

SYSTEM TROUBLESHOOTING GUIDE - HVAC SYSTEMS

SYMPTOM	CHECKS AND POTENTIAL SOLUTIONS
<p>General System Interface of HVAC Systems with the DDC Control System</p>	<p>The building is provided with a Direct Digital Control system (DDC) panel located in each mechanical equipment space. This system is interconnected and extends to a central processor, which includes a computer workstation with a modem, monitor, keyboard, and a printer. The modem connects this facility DDC system via telephone to a DDC system located in the Public Works facility.</p> <p>Each DDC panel is capable of operating its respective connected HVAC systems without communication with other DDC panels or the central system processor.</p> <p>The use of the DDC system as a maintenance aid can be a valuable tool in troubleshooting the HVAC systems. The DDC system should be used as a first step of any maintenance procedure; however, manual checks of output values should be verified to insure that the DDC system is functioning correctly.</p> <p><u>Step 1:</u> Check the DDC central processor system in Room <u>1E-28</u> or the DDC panel in the affected areas respective mechanical room. If the DDC system is in operation, read-out values of different HVAC system components can be observed on the face of this panel. If this DDC panel is in operation, verification of building HVAC systems can be checked, monitored, and controlled through this panel.</p> <p>If the DDC panel has lost electrical power or this system is malfunctioning, manual override of the DDC system should be initiated as hereinafter noted. See Page 2-2-3a1 for DDC system troubleshooting.</p> <p>Operation of the buildings HVAC systems can be performed without operating through the DDC system by placing all starter "HAND-OFF-AUTO" (HOA) switches from "AUTO" position to "HAND" position.</p> <p>See Sheets 2-1-3a2 through 2-1-3a7 for specific troubleshooting of particular symptoms.</p>

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Building/Area Temperature Rises Above 80 Degrees F. (Cont'd.)	<p><u>Step 2:</u> Check the entering and leaving chilled water temperatures from the chiller. The entering water temperature should be 12.8° C. (55° F.) and the leaving water temperature should be 7.2° C. (45° F) if the leaving chilled water is above 45° F. reset the leaving water down to 45°F.</p> <p>Check AHU's Supply and Return systems air flow using the DDC system. If air flow is at or below the design values indicated on the Air Handling Unit Schedule on sheet Page 2-1-1a3, proceed to Step 5 below. If there is no air flow, proceed with the following checks:</p> <ul style="list-style-type: none"> A. Check electrical power supply at respective AHU Supply and Return Fans and the AHU DDC panel. If there is no power, reset the circuit breaker in each respective electrical panel. See sheet Page 1-5-8, 1-5-9 and 1-5-10 for location of electrical panels and breaker numbers. B. Check respective AHU smoke detection shutdown control at the Fire Alarm Control Panel to verify that a fire alarm has broken electoral contact to the fan motor and that a Fire Alarm exist. C. Check outdoor louver and outside air, return air and relief air dampers at the respective AHU to insure that the louver or dampers are not blocked a foreign object, and that the dampers are operating freely. D. Place respective AHU Supply and Return Air Fans "Hand-Off-Auto" switch in the "Hand" position. E. Check AHU Supply and Return Air Fan motor start capacitor and fan motor to insure that they are operational. Replace if found to be defective. F. Check AHU supply and return Variable Frequency Drives to verify that power is being supplied to the fans.

SYMPTOM	CHECKS AND POTENTIAL SOLUTIONS
Building/Area Temperature Rises Above 80 Degrees F (Cont'd.)	<p><u>Step 3:</u> When air flow rates are at or below design values:</p> <ul style="list-style-type: none"> A. Check respective AHU Supply and Return Air fans and motor assemblies for broken or loose belts, damaged or dirty fan blades or loose sheaves. B. Check all AHU filters and coil for blockages from dirt or other debris. C. Check respective AHU economizer outdoor air dampers to insure that they are operating freely. D. Check outdoor air louvers, where AHU O.A. duct connects to the louver, to insure that the louver is not obstructed with ice, snow or other foreign object. E. Check air handling unit cooling coil valve and the discharge air temperature from the air handling unit to insure that the valve is modulating and that it is not stuck closed. See Page 2-1-1c3 for discharge air temperatures from each AHU. F. Check terminal unit(s) serving the space(s) which are experiencing the high temp's. Air flows should be at the air flows indicated on Air Terminal Units Schedule on Page 2-1-1a5 and 6. Verify that the Terminal Units hot water coil valves are in the fully closed position.
Building/Area Temperature Drops Below 65 Degrees F.	<p><u>Step 1:</u> See Step 1 procedure on Sheet 3a-1.</p> <p><u>Step 2:</u> Check Outdoor Air Temperature. If outdoor air temperature is below 6.1° C. (43°F), then the system may be performing as designed. If outdoor air temperature is above 6.1° C. (43°F.) and the DDC system has started the Hot Water Heating System, proceed to Step 4.</p> <p><u>Step 3:</u> Check Boiler B-1, HWP-1 and HWP-2 to verify that they are on and operating. If they are on and operating go to Step 4. If they are not on and operating and the O.A. temperature is below 65° F. check for Boiler Alarms to the DDC system. Correct deficiency if determined.</p>

SYMPTOM	CHECKS AND POTENTIAL SOLUTIONS
Building/Area Temperature Drops Below 65 Degrees F. (cont'd)	<p>A. Check HWP-1 & HWP-2 to see if they are running. If they are not running check circuit breaker in electrical panel 2MEC in Rm. 2C18 and reset if tripped. If pumps fail to start check to see if pumps are getting 480/3 power at the pump. If pumps are getting 480/3 power check each pump start capacitor and replace if required. If pumps fail to start when "Hand-Off-Auto", switch mounted on the pump starter, is in Auto position place switch in Hand Position to start pump. When in the Hand position Pumps would run continuously.</p> <p>B. Check Boiler power to verify that it has 120V power. If power is off check circuit breaker in electrical panel 2MEC in Rm. 2C18 and reset if tripped.</p> <p>C. Check Boiler Water Reset controller and set at 180 degrees F.</p> <p><u>Step 4:</u> Check AHU system air flow. If air flow is at or above values, as indicated on sheet Page 2-1a-3, proceed to Step 5 below. If there is no air flow, proceed with the following checks.</p> <p>A. Check electrical power supply to AHU and to AHU DDC Panel. If there is no power, check circuit breaker in electrical panel 2MEC in Rm. 2C18 and reset if tripped.</p> <p>B. Check AHU cooling coil control valve and verify that the valve is closed.</p> <p>C. Check smoke detection shutdown control at the Fire Alarm Control Panel to verify that a fire alarm has not broken electrical contact to the fan motor.</p> <p>D. Check freeze protection shutdown control; verify that this circuit has not broken electrical contact to the fan motor.</p> <p>E. Check AHU return air and relief air dampers to insure they are in their respective positions. Check AHU outside economizer air damper to insure that it is fully closed and is operating freely see sheets Page 2-1-c-9 for air flows.</p> <p>F. Place AHU "HAND-OFF-AUTO" switch on the AHU starter to "HAND" position.</p>

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	<p>G. Check AHU fan motor start capacitor and fan motor to insure that they are operational and replace if required.</p>
<p>Building/Area Temperature Drops Below 65 Degrees F (Cont'd.)</p>	<p><u>Step 5:</u></p> <p>A. Check air vents on the water heating piping system at the system high points and vent air from system through the air vent valves.</p> <p>B. Check ET-1 located in room 2D05 to insure that the tank is not water logged or the bladder is broken. Check auto fill valve located near RBPB and pressure relief valve on cold water make up near the expansion tanks for proper operation (fill valve is open and relief valve is closed). Drain tank and charge with air.</p>
<p>Room Temperature High/Low Below Set point Temperature</p>	<p>Check Step 1 procedures on Page 3a-1.</p> <p><u>Step 1:</u> If room temperature is high, check the terminal unit serving that space and verify that the air flow is at its maximum set point and that the terminal unit heating coil valve is closed. Check respective AHU leaving air temperature to verify that it is supplying the discharge air temperature as scheduled on Air Handling Unit Schedule on sheet 2-1-1a-5 & 6. After the above checks have been completed and the problem has not been corrected, check for open windows or doors. Check actual room air flow and adjust if required.</p> <p><u>Step 2:</u> If room temperature is low, check the terminal unit serving that space and verify that the air flow has dropped to its minimum set point and that the terminal unit heating coil control valve is open. Check the terminal unit hot water coil and piping for trapped air and bleed off if required. Check the respective AHU and verify that the temperature is no lower than that indicated in Step 1 above. Check boiler system operation to verify that the system is operating properly and supplying the proper temperature of hot water. Reset hot water temperature if required. Check for open windows or doors. Check actual room airflow and adjust if required.</p>