



Liebert® XDU1350

Coolant Distribution Unit

**Operation and Maintenance Manual**

The information contained in this document is subject to change without notice and may not be suitable for all applications. While every precaution has been taken to ensure the accuracy and completeness of this document, Vertiv assumes no responsibility and disclaims all liability for damages resulting from use of this information or for any errors or omissions.

Vertiv recommends installing a monitored fluid detection system that is wired to activate the automatic closure of field-installed coolant fluid supply and return shut off valves, where applicable, to reduce the amount of coolant fluid leakage and consequential equipment and building damage. Refer to local regulations and building codes relating to the application, installation, and operation of this product. The consulting engineer, installer, and/or end user is responsible for compliance with all applicable laws and regulations relating to the application, installation, and operation of this product.

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### **Technical Support Site**

If you encounter any installation or operational issues with your product, check the pertinent section of this manual to see if the issue can be resolved by following outlined procedures.

Visit <https://www.vertiv.com/en-us/support/> for additional assistance.

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# 1 Important Safety Instructions

## Save These Instructions

This manual contains important instructions that should be followed during operation and maintenance of the Vertiv™ Liebert® XDU1350.



**WARNING! Arc flash and electric shock hazard. Can cause serious injury or death. Building and equipment damage may also result. Disconnect all local and remote electric power supplies and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable.**

Verify with a voltmeter that power is Off. The Vertiv™ Liebert® iCOM™ controller does not isolate power from the unit, even in the “Unit Off” mode. Some internal components still require and receive power even during the “Unit Off” mode of the Liebert® iCOM™ controller. The factory-supplied, optional disconnect switch is inside the unit. The line side of this switch contains live high voltage. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic.

Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. Follow all local codes.



**WARNING! Risk of electric shock. Can cause serious injury or death. Building and equipment damage may also result. Open all local and remote electric power supply disconnect switches and verify that power is off with a voltmeter before working within any electric connection enclosures. The Liebert® iCOM™ controller does not isolate power from the unit, even in the "Unit Off" mode. Some internal components require and receive power even during the "unit off" mode of the Liebert® iCOM™ controller.**

Installation, service, and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers' specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.



**WARNING! Risk of short circuits and electric shock. Can cause serious injury or death. Building and equipment damage can result from cut insulation or damaged wires. Can cause overheated wiring, smoke, fire, activation of fire suppression systems and EMS personnel, and loss of power to fans. Verify that all wiring connections are tight and that all wiring is contained within the junction box prior to closing and securing the cover.**

Insert CSA-certified or UL-listed bushings into holes and/or knockouts used to route wiring through metal panels to protect the wire insulation from contact with sheet metal edges.



**WARNING!** Risk of improper wire sizing/rating and loose electrical connections causing overheated wire and electrical connection terminals resulting in smoke or fire. Can cause serious injury or death. Building and equipment damage may also result. Use correctly sized copper wire only and verify that all electrical connections are tight before turning power On. Check all electrical connections periodically and tighten as necessary.



**WARNING!** Risk of improper wiring, piping, moving, lifting and handling. Can cause serious injury or death. Building and equipment damage may also result. Installation and service of this equipment should be done only by qualified personnel who have been specially-trained in the installation of air-conditioning equipment and who are wearing appropriate, OSHA-approved PPE.



**WARNING!** Risk of improper moving. Can cause serious injury or death. Building and equipment damage may also result. Use only lifting equipment that is rated for the unit weight by an OSHA-certified rating organization. The center of gravity varies depending on the unit size and selected options. The slings must be equally spaced on either side of the center of gravity indicator. Shipping weights and unit weights are specified in the Application and Planning Guide. Use the center of gravity indicators on the unit to determine the position of the slings.



**WARNING!** Risk of top-heavy unit falling over when improperly lifted or moved. Can cause serious injury or death. Building and equipment damage may also result. Read all of the following instructions and verify that all lifting and moving equipment is rated for the weight of the unit before attempting to move, lift, remove packaging from or prepare the unit for installation. Unit weights are specified in the Application and Planning Guide.



**WARNING!** Risk of unsecured unit rolling off pallet. Can cause serious injury or death. Building and equipment damage may also result. The unit is on casters. Ensure that the unit and pallet are located on a flat surface before loosening the hardware securing the unit to its shipping pallet.



**CAUTION:** Risk of contact with extremely hot or cold surfaces. Can cause injury. Verify that all components have reached a temperature that is safe for human contact or wear appropriate, OSHA-approved PPE before working with the electric connection enclosures or unit cabinet. Perform maintenance only when the system is de-energized and component temperatures have become safe for human contact.



**CAUTION:** Risk of contact with sharp edges, splinters and exposed fasteners. Can cause injury. Only properly trained and qualified personnel wearing appropriate, OSHA-approved PPE should attempt to move, lift, remove packaging from or prepare the unit for installation.



**CAUTION:** Risk of improper handling heavy and lengthy parts. Can cause injury. Building and equipment damage may also result. Cabinet panels can exceed 5 ft. (1.5 m) in length and weigh more than 35 lb (15.9 kg). Follow relevant OSHA lifting recommendations and consider using a two-person lift for safe and comfortable removal and installation of cabinet panels. Only properly trained and qualified personnel wearing appropriate, OSHA-approved PPE should attempt to remove or install cabinet panels.



**CAUTION:** Risk of improper piping installation, leak checking, fluid chemistry and fluid maintenance. Can cause injury. Building and equipment damage may also result. Installation and service of this equipment should be done only by qualified personnel who have been specially-trained in the installation of air-conditioning equipment and who are wearing appropriate, OSHA-approved PPE.

#### NOTICE

Risk of improper power-supply connection. Can cause equipment damage and loss of warranty coverage.

Prior to connecting any equipment to a main or alternate power source (for example back-up generator systems) for start-up, commissioning, testing, or normal operation, ensure that these sources are correctly adjusted to the nameplate voltage and frequency of all equipment to be connected. In general, power-source voltages should be stabilized and regulated to within +/- 5% of the load nameplate nominal voltage. Also, ensure that no three-phase sources are single-phased at any time.

See transformer label for primary tap connections. Installer will need to change transformer primary taps if applied unit voltage is other than pre-wired tap voltage.

#### NOTICE

Risk of improper electrical connection of three-phase input power. Can cause backward pump rotation and unit damage. Service technicians should use a gauge set on the system during the initial start up to verify that the three-phase power is connected properly. Three-phase power must be connected to the unit line voltage terminals in the proper sequence so that the pump rotates in the proper direction. Incoming power must be properly phased to prevent pump from running backward. We recommend checking the unit's phasing with proper instrumentation to ensure that the power connections were made correctly. We also recommend verifying discharge and suction pressures during start up to ensure that the pumps are running in the correct direction.

## NOTICE

Risk of piping-system corrosion and freezing fluids. Can cause leaks resulting in equipment and very expensive building damage. Heat exchangers and piping systems are at high risk of freezing and premature piping corrosion. Fluids in these systems must contain the proper antifreeze and inhibitors to prevent freezing and premature piping corrosion. When the cooling unit or piping may be exposed to freezing temperatures, charge the system with coolant fluid based on the coldest ambient design temperature. Automotive antifreeze is unacceptable and must NOT be used in any fluid system. Use only coolant fluid solution that meets the requirements of recommended industry practices. Do not use galvanized pipe.

The system coolant fluid must be analyzed by a competent fluid-treatment specialist before start up to establish the inhibitor and antifreeze solution requirement and evaluated at regularly scheduled intervals throughout the life of the system to determine the pattern of inhibitor depletion.

The fluid complexity and variants of required treatment programs make it extremely important to obtain the advice of a competent and experienced fluid-treatment specialist and follow a regularly scheduled coolant-fluid system-maintenance program.

Fluid chemistry varies greatly as do the required additives, called inhibitors, that reduce the corrosive effect of the fluids on the piping systems and components.

The chemistry of the coolant fluid used must be considered, because some sources may contain corrosive elements that reduce the effectiveness of the inhibited formulation. Sediment deposits prevent the formation of a protective oxide layer on the inside of the coolant system components and piping. The coolant fluid must be treated and circulating through the system continuously to prevent the buildup of deposits and/or growth of sulfate reducing bacteria. Proper inhibitor maintenance must be performed to prevent corrosion of the system.

Consult fluid manufacturer for testing and maintenance of inhibitors.

Commercial-grade coolant fluid is generally less corrosive to the common metals of construction than water itself. It will, however, assume the corrosivity of the coolant fluid from which it is prepared and may become increasingly corrosive with use if not properly inhibited.

Vertiv recommends installing a monitored fluid-detection system that is wired to activate the automatic-closure of field-installed coolant-fluid supply and return shut-off valves to reduce the amount of coolant-fluid leakage and consequential equipment and building damage. The shut-off valves must be sized to close-off against the maximum coolant-fluid system pressure in case of a catastrophic fluid leak.

## NOTICE

Risk of no-flow condition. Can cause equipment damage. Do not leave the water/coolant fluid-supply circuit in a no-flow condition. Idle fluid allows the collection of sediment that prevents the formation of a protective oxide layer on the inside of the tubes. Keep unit switched On and water/ coolant fluid-supply circuit system operating continuously.

## NOTICE

Risk of leaking chilled water lines. Can cause equipment and building damage. Lines and joints must be inspected regularly. Improper installation, application and service practices can result in water leakage from the unit. Water leakage can result in severe property damage and loss of critical data center equipment. Do not locate unit directly above any equipment that could sustain water damage.

Vertiv recommends installing monitored leak detection equipment for the unit and supply and return lines.

**NOTICE**

Risk of a catastrophic water circuit rupture. Can cause expensive building and equipment damage.

Install an overflow drain pan under the unit with a monitored leak detection system in the pan and shutoff valves in the supply and return water lines that automatically close if water is detected by the leak detection system. The shutoff valves should be spring return and must be rated for a close-off pressure that is the same as or higher than the supply water pressure. If it is not possible to install an overflow drain pan, then a monitored leak detection system should be installed in the base of the unit or under the unit to actuate the shutoff valves immediately on a leak detection signal.

The overflow drain pan should have a drain line connected to it that flows to a floor drain or maintenance sink in case of a shutoff valve or leak detection system malfunction.

**NOTICE**

Risk of passageway interference. Can cause unit and/or structure damage. The unit may be too large to fit through a passageway while on or off the skid. Measure the unit and passageway dimensions, and refer to the installation plans prior to moving the unit to verify clearances.

**NOTICE**

Risk of damage from forklift. Can cause unit damage. Keep tines of the forklift level and at a height suitable to fit below the skid and/or unit to prevent exterior and/or underside damage.

**NOTICE**

Risk of improper storage. Can cause unit damage.

Keep the unit upright, indoors and protected from dampness, freezing temperatures and contact damage.

**NOTICE**

Risk of improper control circuits. Can cause equipment damage.

When using jumpers for troubleshooting, always remove jumpers when maintenance is complete. Jumpers left connected could override controls and cause equipment damage.

**1.1 General**

Mechanical and electrical equipment such as cooling distribution units (XDUs) present potential mechanical and electrical hazards. All safety, installation, operation and maintenance instructions must be adhered to. Any work on or use of the equipment must only be carried out by technically competent personnel who are fully trained. This product is designed to minimize all potential hazards by restricting access through unit casings, doors, and covers while equipment is operational.

Before any maintenance work being carried out, ensure:

1. Equipment is switched OFF.
2. Equipment and controls are disconnected from the electrical supply.
3. All rotating parts such as pumps and 3-way valve have come to rest.

If in any doubt over anything regarding safety, installation, operation or maintenance instructions, it is essential that the manufacturer, their agent or appointed representative is consulted for clarification and advice.

## 1.2 Installation/Handling



**WARNING!** Risk of improper wiring, piping, moving, lifting and handling. Can cause serious injury or death. Building and equipment damage may also result. Installation and service of this equipment should be done only by qualified personnel who have been specially-trained in the installation of air-conditioning equipment and who are wearing appropriate, OSHA-approved PPE.



**WARNING!** Risk of improper moving. Can cause serious injury or death. Building and equipment damage may also result. Use only lifting equipment that is rated for the unit weight by an OSHA-certified rating organization. Shipping weights and unit weights are specified in the Application and Planning Guide.



**WARNING!** Risk of top-heavy unit falling over when improperly lifted or moved. Can cause serious injury or death. Building and equipment damage may also result. Read all of the following instructions and verify that all lifting and moving equipment is rated for the weight of the unit before attempting to move, lift, remove packaging from or prepare the unit for installation. Unit weights are specified in the Application and Planning Guide.



**WARNING!** Risk of unsecured unit rolling off pallet. Can cause serious injury or death. Building and equipment damage may also result. The unit is on casters. Ensure that the unit and pallet are located on a flat surface before loosening the hardware securing the unit to its shipping pallet.



**CAUTION:** Risk of contact with sharp edges, splinters and exposed fasteners. Can cause injury. Only properly trained and qualified personnel wearing appropriate, OSHA-approved PPE should attempt to move, lift, remove packaging from or prepare the unit for installation.

### NOTICE

Risk of passageway interference. Can cause unit and/or structure damage. The unit may be too large to fit through a passageway while on or off the skid. Measure the unit and passageway dimensions, and refer to the installation plans prior to moving the unit to verify clearances.

### NOTICE

Risk of damage from forklift. Can cause unit damage. Keep tines of the forklift level and at a height suitable to fit below the skid and/or unit to prevent exterior and/or underside damage.

Installation and operation must be conducted in accordance with local and national regulations and normal codes of good practice. When moving or lifting the product, caution must be observed to ensure the safety of personnel. Only the appropriate lifting equipment must be used.

## 1.3 Application

This product is to be used indoors only and must only be used for the application it was designed for. This product must not be used in a hazardous environment.

## 1.4 Warranty

Failure to comply with the Vertiv installation, maintenance, and operation instructions may affect the reliability and performance of the unit and invalidate any warranty.

## 1.5 Electrical Connection



**WARNING! Arc flash and electric shock hazard. Can cause serious injury or death. Building and equipment damage may also result. Disconnect all local and remote electric power supplies and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable.**

Verify with a voltmeter that power is Off. The Vertiv™ Liebert® iCOM™ controller does not isolate power from the unit, even in the “Unit Off” mode. Some internal components still require and receive power even during the “Unit Off” mode of the Liebert® iCOM™ controller. The factory-supplied, optional disconnect switch is inside the unit. The line side of this switch contains live high voltage. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic.

Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. Follow all local codes.



**WARNING! Risk of electric shock. Can cause serious injury or death. Building and equipment damage may also result. Open all local and remote electric power supply disconnect switches and verify that power is off with a voltmeter before working within any electric connection enclosures. The Liebert® iCOM™ controller does not isolate power from the unit, even in the "Unit Off" mode. Some internal components require and receive power even during the "unit off" mode of the Liebert® iCOM™ controller.**

Installation, service, and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers' specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.



**WARNING! Risk of improper wire sizing/rating and loose electrical connections causing overheated wire and electrical connection terminals resulting in smoke or fire. Can cause serious injury or death. Building and equipment damage may also result. Use correctly sized copper wire only and verify that all electrical connections are tight before turning power On. Check all electrical connections periodically and tighten as necessary.**

## NOTICE

Risk of improper power-supply connection. Can cause equipment damage and loss of warranty coverage.

Prior to connecting any equipment to a main or alternate power source (for example back-up generator systems) for start-up, commissioning, testing, or normal operation, ensure that these sources are correctly adjusted to the nameplate voltage and frequency of all equipment to be connected. In general, power-source voltages should be stabilized and regulated to within +/- 5% of the load nameplate nominal voltage. Also, ensure that no three-phase sources are single-phased at any time.

See transformer label for primary tap connections. Installer will need to change transformer primary taps if applied unit voltage is other than pre-wired tap voltage.

## NOTICE

Risk of improper electrical connection of three-phase input power. Can cause backward pump rotation and unit damage. Service technicians should use a gauge set on the system during the initial start up to verify that the three-phase power is connected properly. Three-phase power must be connected to the unit line voltage terminals in the proper sequence so that the pump rotates in the proper direction. Incoming power must be properly phased to prevent pump from running backward. We recommend checking the unit's phasing with proper instrumentation to ensure that the power connections were made correctly. We also recommend verifying discharge and suction pressures during start up to ensure that the pumps are running in the correct direction.

Electrical connections should be carried out in accordance with local and national regulations by a qualified electrician. Never make any electrical connections inside or to the unit unless the electricity supply has been switched OFF at the disconnect (isolator).

## 1.6 Replacement Parts

Any parts replaced during maintenance or servicing must be the same specification as those being replaced and should only be obtained from Vertiv.

The use of incorrect replacement parts may affect the operation or reliability of the unit and invalidate any warranty.

## 1.7 Waste Disposal

Any waste or single use materials must be disposed of in a responsible manner and in strict adherence to local and national environmental regulations. For details, consult local environmental agencies.

## 1.8 Documentation

Operation and maintenance documentation together with commissioning, maintenance or service records must remain with the unit always.

## 2 Agency

### 2.1 Product Standards and Approvals

Vertiv products installed and operated in compliance with this document, the operation and maintenance guide and installation and commissioning guide, conform to the Low Voltage directive 2014/35/EU, the EMC directive 2014/30/EU and the Pressure Equipment directive 2014/68/EU. As manufactured, Cooltera products are designed to comply with an IP21 rating. This product is cUL listed for the appropriate voltage models and certificates will be made available on request (cUL certificate pending).



### 2.2 ROHS 2 Compliance

Vertiv certifies that all products manufactured and supplied by Vertiv are fully RoHS compliant in accordance with EU RoHS Directives 2002/95/EC – 2011/65/EU and the Council of 8 June 2011 directives, unless specified otherwise.



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## 3 Product Description

### 3.1 General

This document describes the operation, alarm management, and maintenance of the Vertiv™ Liebert® XDU1350.

The Liebert® XDU1350 contains a Secondary closed loop circuit that provides a supply of cooling water to IT equipment, either through indirect cooling (e.g. rack mounted rear door heat exchangers), or direct cooling (e.g. cold plates at chip level).

The Secondary circuit is a low pressure sealed system with the heat removed from the high heat density areas of IT equipment rejected to an external cooled water source (Primary circuit) via a low pressure drop plate heat exchanger.

The Secondary circuit ensures that the cooling fluid in a data center environment can be kept to a minimum volume, is closely controlled for flow, pressure, and temperature (with condensation control) and can be accurately maintained for fluid quality (with filtration and additives).

The Primary cooling source can be a chilled water system (either dedicated or from building system), fluid cooler, cooling tower or dry air cooler, depending on the desired Secondary temperature and heat transfer duty (refer to the Primary (Facility) Circuit and the Secondary Circuit of the Application and Planning Guide for more information).

### 3.2 Vertiv™ Liebert® XDU1350 Model Number Nomenclature

The Liebert® XDU1350 can be configured for 2 x or 3 x (redundant) pumps, voltage options to suit most global locations, Secondary filtration, Primary Top/Bottom connections and Secondary Top/Bottom connections. **Table 3.1** below is an example of the Liebert® XDU1350 model number, fully configured. **Table 3.2** below describes each digit of the model number.

**Table 3.1 Liebert® XDU1350 Model Number**

| Digit   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |   |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|
| Model # | X | D | U | 1 | 3 | 5 | 0 | A | A | 0  | 0  | A  | 2  | B  | B  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 2  | 3  | 4  | E |

**Table 3.2 Liebert® XDU1350 Model Number Definitions**

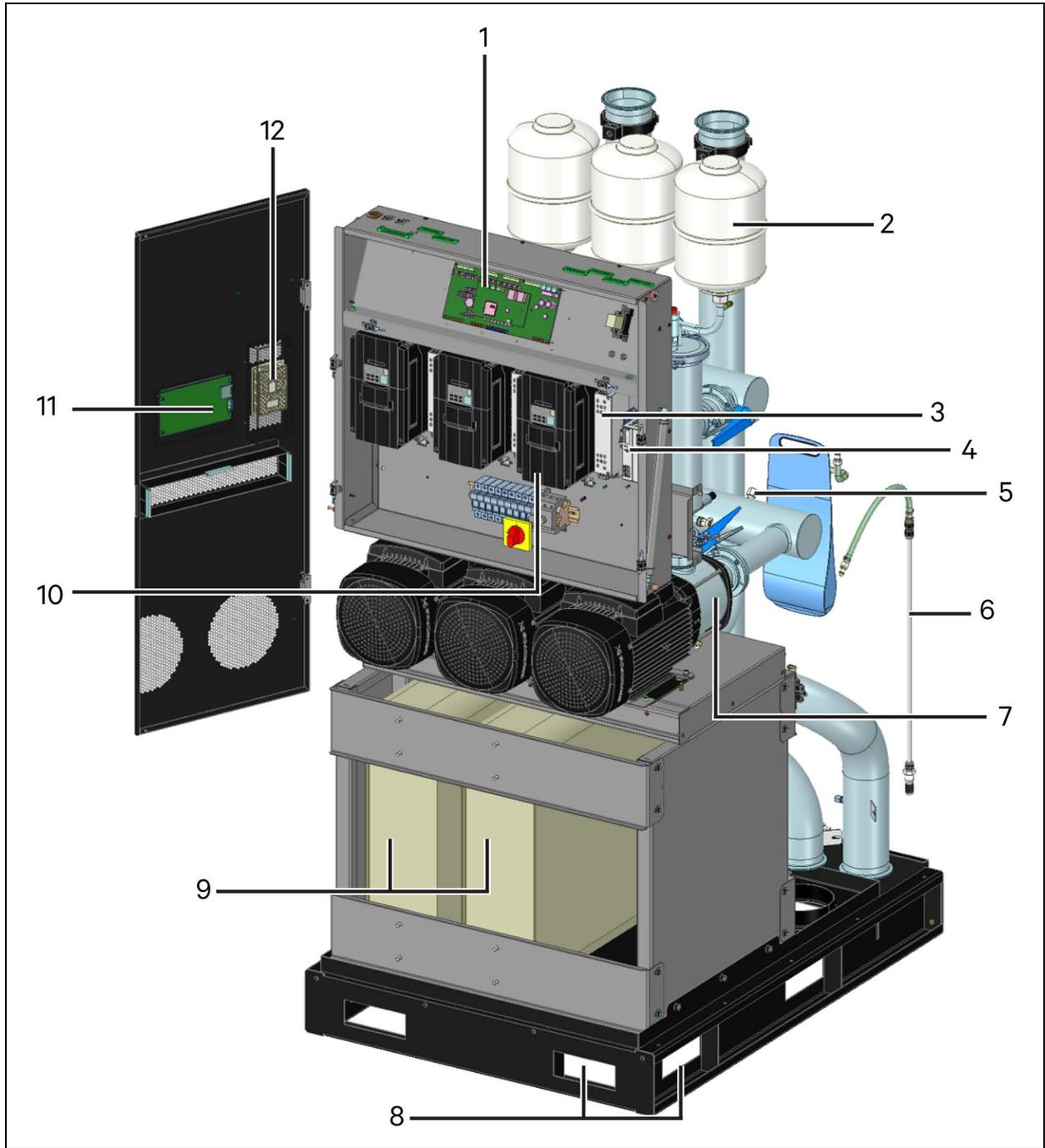
| Digit                          | Description  |
|--------------------------------|--|
| Digit 1-7, Model               | Liebert® XDU1350   |
| Digit 8, Revision              | A  |
| Digit 9, Voltage               | A = 460V/3PH/60Hz  |
| Digit 10, ATS                  | 0 = None<br>A = ATS 440/480V   |
| Digit 11, Communication        | 0 = Standard (Modbus)<br>1 = Standard with BACnet Gateway                    |
| Digit 12, Primary Filtration   | 0 = None   |
| Digit 13, Secondary Filtration | 0 - None (includes 6 bar relief)<br>2 = Fitted (50µ) (includes 3 bar relief) |

**Table 3.2 Liebert® XDU1350 Model Number Definitions (continued)**

| Digit                              | Description   |
|------------------------------------|---|
| Digit 14, Primary Connection       | T = Top Connection<br>B = Bottom Connection                                     |
| Digit 15, Secondary Connection     | T = Top Connection Kit<br>B = Bottom Connection Kit                             |
| Digit 16, Manifolding              | 0 = None  |
| Digit 17                           | Open  |
| Digit 18                           | Open  |
| Digit 19                           | Open  |
| Digit 20                           | Open  |
| Digit 21-24, Factory Configuration | -   |
| Digit 25, Configuration Code Digit | A-Z = Standard Configuration (excluding S)<br>S = Special Feature Authorization |

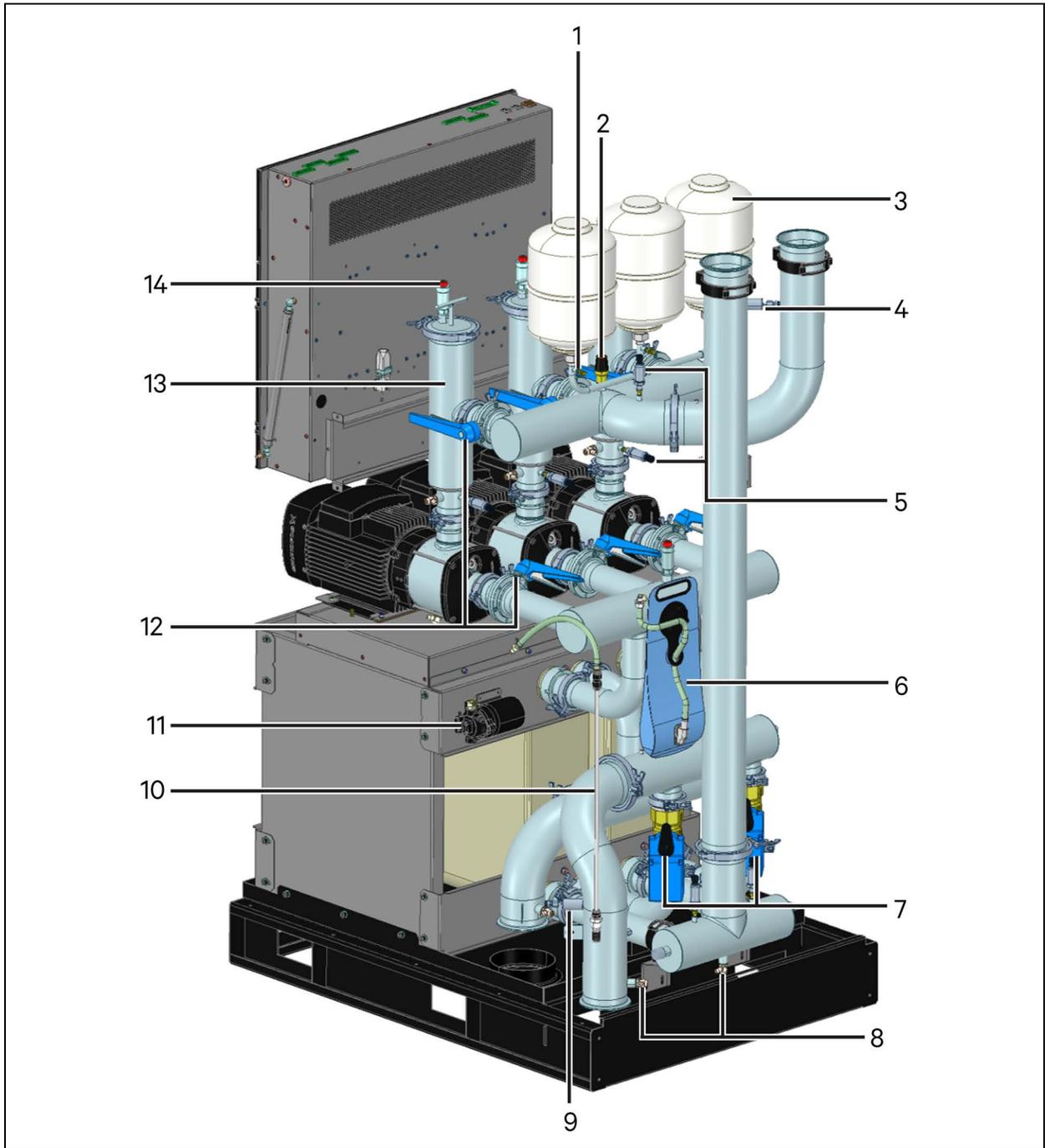
### 3.3 Product Views

Figure 3.1 Front View of Vertiv™ Liebert® XDU1350 (doors, roof, and side panels removed)



| Item | Description                                     |
|------|---|
| 1    | Controller/processor board                      |
| 2    | Expansion vessels                               |
| 3    | EMC filters                                     |
| 4    | Power supply                                    |
| 5    | Level sensors                                   |
| 6    | Filling wand                                    |
| 7    | Secondary pumps                                 |
| 8    | Front and side forklift access                  |
| 9    | Plate heat exchangers                           |
| 10   | Pump inverter drivers                           |
| 11   | Controller touch screen (mounted to front door) |
| 12   | Room temperature and RH sensor                  |

Figure 3.2 Rear View of Vertiv™ Liebert® XDU1350 (with bottom exit Primary and Secondary tails)



| Item | Description   |
|------|---|
| 1    | Manual air vents (fitted below each expansion vessel) |
| 2    | Pressure relief valve                                 |
| 3    | Expansion vessels                                     |

| Item | Description   |
|------|---|
| 4    | Secondary flow meter  |
| 5    | Pressure sensors  |
| 6    | Flexible make-up container  |
| 7    | Primary cooling valves (2-way with manual override)                   |
| 8    | Drain valves  |
| 9    | Primary flow meter  |
| 10   | Filling wand  |
| 11   | Fill pump   |
| 12   | Filter/pump isolation valves  |
| 13   | Secondary filters   |
| 14   | Auto air vent (fitted to each filter housing and pump inlet manifold) |

## 4 Operation

### 4.1 Controller Overview

The Vertiv™ Liebert® XDU1350 controller is designed to monitor and control the supply of cooling water to IT equipment in unattended data center environments. Secondary circuit cooling water is closely controlled to a defined temperature and at a controlled flow rate (or differential pressure), for optimum heat management.

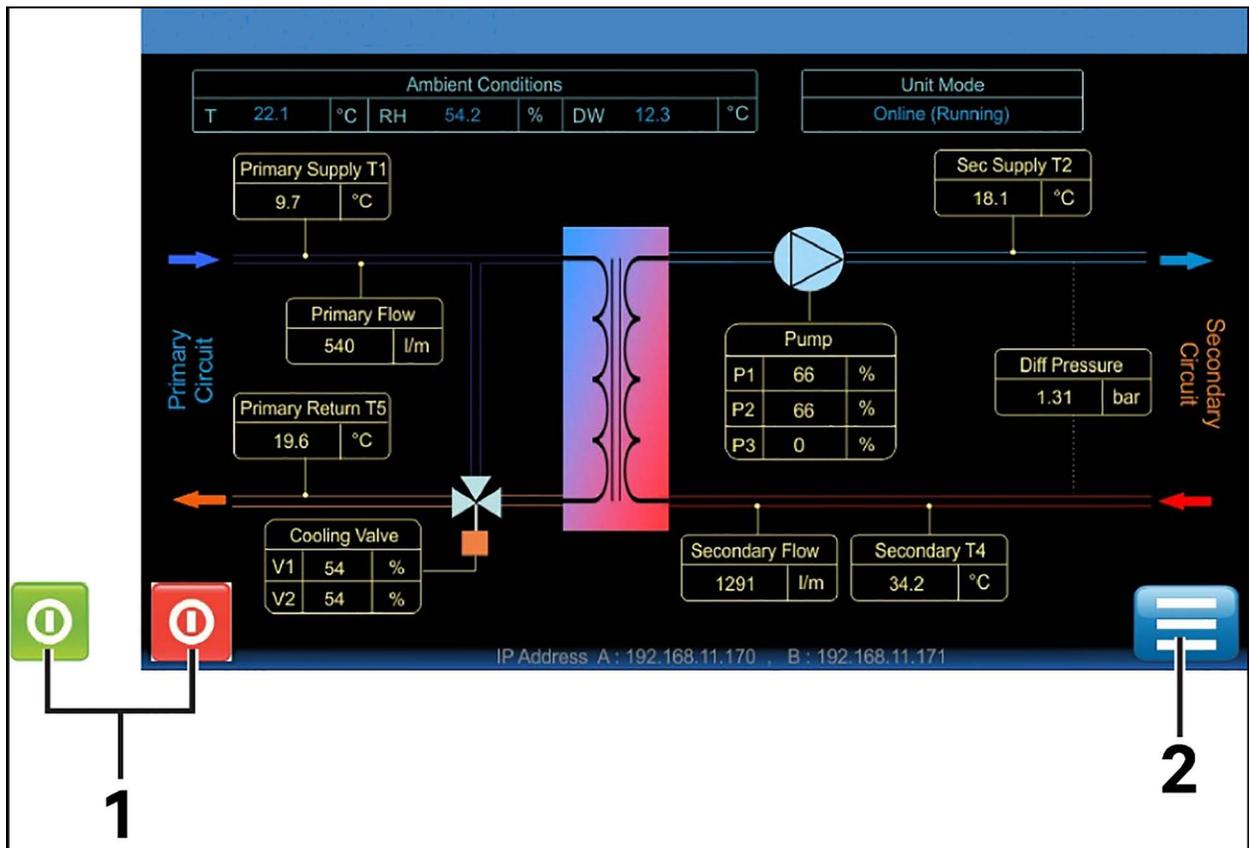
When power is first applied to the unit, the touchscreen will illuminate, and the pump inverter drives will energize. After a short initialization period during which the company logo is presented, the display will default to the 'Home' screen, as shown in Figure 4.1 below.

### 4.2 User Interface

#### 4.2.1 HOME Screen

The Home screen displays a schematic representation of the Vertiv™ Liebert® XDU1350, showing essential temperatures, pressures, flows, etc. for both Primary and Secondary circuits, plus the product code identification, IP addresses, installed software version, and date/time.

Figure 4.1 Control System Home Screen



| Item | Description  |
|------|--|
| 1    | Start/Stop icon changes to green when unit is running. |
| 2    | Pressing displays the Main MENU screen.                |

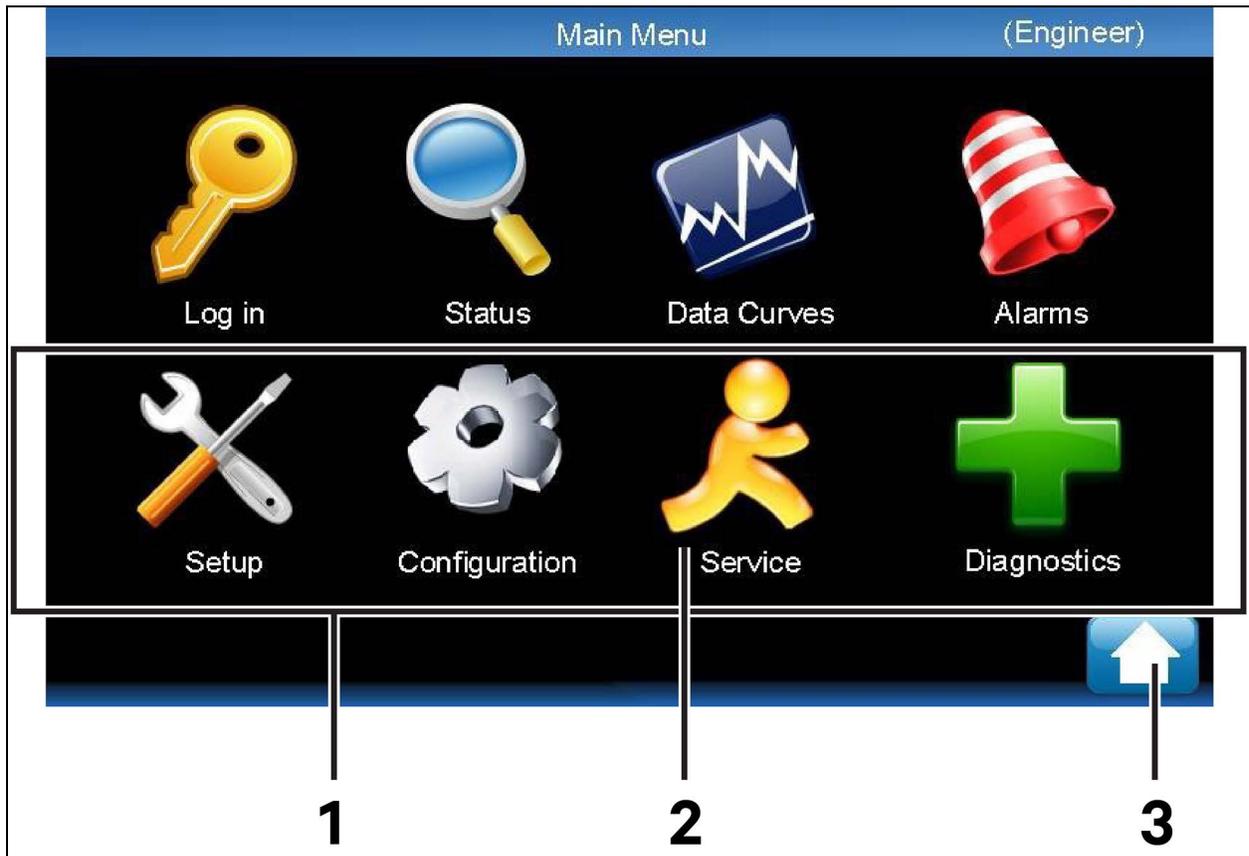
### 4.2.2 MAIN MENU Screen

The Main Menu screen displays further accessible sub-menus for an increased level of information and alteration of certain parameters.

**NOTE: Some Control System menus may not be visible if the user has not logged in and visibility will also depend on the log-in access level used.**

The touchscreen display has been designed to be intuitive and any user should be able to easily navigate through the various menus without the need for this guide. However, the following explanation is available for additional information, or as a reference for when the user is not in front of the unit.

Figure 4.2 Control System Main Menu Screen



| Item | Descriptions   |
|------|--|
| 1    | Only visible when logged in (see LOG-IN Screen on page 24 for access codes). |
| 2    | Only visible when logged in at Service or Engineer level.                    |
| 3    | Pressing returns to Home screen.   |

### 4.2.3 STATUS Screen

The Status screen displays comprehensive viewable only information on the operating condition of the Vertiv™ Liebert® XDU1350.

**NOTE:** If the unit has not been configured for certain options, then corresponding values will not be shown. e.g. if the Secondary filters are not fitted, then PS5a,b,c will show '-101'.

Figure 4.3 Control System Status Screen

| Status                          |           |           |                    |        |           |
|---------------------------------|-----------|-----------|--------------------|--------|-----------|
| Unit Mode                       |           |           | Online (Running)   |        |           |
| Fixed Setpoint                  |           | 18.0 degC | Dew Point Setpoint |        | 22.3 degC |
| Cooling Mode                    |           | Fixed     | Cooling Demand     |        | 74 %      |
| Cooling Valve 1 Demand          |           | 74 %      | Valve 1 Feedback   |        | 74 %      |
| Cooling Valve 2 Demand          |           | 74 %      | Valve 2 Feedback   |        | 74 %      |
| Secondary Supply Temperature T2 |           |           |                    |        | 18.2 degC |
| T2a                             | 18.3 degC | T2b       | 18.2 degC          | T2c    | 18.1 degC |
| Secondary Return Temperature T4 |           | 32.5 degC | Unit Cooling Duty  |        | 528 kW    |
| Page 2                          |           | Page 3    |                    | Page 4 |           |
| Page 5                          |           | Page 6    |                    | ≡      |           |

There are six information pages within the 'Status' screen and the details for each page are shown in the tables below.

Table 4.1 Status - Page 1 (as shown in Figure 4.3 above)

|                                 |   |
|---------------------------------|---|
| Unit Mode                       | (Standby/On-line (running)/ Fault/Shutdown)     |
| Unit Cooling Duty               | -- kW   |
| Cooling Mode                    | (Off/Fixed Setpoint + DW Offset/Fixed Setpoint) |
| Fixed Setpoint                  | -- °F   |
| Dew Point Setpoint              | -- °F   |
| Cooling Demand                  | -- %  |
| Cooling Feedback                | -- %  |
| Secondary Return Temperature T2 | -- °F   |
| T2a                             | -- °F   |
| T2b                             | -- °F   |
| T2c                             | -- °F   |
| Secondary Return Temperature T4 | -- °F   |

**Table 4.2 Status – Page 2**

|  |        |
|--|--------|
| Primary Supply Temperature T1                | -- °F  |
| Primary Flow Rate                            | -- l/m |
| Primary Filter Inlet Pressure PS3            | -- Bar |
| Primary Filter Outlet Pressure PS4           | -- Bar |
| Primary Filter Differential Pressure PS3-PS4 | -- Bar |
| Ambient Temperature T3a                      | -- °F  |
| Ambient Temperature T3b                      | -- °F  |
| Ambient RHa                                  | -- °F  |
| Ambient RHb                                  | -- °F  |
| Dewpoint DWa                                 | -- °F  |
| Dewpoint DWb                                 | -- °F  |

**Table 4.3 Status – Page 3**

|  |        |
|--|--------|
| Secondary Flow Rate                        | -- l/m |
| Secondary Return Pressure PS1              | -- Bar |
| Secondary Return Pressure PS1a             | -- Bar |
| Secondary Return Pressure PS1b             | -- Bar |
| Secondary Supply Pressure PS2              | -- Bar |
| Differential Pressure PS2-PS1              | -- Bar |
| Pump 1 Speed                               | -- %   |
| Pump 2 Speed                               | -- %   |
| Secondary Filter 1 Inlet Pressure PS5a     | -- Bar |
| Secondary Filter 2 Inlet Pressure PS5b     | -- Bar |
| Secondary Filter 1 Diff. Pressure PS5a-PS2 | -- Bar |
| Secondary Filter 2 Diff. Pressure PS5b-PS2 | -- Bar |

**Table 4.4 Status – Page 5**

|                     |       |
|---------------------|-------|
| Pump 1 Comms Status | --    |
| Pump 2 Comms Status | --    |
| Pump 1 Mode         | --    |
| Pump 2 Mode         | --    |
| Pump 1 Frequency    | -- Hz |
| Pump 2 Frequency    | -- Hz |

**Table 4.4 Status – Page 5 (continued)**

|                              |       |
|------------------------------|-------|
| Pump 1 Voltage               | -- V  |
| Pump 2 Voltage               | -- V  |
| Pump 1 Current               | -- A  |
| Pump 2 Current               | -- A  |
| Pump 1 Power                 | -- kW |
| Pump 2 Power                 | -- kW |
| Pump 1 Heat Sink Temperature | -- °F |
| Pump 2 Heat Sink Temperature | -- °F |
| Pump 1 Last Fault Code       | --    |
| Pump 2 Last Fault Code       | --    |

**Table 4.5 Status - Page 6**

| XDU | Mode | DP Bar | Flow Rate l/m | Pump Speed % | Temp T2 °C | Cooling Demand | Lead |
|-----|------|--------|---------------|--------------|------------|----------------|------|
| 1   |      | 0.00   | 0             | 0            | 0.0        | 0              | 0    |
| 2   |      | 0.00   | 0             | 0            | 0.0        | 0              | 0    |
| 3   |      | 0.00   | 0             | 0            | 0.0        | 0              | 0    |
| 4   |      | 0.00   | 0             | 0            | 0.0        | 0              | 0    |
| 5   |      | 0.00   | 0             | 0            | 0.0        | 0              | 0    |
| 6   |      | 0.00   | 0             | 0            | 0.0        | 0              | 0    |
| 7   |      | 0.00   | 0             | 0            | 0.0        | 0              | 0    |
| 8   |      | 0.00   | 0             | 0            | 0.0        | 0              | 0    |

Possible Modes - Not configured, shutdown - remote start/stop, shutdown - network, full manual control, standby, online (running), online (filling), filling, shutdown - fault, and group standby

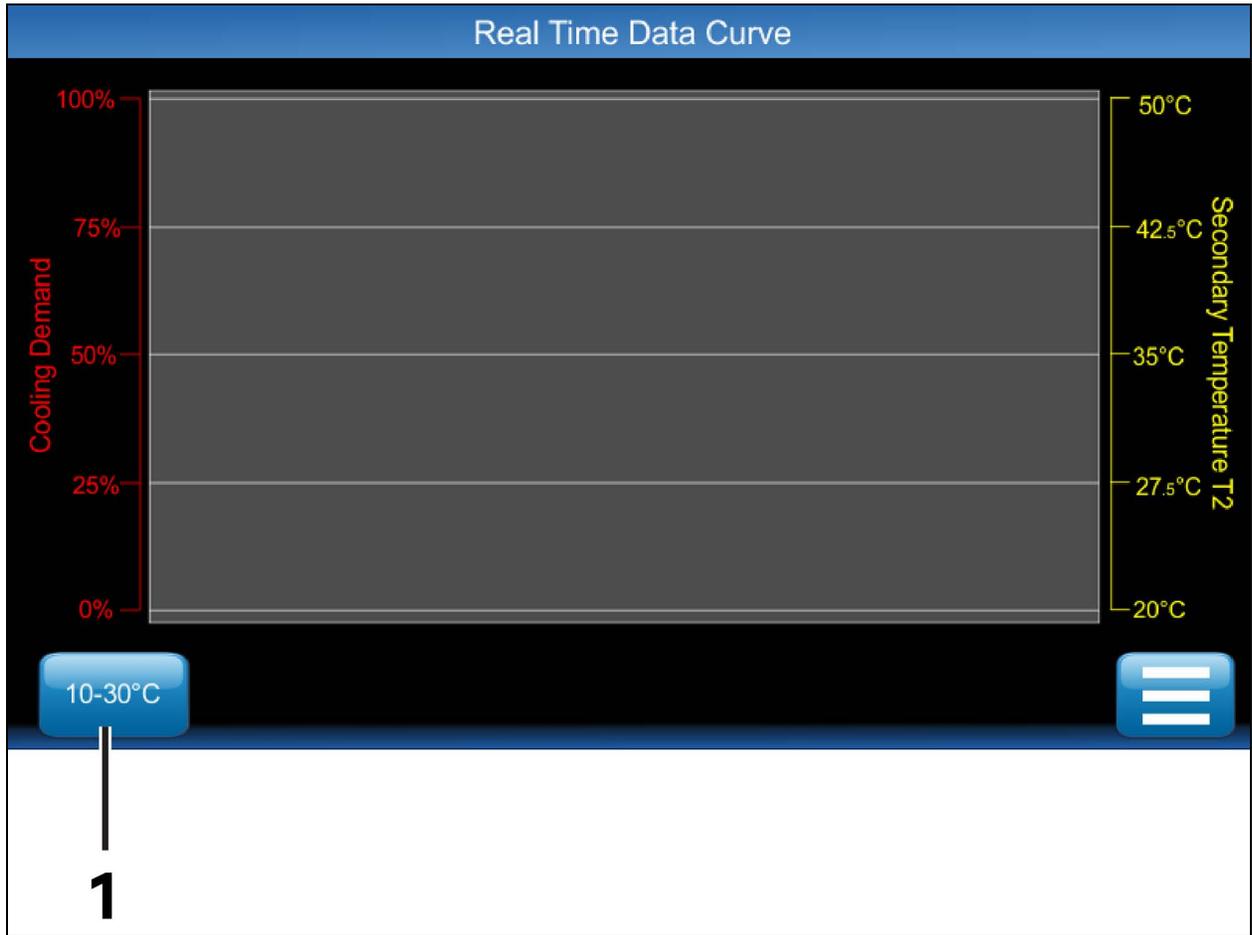
|                        |        |
|------------------------|--------|
| Average System DP      | -- Bar |
| Total System Flow Rate | -- l/m |

**NOTE:** Table 4.5 above is a quick reference for when multiple units are connected on a network under 'Group Control'.

### 4.2.4 DATA CURVES Screen (real time update)

The Data Curves screen displays a graphical representation of two pieces of variable data. A 'red' trace for Cooling (Control Valve) Demand and a 'yellow' trace for Secondary Supply Temperature T2, both of which will update in real time (time span of display is 3 minutes).

Figure 4.4 Control System Data Curves Screen

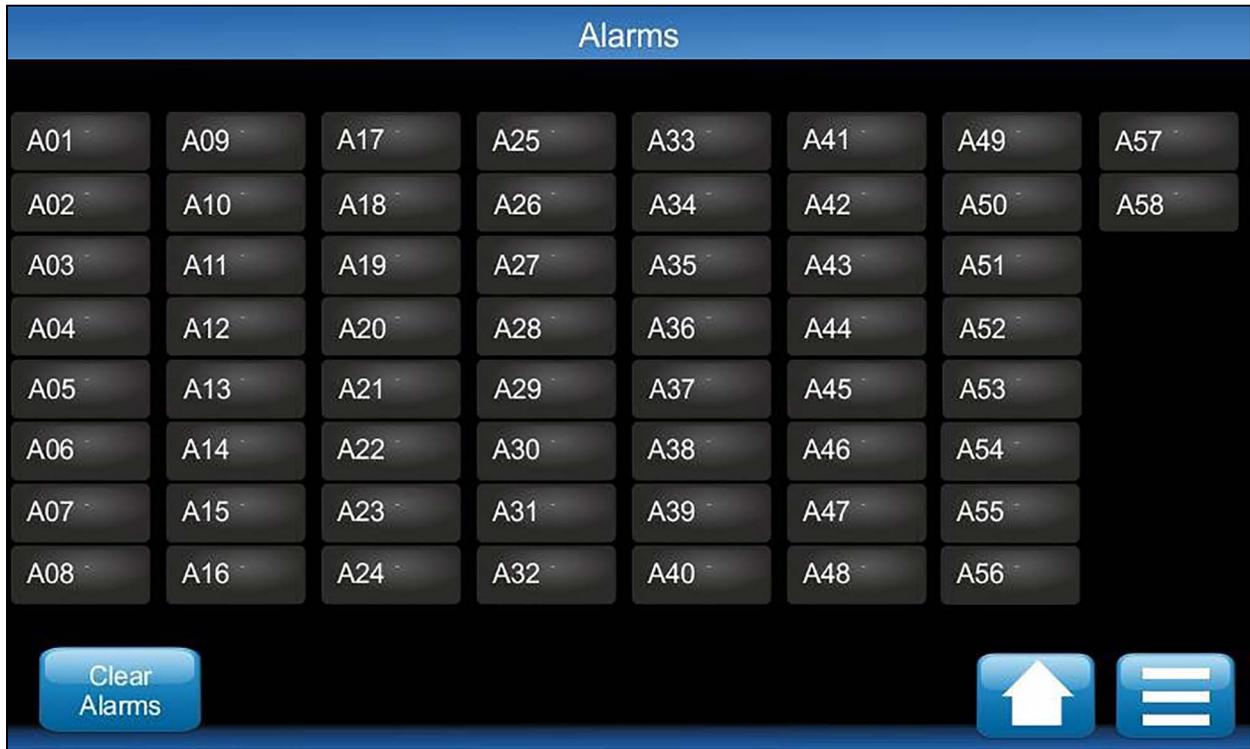


| Item | Description  |
|------|--|
| 1    | Toggle button to switch between Secondary temperature T2 axis range of 10-30 °C or 20-50 °C. |

## 4.2.5 ALARM Screen

The Alarm screen can be used to view new or active Alarms and to acknowledge these events. Refer to [Troubleshooting \(Alarms\)](#) on page 47 for a full list of alarms and further information.

Figure 4.5 Control System Alarms Screen

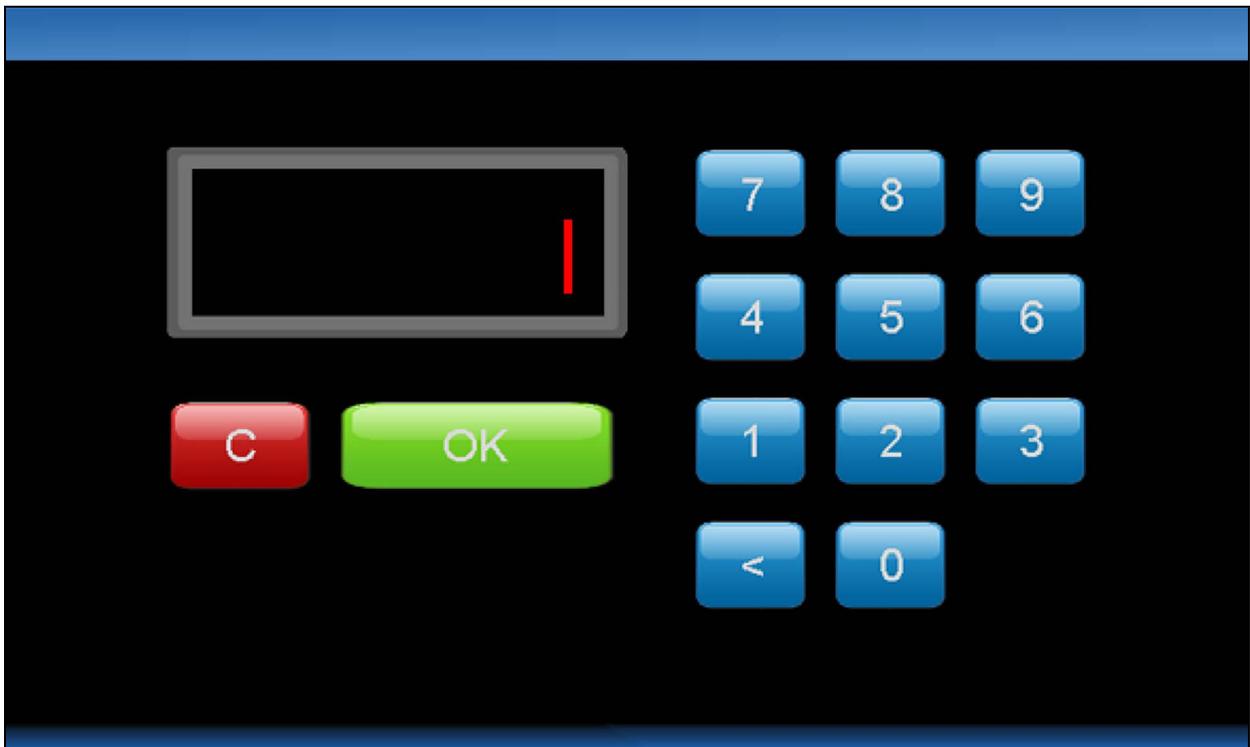


## 4.2.6 LOG-IN Screen

The Log-in screen allows the user access to further information and to adjust various parameters and settings when logged in at Service or Engineer level.

- **No access code** (User Level 1) – provides access to Log-in, Status, Data Curves and Alarm pages.
- Code **1234** (User Level 2) – provides read-only access to Setup, Configuration, and Diagnose menus.
- Code **5699** (Service Level) – provides full read-only access to everything and write access to select configuration and service features.

Figure 4.6 Control System Log-in Screen



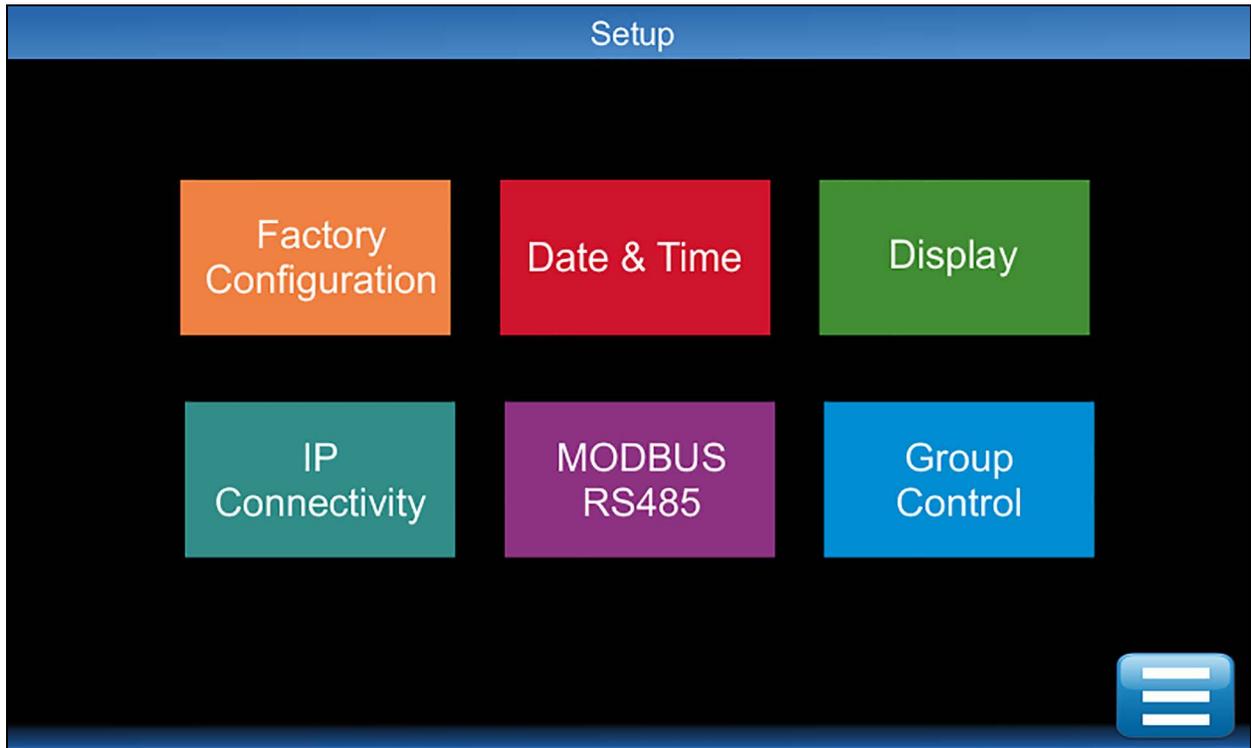
Log-in codes are available on request from the manufacturer. Entering an invalid code will result in the following message: Access Denied.

## 4.2.7 SETUP Screen

**NOTE:** This menu screen is only visible once logged in.

The Setup screen will not normally require access. Items within this screen are either set at the factory, or during commissioning. However, adjustments may need to be made following any site upgrade.

**Figure 4.7** Control System Setup Screen



**NOTE:** Information under 'Factory Configuration' can be viewed with Service and Engineer access codes, but to make changes will require a further special code.

**Table 4.6** Setup - Factory Configuration

| ID   | Title            | Description                    | Range    |
|------|------------------|--------------------------------|----------|
| P004 | Secondary Filter | Select according to unit build | Yes - No |

**Table 4.7** Setup - Date and Time

| ID   | Title       | Description                 | Default  | Range                            | Unit |
|------|-------------|-----------------------------|----------|----------------------------------|------|
|      | Date        | Adjust date                 | -        | dd/mm/yy                         | -    |
| P021 | Date Format | Select preferred format     | dd/mm/yy | dd/mm/yyyy mm/dd/yyyy yyyy/mm/dd | -    |
|      | Time        | Adjust time (24 hour clock) | -        | hh/mm/ss                         | -    |

**Table 4.8 Setup - Display**

| ID   | Title                      | Description  | Default | Range   | Unit |
|------|----------------------------|--|---------|---------|------|
| P030 | Screen Saver/Logout Period | Elapsed time before screen saver launches or display auto logs out | 30      | 1 to 60 | mins |
| P031 | Backlight Period           | Elapsed time before screen dims                                    | 10      | 1 to 60 | mins |

**Table 4.9 Setup - IP Connectivity**

| ID   | Title               | Description   | Default | Range            | Unit |
|------|---------------------|---|---------|------------------|------|
| P040 | Interface A Enabled | Set to active or not (see below for sub-menu details) | Enabled | Enable - Disable | -    |
| P041 | Interface B Enabled | Set to active or not (see below for sub-menu details) | Enabled | Enable - Disable | -    |

**NOTE:** When using the CDU's Webserver feature to visualize real time data of the CDU parameters and status the following should be considered:

Viewing of the CDU's data is via unsecured http and hence the feature is “read only”, there is no function that offers command and control to the unit. The user should be aware as status messages could potentially be tampered with. If misinterpretation of the data and the consequences of such are a concern to the user/operator, the CDU access via http should be configured on an isolated network with limited user access.

**NOTE:** When using the CDU's Telnet “Command Line Interface” feature to make SNMP configuration set-up changes the following should be considered:

Use of telnet offers no protection on any communication to the CDU. It should be remembered that telnet COULD access command and control functions of the unit. However, Telnet is “disabled” by default and should only be enabled temporarily to make any necessary changes to the SNMP settings and disabled after use. If the potential consequences of Telnet are a concern to the user/operator, the CDU should be configured on an isolated network with limited user access.

**Table 4.10 Setup - IP Connectivity (Interface A) Sub-menu**

| ID   | Title                  | Description             | Default        | Range                       | Unit |
|------|------------------------|-------------------------|----------------|-----------------------------|------|
| P050 | MAC Address            | View MAC address        | -----          | Read only                   | -    |
| P051 | DHCP                   | Select as required      | Disabled       | Enable - Disable            | -    |
| P052 | IP Address             | Set IP address          | 192.168.11.170 | Configurable                | -    |
| P053 | Subnet Mask            | Set Subnet Mask         | 255.255.255.0  | Configurable                | -    |
| P054 | Default Gateway        | Set Gateway address     | 0.0.0.0        | Configurable                | -    |
| P055 | Preferred DNS Server   | Set DNS address         | 0.0.0.0        | Configurable                | -    |
| P056 | Alternative DNS Server | Set DNS address         | 0.0.0.0        | Configurable                | -    |
| P057 | SNMPv2 Write Access    | Allow Write Access      | No             | No - Yes                    | -    |
| P058 | TELNET Access          | Configure TELNET access | None           | None, Read Only, Read/Write | -    |

**Table 4.11 Setup - IP Connectivity (Interface B) Sub-menu**

| ID   | Title                  | Description             | Default        | Range                       | Unit |
|------|------------------------|-------------------------|----------------|-----------------------------|------|
| P060 | MAC Address            | View MAC address        | -----          | Read only                   | -    |
| P061 | DHCP                   | Select as required      | Disabled       | Enable - Disable            | -    |
| P062 | IP Address             | Set IP address          | 192.168.11.171 | Configurable                | -    |
| P063 | Subnet Mask            | Set Subnet Mask         | 255.255.255.0  | Configurable                | -    |
| P064 | Default Gateway        | Set Gateway address     | 0.0.0.0        | Configurable                | -    |
| P065 | Preferred DNS Server   | Set DNS address         | 0.0.0.0        | Configurable                | -    |
| P066 | Alternative DNS Server | Set DNS address         | 0.0.0.0        | Configurable                | -    |
| P067 | SNMPv2 Write Access    | Allow Write Access      | No             | No - Yes                    | -    |
| P068 | TELNET Access          | Configure TELNET access | None           | None, Read Only, Read/Write | -    |

**Table 4.12 Setup - Modbus RS485**

| ID   | Title                    | Description            | Default | Range         | Unit |
|------|--------------------------|------------------------|---------|---------------|------|
| P070 | Modbus Secondary Address | Set required address   | 1       | 1 to 247      | -    |
| P071 | Baud Rate                | Set required baud rate | 9600    | 9600 to 38400 | -    |

**Table 4.13 Setup - Group Control**

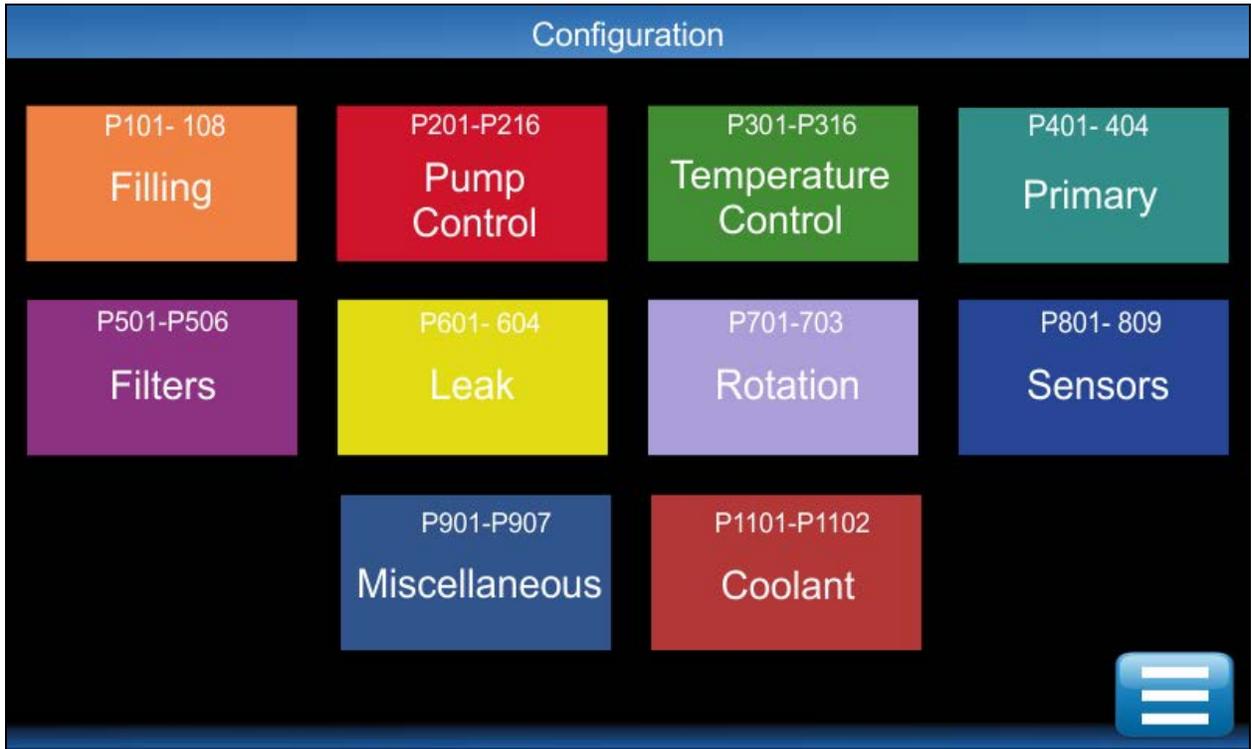
| ID   | Title                          | Description | Default | Range                  | Unit |
|------|--------------------------------|-------------|---------|------------------------|------|
| P081 | Unit Address                   | -           | 1       | 1 to 16                | -    |
| P082 | Number of Units in Group       | -           | 1       | 1 to 16                | -    |
| P083 | Number of Run Units            | -           | 1       | 1 to 16                | -    |
| P084 | Control Reference              | -           | -       | -                      | -    |
| P085 | Rotation Frequency             | -           | Weekly  | Weekly, Monthly, Never | -    |
| P086 | Rotation Day of Week           | -           | Mon.    | Sun. to Sat.           | -    |
| P087 | Rotation Time of Day - Hours   | -           | 10      | 00 to 23               | hrs  |
| P088 | Rotation Time of Day - Minutes | -           | 00      | 00 to 59               | mins |

### 4.2.8 CONFIGURATION Screen

**NOTE:** This screen is only available once logged in.

The Configuration screen can be used to set specific parameters and control functions.

**Figure 4.8** Control System Configuration Screen



**NOTE:** Parameter IDs shown in red text will only be accessible with the Engineer log-in code.

**Table 4.14** Configuration - Filling

| ID   | Title                     | Description  | Default | Range      | Unit    |
|------|---------------------------|--|---------|------------|---------|
| P101 | Fill Pressure             | Start threshold for fill pump  | 0.8     | 0.3 to 1.0 | Bar     |
| P102 | Fill Hysteresis           | Stop hysteresis for fill pump  | 0.2     | 0.1 to 0.5 | Bar     |
| P103 | Fill Pump Run Period      | Time for level sensor to make, or fill pressure to be satisfied, prior to alarm (when unit is on-line) | 1       | 1 to 15    | minutes |
| P104 | Level Sensor Delay        | Level Sensor response time, prior to alarm   | 1       | 1 to 6     | Seconds |
| P105 | Fill Start Delay Period   | Delay prior to pump start after initiate signal  | 10      | 1 to 600   | Seconds |
| P106 | Fill Warning Delay Period | Delay prior to 'check make-up' alarm activated   | 5       | 0 to 60    | Seconds |
| P107 | Group Fill                | Group Fill (0 = no, 1 = yes)   | 0       | 0 to 1     | -       |
| P108 | Delta Load                | Inhibit fill pump change in kW IT load   | 0       | 0 to 1200  | kW      |
| P109 | Delta Load Period         | Change in kW IT load time period   | 60      | 90         | Seconds |

**Table 4.15 Configuration - Pump Control**

| ID    | Title                          | Description  | Default | Range                          | Unit    |
|-------|--------------------------------|--|---------|--------------------------------|---------|
| P201  | Control Type                   | Pump speed flow or diff. pressure (DP) controlled  | DP      | Flow or DP                     | -       |
| P202  | Flow Setpoint                  | Set the required Secondary flow rate   | 100     | 50 to 1800                     | l/m     |
| P203  | Differential Pressure Setpoint | Set the required Secondary differential pressure (DP)                                    | 0.3     | 0.1 to 5.0                     | Bar     |
| P204  | Low Flow %                     | Low flow alarm threshold (% of flow setpoint)  | 90      | 10 to 95                       | %       |
| P205  | Low DP %                       | Low DP alarm threshold (% of DP setpoint)  | 90      | 10 to 95                       | %       |
| P206  | Low Flow/DP Delay              | Time delay prior to low Flow/DP alarm  | 100     | 1 to 300                       | Seconds |
| P207  | Minimum Pump Speed             | Set minimum pump running speed   | 10      | 10 to 70                       | %       |
| P208  | Triple Pump Control            | Set to Twin or Triple pump mode  | No      | No, Yes                        | -       |
| P209  | Maximum Pump Speed             | Set maximum pump running speed   | 100     | 25 to 100                      | %       |
| P211  | Over-pressure Setpoint         | Maximum system pressure, prior to alarm (set to pressure relief valve setting, less 10%) | 5.4     | 2.0 to 6.0                     | Bar     |
| P212  | Over-pressure Action           | Alarm only, shutdown & alarm, back-off & alarm   | Alarm   | Alarm or Alarm+S/D, Alarm +B/O | -       |
| P213* | Start-up Speed                 | Initial pump start fixed speed (0 = Auto)  | 0       | 0 to 100                       | %       |
| P214* | Start-up Period                | Initial start speed hold period, prior control loop taking over                          | 0       | 0 to 100                       | Seconds |
| P215* | Loop Refresh Period            | Scan period for pump speed control loop  | 10      | 1 to 120                       | Seconds |
| P216* | Maximum Control Pressure       | Maximum pump speed control loop pressure   | 4.0     | 1.0 to 8.0                     | Bar     |

\*Parameter ID's will only be accessible with the Engineer log-in code.

**Table 4.16 Configuration - Temperature Control**

| ID    | Title                      | Description   | Default | Range        | Unit    |
|-------|----------------------------|---|---------|--------------|---------|
| P301  | Temperature Setpoint       | Set required Secondary temperature setpoint                       | 18.0    | 10.0 to 55.0 | °C      |
| P302  | Control Mode               | Select from Fixed Setpoint or Fixed Setpoint with Dewpoint Offset | FSDO    | FS, FSDO     | -       |
| P303  | Dewpoint Offset            | Minimum offset of setpoint from dewpoint temp.                    | 3.0     | 1.0 to 5.0   | °C      |
| P304  | Sec. Low Temp Diff.        | Low temp alarm offset below setpoint                              | 2.0     | 1.0 to 10.0  | °C      |
| P305  | Sec. High Temp Diff.       | High temp alarm offset above setpoint                             | 2.0     | 1.0 to 10.0  | °C      |
| P306  | Sec. Temp Reset Hysteresis | Low/High temp. alarm reset point                                  | 1.0     | 0.5 to 5.0   | °C      |
| P307* | PID – Control Period       | Scan period for control valve positioning                         | 1       | 1 to 30      | Seconds |
| P308* | PID – Proportional Band    | Proportional band   | 12.0    | 1.0 to 25.0  | °C      |
| P309* | PID – Integral Reset       | Integral reset time   | 18      | 0 to 999     | Seconds |
| P310* | PID – Derivative           | Derivative reset time   | 5       | 0 to 999     | Seconds |
| P311  | Demand/Actual Error        | Cooling valve demand to feedback error for alarm                  | 10      | 0 to 50      | %       |

**Table 4.16 Configuration - Temperature Control (continued)**

| ID    | Title                  | Description  | Default | Range     | Unit    |
|-------|------------------------|--|---------|-----------|---------|
| P312* | Valve Check Period     | Scan period for cooling valve position monitoring            | 15      | 1 to 120  | Minutes |
| P313  | Valve Runtime          | Cooling valve motor run time for control loop                | 40      | 10 to 180 | Seconds |
| P314  | Minimum Position       | Required minimum valve position to be adopted in online mode | 0       | 0 to 80   | %       |
| P315  | Valve Control Strategy | Select Valve Control scheme (0=parallel, 1=series)           | 0       | 0 or 1    | -       |

\*Parameter ID's will only be accessible with the Engineer log-in code.

**Table 4.17 Configuration - Primary**

| ID   | Title                      | Description                         | Default | Range      | Unit    |
|------|----------------------------|-------------------------------------|---------|------------|---------|
| P401 | Pri. Flow Delay            | Time delay prior to low flow alarm  | 15      | 1 to 120   | Minutes |
| P402 | Pri. Low Temp Setpoint     | Low temp alarm threshold            | 4       | 2 to 40    | °C      |
| P403 | Pri. High Temp Setpoint    | High temp alarm threshold           | 11      | 6 to 50    | °C      |
| P404 | Pri. Temp Reset Hysteresis | Low/High alarm reset from threshold | 1       | 0.5 to 5.0 | °C      |

**Table 4.18 Configuration - Filters**

| ID   | Title                          | Description  | Default | Range      | Unit    |
|------|--------------------------------|--|---------|------------|---------|
| P501 | Pri. Filter Dirty Setpoint     | Differential pressure alarm threshold for filter dirty | 0.3     | 0.2 to 1.0 | Bar     |
| P502 | Pri. Filter Dirty Hysteresis   | Alarm reset from threshold                             | 0.1     | 0.1 to 0.5 | Bar     |
| P503 | Pri. Filter Dirty Delay Period | Time delay prior to alarm                              | 60      | 10 to 600  | Seconds |

**Table 4.19 Configuration - Leak Detection**

| ID   | Title                       | Description                       | Default | Range              | Unit    |
|------|-----------------------------|-----------------------------------|---------|--------------------|---------|
| P601 | Leak Detection - Flood Tray | Alarm only, or shutdown and alarm | Alarm   | Alarm or Alarm+S/D | -       |
| P602 | Leak Detection - Underfloor | Alarm only, or shutdown and alarm | Alarm   | Alarm or Alarm+S/D | -       |
| P604 | Underfloor Delay Period     | Time delay prior to alarm         | 30      | 5 to 60            | Seconds |

**Table 4.20 Configuration - Rotation**

| ID   | Title                 | Description   | Default | Range                  | Unit    |
|------|-----------------------|---|---------|------------------------|---------|
| P701 | Frequency             | Frequency of pump changeover (twin pump operation only) | Weekly  | Never, Weekly, Monthly | -       |
| P702 | Day of Week           | Set day of changeover                                   | Mon.    | Sun. to Sat.           | -       |
| P703 | Time of Day - Hours   | Time of changeover (hour)                               | 10      | 00 to 23               | Hours   |
| P704 | Time of Day - Minutes | Time of changeover (minute)                             | 00      | 00 to 59               | Minutes |

**Table 4.21 Configuration - Sensors**

| ID    | Title                                 | Description   | Default | Range      | Unit    |
|-------|---------------------------------------|---|---------|------------|---------|
| P801* | Secondary T2 Temperature Differential | Alarm threshold T2a/b/c temperature differential                          | 1       | 0.1 to 10  | °C      |
| P802* | Secondary T2 Period                   | Time delay before T2a/b/c differential alarm                              | 30      | 0 to 120   | Seconds |
| P803* | Secondary PS1 Pressure Differential   | Alarm threshold PS1a-PS1b pressure differential                           | 0.2     | 0.1 to 1.0 | Bar     |
| P804* | Secondary PS1 Period                  | Time delay before PS1a-PS1b differential alarm                            | 30      | 0 to 120   | Seconds |
| P809* | PS1a Scaling                          | Set measurement range. 0 = 0 to 30 bar, 1 = 0 to 15 bar, 2 = -1 to 8 bar. | 2       | 0 to 2     | -       |
| P810* | PS1b Scaling                          | Set measurement range. 0 = 0 to 30 bar, 1 = 0 to 15 bar, 2 = -1 to 8 bar. | 2       | 0 to 2     | -       |
| P811* | PS2 Scaling                           | Set measurement range. 0 = 0 to 30 bar, 1 = 0 to 15 bar, 2 = -1 to 8 bar. | 2       | 0 to 2     | -       |
| P812* | PS3 Scaling                           | Set measurement range. 0 = 0 to 30 bar, 1 = 0 to 15 bar, 2 = -1 to 8 bar. | 2       | 0 to 2     | -       |
| P813* | PS4 Scaling                           | Set measurement range. 0 = 0 to 30 bar, 1 = 0 to 15 bar, 2 = -1 to 8 bar. | 2       | 0 to 2     | -       |
| P814* | PS5a Scaling                          | Set measurement range. 0 = 0 to 30 bar, 1 = 0 to 15 bar, 2 = -1 to 8 bar. | 2       | 0 to 2     | -       |
| P815* | PS5b Scaling                          | Set measurement range. 0 = 0 to 30 bar, 1 = 0 to 15 bar, 2 = -1 to 8 bar. | 2       | 0 to 2     | -       |
| P816* | PS5c Scaling                          | Set measurement range. 0 = 0 to 30 bar, 1 = 0 to 15 bar, 2 = -1 to 8 bar. | 2       | 0 to 2     | -       |

\*Parameter ID's will only be accessible with the Engineer log-in code.

**Table 4.22 Configuration - Miscellaneous**

| ID    | Title                      | Description   | Default | Range        | Unit    |
|-------|----------------------------|---|---------|--------------|---------|
| P901* | Manual Override Period     | Time delay before controls revert to Auto mode                                    | 15      | 0 to 120     | Minutes |
| P902* | Alarm Delay                | Alarm suppression on start-up   | 20      | 1 to 120     | Minutes |
| P903* | Alarm Relays               | Extended alarm relay operation mode   | N/O     | N/O or N/C   | -       |
| P904* | Post Power Failure Options | Action to be taken following a power failure once power is restored               | Run     | Run, Standby | -       |
| P905* | Data Logging Interval      | Set logging interval (0 = 1 minute 1 = 30 seconds, 2 = 10 seconds, 3 = 5 seconds) | 0       | 0-3          | -       |
| P906* | Remote Start/Stop Options  | Closed or Open circuit to run unit  | N/C     | N/O or N/C   | -       |

\*Parameter ID's will only be accessible with the Engineer log-in code.

**Table 4.23 Configuration - Coolant**

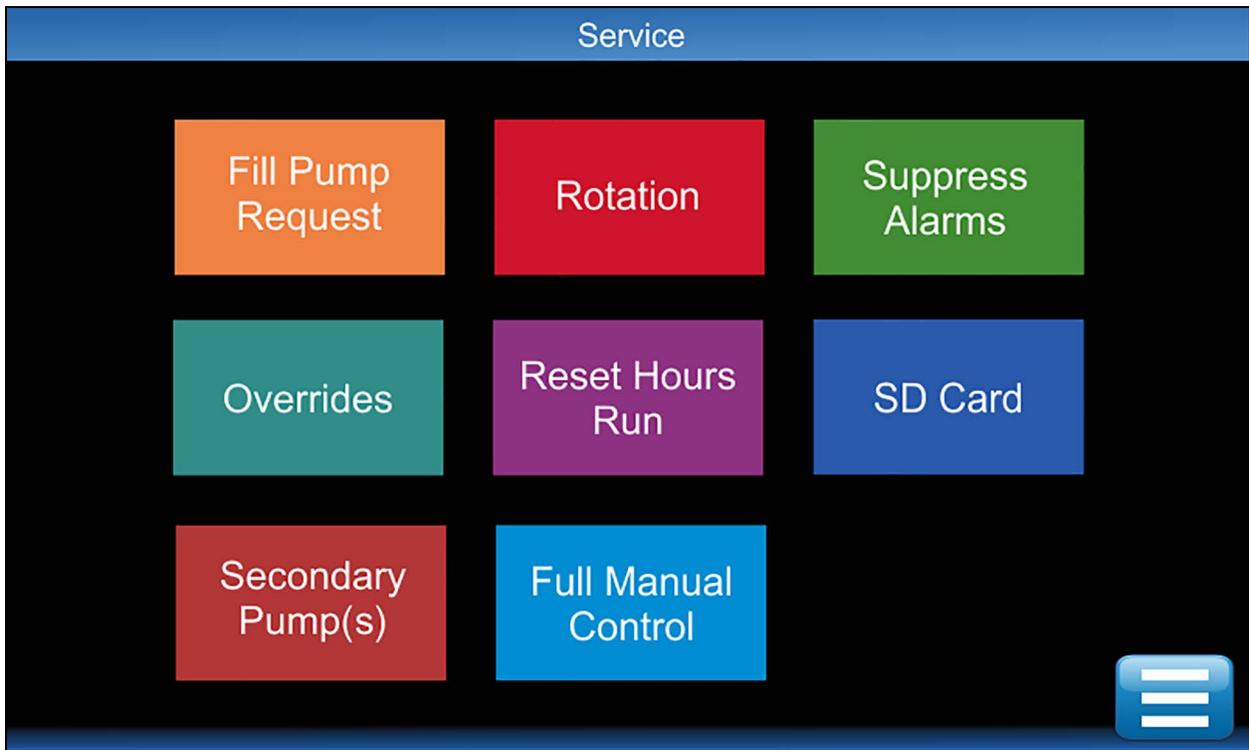
| ID    | Title                       | Description                      | Default | Range       | Unit |
|-------|-----------------------------|----------------------------------|---------|-------------|------|
| P1101 | Secondary Loop Coolant Type | Set secondary loop coolant type. | PG25    | Water, PG25 | -    |
| P1102 | Primary Loop Coolant Type   | Set primary loop coolant type.   | PG25    | Water, PG25 | -    |

### 4.2.9 SERVICE Screen

**NOTE:** This screen is only available once logged in.

The Service screen (accessible only with Service and Engineer log-on codes) can be used to set some parameters and to assist in commissioning.

**Figure 4.9 Control System Service Screen**



**NOTE:** The 'Full Manual Control' option (Service IDs shown in red text) will only be accessible with the Engineer log-in code.

**Table 4.24 Service - Fill Pump Request**

|   |  |
|---|--|
| <p>A dialog box titled 'Switch Fill Pump' with three buttons: 'Cancel' (blue), 'Off' (red), and 'ON' (green).</p> | <p>This fill function is used at commissioning only and will allow the fill pump to run without any time limit. Fill pump will still switch Off automatically when unit reaches required static pressure</p> |
|---|--|

**Table 4.25 Service - Rotation**

|   |  |
|---|--|
|  | <p>Used to force a pump changeover at an unscheduled time, or to force a unit changeover when Group Control is active.</p> |
|---|--|

**Table 4.26 Service - Suppress Alarms**

|   |   |
|---|---|
|  | <p>Resets the alarm delay timer (normally only activated during start-up) to stop nuisance alarms breaking through during manual operation.</p> |
|---|---|

**Table 4.27 Service - Overrides**

| ID   | Title           | Description                                    | Default | Range       | Unit |
|------|-----------------|--|---------|-------------|------|
| S101 | Pump 1 Speed    | Set pump 1 inverter speed. 0% = no override.   | 0       | 0 to 100    | %    |
| S102 | Pump 2 Speed    | Set pump 2 inverter speed. 0% = no override.   | 0       | 0 to 100    | %    |
| S103 | Pump 3 Speed    | Set pump 3 inverter speed. 0% = no override.   | 0       | 0 to 100    | %    |
| S104 | Cooling Valve 1 | Set cooling valve 1 position. 0% = no override | 0       | 0 to 100    | %    |
| S105 | Cooling Valve 2 | Set cooling valve 2 position. 0% = no override | 0       | 0 to 100    | %    |
| S106 | Fill Pump P3    | Switch fill pump on                            | Auto    | Auto – Man. | -    |
| S107 | Alarm           | Simulate fault on customer alarm relay         | Auto    | Auto – Man. | -    |

'Overrides' allows the user to manually control some functions of the unit for a limited time period while running in automatic mode, for the purposes of troubleshooting, etc. (see Installation and Commissioning manual for more information). If the operator issues an override while the Vertiv™ Liebert® XDU is not in automatic mode the override is ignored and the value will be automatically set back to default.

**Table 4.28 Service - Reset Hours Run**

| ID   | Title                     | Description                           | Default | Range | Unit |
|------|---------------------------|---------------------------------------|---------|-------|------|
| S201 | Pump 1 Run Hours          | Set pump 1 run hours to zero          | -       | -     | -    |
| S202 | Pump 2 Run Hours          | Set pump 2 run hours to zero          | -       | -     | -    |
| S202 | Pump 3 Run Hours          | Set pump 3 run hours to zero          | -       | -     | -    |
| S203 | Cooling Valve 1 Run Hours | Set cooling valve 1 run hours to zero | -       | -     | -    |
| S204 | Cooling Valve 2 Run Hours | Set cooling valve 2 run hours to zero | -       | -     | -    |

**Table 4.29 Service - SD Card**

|   |   |
|---|---|
|  | <p>This dialog is used to control access to the SD card. Select Unmount in order to allow safe removal of the SD card or mount following re-insertion of SD card.</p> |
|---|---|

**Table 4.30 Service - Secondary Pump(s)**

| ID   | Title                 | Description   | Default    | Range                       | Unit |
|------|-----------------------|---|------------|-----------------------------|------|
| S401 | Pump 1 Service Status | Allows pump 1 to be set for in service or out of service. | In Service | In Service – Out of Service | -    |
| S402 | Pump 2 Service Status | Allows pump 2 to be set for in service or out of service. | In Service | In Service – Out of Service | -    |
| S403 | Pump 3 Service Status | Allows pump 3 to be set for in service or out of service. | In Service | In Service – Out of Service | -    |

**Table 4.31 Service - Full Manual Control**

| ID   | Title               | Description                                 | Default | Range              | Unit |
|------|---------------------|---|---------|--------------------|------|
| S301 | Full Manual Control | Allows full manual control of all functions | Enabled | Disabled - Enabled | -    |
| S302 | Pump 1 Speed        | Set pump 1 inverter speed                   | 0       | 0 to 100           | %    |
| S303 | Pump 2 Speed        | Set pump 2 inverter speed                   | 0       | 0 to 100           | %    |
| S304 | Pump 3 Speed        | Set pump 3 inverter speed                   | 0       | 0 to 100           | %    |
| S305 | Cooling Valve 1     | Set control valve 1 position                | 0       | 0 to 100           | %    |
| S306 | Cooling Valve 2     | Set control valve position                  | 0       | 0 to 100           | %    |
| S307 | Fill Pump P3        | Switch fill pump on                         | Off     | Off – On           | -    |
| S308 | Alarm               | Simulate fault on customer alarm relay      | Off     | Off – On           | -    |

‘Full Manual Control’ allows the user to manually control all functions of the unit for a limited time period. Selection causes the unit to shut down and all outputs will be inactive unless manually set and all alarms will be ignored. (See Installation and Commissioning manual for more information.) Manual override requests are only honored if S301 is set to ‘Enabled’, otherwise commands are automatically reset to default.

## 4.2.10 DIAGNOSTICS Screen

**NOTE:** This screen is only available once logged in.

This screen will give raw information and analog to digital conversion factors for the status for all Universal Inputs, Resistive Inputs, Digital Inputs, Digital Outputs, and Analogue Outputs.

**Figure 4.10** Control System Diagnostics Screen

| I/O Diagnostic - Universal Inputs 1 to 8    |           |            |           |
|---|-----------|------------|-----------|
|   | ADC Value | Electrical | Processed |
| UI01 Cooling Valve 1 Feedback               | 32000     | 4.83 V     | 48%       |
| UI02 Cooling Valve 2 Feedback               | 0         | 0.01V      | 0%        |
| UI03 Secondary Return Pressure PS1a         | 15552     | 4.75 mA    | 1.38 bar  |
| UI04 Secondary Return Pressure PS1b         | 21201     | 5.21 mA    | 3.01 bar  |
| UI05 Secondary Supply Pressure PS2          | 41021     | 6.89 mA    | 3.36 bar  |
| UI06 Primary Inlet/Outlet Pressure PS3/PS4  | 37124     | 6.87 mA    | 3.35 bar  |
| UI07 Secondary Filter 1 Inlet Pressure PS5a | 65496     | 4.93 mA    | 2.01 bar  |
| UI08 Secondary Filter 2 Inlet Pressure PS5b | 15116     | 4.99 mA    | 2.13 bar  |

UI 09 to 16    RI 01 to 04    Digital Inputs    Outputs    ≡

**Table 4.32** I/O Diagnostic – Universal Inputs 1 to 8 (as shown in **Figure 4.10** above )

| ID   | Description                                  | ADC Value | Electrical | Processed |
|------|--|-----------|------------|-----------|
| UI01 | Cooling Valve 1 Feedback                     | 0         | 0.00 V     | 0.00 %    |
| UI02 | Cooling Valve 2 Feedback                     | 0         | 0.00 V     | 0.00 %    |
| UI03 | Secondary Return Pressure PS1a               | 0         | 0.00 mA    | 0.00 bar  |
| UI04 | Secondary Return Pressure PS1b               | 0         | 0.00 mA    | 0.00 bar  |
| UI05 | Secondary Supply Pressure PS2                | 0         | 0.00 mA    | 0.00 bar  |
| UI06 | Primary Filter Inlet/Outlet Pressure PS3/PS4 | 0         | 0.00 mA    | 0.00 bar  |
| UI07 | Secondary Filter Inlet Pressure PS5a         | 0         | 0.00 mA    | 0.00 bar  |
| UI08 | Secondary Filter Inlet Pressure PS5b         | 0         | 0.00 mA    | 0.00 bar  |

**Table 4.33 I/O Diagnostic – Universal Inputs 9 to 14**

| ID   | Description                            | ADC Value | Electrical | Processed |
|------|--|-----------|------------|-----------|
| UI09 | Secondary Filter 3 Inlet Pressure PS5c | 0         | 0.00 mA    | 0.00 bar  |
| UI10 | Primary Flow Rate                      | 0         | 0.00 mA    | 0.00 l/m  |
| UI11 | Secondary Flow Rate                    | 0         | 0.00 mA    | 0.00 l/m  |
| UI12 | (unused)                               | -         | -          | -         |
| UI13 | Primary Return Temperature T5          | 0         | 0.00 Ohms  | 0.00 °C   |
| UI14 | Secondary Return Temperature T4        | 0         | 0.00 Ohms  | 0.00 °C   |
| UI15 | Ambient Sensor – RH                    | 0         | 0.00 mA    | 0%        |
| UI16 | Ambient Sensor – Temperature T3        | 0         | 0.00 mA    | 0.00 °C   |

**Table 4.34 I/O Diagnostic – Resistive Inputs 1 to 4**

| ID   | Description                    | ADC Value | Electrical | Processed |
|------|--------------------------------|-----------|------------|-----------|
| RI01 | Primary Supply Temperature T1  | 0         | 0.00 Ohms  | 0.00 °C   |
| RI02 | Secondary Flow Temperature T2a | 0         | 0.00 Ohms  | 0.00 °C   |
| RI03 | Secondary Flow Temperature T2b | 0         | 0.00 Ohms  | 0.00 °C   |
| RI04 | Secondary Flow Temperature T2c | 0         | 0.00 Ohms  | 0.00 °C   |

**Table 4.35 I/O Diagnostic – Digital Inputs 1 to 6**

| ID   | Description             |   | State |
|------|-------------------------|---|-------|
| DI01 | Remote Start/Stop       | - | open  |
| DI02 | Flood Tray Level Switch | - | open  |
| DI03 | Optical Level Sensor #1 | - | open  |
| DI04 | Optical Level Sensor #2 | - | open  |
| DI05 | (unused)                | - | open  |
| DI06 | Underfloor Leak Tape    | - | open  |

**Table 4.36 I/O Diagnostic – Digital and Analogue Outputs**

| ID   | Description     |   | State |
|------|-----------------|---|-------|
| R02  | Fill Pump       | - | Off   |
| R03  | PS3/PS4 Select  | - | Off   |
| R06  | Extended Alarm  | - | Off   |
| AO01 | Cooling Valve 1 | - | %     |
| AO02 | Cooling Valve 2 | - | %     |

### 4.2.11 CALIBRATION Screen

The touchscreen will enter calibration mode if the screen is pressed 20 times within a 4 second interval. To complete calibration follow the on screen instructions.

**NOTE:** This screen is only available once logged in.

Figure 4.11 Control System Calibration Screen



### 4.3 Automatic Operation

After commissioning, the unit will be ready to run in automatic mode – press the Start/Stop icon button on the display Home screen (see Figure 4.1 on page 17), then select the ON button as shown in Figure 4.12 below .

Figure 4.12 Control System On/Off Button



| Item | Description                 |
|------|-----------------------------|
| 1    | Press ON to start the unit. |

### 4.3.1 Secondary Circuit Operation

When the ON button is pressed, the icon on the Home screen will change from Red to Green and providing the fluid level and static pressure are healthy, one or both pumps (depending on configuration) will start to increase in speed – arrows will show on the Home screen for both Primary and Secondary circuits and the pump speed as a percentage of maximum will be displayed. The inverter display(s) will also show the actual frequency output to the pump motor(s).

#### Fluid Level

- If the fluid level switch is not made, signifying insufficient water, then neither main pump will be allowed to run.
- If after a default period of 1 minute of fill pump operation the level switch has still not made, then the fill pump will stop and an 'A21 - Insufficient Water Level' alarm will be generated. This is a latched alarm and it will not be possible to restart the unit until the event has been manually cleared.

The system pressure at the Vertiv™ Liebert® XDU1350 inlet (PS1) is continuously monitored (see page 3 of Status screen) to ensure that the system is always pressurized.

#### Static Pressure

- Once the unit is running, a low system pressure below the default 0.8 bar (12 psi) at PS1 will not stop the main pump from running, but will initialize the fill pump (after a default 10 second delay) to raise the PS1 pressure to a default of 1.0 bar (15 psi), at which point the fill pump will stop. If fill pump has been running for more than 5 seconds, an 'A38 - Check Water Make-up Level' alarm will also be generated. If the fill pump runs for more than 1 minute (default) and PS1 pressure has still not reached 1.0 bar (15 psi), then the fill pump will stop and a 'A20 - Water Make-up Empty' alarm will be generated. This is a latched alarm and will need to be manually cleared, but will not stop the unit from running.
- If inlet pressure drops to 0.2 bar (3 psi) (set, non-adjustable) below fill pump activation threshold (i.e. to 0.6 bar (9 psi), if default values) for more than 1 minute (set, non-adjustable), a 'A39 System Low Pressure' event will be generated.

The following flow charts show the unit pressure/level monitoring and fill pump control during initial start-up of the unit after commissioning (from a unit off-line condition) and also during normal running (unit on-line):

Figure 4.13 Fill Pressure and Level Flow Chart (at initial start)

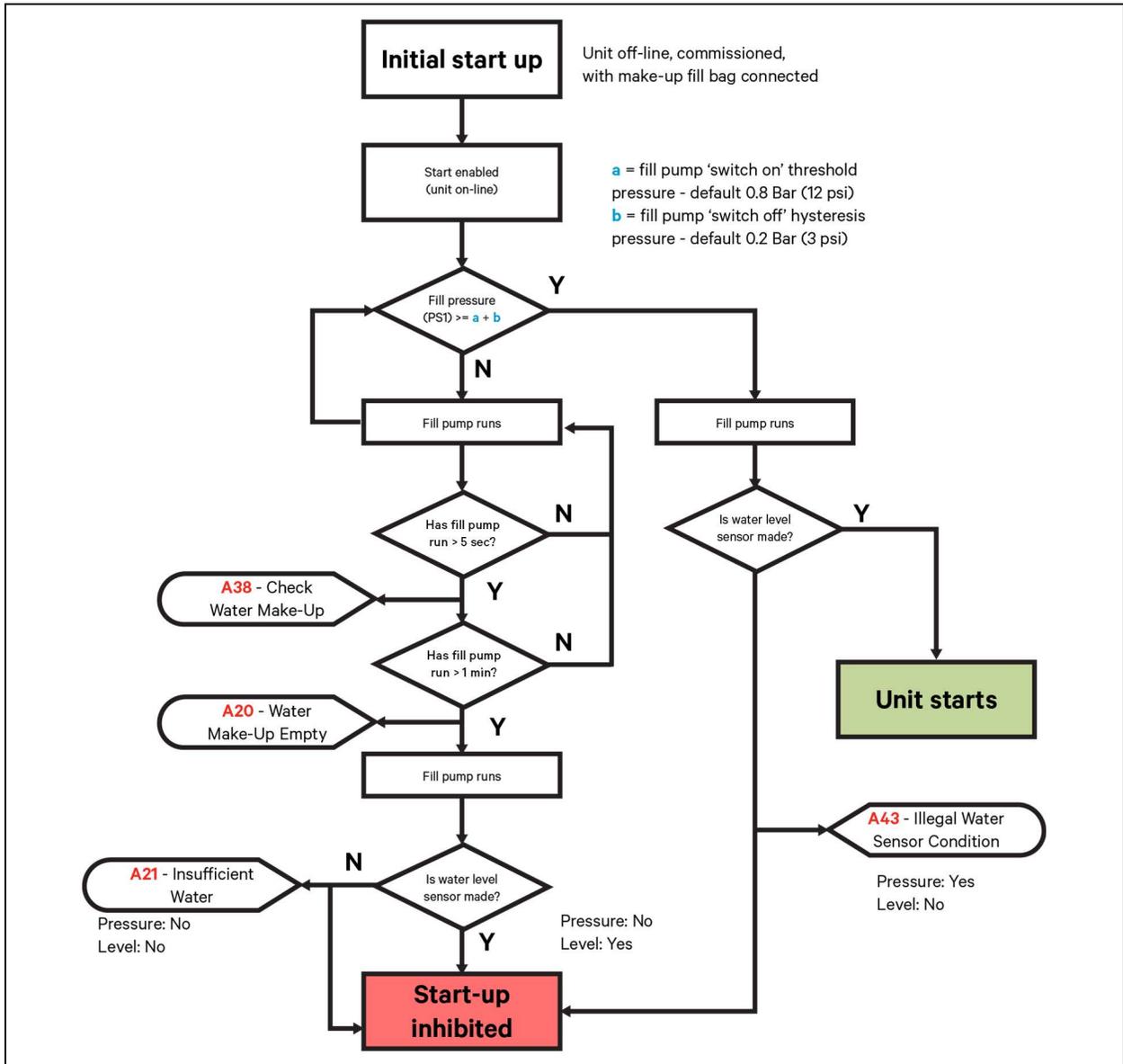


Figure 4.14 Fill Pressure and Level Flow Chart (when running)

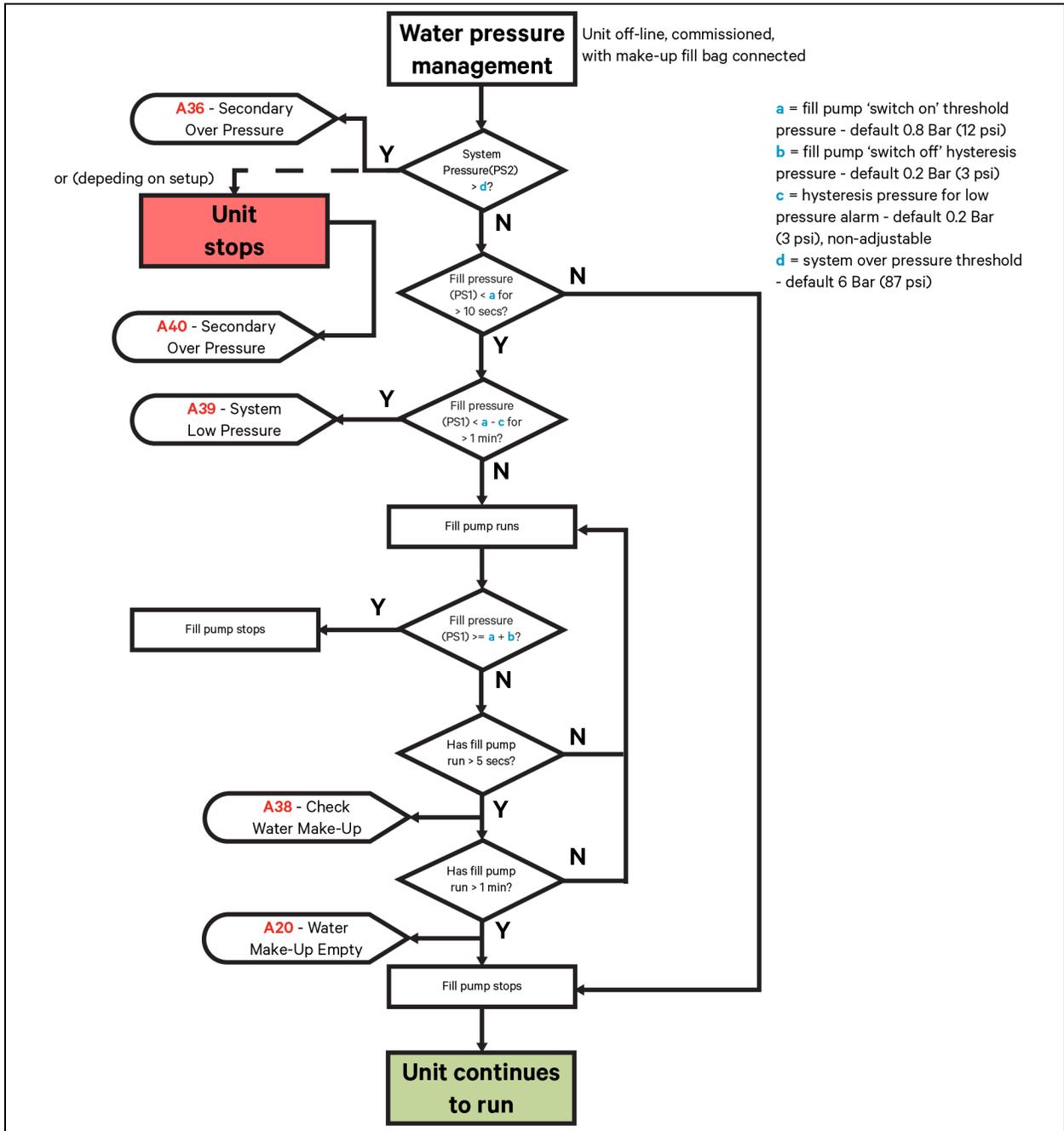
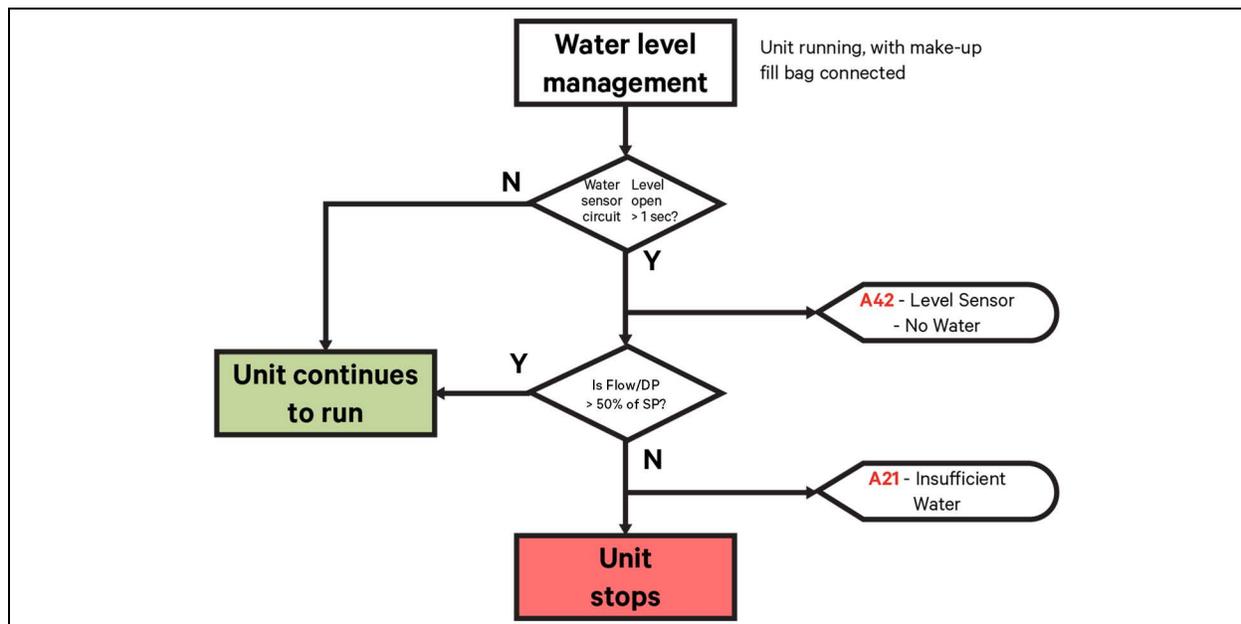


Figure 4.15 Water Level Management Flow Chart (when running)



Pump flow/pressure performance (pump speed) can be controlled through either a flow or differential pressure control loop depending on configuration ([Configuration - Pump Control](#) on page 29 ).

Flow Control monitors the Secondary flow with a calorimetric flow meter and on start-up, the control loop will increase the pump speed in stages until the flow matches the demand setpoint. If over-pressure protection is enabled then the flow will be automatically restricted to reduce any buildup in secondary pressure.

DP Control monitors the Secondary differential pressure with sensors on the supply and return connections of the Vertiv™ Liebert® XDU1350 and on start-up, the control loop will increase the pump speed in stages until the DP matches the DP setpoint. If over-pressure protection is enabled then the flow will be automatically restricted to reduce any buildup in secondary pressure.

The pump control loop has a default scan time of 10 seconds to avoid control oscillation.

During normal operation, if set up for run/standby (twin) pump operation, the pumps will operate on a duty sharing cycle, i.e. every 7 days (default) one of the operational pumps will ramp down to a stop and the standby pump will then start and continue operating for the next 7 days, etc. Changeover default time is set at 10:00 am on a Monday morning (default) and the complete changeover sequence takes approx. 0.25 seconds (default).

**NOTE: Each time the unit is stopped and re-started, it will select the operating pumps that have accrued the lowest run time hours (twin pump operation only).**

The secondary water temperature is monitored close to the Secondary circuit supply connection. Three temperature sensors are positioned here to give extended component redundancy (T2a, T2b, and T2c). The controller will take an average between all three readings as its input value.

- If the difference between the sensors exceeds a default 1.0°C (2°F), then an 'A50 (A51 or A52) - Secondary Temp T2a (T2b or T2c) Diff Out of Limits' alarm will be raised (after a default 30 second delay) and the controller will only read and average the two remaining healthy sensors.
- If any of the T2 temp. sensors go open circuit, then an 'A02 (A03 or A04) - T2a (T2b or T2c) Secondary Temperature Sensor Fault' alarm will be raised (no time delay) and the controller will only read and average the two remaining healthy sensors.

Temperature sensor (T4) monitors the secondary circuit return temperature and is used in conjunction with the flow rate to calculate the heat transfer duty.

The secondary supply temperature should correspond to the desired setpoint (default fixed setpoint is 18°C (65°F) and is used by the control loop to regulate the primary water cooling valve positions to achieve and maintain the setpoint. The cooling valve positions can be monitored on the Home screen or page 1 of the Status screen (Cooling Valve Demand/Feedback). High and low temperature alarms are set at a default value of 2°C (4°F) either side of setpoint (floating with setpoint) when either 'Fixed SP' or 'Fixed SP + Dew Point Offset control mode is selected from Configuration – Temperature Control screen, with a default hysteresis of 1°C (2°F).

- The high and low temperature alarms are ignored for a period of 20 minutes (default) on start up to allow the system time to settle without generating nuisance alarms.
- If the secondary temperature deviates by more than 2°C (4°F) below setpoint for 2 minutes or more, a 'A32 - Secondary Water Low Temp' alarm will be generated. This alarm will remain present until the temperature rises above the hysteresis value.
- If the secondary temperature deviates by more than 2°C (4°F) (default) above setpoint for 2 minutes or more, a 'A33 - Secondary Water High Temp' alarm will be generated. This alarm will remain present until the temperature falls below the hysteresis value.

In 'Fixed SP + Dew Point Offset' control mode, the setpoint can be overridden by a Dew Point condition – i.e. where there is a risk of condensation occurring at the IT equipment. The room temperature and relative humidity are constantly monitored and used to calculate the anticipated dew point adjacent to the Vertiv™ Liebert® XDU1350 (or wherever the room temp/hum sensor has been located).

- Dew Point Offset – When activated, this will be displayed on the Home screen under the Unit Mode heading. With this cooling mode, the Liebert® XDU1350 will operate as per fixed setpoint mode unless the dew point temperature rises to within 3°C (6°F) of this setpoint. When this happens, Dew point override will be activated and the controller will re-adjust the fixed setpoint to keep it at least 3°C (6°F) above the dew point.

If the optional filtration has been specified and fitted to the Secondary circuit, there will be additional sensors (PS5a for filter 1, PS5b for filter 2, PS5c for filter 3) fitted for monitoring the filter differential and give pre-warning of potential filter clogging.

- If the differential pressure exceeds 0.3 bar (4.5 psi) for Filter 1, then an 'A47 – Secondary Filter 1 Dirty' alarm is generated.
- If the differential pressure exceeds 0.3 bar (4.5 psi) for Filter 2, then an 'A48 – Secondary Filter 2 Dirty' alarm is generated.
- If the differential pressure exceeds 0.3 bar (4.5 psi) for Filter 3, then an 'A49 – Secondary Filter 3 Dirty' alarm is generated.

Secondary flow rate is monitored with a calorimetric flow meter at the Secondary inlet to the Liebert® XDU1350. The flow can be read on the Home screen or on page 3 of the Status screen.

**NOTE: Flows below 18 l/m (4.8 gpm) are outside the range of the flow sensor and will not be displayed.**

### 4.3.2 Primary Circuit Operation

The primary water temperature is monitored at the inlet to the Vertiv™ Liebert® XDU1350 cabinet. The cooling performance of the Liebert® XDU1350 has been calculated for a primary temperature range from 6 to 45°C (43 to 113°F) (ASHRAE W3) – refer to Application and Planning Guide for more information.

- If the primary temperature falls below default 4°C (40°F), an 'A30 - Primary Water Low Temp' alarm will be generated. This alarm will remain present until the temperature rises above the default 1°C (2 °F) reset hysteresis.
- If the primary temperature rises above default 11°C (52°F), an 'A31 - Primary Water High Temp' alarm will be generated. This alarm will remain present until the temperature falls below the default 1°C (2°F) reset hysteresis.
- The high and low temperature alarms are ignored for a default 20-minute period on start up to allow the system time to settle without generating nuisance alarms.

The secondary temperature PID control loop will be operational from when the Start/Stop button is pressed and the pumps have ramped up to speed. If the secondary circuit temperature starts to rise above the setpoint, then the cooling valves will start to open to allow more primary cooling water through the heat exchangers. The cooling valves will modulate from 0% (full closed) to 100% (full flow through heat exchanger) - the valve positions can be monitored on the Home screen or page 1 of the Status screen. The demand signal to each valve is compared to a position feedback signal every 15 minutes (default) to check the healthy operation of the valves.

- If the feedback signal is more than 10% (default) different from the demand signal (allowing for the drive time of the actuator to respond to load changes), then a 'A27 – Valve 1 Fault' and/or 'A28 – Valve 2 Fault' alarm will be generated. Valves will continue to operate until fault is rectified.

The cooling valves are drive open/drive close devices and in the event of the positioning signal being lost, they will remain at the last known operating position (assuming no signal, if at 0 V then valve will close).

The default setting for valve operation is for both valves to run in parallel (Configuration – Temperature Control screen P315). In instances where the heat transfer load is low, this can alternatively be set for series (sequential) operation, for improved secondary temperature control.

Primary flow rate is monitored with a calorimetric flow meter at the Primary inlet to the XDU. The flow can be read on the Home screen or on page 2 of the Status screen.

**NOTE: The flow meter will only read the 'total' primary flow through the Vertiv™ Liebert® XDU1350, it does not monitor the flow rate through individual heat exchangers.**

- A 'A29 – Primary Water Low Flow' alarm is generated if: - The 'A33 – Secondary Water High Temperature' alarm is active, there is not a 'A31 - Primary Water High Temperature' alarm present and the demand to the operational cooling valves is at 100%.
- A 'A41 - Primary No Flow' alarm will also be generated if: - The 'A33 - Secondary Water High Temperature' event is active, there is a 'A31 - Primary Water High Temperature' alarm present and the demand to the operational cooling valve is at 100%.

**NOTE: Flows below 46 l/m (12 gpm) are outside the range of the flow sensor and will not be displayed.**

## 4.4 Temperature Control Loop Adjustment

In most applications, the default PID settings in the controller will give temperature control. If it is found necessary to change these, then it is recommended that the Zeigler-Nichols manual tuning method is adopted.

**NOTE: This method requires the system to be operating under typical load conditions and will initially cause the control loop to temporarily become unstable with wide temperature swing oscillations. It is important to ensure that this will not cause any damage to the equipment being cooled.**

**Log-in at Engineering level will be required to make the necessary changes.**

1. Set the Integral Reset Time and Derivative Reset Time (Configuration – Temperature Control screens P309 and P310) to 0 seconds.
2. Increase the Proportional Band (Configuration – Temperature Control screen P308) to a higher value from the default, e.g. 20°C (68°F).
3. Check that secondary supply temperature (T2) stabilizes. Note: temperature will stabilize at a higher temperature than the current setpoint. This offset will be eradicated once the Integral Reset Time is added back in.
4. If temperature control is un-stable, raise the Proportional Band to a higher value until temperature stabilizes, otherwise gradually decrease the Proportional Band in 1°C (33.8°F) steps until the supply temperature (T2) starts to oscillate at a constant rate.
5. Measure the frequency of the oscillation time (peak to peak) in seconds (t).

### 4.4.1 PI Control

For systems that have reasonably steady or slow changing heat loads, PI control only should be sufficient.

1. Set the Proportional Band to 2.2 x the Proportional Band setting at which the system became unstable.
2. Set the Integral Reset Time to 0.83 x the oscillation time (t).
3. Leave the Derivative Reset Time at 0.

### 4.4.2 PID Control

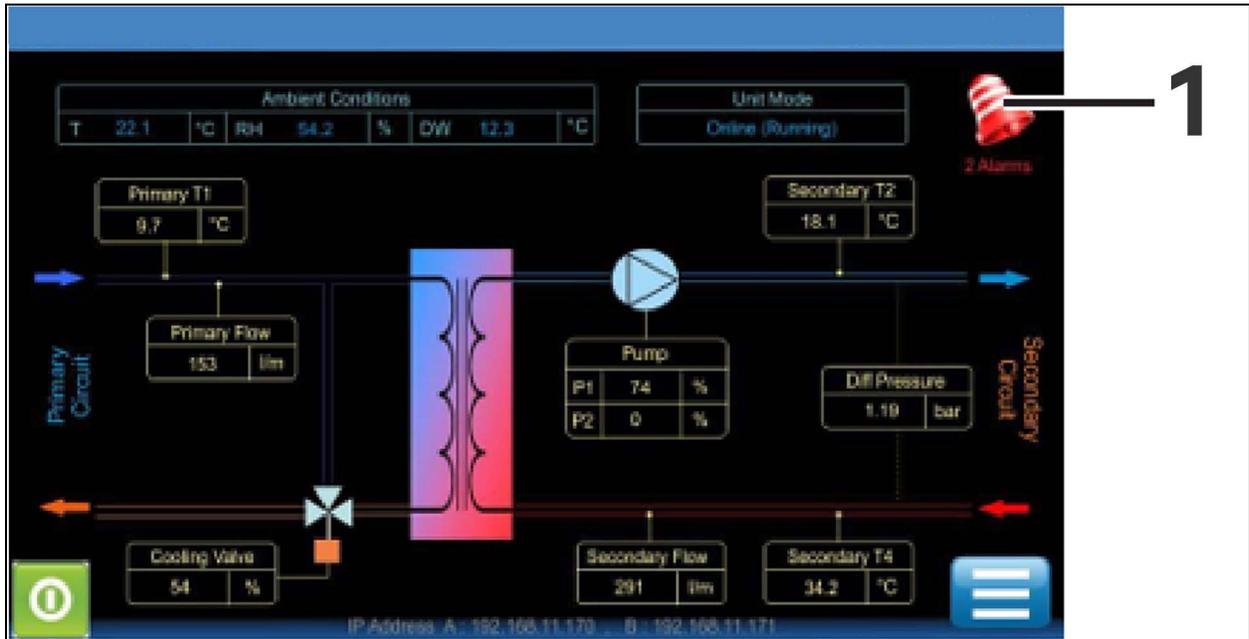
For systems that will see high or sudden changing heat loads, PID control will generally be the preferred option.

1. Set the Proportional Band to 1.67 x the Proportional Band setting at which the system became unstable.
2. Set the Integral Reset Time to 0.5 x the oscillation time (t).
3. Set the Derivative Reset Time to 0.125 x the oscillation time (t).

## 4.5 Alarm Management

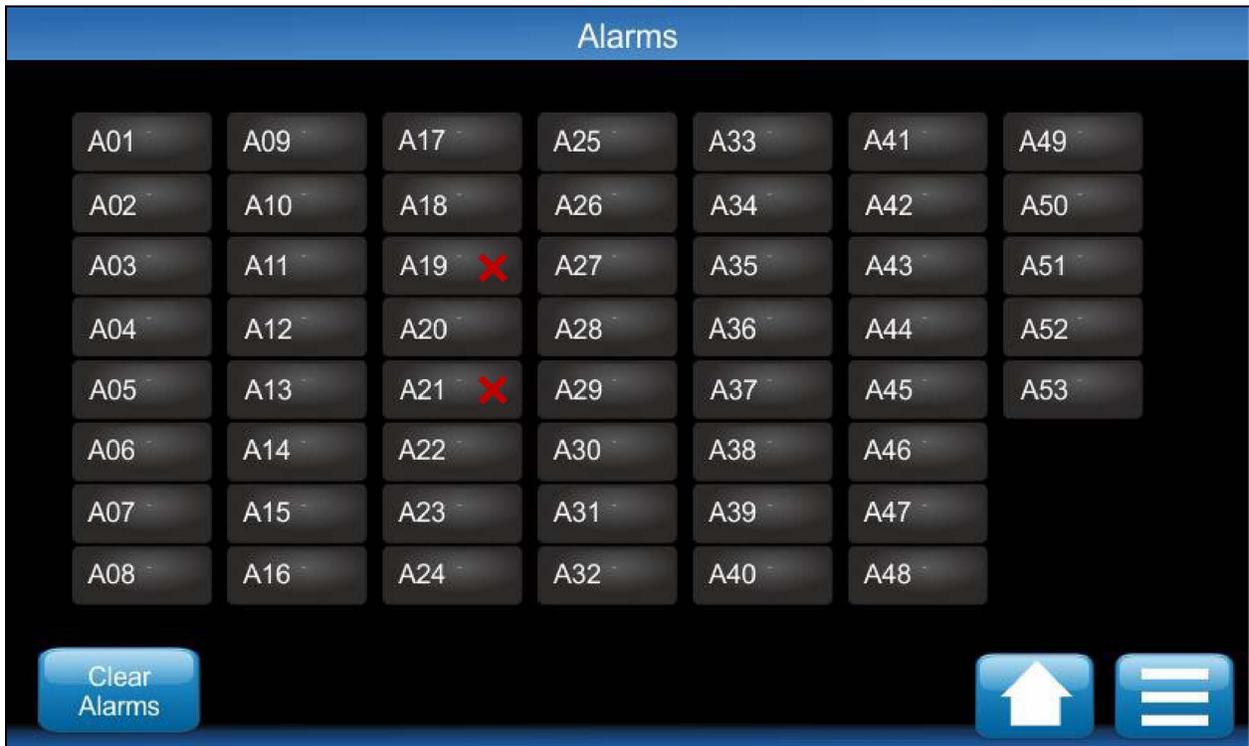
When an alarm occurs, a flashing alarm bell icon will immediately break through at the top right-hand corner of the Home screen with the number of active alarms stated below.

Figure 4.16 Control Screen Alarm Indication



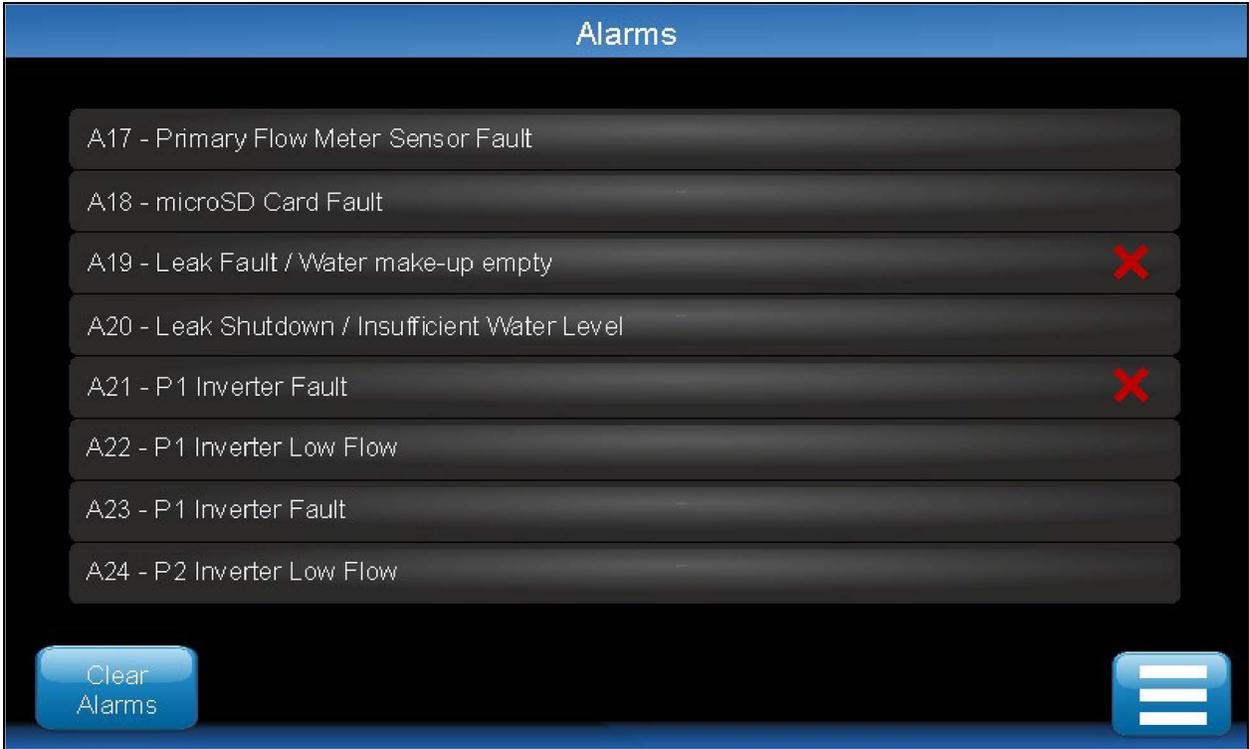
| Item | Description   |
|------|---|
| 1    | A flashing alarm bell icon gives alarm indication.<br>Pressing the alarm bell icon will bring up the Alarm page ( as shown in <b>Figure 4.17</b> below ) which will identify which alarms are active. |

Figure 4.17 Control Screen Active Alarms



The alarm descriptions may be accessed by selecting the vertical columns where the alarm(s) appear (as shown in **Figure 4.18** below ).

**Figure 4.18 Control Screen Alarm Identification**



Some alarms will 'self-clear' if the condition is a brief one (e.g. a temperature goes over an alarm threshold then comes back to a healthy condition) or when the fault has been rectified (e.g. a faulty sensor has been replaced.)

Latching alarms will need to be manually cleared when logged on at the Service level or higher, by pressing the 'Clear Alarms' button on either of the screens above.

The self-clearing and latching alarms are identified in [Troubleshooting \(Alarms\)](#) on the facing page .

All alarms are automatically logged in an Alarm Log file stored on the controller SD card, with the time and date of generation.

## 4.6 Troubleshooting (Alarms)



**WARNING! Risk of electric shock. Can cause serious injury or death. Building and equipment damage may also result. Open all local and remote electric power supply disconnect switches and verify that power is off with a voltmeter before working within any electric connection enclosures. The Vertiv™ Liebert® iCOM™ controller does not isolate power from the unit, even in the "Unit Off" mode. Some internal components require and receive power even during the "unit off" mode of the Liebert® iCOM™ controller.**

**Installation, service, and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers' specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.**

**NOTE: This is the full list of all alarms, however not all will necessarily be active depending on unit configuration, e.g. if the XDU has not been fitted and configured for a Primary filter, then the associated A29 – Filter Dirty alarm will not be active, etc.**

**Alarms shown with an asterisk (\*) beside the code number in this table may not be active, depending on unit configuration.**

**Table 4.37 Alarms**

| Code | Description   | Type  | Self-clear | Latching | Shutdown | Delay |
|------|---|-------|------------|----------|----------|-------|
| ---- | No Display  |       |            |          |          |       |
|      | Detail: Display not illuminated. Power failure on display board or controller I/O board.<br>Action: Open upper electrical panel door to check that 24v DC is available at controller I/O board. If there are no LEDs showing on processor board then check I/O board 24v fuse FS1. If LEDs are on, check for wiring faults between I/O board and display. |       |            |          |          |       |
| A01  | T1 Primary Temperature Sensor Fault   | Alarm | X          |          |          |       |
|      | Detail: Reading from Primary temperature sensor T1 is outside the normal range of -5 to 70°C (23 to 158°F), or disconnected.<br>Action: Check sensor connections to the control board, check in-line connections, replace sensor.   |       |            |          |          |       |
| A02  | T2a Secondary Temperature Sensor Fault  | Alarm | X          |          |          |       |
|      | Detail: Reading from Secondary supply temperature sensor T2a is outside the normal range of 5 to 70°C (41 to 158°F), or disconnected.<br>Action: Check sensor connections to the control board, check in-line connections, replace sensor.  |       |            |          |          |       |
| A03  | T2b Secondary Temperature Sensor Fault  | Alarm | X          |          |          |       |
|      | Detail: Reading from Secondary supply temperature sensor T2b is outside the normal range of 5 to 70°C (41 to 158°F), or disconnected.<br>Action: Check sensor connections to the control board, check in-line connections, replace sensor.  |       |            |          |          |       |
| A04  | T2c Secondary Temperature Sensor Fault  | Alarm | X          |          |          |       |
|      | Detail: Reading from Secondary supply temperature sensor T2c is outside the normal range of 5 to 70°C (41 to 158°F), or disconnected.<br>Action: Check sensor connections to the control board, check in-line connections, replace sensor.  |       |            |          |          |       |
| A05  | T3a Room Temperature Sensor Fault   | Alarm | X          |          |          |       |
|      | Detail: Reading from Room temperature sensor T3a is outside the normal range of 5 to 70°C (41 to 158°F), or disconnected.<br>Action: Check sensor connections to the control board, check in-line connections, replace sensor.  |       |            |          |          |       |

**Table 4.37 Alarms (continued)**

| Code | Description  | Type  | Self-clear | Latching | Shutdown | Delay |
|------|--|-------|------------|----------|----------|-------|
| A06  | T3b Room Temperature Sensor Fault  | Alarm | X          |          |          |       |
|      | Detail: Reading from Room temperature sensor T3b is outside the normal range of 5 to 70°C (41 to 158°F), or disconnected.<br>Action: Check sensor connections to the control board, check in-line connections, replace sensor.   |       |            |          |          |       |
| A07  | T4 Secondary Temperature Sensor Fault  | Alarm | X          |          |          |       |
|      | Detail: Reading from Secondary return temperature sensor T4 is outside the normal range of 5 to 70°C (41 to 158°F), or disconnected.<br>Action: Check sensor connections to the control board, check in-line connections, replace sensor.  |       |            |          |          |       |
| A08  | RHa Relative Humidity Sensor Fault   | Alarm | X          |          |          |       |
|      | Detail: Reading from Room humidity sensor RHa is outside the normal range of 5 to 100% RH, or disconnected. [Note: if in Fixed Setpoint + DW Offset mode, unit will revert to Fixed Set Point mode – default 18°C (65°F)].<br>Action: Check sensor connections to the control board, check in-line connections, replace sensor.  |       |            |          |          |       |
| A09* | RHb Relative Humidity Sensor Fault   | Alarm | X          |          |          |       |
|      | Detail: Reading from Room humidity sensor RHb is outside the normal range of 5 to 100% RH, or disconnected. [Note: if in Fixed Setpoint + DW Override mode, unit will revert to Fixed Setpoint mode – default 18°C (65°F)].<br>Action: Check sensor connections to the control board, check in-line connections, replace sensor.   |       |            |          |          |       |
| A10  | PS1a Secondary Pressure Sensor Fault   | Alarm | X          |          |          |       |
|      | Detail: Reading from Secondary return pressure sensor PS1a ('Fill' pressure) is outside the normal range of 0 to 15 bar (0 to 218 PSI) and min/max values only will be displayed. [Note: for DP control, if system differential pressure is not valid, then pump speed will remain at last known demand].<br>Action: Check sensor connections to the control board, check in-line connections, replace sensor.             |       |            |          |          |       |
| A11  | PS1b Secondary Pressure Sensor Fault   | Alarm | X          |          |          |       |
|      | Detail: Reading from Secondary return pressure sensor PS1b (also static 'Fill' pressure) is outside the normal range of 0 to 15 bar (0 to 218 PSI) and min/max values only will be displayed. [Note: for DP control, if system differential pressure is not valid, then pump speed will remain at last known demand].<br>Action: Check sensor connections to the control board, check in-line connections, replace sensor. |       |            |          |          |       |
| A12  | PS2 Secondary Pressure Sensor Fault  | Alarm | X          |          |          |       |
|      | Detail: Reading from Secondary supply pressure sensor PS2 is outside the normal range of 0 to 15 bar (0 to 218 PSI) and min/max values only will be displayed [Note: for DP control, if system differential pressure is not valid, then pump speed will remain at last known demand].<br>Action: Check sensor connections to the control board, check in-line connections, replace sensor.                                 |       |            |          |          |       |
| A13* | PS3 Primary Pressure Sensor Fault  | Alarm | X          |          |          |       |
|      | Detail: Reading from Primary filter inlet pressure sensor PS3 is outside the normal range of 0 to 15 bar (0 to 218 PSI) and min/max values only will be displayed [Note: if filter differential pressure is not valid, then pump speed will remain at last known demand].<br>Action: Check sensor connections to the control board, check in-line connections, replace sensor.   |       |            |          |          |       |
| A14* | PS4 Primary Pressure Sensor Fault  | Alarm | X          |          |          |       |
|      | Detail: Reading from Primary filter outlet pressure sensor PS4 is outside the normal range of 0 to 15 bar (0 to 218 PSI) and min/max values only will be displayed [Note: if filter differential pressure is not valid, then pump speed will remain at last known demand].<br>Action: Check sensor connections to the control board, check in-line connections, replace sensor.  |       |            |          |          |       |

**Table 4.37 Alarms (continued)**

| Code | Description  | Type  | Self-clear | Latching | Shutdown | Delay |
|------|--|-------|------------|----------|----------|-------|
| A15* | PS5a Secondary Pressure Sensor Fault   | Alarm | X          |          |          |       |
|      | Detail: Reading from Secondary filter inlet pressure sensor PS5a (Pump 1 outlet) is outside the normal range of 0 to 15 bar (0 to 218 PSI) and min/max values only will be displayed.<br>Action: Check sensor connections to the control board, check in-line connections, replace sensor.   |       |            |          |          |       |
| A16  | PS5b Secondary Pressure Sensor Fault   | Alarm | X          |          |          |       |
|      | Detail: Reading from Secondary filter inlet pressure sensor PS5b (Pump 2 outlet) is outside the normal range of 0 to 15 bar (0 to 218 PSI) and min/max values only will be displayed.<br>Action: Check sensor connections to the control board, check in-line connections, replace sensor.   |       |            |          |          |       |
| A17  | Secondary Flow Meter Sensor Fault  | Alarm | X          |          |          |       |
|      | Detail: Secondary flow meter output is below 4mA.<br>Action: Check sensor connections to the control board, check in-line connections, replace sensor.   |       |            |          |          |       |
| A18  | Primary Flow Meter Sensor Fault  | Alarm | X          |          |          |       |
|      | Detail: Primary flow meter output is below 4mA.<br>Action: Check sensor connections to the control board, check in-line connections, replace sensor.   |       |            |          |          |       |
| A19  | Micro SD Card Fault  | Alarm | X          |          |          |       |
|      | Detail: The SD card has either been removed or physically damaged.<br>Action: Replace the SD card  |       |            |          |          |       |
| A20  | Leak Fault/Water Make-up Empty   | Alarm |            | X        |          |       |
|      | Detail: Fill pump has been running for more than 1 minute (default), with level sensor is made, but minimum system pressure level has not been achieved. Also activated when level switch remains open and system pressure has not been achieved (accompanied by an 'A21 - Insufficient Water Level' alarm).<br>Action: Check the make-up water container is full, tubes are free of air locks, container is properly connected and fill pump is operational. Check system for leaks.  |       |            |          |          |       |
| A21  | Leak Shutdown/Insufficient Water   | Alarm |            | X        | X        |       |
|      | Detail: <u>On Initial Start-up</u> – If level sensors are not made, fill pressure has not been achieved and fill pump has been running for more than 1 minute, then unit will not start or shutdown immediately.<br><u>While Unit is Running</u> – This will be in conjunction with a 'A42 – Level Sensor – No Water Detected' alarm (refer to A41 for detail). If level sensors are not made and flow or DP is < 50% of flow/DP setpoint, then unit will shutdown after a 1 second delay.<br>Action: Check that water make-up container is properly connected (or filling wand is fully immersed, if used). Check system for leaks. Check there is no trapped air in fill pump hoses and system is fully vented. Check auto air vents are open. |       |            |          |          |       |
| A22  | P1 Inverter Fault  | Alarm |            | X        |          |       |
|      | Detail: Pump 1 is drawing excessive current, or inverter has been subjected to over/under voltage. Alarm will only appear after inverter has gone into fault condition a second time (default), after first attempting a fault reset. Pump 2 will then run.<br>Action: Note any fault code on the inverter display and contact Vertiv for more information/corrective action.  |       |            |          |          |       |
| A23  | P1 Inverter Low Flow   | Alarm |            | X        |          |       |
|      | Detail: Pump 1 has not reached the flow rate (or differential pressure) setpoint in the specified time limit (default 100 seconds) and Pump 2 will then run.<br>Action: Check that unit has been set for the correct system flow rate (or DP), check for system blockages, check inverter drive for faults, check non-return valve on Pump 2 is not sticking open (Pump 2 rotating slowly backwards). Reduce flow setting (or DP).   |       |            |          |          |       |

**Table 4.37 Alarms (continued)**

| Code | Description  | Type  | Self-clear | Latching | Shutdown | Delay |
|------|--|-------|------------|----------|----------|-------|
| A24* | P2 Inverter Fault  | Alarm |            | X        |          |       |
|      | Detail: Pump 2 is drawing excessive current, or inverter has been subjected to over/under voltage. Alarm will only appear after inverter has gone into fault condition a second time (default), after first attempting a fault reset. Pump 1 will then run.<br>Action: Note any fault code on the inverter display and contact Vertiv for more information/corrective action.  |       |            |          |          |       |
| A25  | P2 Inverter Low Flow   | Alarm |            | X        |          |       |
|      | Detail: Pump 2 has not reached the flow rate (or differential pressure) setpoint in the specified time limit (default 100 seconds) and Pump 1 will then run.<br>Action: Check that unit has been set for the correct system flow rate (or DP), check for system blockages, check inverter drive for faults, check non-return valve on Pump 1 is not sticking open (Pump 1 rotating slowly backwards). Reduce flow setting (or DP).                               |       |            |          |          |       |
| A26  | Secondary Pump Shutdown  | Alarm |            | X        | X        |       |
|      | Detail: An A22/A24 – Inverter Fault and/or an A45/A46 – Inverter Comms Fault has been generated (for both pumps if a twin pump unit).<br>Action: Check running current of pumps, check inverters for faults. Faults will need to be rectified and alarms cleared before unit can be started again.   |       |            |          |          |       |
| A27  | Valve Fault  | Alarm |            | X        |          |       |
|      | Detail: Feedback signal from cooling valve is more than 10% (default) adrift from demand signal (sampled every 15 minutes (default) and allowing for 40 second (default) positioning time).<br>Action: Check the wiring connections to the actuator. Try to set the actuator position manually using the 'Auto Overrides' function. Check the voltage out and return signals (Page 1 of Diagnostics screen)  |       |            |          |          |       |
| A28  | Primary Water Low Flow   | Alarm |            | X        |          | X     |
|      | Detail: Will only activate when valve demand is at 100%, 'A32 - Secondary Water High Temp' alarm is active and Primary water temperature is within specified limits (default 5 minutes delay applies).<br>Action: Check operation of cooling valve. Check chilled water supply flow rate. Ensure system heat load does not exceed the FS400 capacity (i.e. check that Primary flow is sufficient for heat load – refer to FS400 Application and Planning Guide). |       |            |          |          |       |
| A29* | Primary Filter Dirty   | Alarm | X          |          |          | X     |
|      | Detail: Differential pressure across Primary filter (if fitted) is greater than 0.6 bar (9 PSI), indicating that the filter should be cleaned (default 60 second delay applies).<br>Action: Clean filter screen as described in the Maintenance section.   |       |            |          |          |       |
| A30  | Primary Water Low Temperature  | Alarm | X          |          |          | X     |
|      | Detail: Primary water temperature has dropped below the default 4°C (40°F) threshold. Alarm will cancel when temperature rises to 5°C (42°F) or more (default 2 minute delay applies).<br>Action: Check chilled water supply.  |       |            |          |          |       |
| A31  | Primary Water High Temperature   | Alarm | X          |          |          | X     |
|      | Detail: Primary water temperature has risen above the default 11°C (52°F) threshold. Alarm will cancel when temperature falls to 10°C (50°F) or less (default 2 minute delay applies).<br>Action: Check chilled water supply   |       |            |          |          |       |
| A32  | Secondary Water Low Temperature  | Alarm | X          |          |          | X     |
|      | Detail: Secondary water temperature has dropped by more than 2°C (4°F) below setpoint (default). Alarm will cancel when temperature rises to 1°C (2°F) below setpoint or higher. If Dew Point Offset is active, then this alarm will only activate when at or below dew point for a period of 3 minutes or more (default 2 minute delay applies).<br>Action: Check operation of control valve.   |       |            |          |          |       |

**Table 4.37 Alarms (continued)**

| Code | Description  | Type  | Self-clear | Latching | Shutdown   | Delay |
|------|--|-------|------------|----------|------------|-------|
| A33  | Secondary Water High Temperature   | Alarm | X          |          |            | X     |
|      | <p>Detail: Secondary water temperature has risen by more than 2°C (4°F) above setpoint (default). Alarm will cancel when temperature falls to 1°C (2°F) above setpoint or lower. If Dew Point Offset is active, then this alarm will activate at a pre-set default value of 20°C (70°F) – see Parameters screen 3-12 (default 2 minute delay applies).</p> <p>Action: Check operation of cooling valve.</p>  |       |            |          |            |       |
| A34  | Flood Unit   | Alarm |            | X        | X (or not) |       |
|      | <p>Detail: Level switch in cabinet drip tray has detected a substantial water leak. Event may be set for 'Alarm Only' (default), or 'Alarm + Unit Shutdown'.</p> <p>Action: Identify and repair the leak (Note: A leak of this magnitude that does not bring up any other alarms would most likely be from the Primary circuit.</p>  |       |            |          |            |       |
| A35  | PS1 Difference Out of Limits   | Alarm | X          |          |            |       |
|      | <p>Detail: Difference between Secondary return pressure sensors PS1a and PS1b is more than 0.2Bar (3PSI), (default) for a period of 30 seconds (default) or more. Controller will continue to read just the higher of the 2 values</p> <p>Action: Replace sensor with the lower reading.</p>   |       |            |          |            |       |
| A36  | Sec. Over Pressure (Alarm)   | Alarm | X          |          |            |       |
|      | <p>Detail: Pressure at PS2 has increased above the set value of 6 bar (87 PSI) (default). This alarm is only active if unit has been configured for alarm only (See Configuration - Pump Control).</p> <p>Action: Most likely cause will be excessive heat build-up in the system, or a breach between Primary and Secondary circuits within the plate heat exchanger. Check for High Temp alarms, check bladder in expansion vessel(s) has not ruptured, relieve pressure at drain point. Remove heat exchanger and replace.</p>            |       |            |          |            |       |
| A37* | Flood Under Floor  | Alarm |            | X        | X (or not) |       |
|      | <p>Detail: The water detection tape installed under the floor (if fitted – optional extra) has detected a substantial water leak. Alarm may be set for 'Alarm Only' (default), or 'Alarm + Unit Shutdown'.</p> <p>Action: Identify and repair leak (note: a leak of this magnitude that does not bring up other alarms will most likely be from the Primary chilled water circuit.</p>   |       |            |          |            |       |
| A38  | Check Water Make-up Level  | Alarm |            | X        |            |       |
|      | <p>Detail: Fill pump has run for more than 5 seconds (fill pump will run when pressure at PS1 drops fill below the activation threshold - default 0.8 bar (12 PSI) for more than 10 seconds, while unit is running in automatic/on-line mode).</p> <p>Action: Check amount of fluid in make-up container and re-fill if necessary with treated water (check system for any sign of leakage).</p>   |       |            |          |            |       |
| A39  | System Low Pressure  | Alarm |            | X        |            | X     |
|      | <p>Detail: Pressure at PS1 has dropped more than 0.2 bar (3 PSI) (set, non-adjustable) below fill pump activation threshold for more than 1 minute (set, non-adjustable, applicable when unit is running in automatic/on-line mode).</p> <p>Action: Check amount of fluid in make-up container and re-fill if necessary. Ensure fill pump hoses are free of air locks, container is properly connected and fill pump is operational. Check system for leaks.</p>   |       |            |          |            |       |
| A40  | Sec. Over Pressure (Alarm + Shutdown)  | Alarm | X          |          | X          |       |
|      | <p>Detail: Pressure at PS2 has increased above the set value of 6 bar (87 PSI) (default). This alarm is only active if unit has been configured for alarm + shutdown only (See Configuration - Pump Control).</p> <p>Action: Most likely cause will be excessive heat build-up in the system, or a breach between Primary and Secondary circuits within the plate heat exchanger. Check for High Temp alarms, check bladder in expansion vessel(s) has not ruptured, relieve pressure at drain point. Remove heat exchanger and replace.</p> |       |            |          |            |       |

**Table 4.37 Alarms (continued)**

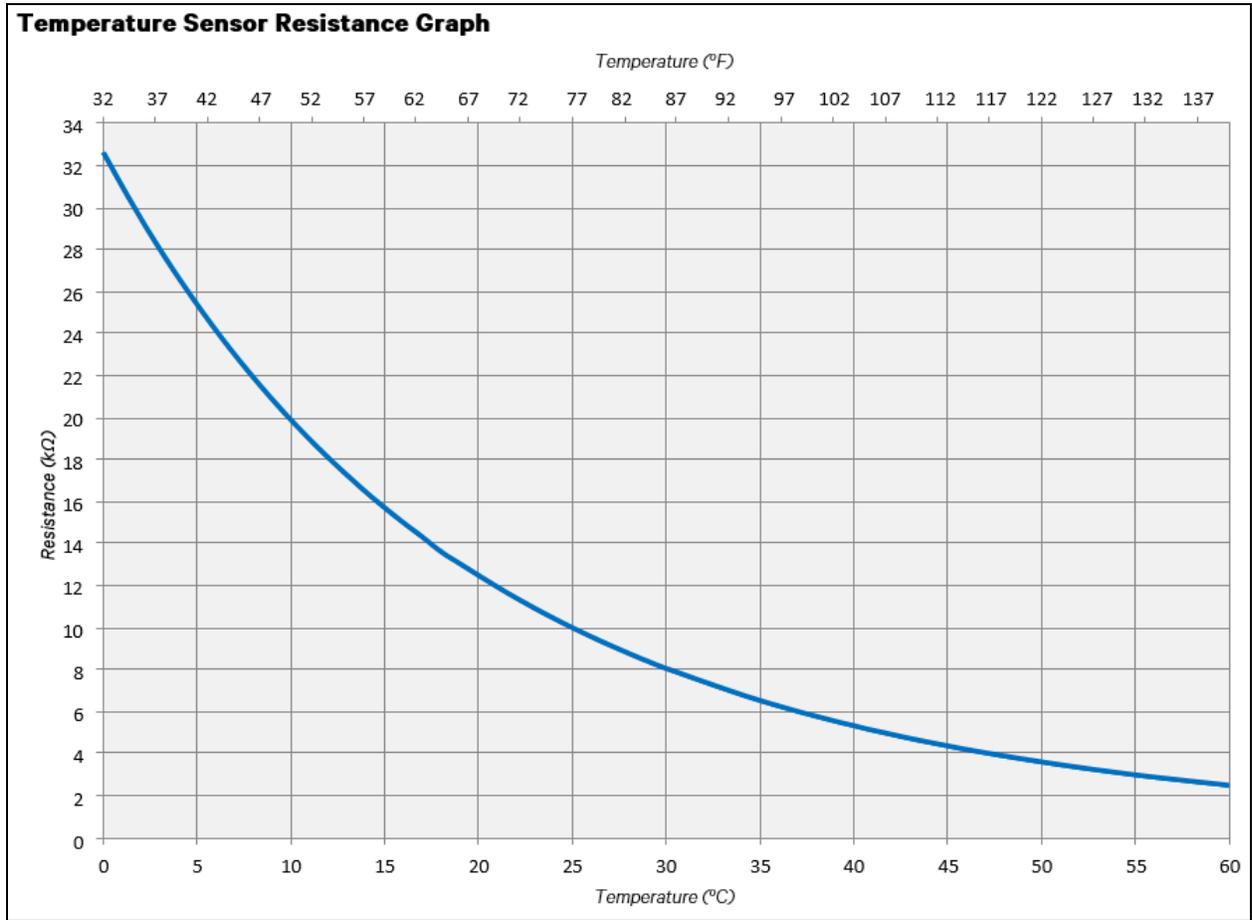
| Code | Description   | Type  | Self-clear | Latching | Shutdown | Delay |
|------|---|-------|------------|----------|----------|-------|
| A41  | Primary Water No Flow   | Alarm |            | X        |          |       |
|      | Detail: Will only activate when Valve Demand is at 100%, A32 - Secondary Water High Temp and A30 - Primary High Temp alarms are active (default 5 minute delay applies).<br>Action: Check that the chiller or facility water supply is operational and fault free.  |       |            |          |          |       |
| A42  | Level Sensor – No Water Detected  | Alarm | X          |          |          |       |
|      | Detail: <u>While Unit is Running only</u> – if both level sensors are open circuit for more than 1 second then this alarm will be raised, providing flow or DP (depending on control function set) is >50% of flow/DP setpoint. If flow/DP is below this threshold, then 'A21 - Leak Shutdown/Insufficient Water' alarm (refer to A21 for detail) will be raised and unit will shutdown after a 1 second delay.<br>Action: Check that water make-up container is properly connected (or filling wand is fully immersed, if used). Check system for leaks. Check there is no trapped air in fill pump hoses and system is fully vented. Check auto air vents are open. |       |            |          |          |       |
| A43  | Illegal Water Sensor Condition  | Alarm | X          |          |          |       |
|      | Detail: On Initial Start-up – if fill pressure has been achieved, but level sensors are not made.<br>Action: Replace level sensor/s.  |       |            |          |          |       |
| A44* | Group Control Network Fault   | Alarm | X          |          |          |       |
|      | Detail: Comms failure between XDUs on network<br>Action: Check wiring and terminations.   |       |            |          |          |       |
| A45  | Inverter 1 Comms Fault  | Alarm | X          |          |          |       |
|      | Detail: Controller unable to communicate with pump Inverter 1.<br>Action: Check wiring and terminations.  |       |            |          |          |       |
| A46* | Inverter 2 Comms Fault  | Alarm | X          |          |          |       |
|      | Detail: Controller unable to communicate with pump Inverter 2.<br>Action: Check wiring and terminations.  |       |            |          |          |       |
| A47* | Secondary Filter 1 Dirty  | Alarm | X          |          |          |       |
|      | Detail: Differential pressure across Secondary filter 1 (if fitted) is greater than 0.2 bar (3 PSI), indicating that the filter should be cleaned (default 60 second delay applies).<br>Action: Clean filter screen as described in the Maintenance section.  |       |            |          |          |       |
| A48* | Secondary Filter 2 Dirty  | Alarm | X          |          |          |       |
|      | Detail: Differential pressure across Secondary filter 2 (if fitted) is greater than 0.2 bar (3 PSI), indicating that the filter should be cleaned (default 60 second delay applies).<br>Action: Clean filter screen as described in the Maintenance section.  |       |            |          |          |       |
| A49  | Secondary Temp T2a Diff Fault   | Alarm | X          |          |          |       |
|      | Detail: Difference between Secondary temp. sensor T2a is more than default 1°C (2°F) adrift from T2b and T2c, for a period of 30 seconds (default) or more. Controller will read the average of T2b and T2c only.<br>Action: Check T2a sensors against temperature sensor resistance chart in Section 2.5 and replace if faulty.  |       |            |          |          |       |
| A50  | Secondary Temp T2b Diff Fault   | Alarm | X          |          |          |       |
|      | Detail: Difference between Secondary temp. sensor T2b is more than default 1°C (2°F) adrift from T2a and T2c, for a period of 30 seconds (default) or more. Controller will read the average of T2a and T2c only.<br>Action: Check T2b sensors against temperature sensor resistance chart in section 2.5 and replace if faulty.  |       |            |          |          |       |

**Table 4.37 Alarms (continued)**

| Code | Description   | Type  | Self-clear | Latching | Shutdown | Delay |
|------|---|-------|------------|----------|----------|-------|
| A51  | Secondary Temp T2c Diff Fault   | Alarm | X          |          |          |       |
|      | Detail: Difference between Secondary temp. sensor T2c is more than default 1°C (2°F) adrift from T2a and T2b, for a period of 30 seconds (default) or more. Controller will read the average of T2a and T2b only.<br>Action: Check T2c sensors against temperature sensor resistance chart in section 2.5 and replace if faulty.  |       |            |          |          |       |
| A52* | Group Control Insufficient Units Available  | Alarm | X          |          |          |       |
|      | Detail: Group control cannot bring a redundant unit on-line because it's either in a fault condition, has locally been put into standby mode, or has a comms. failure.<br>Action: Check status of redundant unit, check wiring and terminations.  |       |            |          |          |       |
| A53  | Restricted Pump Performance   | Alarm | X          |          |          |       |
|      | Detail: The pump speed is being automatically reduced (or backed-off) in response to an overpressure condition in the secondary circuit.<br>Action: Investigate the cause of the overpressure by checking the status of primary circuit temperature, secondary circuit temperatures and any changes to the secondary load – this could include the number of servers connected via rack manifold(s), the number of connected rear doors, or the position of any isolation valves. |       |            |          |          |       |

## 4.7 Temperature Sensor Graph

Figure 4.19 Temperature Sensor Resistance



This chart may be used to check the validity of the 10 K thermistor temperature sensors used in the unit.

## 4.8 Manual Operation of Cooling Valve



**WARNING!** Risk of electric shock. Can cause equipment damage, injury or death. Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is off before working within any electric connection enclosures. Service and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers' specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.

If the control valve actuator should fail completely, the Secondary supply temperature can be controlled by manually overriding the valve actuator as detailed below.

**NOTE:** The valve actuator should first be disconnected from the control panel (i.e. unplug the 4-way connector, terminals 9 to 12, from socket SK8). This will ensure the actuator maintains its manually set position.

Figure 4.20 Manual Operation of Cooling Valve



| Item | Description                              |
|------|--|
| 1    | Internal gear release for manual control |
| 2    | Less cooling                             |
| 3    | More cooling                             |

Press the internal gear release button down and move the valve handle to the desired position. This will allow the Vertiv™ Liebert® XDU1350 unit to continue running and providing cooling until the valve actuator can be replaced.

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## 5 Maintenance

### 5.1 General



**WARNING!** Arc flash and electric shock hazard. Can cause serious injury or death. Building and equipment damage may also result. Disconnect all local and remote electric power supplies and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable.

Verify with a voltmeter that power is Off. The Vertiv™ Liebert® iCOM™ controller does not isolate power from the unit, even in the “Unit Off” mode. Some internal components still require and receive power even during the “Unit Off” mode of the Liebert® iCOM™ controller. The factory-supplied, optional disconnect switch is inside the unit. The line side of this switch contains live high voltage. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic.

Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. Follow all local codes.



**WARNING!** Risk of electric shock. Can cause equipment damage, injury or death. Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is off before working within any electric connection enclosures. Service and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers’ specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.



**WARNING!** Risk of short circuits and electric shock. Can cause serious injury or death. Building and equipment damage can result from cut insulation or damaged wires. Can cause overheated wiring, smoke, fire, and activation of fire suppression systems and EMS personnel. Verify that all wiring connections are tight and that all wiring is contained within the junction box prior to closing and securing the cover.

Insert CSA-certified or UL-listed bushings into holes and/or knockouts used to route wiring through metal panels to protect the wire insulation from contact with sheet metal edges.



**WARNING!** Risk of improper wiring, piping, moving, lifting and handling. Can cause serious injury or death. Building and equipment damage may also result. Installation and service of this equipment should be done only by qualified personnel who have been specially-trained in the installation of air-conditioning equipment and who are wearing appropriate, OSHA-approved PPE.



**CAUTION:** Risk of contact with extremely hot or cold surfaces. Can cause injury. Verify that all components have reached a temperature that is safe for human contact or wear appropriate, OSHA-approved PPE before working with the electric connection enclosures or unit cabinet. Perform maintenance only when the system is de-energized and component temperatures have become safe for human contact.



**CAUTION: Risk of improper handling heavy and lengthy parts. Can cause injury. Building and equipment damage may also result. Cabinet panels can exceed 5 ft. (1.5 m) in length and weigh more than 35 lb (15.9 kg). Follow relevant OSHA lifting recommendations and consider using a two-person lift for safe and comfortable removal and installation of cabinet panels. Only properly trained and qualified personnel wearing appropriate, OSHA-approved PPE should attempt to remove or install cabinet panels.**

The Vertiv™ Liebert® XDU1350 should be cleaned on a regular basis and checked for leaks and malfunctions. Maintenance should only be carried out by personnel qualified to work on this type of equipment. For information on Maintenance or Service Support, contact the supplier - detail in the [Technical Support and Contacts](#) on page 67 .

## 5.2 Fluid Specifications



**CAUTION: Risk of improper piping installation, leak checking, fluid chemistry and fluid maintenance can cause equipment damage and personal injury. Installation and service of this equipment should be done only by qualified personnel who have been specially trained in the installation of air-conditioning equipment and who are wearing appropriate, OSHA-approved PPE.**

### NOTICE

Risk of leaking water/coolant fluid lines. Can cause equipment and building damage. Lines and joints must be inspected regularly. Improper installation, application, and service practices can result in water/coolant leakage from the unit. Water/coolant fluid can result in fluid leakage, severe property damage and loss of critical data center equipment. Do not locate unit directly above any equipment that could sustain water damage. Vertiv recommends installing monitored leak detection equipment for the unit and supply and return lines.

**NOTICE**

Risk of piping-system corrosion and freezing fluids. Can cause leaks resulting in equipment and very expensive building damage. Heat exchangers and piping systems are at high risk of freezing and premature piping corrosion. Fluids in these systems must contain the proper antifreeze and inhibitors to prevent freezing and premature piping corrosion. When the cooling unit or piping may be exposed to freezing temperatures, charge the system with coolant fluid based on the coldest ambient design temperature. Automotive antifreeze is unacceptable and must NOT be used in any fluid system. Use only coolant fluid solution that meets the requirements of recommended industry practices. Do not use galvanized pipe.

The system coolant fluid must be analyzed by a competent fluid-treatment specialist before start up to establish the inhibitor and antifreeze solution requirement and evaluated at regularly scheduled intervals throughout the life of the system to determine the pattern of inhibitor depletion.

The fluid complexity and variants of required treatment programs make it extremely important to obtain the advice of a competent and experienced fluid-treatment specialist and follow a regularly scheduled coolant-fluid system-maintenance program.

Fluid chemistry varies greatly as do the required additives, called inhibitors, that reduce the corrosive effect of the fluids on the piping systems and components.

The chemistry of the coolant fluid used must be considered, because some sources may contain corrosive elements that reduce the effectiveness of the inhibited formulation. Sediment deposits prevent the formation of a protective oxide layer on the inside of the coolant system components and piping. The coolant fluid must be treated and circulating through the system continuously to prevent the buildup of deposits and/or growth of sulfate reducing bacteria. Proper inhibitor maintenance must be performed to prevent corrosion of the system.

Consult fluid manufacturer for testing and maintenance of inhibitors.

Commercial-grade coolant fluid is generally less corrosive to the common metals of construction than water itself. It will, however, assume the corrosivity of the coolant fluid from which it is prepared and may become increasingly corrosive with use if not properly inhibited.

Vertiv recommends installing a monitored fluid-detection system that is wired to activate the automatic-closure of field-installed coolant-fluid supply and return shut-off valves to reduce the amount of coolant-fluid leakage and consequential equipment and building damage. The shut-off valves must be sized to close-off against the maximum coolant-fluid system pressure in case of a catastrophic fluid leak.

**NOTICE**

Risk of no-flow condition. Can cause equipment damage. Do not leave the water/coolant fluid-supply circuit in a no-flow condition. Idle fluid allows the collection of sediment that prevents the formation of a protective oxide layer on the inside of the tubes. Keep unit switched On and water/coolant fluid-supply circuit system operating continuously. In multiple unit teams, allow standby units to enter the rotation automatically or schedule regular manual rotations.

**Primary Circuit**

The Vertiv™ Liebert® XDU1350 is designed for use with a facility supply of plain water or up to 20% glycol/water. A 20% glycol concentration will give protection to approximately -9°C (16°F). If a higher concentration of glycol is used, then the cooling capacity of the unit may have to be de-rated (contact manufacturer for advice).

## Secondary Circuit

The secondary circuit should be filled with particulate free deionized water treated with suitable corrosion inhibitors and biocides.

Failure to use adequate water treatment may result in decreased system performance and reliability due to corrosion, scaling, fouling, and microbiological growth which may invalidate the warranty.

## 5.3 Planned Preventative Maintenance

Planned maintenance services should be carried out in 3 months, 6 months and 12 months in the first year, after the commissioning. After then, the planned maintenance service will be twice every year, with interval of 6 months.

### Planned maintenance services every 3 months

- Check Vertiv™ Liebert® XDU1350 valve operation, with necessary parameter adjustment.
- Check valve command and feedback.
- Check for any current alarms, correct and clear.
- Download historic alarm and event logs (refer to manufacturer for instructions).
- Record and clear any inverter error code and historic data.
- Check T2a, T2b, and T2c difference less than 0.5°F (0.3°C).
- Check all temperature sensors with calibrated temperature sensor.
- Check all temperature and pressure sensors are securely fixed with no leakage.
- Check primary pipework is securely connected with no leakage.
- Check primary pipework thermal insulation (if fitted).
- Check the maximum flow rate of primary circuit, and adjust if necessary.
- Check the primary supply temperature.
- Check the primary pressure.
- Check fuses.
- Check contactors for pitting (replace if pitted).
- Check/Retighten wire connections.
- Pump - Compare to nameplate amps L1, L2, L3.
- Remove and clean primary filter if necessary.
- Check secondary (manifold and hose) is securely connected with no leakage.
- Check the normal secondary flow rate.
- Check the opening of Liebert® XDU1350 auto air vent.
- Check the expansion vessels and the air vent.
- Test the supplementary filling with override operation (check make-up bag is full, properly connected and purged of air).
- Check the sync date and time of the units in parallel or in redundancy.
- Check firmware status and upgrade if necessary.
- Take water sample and have tested for correct levels of inhibitors and biocides.

**Planned maintenance services every 6 months (in addition to 3 month maintenance)**

- Simulate the pump change over.
- Simulate the Vertiv™ Liebert® XDU1350 switch off, using backup XDU1350 or parallel operation to meet the performance requirement.
- Check the leakage detection.
- Check remote communication functions correctly if applied.

**Planned maintenance services every 12 months (in addition to 3 and 6 months maintenance)**

- Check, clean or change the primary filter (if fitted).
- Check drain valves.
- Check all the cable connections and terminals.
- Check the rack heat load and the secondary flow rate setting.
- Override primary valve from 0% to 100%.
- Override pump inverters from 0% to 100%.
- Visual and audio check the pump bearings running.
- Record current of pump.
- Record pump run times.
- Record valve run times.

**Planned maintenance services every 24 months**

- Drain the water and re-commissioning the secondary circuit, if necessary (only replace with DEI water that has the correct treatment additives – see the [Fluid Specifications](#) on page 58 ).
- Change the primary filter and secondary filter screen (if fitted), if necessary.

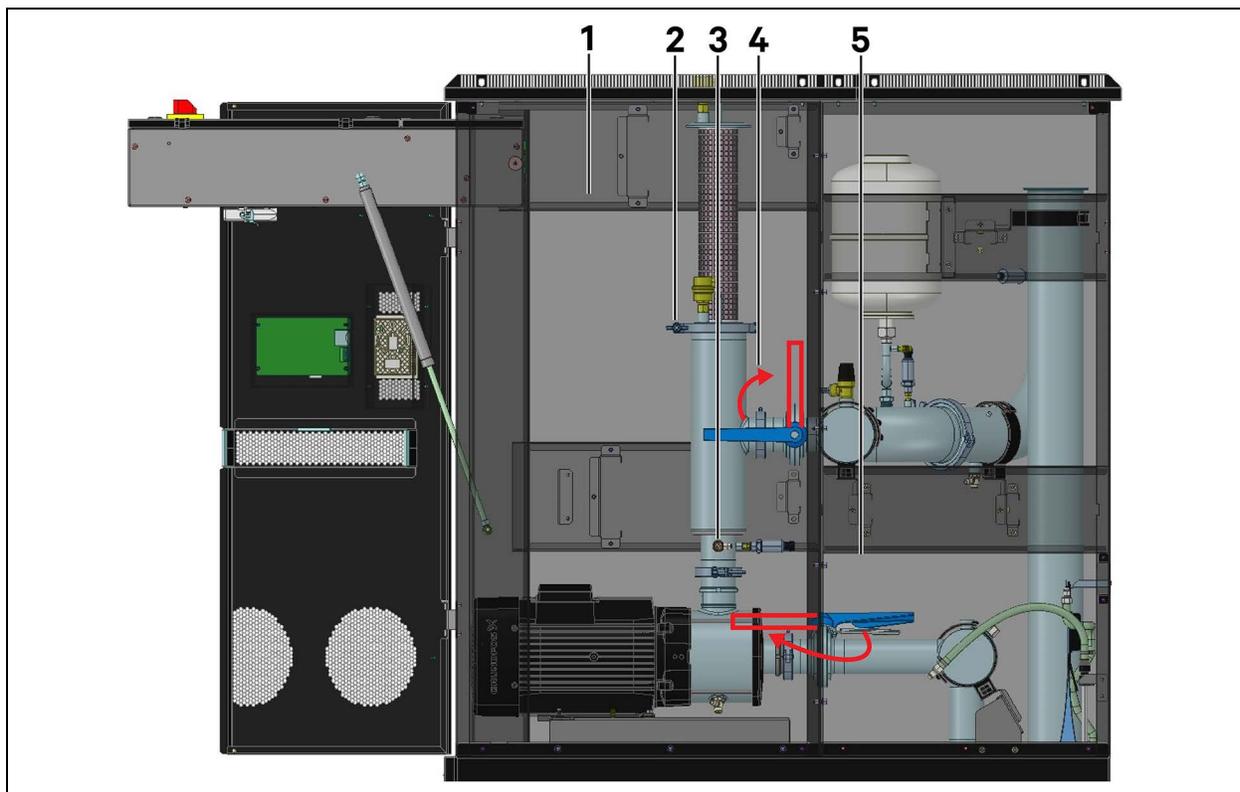
## 5.4 Secondary Filter Service (if fitted)

Providing the electrical panel transit screws were removed during installation (see the Installation and Commissioning Guide), the electrical panel can be easily hinged upwards to a horizontal position to give unimpeded access to the Secondary filters. This can be done while the Vertiv™ Liebert® XDU1350 remains operational.

**Figure 5.1 Access to Secondary Filters with Electrical Panel in Horizontal Position**



Figure 5.2 Servicing Secondary Filter



| Item | Description                  |
|------|------------------------------|
| 1    | Withdraw filter from housing |
| 2    | Filter clamp ring            |
| 3    | Connect hose to drain valve  |
| 4    | Filter isolation valve       |
| 5    | Filter isolation valve       |

**NOTE:** Each filter can be cleaned while the unit is running provided the operation is switched to the pumps/filters not to be cleaned (i.e. place the pump for the filter to be cleaned into 'out-of-service' state via the Service – Secondary Pumps menu).

The Secondary filter may be removed and cleaned following the procedure below:

1. Open the cabinet front doors, and swing the electrical panel up and out of the way as shown in **Figure 5.1** on the previous page.
2. Close filter isolation valves [4 and 5] to positions shown by red handle outlines, as shown in **Figure 5.2** above (i.e. handles vertical/horizontal).
3. Connect hose to drain valve [3].
4. Once drained, undo the clamp ring then withdraw the cap and filter screen using the Tee handle provided. Lift filter screen up and out of the filter housing, then out through the front of the unit.

- The filter screen may now be washed under a running tap however, if possible, a high-pressure water jet is preferable for more effective cleaning.

Replacement is the reverse of above procedure, taking care to first check there is no damage to the sealing gasket and to ensure good gasket alignment before tightening the clamp ring. Ensure the water make-up container is full, with additional water available to fill the filter housing. When opening the valves, open valve [5] initially until all the contained air is purged out of the filter housing through the automatic air-vent. Then open valve [4]. When valve [5] is opened, the loss of system pressure should automatically start the fill pump to fill the filter housing and bring the system back to the operating pressure.

## 5.5 Unit Draining

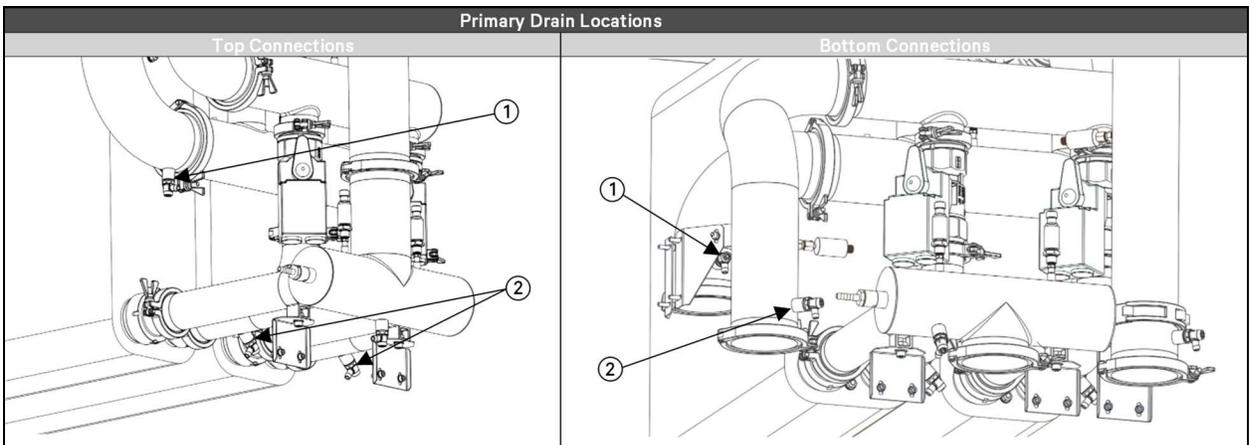
Drain valves are provided throughout the Vertiv™ Liebert® XDU to permit the removal of system fluid for filter change and other service work. Field supplied external isolation valves should be fitted by the installer to both supply and return pipes, as close as possible to the Liebert® XDU1350 for maintenance purposes.

Figure 5.3 Drain Valve



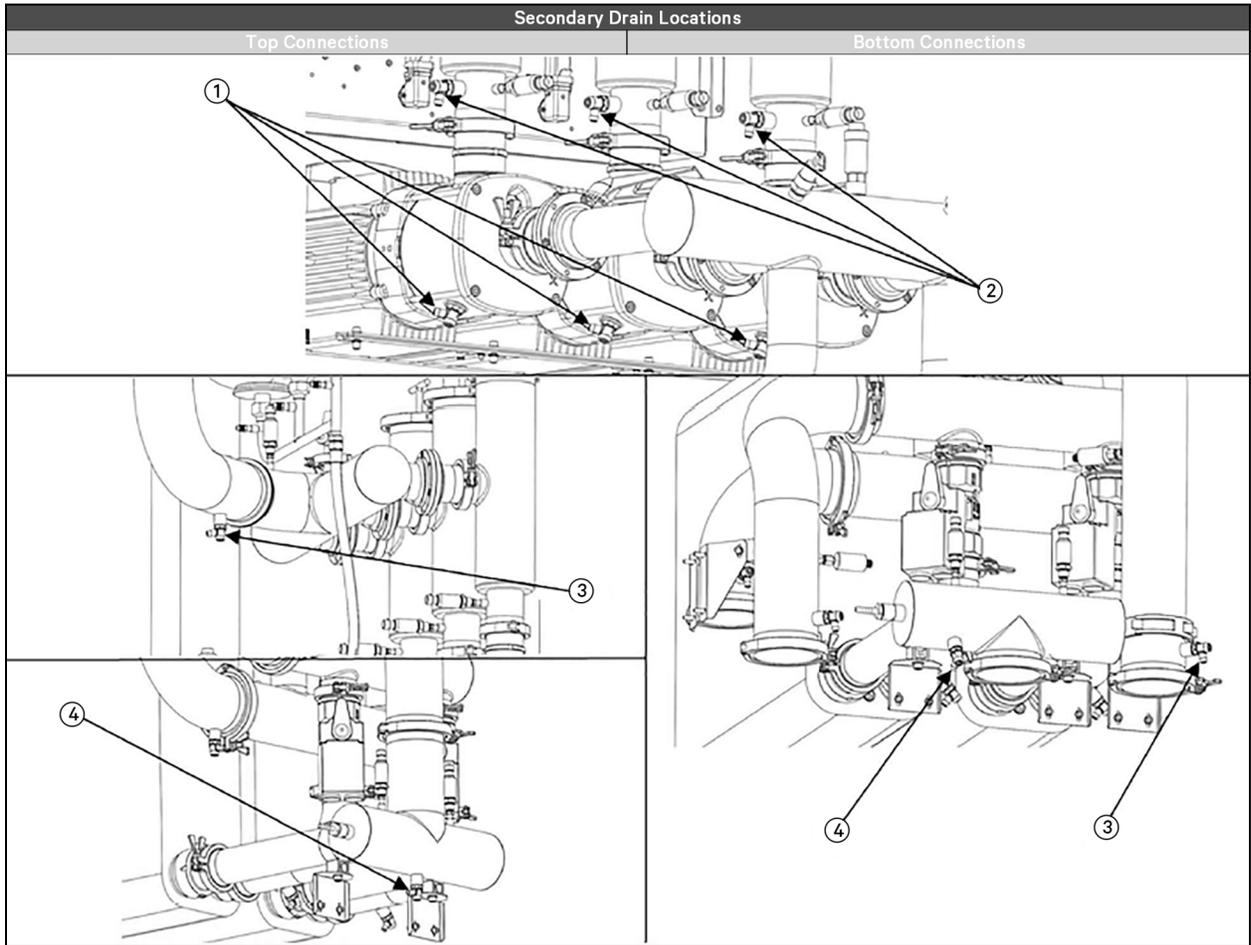
| Item | Description                    |
|------|--------------------------------|
| 1    | Use 3/8" ID hose for draining. |

Figure 5.4 Primary Drain Valve Locations



| Item | Description                           |
|------|---------------------------------------|
| 1    | Supply tail pipe (top or bottom exit) |
| 2    | Return tail pipe (top or bottom exit) |

Figure 5.5 Secondary Drain Valve Locations



| Item | Description                           |
|------|---------------------------------------|
| 1    | Pump base                             |
| 2    | Pump discharge                        |
| 3    | Supply tail pipe (bottom exit only)   |
| 4    | Return tail pipe (top or bottom exit) |

## 5.6 Spare Parts

It is recommended that the end user holds a kit of essential spare parts to enable the Vertiv™ Liebert® XDU1350 to be kept running with the minimum of down time. Any parts replaced during maintenance or servicing must be the same specification as those being replaced and should only be obtained from Vertiv. Please contact your local Vertiv representative for Vertiv engineered parts, check <https://www.Vertiv.com/en-us/support/> or call 1-800-543-2778.

The use of incorrect replacement parts may affect the operation or reliability of the unit and invalidate any warranty.

# Appendices

## Appendix A: Technical Support and Contacts

### A.1 Technical Support/Service in the United States

Vertiv Group Corporation

24x7 dispatch of technicians for all products.

1-800-543-2378

Liebert® Thermal Management Products

1-800-543-2778

Liebert® Channel Products

1-800-222-5877

Liebert® AC and DC Power Products

1-800-543-2378

### A.2 Locations

#### United States

Vertiv Headquarters

1050 Dearborn Drive

Columbus, OH, 43085, USA

#### Europe

Via Leonardo Da Vinci 8 Zona Industriale Tognana

35028 Piove Di Sacco (PD) Italy

#### Asia

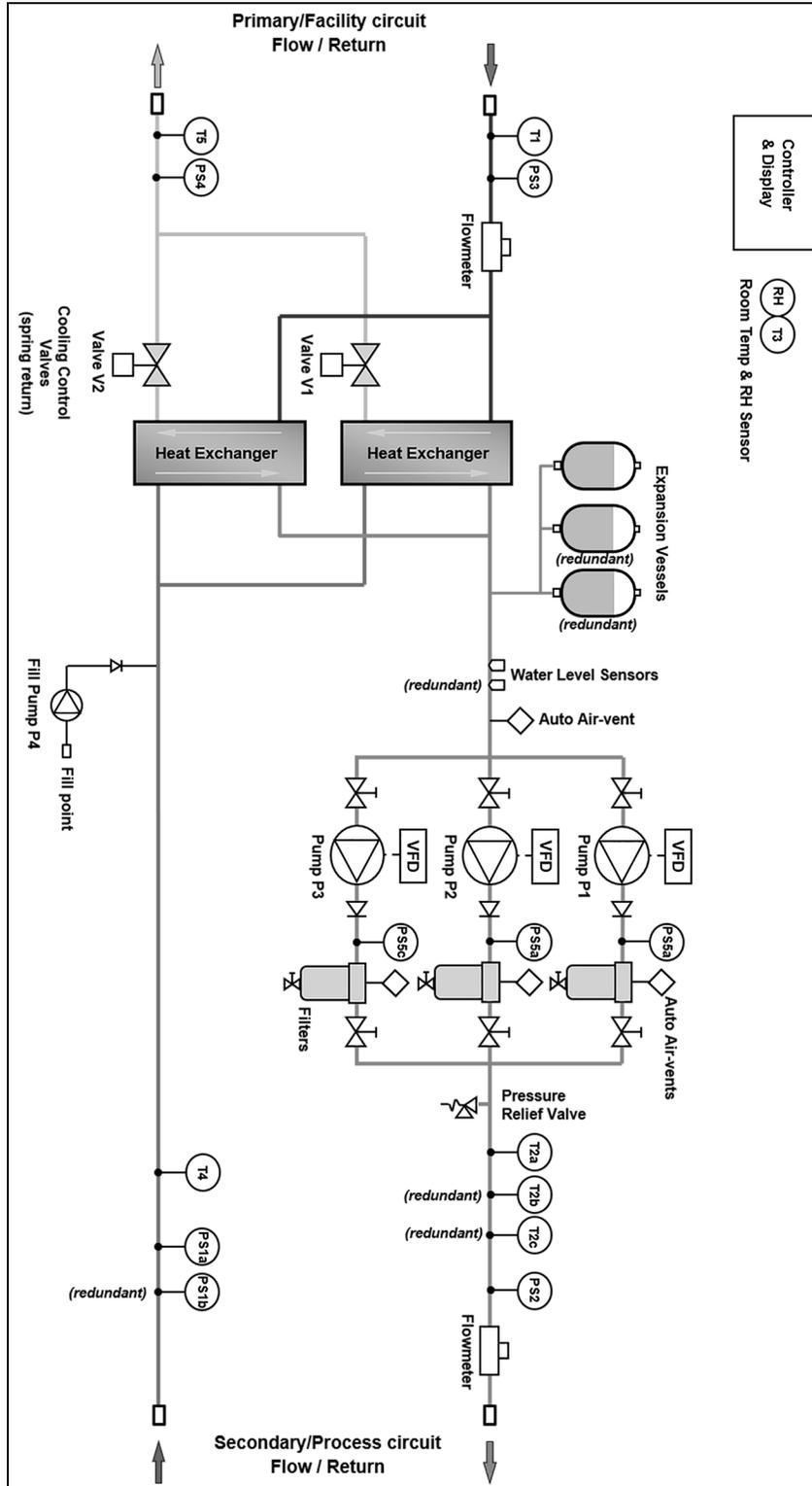
7/F, Dah Sing Financial Centre

3108 Gloucester Road, Wanchai

Hong Kong

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## Appendix B: Pipe Schematic Vertiv™ Liebert® XDU1350



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## **Appendix C: Warranty Details**

### **C.1 Limited Product and Service Warranty**

Extended warranties, service, and maintenance programs are available in most locations, details available upon request. To obtain further details of limited warranty, also after sales service offerings, contact your local sales representative or technical support if you have any questions or problems during unit installation.

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## Appendix E: Disposal Information

**NOTE: Waste materials must be disposed of in a responsible manner in line with environmental regulations.**

The de-commissioning and disposal of this product should be undertaken by qualified personnel in adherence to local and national safety regulations, particularly for protection of lungs, eyes, and skin from chemicals, dust, etc. Approved lifting gear and power tools should be used and access to the work area must be restricted to authorized personnel.

The following steps are a guide only and should be adjusted to take into account local site conditions:

1. Disconnect unit from electrical supply.
2. Drain and dispose of any heat transfer fluid through an approved recycling facility.
3. Remove unit to approved recycling facilities only.

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