



UFS-4331 Combination Fountain Circulator/ Vibrator Temperature Controller

Installation, Operation and Maintenance Manual

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Foreword

The UFS-4331-10R is a combined vibrator roller temperature control unit and fountain circulator. It consists of three modules; zone (vibrator) chiller, fountain circulator, and fountain chiller.

This manual is to serve as a guide for placing your UFS-4331 in service and operating and maintaining it properly. It is supplemented by drawings and vendor literature specific to your equipment.

This manual should be thoroughly reviewed before attempting to install or operate the UFS-4331. Please also note that technicians performing installation or service work on the UFS-4331 refrigeration circuits must be certified by an EPA approved organization (for installations outside the USA, consult local authorities for guidance). Although, due to their ever-changing nature, no reference is made herein to current codes, ordinances, etc., all applicable regulations, as well as good operating practices, should be followed. AWS cannot assume liability for installation or operating practices of others that are not in compliance with the recommendations of this manual and its attached documents.

The UFS-4331 uses R-22, an HCFC refrigerant. In the event of a refrigerant circuit leak or overpressurization, R-22 may be released into the pressroom. R-22 displaces air, and so may cause asphyxiation, and if exposed to flame, may produce toxic fumes. It is therefore recommended that the UFS-4331 be installed in an adequately ventilated location.

We trust your equipment will have a long and useful life. If you should have any questions, please contact our Customer Service Department, specifying the serial number and model number of the unit as indicated on the nameplate.

Installation

Receiving Inspection

Each unit is skid mounted and boxed or crated to protect it during shipping. Before accepting delivery, check the box or crate for visible damage. If damage is evident, it should be properly documented on the delivery receipt, and the box or crate should be immediately removed to allow for detailed inspection of the unit. Check for broken refrigerant lines, oil leaks, damaged controls, or any other major component torn loose from its mounting point. Any sign of damage should be recorded and a claim filed immediately with the shipping company. In order to expedite payment for damages it is important to record and document damage. An excellent way to do this is by taking pictures. Our Customer Service Department will provide assistance with the preparation and filing of your claims, including arranging for an estimate and quotation on repairs.

Rigging, Handling, and Locating Equipment

Proper rigging methods must be followed to prevent damage to components. Avoid impact loading caused by sudden jerking when lifting or lowering the chiller. Use pads where abrasive surface contact is anticipated.

Electrical Power

All wiring must comply with local codes and the National Electric Code (USA). Voltage must be within the voltage utilization range given in Table 1.

Table 1 - Voltage Utilization Range

Rated Voltage	Utilization Range
230	208 to 254
460	414 to 506
575	516 to 633

If the measured voltage on any leg is not within the specified range, notify the supplier and correct before operating the unit. Voltage imbalance must not exceed two percent. Excessive voltage imbalance between the phases of a three-phase system can cause motors to overheat and eventually fail. Voltage imbalance is determined using the following calculations:

$$\% \text{ Imbalance} = (V_{\text{avg}} - V_x) \times 100 / V_{\text{avg}}$$

$$V_{\text{avg}} = (V_1 + V_2 + V_3) / 3$$

V_x = phase with greatest difference from V_{avg}

For example, if the three measured voltages were 442, 460, and 454 volts, the average would be:

$$(442 + 460 + 454) / 3 = 452$$

The percentage of imbalance is then:

$$(452 - 442) \times 100 / 452 = 2.2 \%$$

This exceeds the maximum allowable of 2%.

A disconnect switch is provided for connection of the main power source. A separate fused disconnect is required at the power source (by others)

Electrical phase sequence must be checked at installation and prior to start-up. Operation of the compressor with incorrect electrical phase sequencing will result in mechanical damage. The phasing must be checked with a phase sequence meter prior to applying power. The proper sequence should read "ABC" on the meter. If the meter reads "CBA", open the main power fused disconnect, and switch two line leads on the disconnect on the UFS-4331. All components requiring electric power are wired in-phase at the factory. Do not interchange any load leads that are from the unit contactors or the motor terminals.



WARNING: *It is imperative that L1-L2-L3 are connected in the A-B-C phase sequence to prevent equipment damage due to reverse rotation.*



CAUTION: *The unit requires the main power to remain connected during off-hours to energize the compressor's crankcase heater. Disconnect main power only when servicing the chiller. The crankcase heater should remain on when the compressor is off to ensure liquid refrigerant does not accumulate in the compressor crankcase.*

Remote Air-Cooled Condenser Installation

Install the remote condenser as shown in the attached installation details drawing(s). The required 400 psi relief valve and liquid line check valve are supplied by AWS. Refrigerant piping is to be ACR copper, with all joints brazed using Silfos™ or equivalent.

Before beginning the start-up procedure, leak test the refrigerant circuit with N2 at 150 psig, and evacuate to a pressure of 500 microns or less for a minimum of 12 hours.

For general guidance, consult the Thermal Care Remote Air Cooled Condenser Installation Guidelines Manual.

Press Piping Installation

The details of flow distribution to the vibrators at the printing units vary according to press manufacturer and model, and cannot be addressed here. Consult the press manufacturer or AWS Customer Service for recommendations.

Note: *The manual isolation and drain/fill valves shown in the UFS-4331 Process and Instrumentation Diagram (labeled MV-1 through mv-6; to be provided by the installer) MUST BE IN PLACE BEFORE START-UP. Proper filling and draining of the water circuit is not possible without these valves.*

City Water Connection

The UFS-4331 has a closed water circuit which must be pressurized by a **permanent** city water connection. Local codes may require a backflow preventer (by installer) as shown in the UFS-4331 Process and Instrumentation Diagram.

Start-Up

Zone Chiller

The following start-up procedure should be used as a checklist for the initial and all subsequent start-ups of the UFS-4331.

1. Assure the main power source is connected properly, that it matches the voltage shown on the nameplate of the unit, and that it is within the voltage utilization range given in Table 1. Electrical phase sequence must be checked at installation and prior to start-up. Operation of the compressor with incorrect electrical phase sequencing will result in mechanical damage to the compressors. The phasing must be checked with a phase sequence meter prior to applying power. The proper sequence should read "ABC" on the meter. If the meter reads "CBA", open the main power fused disconnect and switch two line leads on the disconnect on the UFS-4331. All components requiring electric power are wired in-phase at the factory. Do not interchange any load leads that are from the unit contactors or the motor terminals. Once proper power connection and grounding have been confirmed, turn the main power on.



WARNING: It is imperative that L1-L2-L3 are connected in the A-B-C phase sequence to prevent equipment damage due to reverse rotation.

Note: The main power must be on for 24 hours prior to starting the compressor to allow the crankcase heater to sufficiently vaporize any liquid refrigerant that may be present in the compressor.

2. Open the disconnect on the UFS-4331, remove the fuses for M01 and M04 (chiller and fountain compressor) overloads (remove wire plugs), and close the disconnect to restore power.
3. Check to make sure that all water piping connections are secure.
4. Close the Fountain Makeup Water Isolation Valve (upstream of the filter and metering pump).
5. Fill the water circuit using the following procedure:

Note: Refer to the Process and Instrumentation Diagram.

- a. Close valves MV-1 through MV-6 and the City Water Isolation Valve (along the lower right wall of the fountain circulator cabinet, upstream of the pressure regulator). Unscrew the red plastic cap on the automatic vent to allow venting.
- b. Open the City Water Isolation Valve to fill the piping inside the UFS-4331. Listen for air escaping from the Automatic Vent. When venting has stopped, close the City Water Isolation Valve. The pump is now primed.
- c. Connect a hose from MV-3 to the ethylene glycol container.
- d. Open MV-1, and open MV-5 about 25%.
- e. Press the power ON button to energize the OIU, and press the SYSTEM START button to start the zone pump.
- f. IMMEDIATELY after starting the pump, open MV-3 to allow ethylene glycol to be pumped into the circuit. Pump a total of approximately **2 gallons of ethylene glycol per printing unit** into the circuit. Close MV-3 and turn off the pump (using the System Off Sequence button on the OIU) after the proper quantity of ethylene glycol has been added.

- g. Check that MV-1 is open. Open MV-5 fully. Set the pressure regulator to its minimum (10 psig) setting. Open the City Water Isolation Valve to begin filling the circuit with water.
- h. When the system is substantially full, close MV-1. Check that the Automatic Vent cap is loose, allowing it to vent.
- i. Use the operator interface screens (see the attached screen flow diagram) to run the chiller pump in manual mode, starting and stopping it at roughly one minute intervals, to promote venting of entrapped air. Do this several times.
- j. Run the pump continuously for several hours to ensure complete venting of entrapped air.
- k. With the pump running, take a small sample from the water circuit. Use a hydrometer to check the ethylene glycol concentration. If the concentration (by mass) is less than 30%, close the City Water Isolation Valve and drain the circuit at MV-1 while filling with ethylene glycol at MV-3 to increase the concentration. If the concentration (by mass) is greater than 50%, leave the City Water Isolation Valve open, and drain solution at MV-4 as necessary to dilute the circuit.



CAUTION: *The city water isolation valve should be left open AT ALL TIMES when the UFS-4331 is in operation. Since system volume can decrease due to minor leakage and ongoing venting of entrapped air, makeup water is occasionally required to maintain a positive pressure at the pump suction. Negative pressure at the pump suction could cause pump cavitation and loss of flow to the press.*

- 6. With the pump off, verify that the the pressure gauge on the pump discharge reads 10-20 psig, and the pressure switch PS04 is closed. If necessary, adjust the pressure switch setting, following the instructions on the switch label.



PS04 stops the chiller pump, stops both the zone and fountain chillers, and provides an alarm whenever the pressure on the suction side of the chiller pump is too low for safe operation.

- 7. Verify that all manual refrigerant valves are open.



CAUTION: *Do not operate the unit with the compressor or liquid line service valves "CLOSED". Failure to have these "OPEN" may cause serious compressor damage.*

- 8. Add an initial refrigerant charge (estimated from the Thermal Care Remote Air Cooled Condenser Installation Guidelines Manual) by connecting the charging line to the suction service valve and charging through the backseat port. Close the manual isolation valve on the hot gas bypass line.
- 9. Unplug the signal/power wire to the chiller proportional control valve. Push the manual release button on the actuator, and use the handle to turn the valve to direct the entire flow of water through the evaporator.
- 10. Open the disconnect on the UFS-4331, replace the fuses for M01 (chiller compressor), and close the disconnect to restore power. Set the zone temperature set point on the operator interface more than 5 °F below the actual temperature to start the compressor and complete the charging process.



WARNING: *Under no circumstance should the High Refrigerant Pressure Transducer (PT-07), Low Refrigerant Pressure Transducer (PT-07), Discharge Temperature Sensor (TE-07) or Suction Temperature Sensor (TE-06) be deactivated. Failure to heed this warning can cause serious compressor damage, severe personal injury or death.*

- Operate the system for approximately 30 minutes or as long as possible. Check the liquid line sight glass. The refrigerant flow past the sight glass should be clear. Bubbles in the refrigerant indicate either low refrigerant charge or excessive pressure drop in the liquid line. A shortage of refrigerant is indicated if operating pressures are low and subcooling is low. Normal subcooling ranges are from 10°F (5.5°C) to 20°F (11°C). If subcooling is not within this range, check the superheat and adjust if required. The superheat should be approximately 10°F (5.5°C). If the operating pressures, sight glass, superheat, and subcooling readings indicate a refrigerant shortage, gas-charge refrigerant as required with the unit running until operating conditions become normal.



CAUTION: A clear sight glass alone does not mean that the system is properly charged. Also check system superheat, subcooling, and unit operating pressures. If both suction and discharge pressures are low but subcooling is normal, a problem other than refrigerant shortage exists. Do not add refrigerant, as this may result in overcharging the circuit.

- Re-connect the the signal/power wire plug of the chiller proportional control valve.
- Open the hot gas bypass valve. The UFS-4331 should maintain zone return (vibrator leaving water) temperature within ± 5 °F of set point when there is no load (i.e., when the press is not running). With the press operating, the zone return temperature should normally be within ± 1 °F of set point. If satisfactory performance is not obtained, contact Customer Service.

Fountain Circulator

- Set the metering pump(s) to the desired mixing ratios. The scale on the pump reads volume % of chemical additive. Use the chart below to convert from Oz./Gal.:

Table 2 – Additive Ratio Conversion Chart

Oz/Gal	Volume %
1.0	0.8
1.5	1.2
2.0	1.6
2.5	2.0
3.0	2.3
3.5	2.7
4.0	3.1
4.5	3.5
5.0	3.9
5.5	4.3
6.0	4.7
6.5	5.1
7.0	5.5
7.5	5.9
8.0	6.3

- Fill the chemical additive containers.
- Open the Fountain Makeup Water Isolation Valve (upstream of the filter and metering pump). With the system on (power on + 45 sec delay), the fountain tanks should automatically fill and begin circulating and cooling.

Fountain Chiller

- This chiller is factory-charged, and requires no start-up procedure. The fountain supply temperature should normally be within ± 2 °F of set point. If satisfactory performance is not obtained, contact Customer Service.

The unit is now ready to be placed into service.

Controls

Introduction

A power ON/OFF button and a touch pad OIU (operator interface unit) are located on the front of the UFS-4331 cabinet. Except in an emergency situation, power should not be turned off until the system stop sequence (see below) has been completed.

From the OIU the operator can start and stop system operation, change the zone return and fountain supply temperature set points, read alarm messages, and monitor pressures and temperatures being measured by the various sensors. Password-protected screens allow the operator to run pumps manually and change program parameters. These screens are intended for the use of AWS/Thermal Care Service Technicians only.

OIU Screens

An OIU screen flow chart is included in the attached documents. This chart shows all of the screens, as well as the path to navigate from one to another.

Alarms

Alarms indicate an off-normal condition that may be

When an alarm is triggered, the amber alarm light is illuminated, the horn sounds, and an alarm message is displayed.

Table 3 – Alarm Messages

Alarm Message	Device	Cause/Action
FOUNTAIN Evaporator FREEZESTAT Alarm (TI12)(below 40°F) (1.0)	TI12	The FOUNTAIN Evaporator Temperature is/was below 40°F. This alarm is self-resetting but will be displayed until cleared. Low fountain evaporator leaving water temperature is usually caused by low fountain flow rate or inoperative hot gas bypass solenoid valve SOV10 (ref. dwg UFS40025MP11). This valve can be heard to pulse in approximately 10 second cycles. If it is not, check the valve. If the hot gas SOV is operating properly, increase flow through the fountain recirculation line (ref. dwg UFS40002MP11).
(1.1)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
FOUNTAIN MAIN Tank HIGH Level Fault (LS13D) (1.2)	LV13D	The FOUNTAIN MAIN Tank was at a HIGH Level for longer than 30 seconds. Check the supply pump for proper operation. When the condition has been corrected, press the Alarm(s) cleared button on the Current Alarm Screen.
FOUNTAIN MAIN Tank LOW Level Fault (LS13A) (1.3)	LV13A	The FOUNTAIN MAIN Tank was at a LOW Level. Check the RETURN pump for proper operation. Check the makeup water supply to the metering pump(s). AFTER the condition has been corrected, press the Alarm(s) cleared button on the Current Alarm Screen.
FOUNTAIN RETURN HIGH Level Fault (LS14A) (1.4)	LV14A	The FOUNTAIN RETURN Tank was at a HIGH Level. Check the RETURN pump for proper operation. Check the RETURN loop for problems. AFTER the condition has been corrected, press the Alarm(s) cleared button on the Current Alarm Screen.
Alarm Acknowledged (1.5)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
FOUNTAIN Additive #1 LOW Tank Level (LS16) (1.6)	LV16	The FOUNTAIN Additive #1 is LOW. ADD FOUNTAIN Additive #1 to the tank. AFTER the condition has been corrected, press the Alarm(s) cleared button on the Current Alarm Screen.
FOUNTAIN Additive #2 LOW Tank Level (LS17) (1.7)	LV17	The FOUNTAIN Additive #2 is LOW. ADD FOUNTAIN Additive #2 to the tank. AFTER the condition has been corrected, press the Alarm(s) cleared button on the Current Alarm Screen.
(0.0)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
ZONE High Temperature Alarm [Over {THAH_CHILL}°F](TI03) (0.1)]	TI03	
ZONE Compressor Suction-Side Low Pressure Alarm (PI06) (0.2)	PT06	
Add water to the loop ZONE Supply Pump Low Pressure Alarm (PS04) (0.3)	PS04	The System has lost water. Add water to the system. AFTER the condition has been corrected, press the

		Alarm(s) cleared button on the Current Alarm Screen.
ZONE Compressor Discharge-Side High-Pressure Alarm (PI07) (Over {PHAH_COMP}p.s.i.g.)(0.4)	PI07	The Chiller ZONE Compressor has gone off on High Discharge-Side Pressure. The most common cause is failure of a condenser fan or improper setting of the condenser fan P66 or pressure switch. This is self resetting. AFTER the condition has been corrected, press the Alarm(s) cleared button on the Current Alarm Screen.
(0.5)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
FOUNTAIN Supply Flow Fault (FS12) (0.6)	FS12	
ZONE Evaporator FREEZESTAT Alarm (Under 40 °F)(TI02) (0.7)	TI02	
FOUNTAIN RETURN Pump #2 Overload Tripped (OL-0) (3.0)		
(3.1)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
ZONE Compressor 1 Overload Tripped (OL-01/01A) (3.2)		
ZONE Compressor 2 Overload Tripped (OL-02/2A) (3.3)		
FOUNTAIN High Supply Temperature (Over {THAH_FSMS} °F)(3.4)		
(3.5)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(3.6)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(3.7)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
Chiller Evaporator Temperature over 85°F, too high for Fountain compressor to run(2.0)		The Fountain Compressor will NOT run if the Chiller Evaporator Temperature is over 85°F. Check the Chiller comp. for proper operation (i.e. does a chiller comp. fault exist, preventing a start?). AFTER the condition has been corrected, press the Alarm(s) cleared button on the Current Alarm Screen.
(2.1)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(2.2)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(2.3)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
ZONE Pump Overload Tripped (OL-03) (2.4)		
(2.5)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
FOUNTAIN MAIN Pump Overload Tripped (OL-05) (2.6)		
FOUNTAIN RETURN Pump #1 Overload Tripped (OL-06) (2.7)		
(5.0)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(5.1)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(5.2)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(5.3)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
ZONE Compressor Suction-Side MAX. Temperature (TI06)(Over {THAH_COMP_S} °F)(5.4)	TE06	
ZONE Compressor Suction-Side MIN. Temperature (TI06) (Under {THAH_COMP_SU} °F)(5.5)	TE06	
ZONE Compressor MAX. Discharge-SideTEMP (TI07)(Over {THAH_COMP_DI} °F)(5.6)	TE07	
(5.7)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(4.0)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(4.1)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(4.2)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(4.3)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.

(4.4)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
FOUNTAIN HIGH Conductivity Alarm (CI13) (Above {AHAH_01}microSiemens/cm)(4.5)	CE13	
FOUNTAIN Compressor Suction Low Pressure Fault (PS10) (4.6)	PS10	The FOUNTAIN Compressor Suction Low Pressure switch has gone off. This switch is self resetting. AFTER the condition has been corrected, press the Alarm(s) cleared button on the Current Alarm Screen.
FOUNTAIN Compressor Discharge HIGH Pressure Fault (PS11) RESET The Switch(4.7)	PS11	The FOUNTAIN Compressor HIGH Discharge Pressure Switch has gone off. Reset this switch manually (it is located on the FOUNTAIN Chiller module). AFTER the condition has been corrected, press the Alarm(s) cleared button on the Current Alarm Screen.
(7.0)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(7.1)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(7.2)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(7.3)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(7.4)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(7.5)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(7.6)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(7.7)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(6.0)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(6.1)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(6.2)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(6.3)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(6.4)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(6.5)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(6.6)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(6.7)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(9.0)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(9.1)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(9.2)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(9.3)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(9.4)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(9.5)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(9.6)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(9.7)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(8.0)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(8.1)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(8.2)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(8.3)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(8.4)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.
(8.5)		This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.

(8.6)

This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.

(8.7)

This alarm has been triggered in error. Press the Alarm(s) cleared button on the Current Alarm Screen.

Interlocks

Remote Start

A dry contact at the press console may be used to provide a remote start signal to the UFS-4331. Contact closure starts the unit after a delay of 45 seconds.

Opening the contact stops the unit immediately. However it is recommended that the unit be stopped manually at the OIU by pressing the System Off Sequence button several minutes before opening the remote start contacts.



CAUTION: The remote return pump (in the tank located at the press) remains operable for 10 minutes after the System Off Sequence button is pressed. This allows fountain solution that drains from the press pans on press shut-down to be transferred to the main fountain tank. If this pump is stopped immediately, overflow of the tank at the press is possible.

Principles of Operation

Chiller (Vibrator Zone) Water Circuit

Refer to the UFS-4331 Zone Piping Flow Diagram. The circuit is a closed loop with expansion tank, pressurized by a permanent city water connection. The chiller pump circulates water through the zone chiller and the press vibrator rollers. A small portion of the zone flow is used to cool the fountain chiller condenser. The chiller proportional valve regulates the vibrator RETURN temperature (sensed by TE-01B) by mixing a cold flow stream, that has passed through the zone chiller evaporator, with a warm flow stream that has bypassed it.

Chiller (Vibrator Zone) Refrigerant Circuit

Refer to the UFS-4000-10R Zone Chiller Process & Instrumentation Diagram. The major components are the evaporator (braze plate type), compressor (scroll type), and condenser (remote, air-cooled).

In the evaporator, heat is transferred from the zone water to the refrigerant, causing it to boil. This low-pressure vapor is then compressed and discharged to the condenser, where it returns to the liquid state, releasing heat to the outdoor air. From the condenser, the high-pressure liquid passes through an expansion valve. This reduces the pressure of the liquid so that it can boil at the temperature of the water in the zone circuit. The expansion valve also meters the flow of refrigerant to match the cooling load (by maintaining a constant superheat at the evaporator outlet). A solenoid valve (SOV08) in the

liquid line upstream of the expansion valve closes when the compressor is off, to prevent migration of liquid refrigerant from the condenser to the compressor (Starting the compressor with liquid in its crankcase can cause loss of lubricating oil).

The capacity of the zone chiller is modulated to follow the actual cooling load of the press. This occurs through the action of the chiller proportional control valve described above. As less water passes through the evaporator, less heat is transferred to the refrigerant. A suction-actuated hot gas bypass valve (pressure regulator) opens as required to prevent the pressure and temperature at the compressor suction from falling below an allowable minimum. Without this pressure regulator, when there is little or no water flow through the evaporator to warm the refrigerant, the temperature in the evaporator could fall below the freezing point of the water. This could damage the evaporator (and compressor, if water were to leak into the refrigerant circuit).

The zone compressor can run even with no water flowing through the evaporator. This allows the compressor to be kept running for an arbitrary time whenever it is started, regardless of the actual cooling load. Minimizing cycling in this way lengthens compressor life.

Fountain Water Circuit

Refer to the UFS-4000 Fountain Circulator Process and Instrumentation Diagram. The Fountain Supply Pump takes suction from the Fountain Tank, and discharges the fountain solution through the Fountain Chiller Evaporator (where it is cooled) and to the press. The fountain solution drains by gravity from the press pans into the Remote Return Tank. As solution enters the Remote Return Tank, it passes through a bag filter and sheet filter. A pump on this tank (M07) cycles on and off as necessary to maintain a water level between switches LV-14A and LV-14B. Fountain solution discharged from the Remote Return Pump passes through a bag filter bag and sheet filter upon entering the Fountain Tank.

New solution is added to the Fountain tank as required by opening the makeup water valve SOV15. Chemical additives (etch, alcohol substitute) are added to the incoming water flow by a water-driven dosing pump.

Fountain Refrigerant Circuit

Refer to dwg. UFS40025MPI1A. The Fountain Chiller Module is a water-cooled chiller, with fountain solution flowing through the evaporator, and cooling water for the condenser taken from the zone water circuit.

The temperature of the fountain solution leaving the evaporator and flowing to the press is measured by

sensor TE-12. The temperature is controlled by pulsing the hot gas bypass solenoid valve SOV10.

The module includes high and low refrigerant pressure switches PS-11 and PS-10, respectively, and flow switch FS-12.

Components

Compressor (zone and fountain chillers)

The chiller is equipped with a hermetic scroll compressor. Both the compressor and the motor are encased together and solidly mounted in the cabinet. The compressor is unidirectional and will only pump refrigerant when properly phased. The cool refrigerant suction gas cools the motor windings, and there is an internal thermal overload to protect the windings from overheating. The compressor is lubricated with oil that travels throughout the system with the refrigerant.

Remote Air Cooled Condenser (zone chiller)

The condenser is constructed of heavy gauge copper tubing and aluminum fins for maximum heat transfer capabilities. The condenser has been generously sized so the chiller can operate with full cooling capacities with an outdoor air temperature of up to 95°F. At higher outdoor temperatures, the UFS-4331 will lose approximately 1% of its cooling capacity per 1°F above 95°F. The UFS-4331 can operate with an outdoor temperature of up to 110°.

The fan(s) draw cool air into the bottom of the condenser and discharge warm air out the top. The discharge air will be approximately 35°F warmer than the intake air.

Head pressure controls are contained in the condenser electrical enclosure. The first stage fan is variable speed, controlled by a Johnson Controls P-66 module. The second fan is cycled by a pressure switch.

Evaporator (zone and fountain chillers)

The evaporator is constructed of stainless steel plates and copper brazing (nickel brazed on the fountain chiller). The refrigerant passes between every other set of plates, while the coolant flows on the other side of the plates in the opposite direction.

Thermostatic Expansion Valve (TXV) (zone and fountain chillers)

The TXV separates the high pressure/high temperature side of the refrigeration circuit (the condenser side) from the low pressure/low

temperature side of the refrigeration circuit (the evaporator side). The TXV maintains constant superheat at the evaporator outlet, regardless of process load, by precisely metering the amount of refrigerant into the evaporator. Superheat is the difference between the saturated evaporative temperature and the actual measured temperature at the TXV sensor bulb. The superheat is factory set for 10°F to 12°F and should never exceed 15°F. Only a trained refrigeration technician should adjust this valve.

Refrigerant Sight Glass (zone and fountain chillers)

The refrigerant sight glass is located in the liquid line immediately ahead of the expansion valve. It allows the operator or service technician to observe the flow of liquid refrigerant. Prolonged periods of foaming in the sight glass may indicate a low refrigerant condition or a restriction in the liquid line.

Note: Occasional bubbling in the sight glass may occur at a time when load conditions are changing and the thermostatic expansion valve is adjusting to the new conditions. It can also occur when the hot gas bypass solenoid valve is open. These momentary occurrences do not adversely affect the refrigeration circuit operation.

The sight glass can also be used to check if there is moisture in the refrigeration system. If there is moisture in the system, the green dot in the center of the sight glass will turn yellow. If this occurs, the refrigeration circuit should be serviced immediately.

Refrigerant Filter Drier (zone and fountain chillers)

The filter drier is located in the liquid line between the condenser and the refrigerant sight glass. It is designed to remove any moisture and/or foreign matter that may have gotten into the refrigerant stream. Moisture and foreign matter can cause serious damage to the components of a refrigeration system. For this reason, it is important that the chiller be equipped with a clean filter drier. Replace the filter drier if any of the following conditions occur.

1. The refrigeration system is opened to the atmosphere for repairs or maintenance.
2. Moisture is indicated in the sight glass (the green dot has changed to yellow).
3. An excessive pressure drop develops across the filter drier. This is indicated by a significant temperature difference between the filter inlet and outlet.

Relief Valves (zone and fountain chillers)

Relief valves are located at the condenser and receiver (zone chiller). These prevent damage to equipment and danger to personnel in the event that heat cannot be removed from the refrigeration circuit (e.g., in the event of a condenser malfunction or closure of a refrigerant valve)

Hot Gas Bypass Valve (suction actuated) (zone chiller)

This valve is located in the refrigerant line that runs from the compressor discharge to the evaporator inlet. It is designed to artificially load the chiller when the load from the press is less than the maximum cooling capacity of the UFS-4331. This is accomplished by directing some of the hot compressor discharge gas directly back into the evaporator rather than through the condenser. The valve is mechanically actuated. It opens as necessary to maintain a zone compressor suction pressure of at least 76 psig. This greatly reduces cycling of the compressor, since it is able to run with little or no water flow through the zone evaporator, i.e., when there is little cooling load from the press. As a result compressor life is significantly extended..

Hot Gas Bypass Valve (solenoid actuated) (fountain chiller)

This valve is located in the refrigerant line that runs from the compressor discharge to the evaporator inlet. It is designed to artificially load the chiller when the load from the press is less than the maximum cooling capacity of the UFS-4331. This is accomplished by directing some of the hot compressor discharge gas directly back into the evaporator rather than through the condenser. The PLC opens and closes this valve as necessary to maintain the press supply temperature (at TE-12) near set point. This improves temperature control, as well as greatly reducing cycling of the compressor, which significantly extends the life of the compressor.

Liquid Line Solenoid Valve (zone chiller)

This valve (SOV08), located between the filter and sight glass, is closed when the compressor is shut off. This prevents migration of the refrigerant to the compressor from the condenser. Starting the compressor with liquid in the crankcase could flush out the oil and cause mechanical damage.

Receiver (zone chiller)

The receiver provides the refrigeration circuit with liquid refrigerant for start-up. This allows adequate pressure to be maintained at the compressor suction on cold days when some time is required to build up pressure in the condenser.

Pumps

All pumps (zone (M03), fountain supply (M05), fountain return (M07)) These are all stainless steel, close-coupled, centrifugal pumps, equipped with mechanical seals. The pump motors meet NEMA specifications and industry standards.

Pressure Gauge

A pressure gauge is located in the UFS-4331 on the zone pump discharge. This can be used to check that the pressure being applied to hoses and rotary unions at the press is not excessive.

Y-Strainer

A Y-strainer with a 20-mesh screen is installed in the water line to help protect the evaporator passages from becoming clogged. It also provides some protection for the press.

Refrigerant Pressure Transmitters (zone chiller)

0-500 psig transducers are located on the compressor suction (PS-06) and discharge (PS-07). Pressures are displayed on the OIU.

Refrigerant Pressure Switches (fountain chiller)

Pressure switches are located on the compressor suction (low) and discharge (high). The high pressure switch opens at 350 psig, and must be re-set manually. The low pressure switch opens at 35 and closes at 60 psig.

Flow Switch (fountain chiller)

This switch is located in the water piping on the supply to press. It is designed to shut the compressor off if there is insufficient water flow through the evaporator. The switch is adjustable; however, no adjustments should be made without prior approval from the factory.

Pressure Regulator

A pressure regulator is supplied on the incoming city water line to ensure that the pressure of the water supplied to the press is low enough to prevent damage to hoses and rotary unions. Since the press supply pressure is the sum of the makeup water pressure and the pump head, press supply pressure can be controlled by regulating the makeup water pressure.

Preventive Maintenance

Establishing a preventive maintenance routine according to the recommendations below will help to prolong the life of the UFS-4331 as well as help to prevent unplanned press downtime. A checklist is provided at the end of this section which can be used to document the preventive maintenance performed.

Once a Week

1. Inspect the remote air-cooled condenser. Remove debris (leaves, cottonwood seeds, etc.) that may be lodged in the cooling fins.
2. Check that the actual temperature of the water returning from the vibrators is within 5°F of the set when the press is not running, and within 1°F when the press has been running steadily for at least 30 minutes. The fountain supply temperature should be within 2°F of set point. If temperatures are not being controlled within this range, refer to the Troubleshooting Chart or contact the Customer Service Department.
3. Check the pressure gauge. With the pump off, it should read 10-20 psig. With the pump on, it should read at least 50 psig. Lower pressures may allow negative pressure at the pump inlet, which may damage the pump (cavitation). If this is observed, check that the City Water Isolation valve is open, and city water is being supplied to the UFS-4331.
4. Check the pump for leaks in the seal area. Replace pump seal if necessary.
5. Check the refrigerant sight glasses for air bubbles or moisture indication. If the sight glass indicates that there is a refrigeration problem, have the unit serviced as soon as possible.
6. Drain the fountain system. Wipe tanks clean. Take care to GENTLY wipe off float switches. Replace all filter media (bags and sheets).



NOTE: *More frequent replacement of filter media may be required, depending on press operating conditions.*

Once a Month

Repeat items 1 through 6 as listed above and continue with the following.

7. With the main disconnect shut off and locked out, check the condition of electrical connections

at all contactors, starters and controls. Check for loose or frayed wires.

8. Check the incoming voltage to make sure it is within 10% of the design voltage of the UFS-4331.
9. Check the amp draws to each leg of the compressor and pump to confirm that they are drawing the proper current.

Every Three Months

Repeat items 1 through 9 listed above and continue with the following.

10. Units are equipped with a Y-strainer between the pump and the evaporator inlet. The strainer basket should be removed and cleaned if necessary.
11. Take a sample from the water circuit. Check the ethylene glycol concentration. If it is less than 30%, add ethylene glycol to obtain a concentration of between 30 and 50%. Also check for leaks in the water circuit, as dilution of the ethylene glycol indicates that makeup water has been added. If the sample shows visible contamination (rust, etc.), contact Customer Service
12. Have the refrigeration circuits inspected by a certified refrigeration technician. Record suction pressure, discharge pressure, and superheat.

AWS UFS-4331 Preventive Maintenance Checklist

Model # _____
Serial # _____

Maintenance Activity	Week Number												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Date													
Inspect Condenser													
Temperature Control													
Press Supply Pressure													
Pump Seal													
Refrigerant Sight Glass													
Fountain System Cleaning													
Electrical Connections													
Incoming Voltage													
Compressor L1 Amps													
Compressor L2 Amps													
Compressor L3 Amps													
Pump L1 Amps													
Pump L2 Amps													
Pump L3 Amps													
Clean Y-Strainer													
Glycol Concentration													
Refrigerant Circuit Check													
Refrigerant Suction Pressure													
Refrigerant Discharge Pressure													
Refrigerant Superheat													

Troubleshooting

Problem	Possible Cause	Remedy
Compressor will not start	Compressor fuses	Check supply voltage, amperage of each leg, contactor and wiring
	Compressor contactor	Replace if faulty
	Compressor failure	Contact Customer Service Department for assistance
Pump will not start	Pump fuses	Check supply voltage, amperage of each leg, contactor and wiring
	Pump contactor	Replace if faulty
	Pump failure	Replace if faulty
Low refrigerant pressure	Low refrigerant charge	Contact refrigeration service technician
	Refrigerant leak	Contact refrigeration service technician
	Low refrigerant pressure switch (transmitter)	Check for proper range, replace if faulty
	Condenser fins blocked	Remove debris
	High ambient air temperature	Ambient temperature must be reduced below 110°F
	Condenser fan motor	Replace if faulty
	Condenser fan cycling control	Confirm proper operation, replace pressure switch or P-66 module if faulty
	Refrigerant circuit overcharged	Contact refrigeration service technician
	High refrigerant pressure switch	Replace if faulty

Problem	Possible Cause	Remedy
Freezestat alarm	Low flow through evaporator	Adjust flow to proper level
	Freezestat switch	Replace if faulty
Low pump discharge pressure	Pump running backwards	Switch 2 legs of the incoming power
	Pressure gauge	Replace if faulty
	Pump failure	Replace if faulty
	Excessive flow	Reduce flow
High pump discharge pressure	Closed valves in process piping	Open valves
	Obstruction in piping or process	Remove obstruction
	Clogged Y-strainer	Clean strainer
	Pressure gauge	Replace if faulty
Erratic temperature control	Low coolant flow through evaporator	Adjust flow to proper level
	Intermittent overloading of chiller capacity	Check to make sure chiller is properly sized for process load
	Hot gas bypass valve	Contact refrigeration service technician
	Thermocouple	Replace if faulty
Insufficient cooling (temperature continues to rise above set point)	Process load too high	Check to make sure chiller is properly sized for process load
	Coolant flow through evaporator too high or too low	Adjust flow to proper level
	Insufficient condenser cooling	See "High Refrigerant Pressure"
	Hot gas bypass valve stuck open	Contact refrigeration service technician
	Refrigeration circuit problem	Contact refrigeration service technician
	Thermocouple	Replace if faulty

Schedule of Attached Documents

Document Number	Description
UFS40003MPI1E	UFS-4331 Zone Piping Flow Diagram
UFS40027MPI1A	UF-4000-10R Zone Chiller Process & Instrumentation Diagram
UFS40002MPI1C	UFS-4000 Fountain Circulator Process & Instrumentation Diagram
UFS40025MPI1A	UFS-4000 Fountain Chiller Module Process & Instrumentation Diagram
SZII0014MID1,2A	3-15 Ton Single Zone II Chill Pac Remote Condenser Installation Details (2 sheets)
UFS4XXXXEEL1-16A	UF-4331-10R Electrical Schematic (16 sheets)
UFS4XXXXCPC1A	UFS-4331-10R Control Panel Layout
OIU Screen Flow Chart	

Warranty

AWS, a Thermal Care Division warrants its equipment to be free from defects in material and workmanship when used under recommended operating conditions.

AWS, a Thermal Care Division's commitment is limited to replacement (not normal wear and maintenance) and/or repair (e.g. replace pump seal), F.O.B. Niles, IL, of any parts supplied by AWS, a Thermal Care Division found to be defective during the time period shown below. This commitment applies to the original purchaser from the date of start-up.

AWS, a Thermal Care Division is not responsible for any sales, use, excise or other applicable taxes associated with the replacement of parts under this warranty. The warranty does not extend to damage caused by accident, misuse, neglect, or failure to follow published operating procedures, and failures to perform routine maintenance procedures. This warranty shall not apply to equipment that is installed or used in operating conditions or environments deemed as hostile or unusual unless such operating conditions or environments are acknowledged and accepted in writing by AWS, a Thermal Care Division prior to equipment manufacture. This warranty is not transferable.

At no time will AWS, a Thermal Care Division be responsible for loss of prospective or contemplative profits, loss of time due to plant shutdown, or other consequential or special damages to persons or property.

All defective parts become the property of AWS, a Thermal Care Division and must be returned as advised by AWS, a Thermal Care Division

This warranty statement is the expressed warranty for AWS, Inc in its entirety. AWS, a Thermal Care Division assumes no liability for statements or agreements of its employees or others unless made in writing from authorized AWS, a Thermal Care Division personnel. There is an implied equipment warranty for merchantability and fitness for use. All other implied warranties and any liability not based upon contract are hereby disclaimed and denied. This warranty is part of our standard Terms and Conditions of sale (existing separately) for AWS, a Thermal Care Division equipment and services.

Products sold within the United States: One (1) year parts/One (1) year labor

Products sold outside the United States: One (1) year parts/One (1) year labor

Note: This warranty excludes travel expenses/per diem (i.e. air fare, hotel, car, meals). AWS, a Thermal Care Division will require a purchase order prior to onsite visits to cover travel expenses.