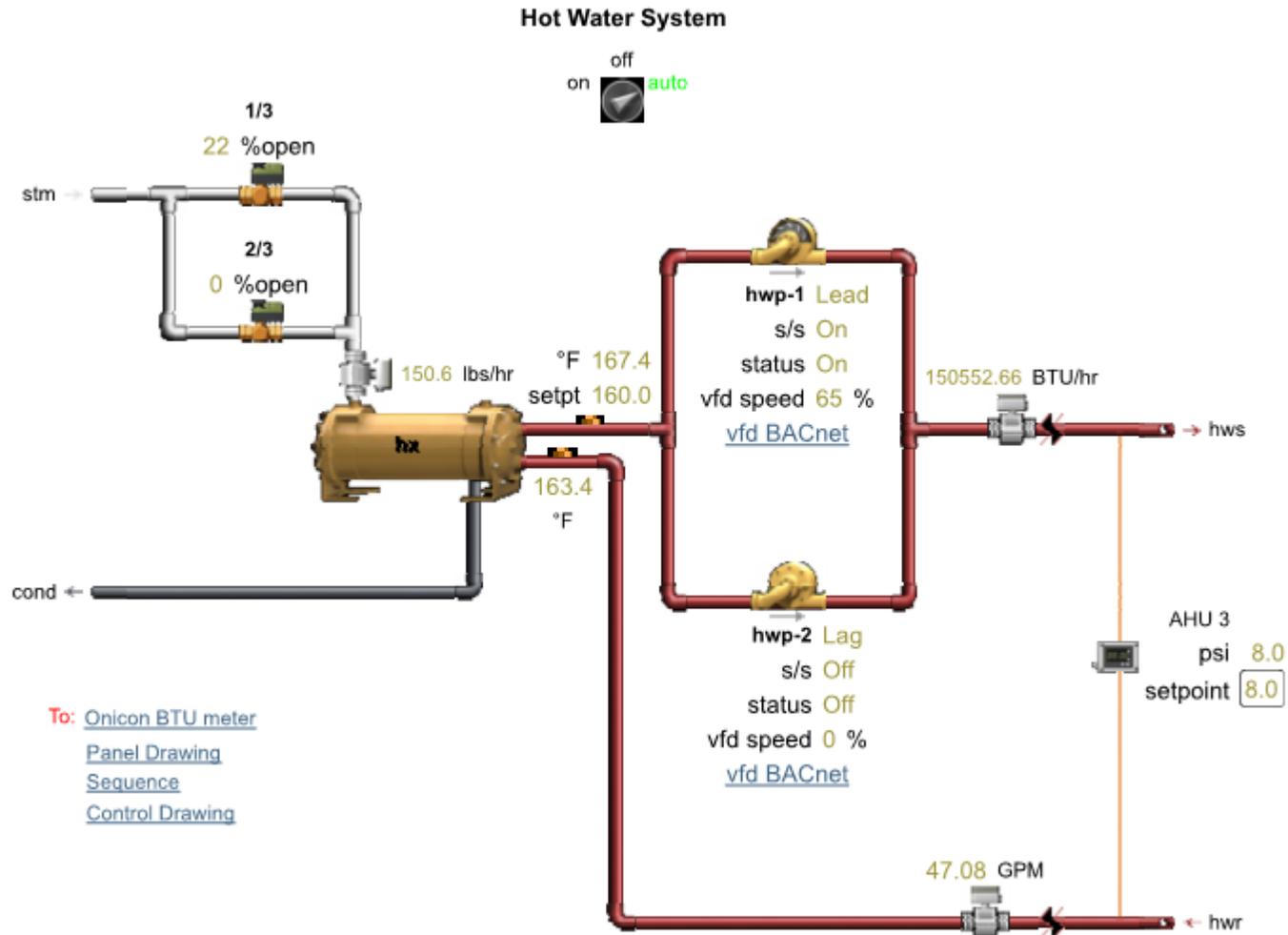


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I. Chilled Water Pumping System

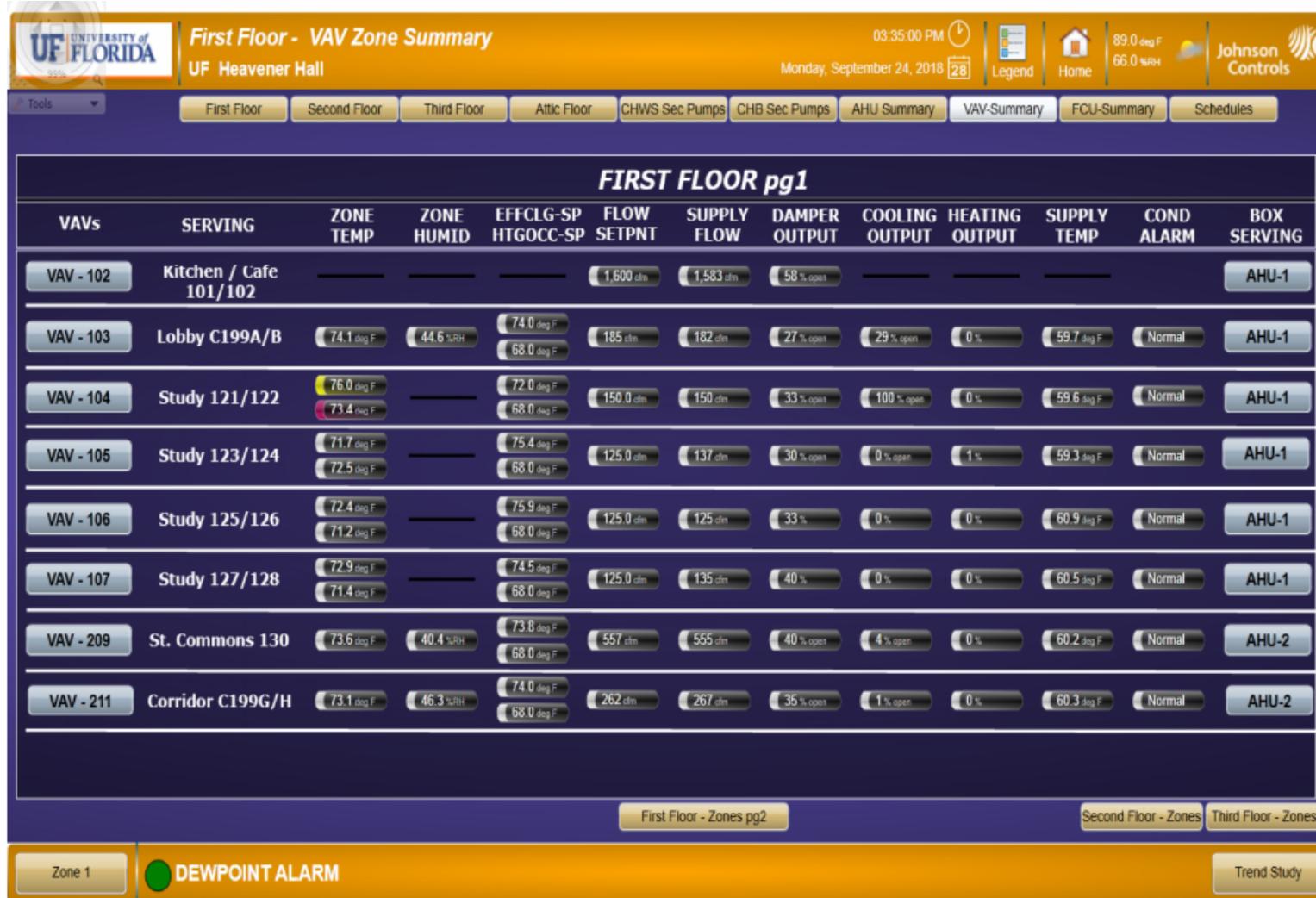


J. Heating Hot Water System



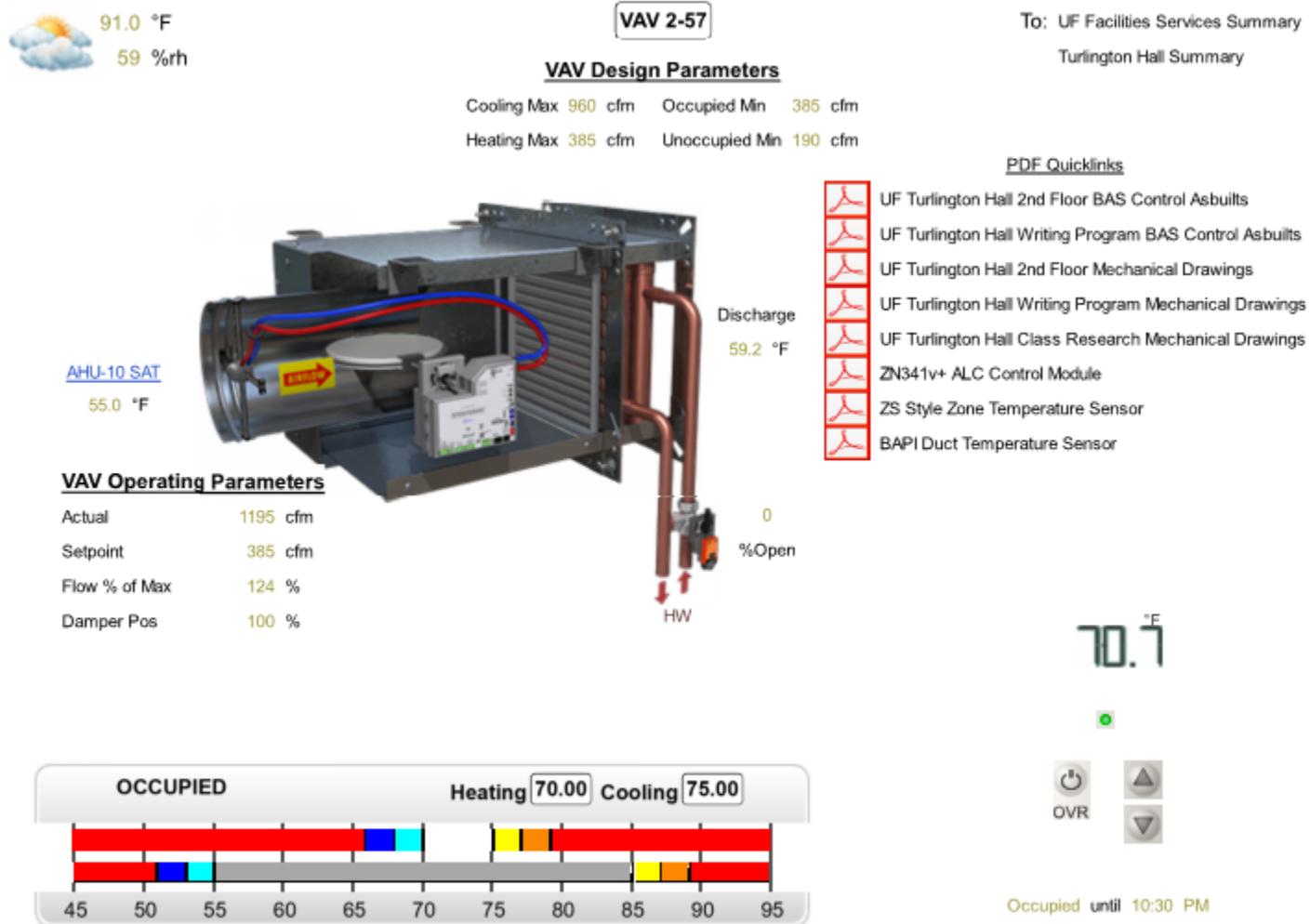
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K. VAV Summary Report



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L. VAV Typical



END OF SECTION