CoolChip CDU100kW

Operation and Maintenance Guide

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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 must be followed during operation and maintenance of the Vertiv™ CoolChip CDU100kW.

NOTICE

Some control system menus may not be visible if the user is not logged in. Visibility also depends on the log in access level.

NOTICE

Information under factory configuration can be viewed with the service and engineer access codes. However, to make changes will require a further code that is available on request from Vertiv.

NOTICE

This method requires that the system operate under local conditions and initially causes 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. Login at the Engineer level is required to make the necessary changes.

NOTICE

It is not necessary to fully drain the filter housing in order to clean the filter. Drain just enough fluid to ensure the level has dropped approximately a cupful in the filter housing.

NOTICE

It may be necessary to break the seal on the top flange of the filter housing by giving the cap flange a gentle tap on the side with a soft faced mallet.

NOTICE

Check the condition of the O-ring seal at the base of the filter screen and the face seal at the top before reassembling and replace if there are any signs of damage. When opening the valves, open the pump inlet valve initially until all the contained air is purged out of the filter housing through the automatic air-vent, before then opening the filter outlet valve. When the pump inlet valve is opened, the loss of system pressure will most likely automatically start the fill pump P3 to bring the system back to the operating pressure.

NOTICE

If this pump and hose have been used to remove PG-25 fluid, it is recommended that pump and hose are flushed through with plain water before coiling up and storing back inside the unit.

NOTICE

This equipment is required to be installed only in locations not accessible to the general public. Installation, service, and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers specifications.

1.1 General

Mechanical and electrical equipment such as coolant distribution units (CDUs) 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 carrying out maintenance work, ensure that:

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 valves have come to rest.

If there is a doubt concerning safety, installation, operation, or maintenance instructions, consult Vertiv representative for clarification and advice. See Technical Support and Contacts on page 61.

1.2 Installation and Handling

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.

WARNING! This product is supplied with a 1.5 bar (21.7 psi) nitrogen holding charge in the fluid circuit. This needs to be vented during the installation process. See the Vertiv™ CoolChip CDU100kW Installation and Commissioning Guide SL- 71337 for more information.

1.3 Application

This product is to be used indoors only and must be only used for the application it was designed for. As consulted by Vertiv engineering 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! This unit is powered by high voltage. Serious injury or death can occur. Power supplied to this product must be provided with an external means of isolation.

Electrical connections must be carried out in accordance with local and national regulations by a qualified electrician. Never make any electrical connections inside the unit 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 always remain with the unit.

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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, Vertiv products are designed to comply with an IP21 rating. This product is cULus listed for the appropriate voltage models and certificates will be made available on request (cULus certificate 60335-1 pending).

2.2 RoHS 3 Compliance

Vertiv certifies that all products manufactured and supplied by Vertiv are fully RoHS compliant in accordance with EU RoHS Directives EU 2015/863.

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3 Product Description

3.1 General

This document describes the basic characteristics and operation of the Vertiv™ CoolChip CDU100kW and the required ongoing maintenance considerations.

The CoolChip CDU100kW contains a secondary closed loop circuit that provides a supply of cooling fluid to IT equipment, either through indirect cooling (such as rack mounted rear door heat exchangers), or direct cooling (such as cold plates at chip level).

The secondary circuit loop 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) through a low pressure drop plate heat exchanger.

The secondary circuit ensures that the cooling fluid in a data centre 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 sections 4.6 and 4.7 of **Vertiv™ CoolChip CDU100kW Application and Planning Guide SL-71339** for more information.

3.2 Vertiv™ CoolChip CDU100kW Model Number Nomenclature

Table 3.1 CoolChip CDU100kW Model Number

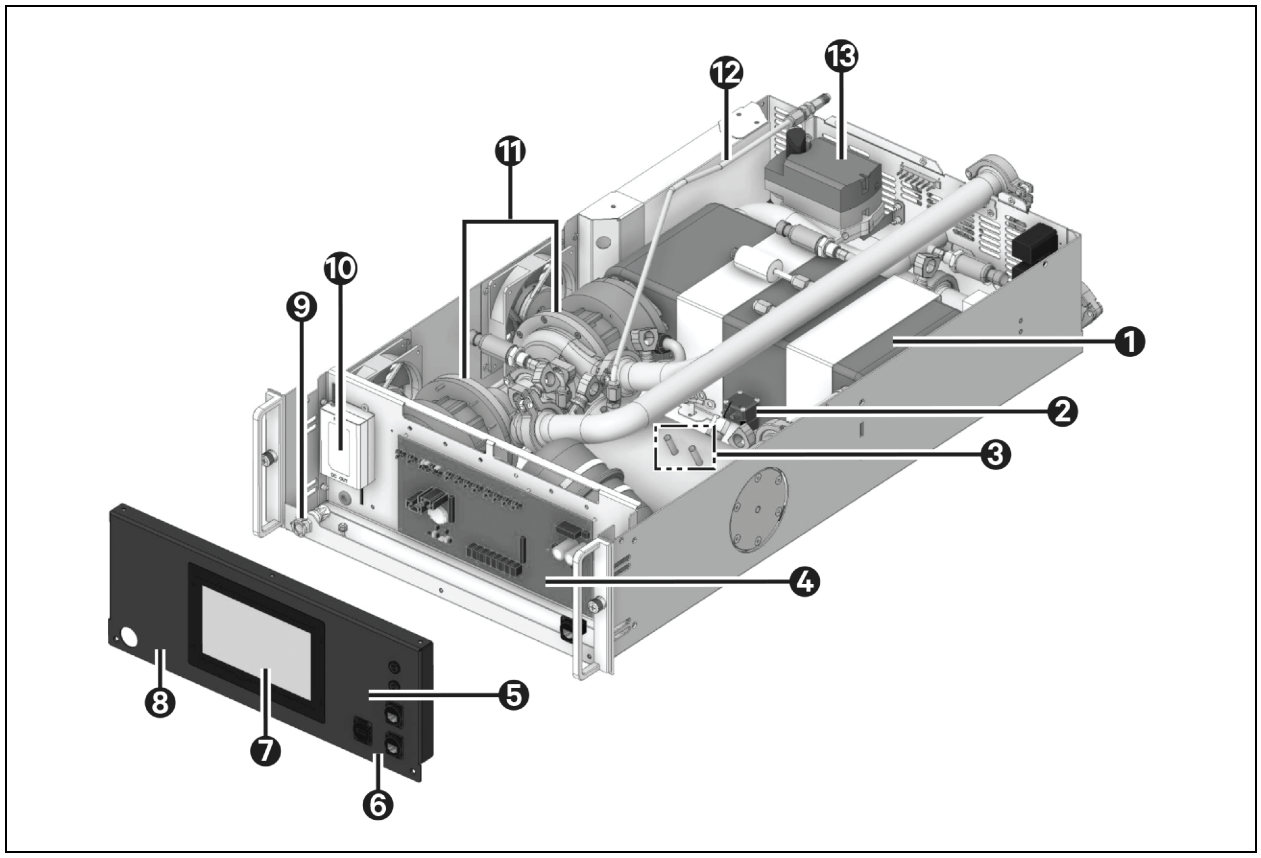
Digit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Model Number	X	D	U	1	0	0	W	A	K	P	1	4	2	0	0	0	0

Table 3.2 CoolChip CDU100kW Model Number Definitions

Digit	Feature	Value	Description
1,2,3	Family name	XDU	Product family
4,5,6	Unit model	100	Base model
7	Cooling Type	W	Liquid to liquid
8	Unit revision	A	Revision A
9	Voltage	K	120 V/1 PH/60 Hz
		S	208 V - 240 V/1 PH/60 Hz
10	Power input	P	C14—IEC power inlet
11	Monitoring	1	Standard
12	Pressure relief valve	3	3 bar pressure relief valve
		4	4 bar pressure relief valve
13	Secondary filtration	1	Fitted (25 micron)
		2	Fitted (50 micron)
14	Place holder	0	Place holder
15	Place holder	0	Place holder
16	Place holder	0	Place holder
17	Configuration	0	Standard configuration
		S	Special feature authorization

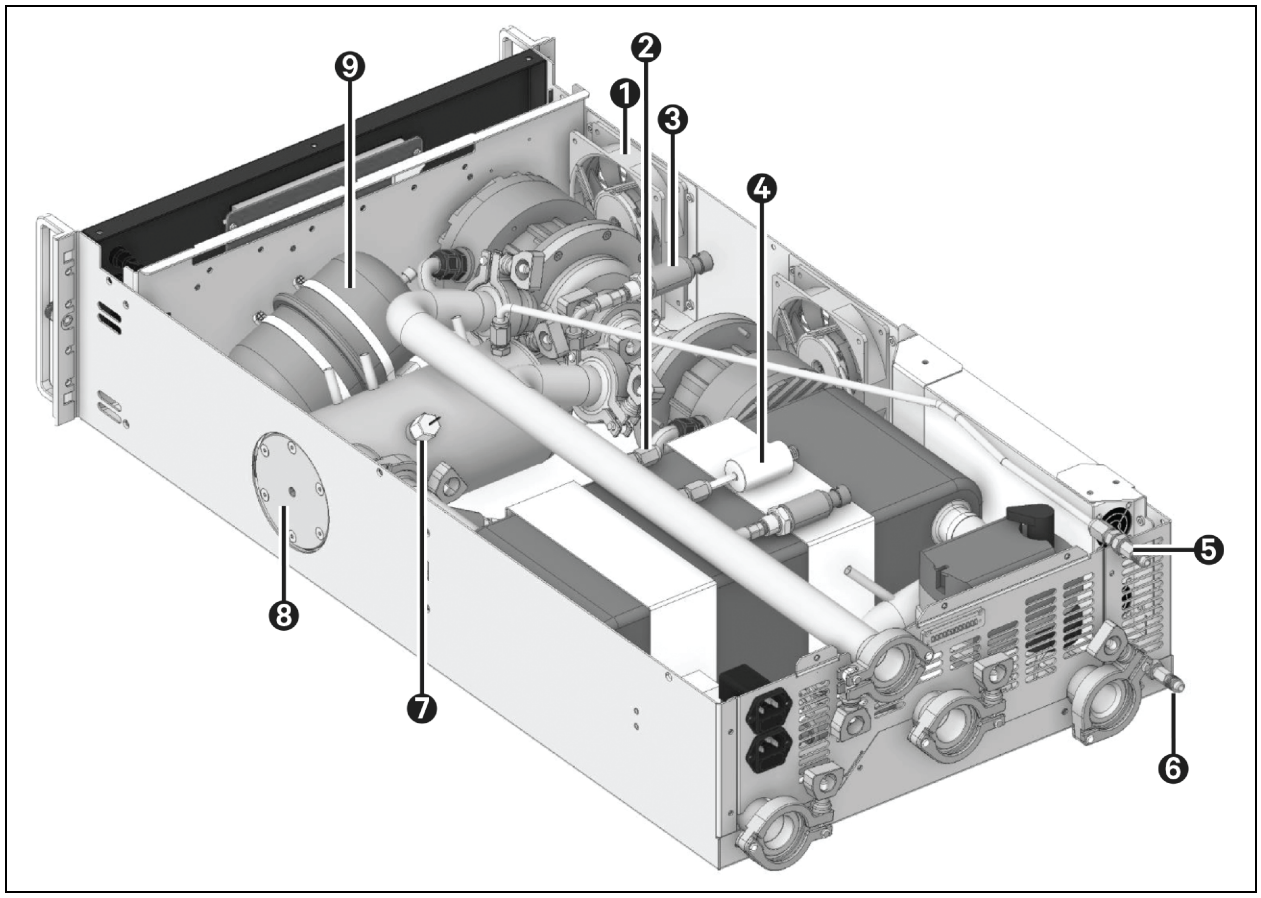
3.3 Product Views

Figure 3.1 Front View of CoolChip CDU100kW (Top Cover Panel Removed)



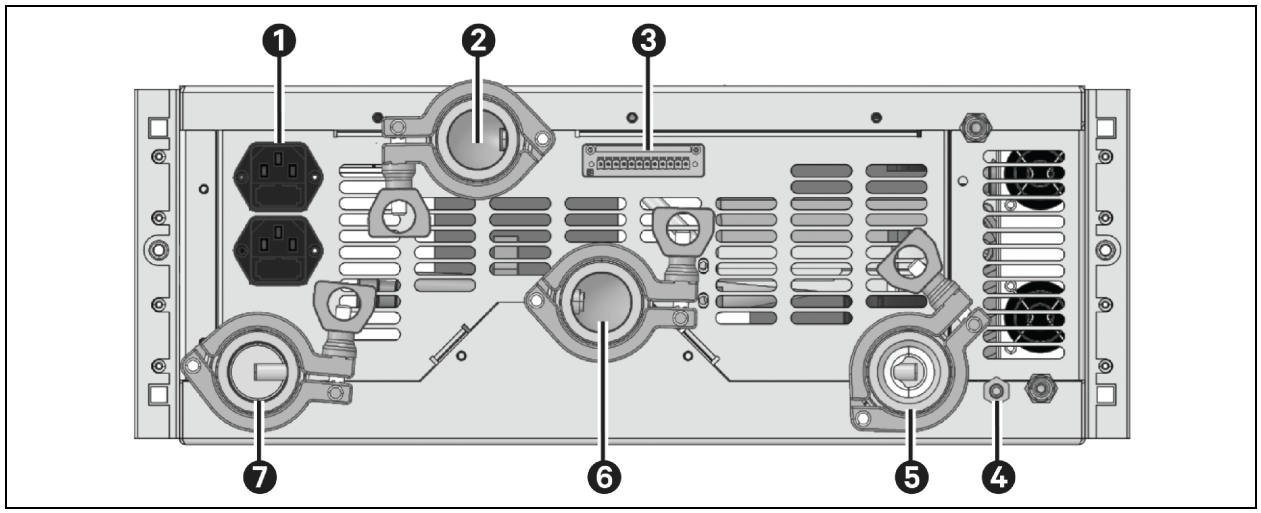
Item	Description
1	Plate heat exchanger
2	Fill pump
3	Temperature sensors
4	Control board
5	Alarm buzzer
6	Dual Ethernet (RJ45) and USB connections
7	Controller 7-inch touchscreen display
8	Removable fascia panel
9	Fill pump water connection
10	24 VDC power supply
11	Secondary circuit pumps
12	Pump 48 VDC power supply
13	Primary 3-way circuit control valve

Figure 3.2 Rear View of Vertiv™ CoolChip CDU100kW (Top Cover Panel Removed)



Item	Description
1	Cooling fans
2	Pressure relief valve set at 3.5 bar/50 psi
3	Pressure sensors
4	Secondary flow meter
5	Reservoir/secondary circuit vent
6	Reservoir/secondary circuit drain
7	Level sensor
8	Reservoir tank with 50 micron secondary filter
9	Expansion vessel

Figure 3.3 Rear View of Vertiv™ CoolChip CDU100kW (Electrical and Hose Connectiones)



Item	Description
1	A and B 1-phase IEC—C14 power Inlet connections (factory provided fuses)
2	Secondary circuit supply
3	Connection for external temperature/humidity sensor external leak detection tape RS485 and CANbus communication
4	Pressure relief valve outlet
5	Primary circuit return
6	Secondary circuit return
7	Primary circuit supply

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4 Operation

4.1 Controller Overview

The Vertiv™ CoolChip CDU100kW controller is designed to monitor and control the supply of cooling fluid to IT equipment in unattended data center environments. Secondary circuit cooling fluid is closely controlled to a defined temperature and at a controlled differential pressure (or flow rate) for optimum heat management.

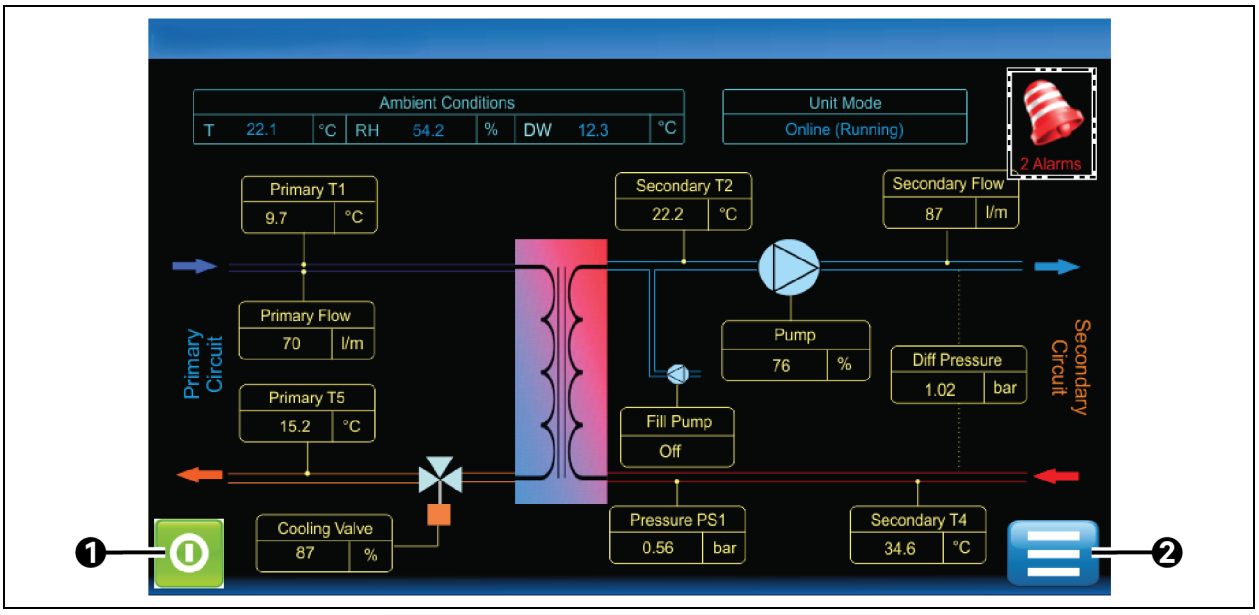
When power is first applied to the unit, the touchscreen will illuminate and the pump inverter drives will energize. After a short initialization period during which the company logo is presented, the display defaults to the Home screen, as shown in Figure 4.1 below.

4.2 User Interface

4.2.1 Home Screen

The Home screen displays a schematic representation of the CoolChip CDU100kW, showing essential temperatures, pressures, flows and more parameters for primary and secondary circuits. The product code identification, installed software version and date/time.

Figure 4.1 Control System Home Screen



Item	Description
1	Start/Stop icon - Changes to red when unit is in standby
2	Menu icon - Pressing it displays the Main Menu screen

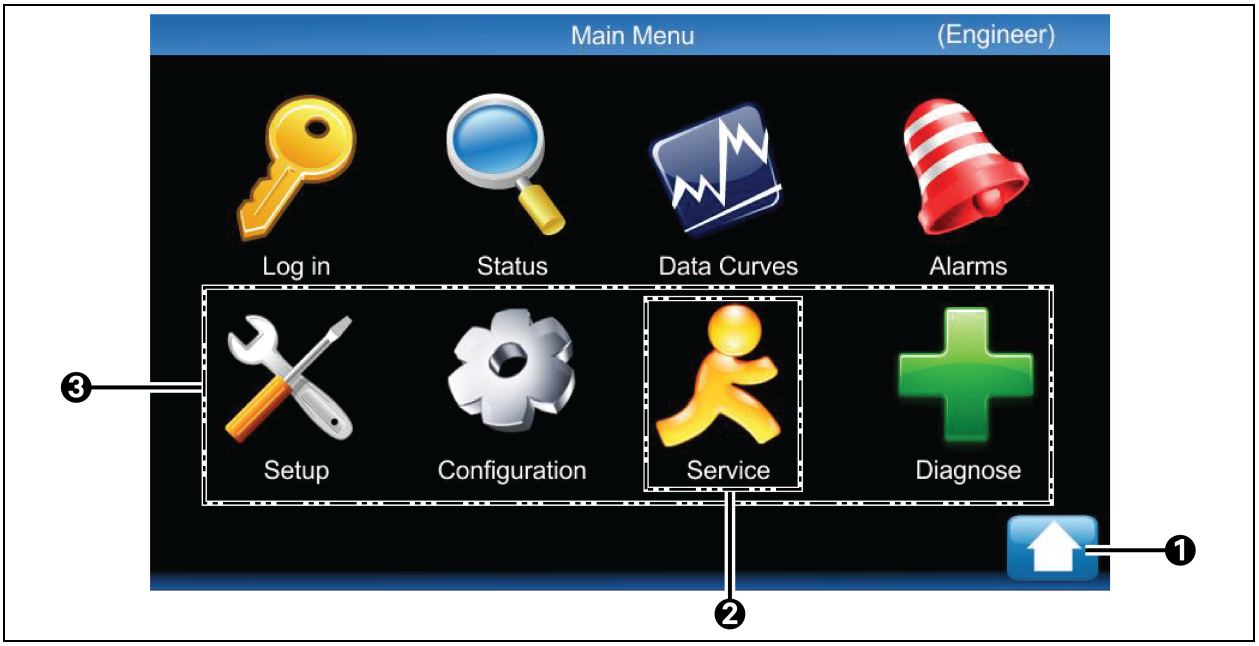
4.2.2 Main Menu

The Main Menu screen displays submenus for an increased level of information and modification of some parameters.

NOTE: Some control system menus may not be visible if the user is not logged in. Visibility will also depend on the login access level used.

The touchscreen display is intuitive and easily navigable. The touchscreen display has been designed to be intuitive and for easy navigation. Figure 4.2 below provides an explanation of the elements in the Main Menu screen.

Figure 4.2 Control System Main Menu Screen



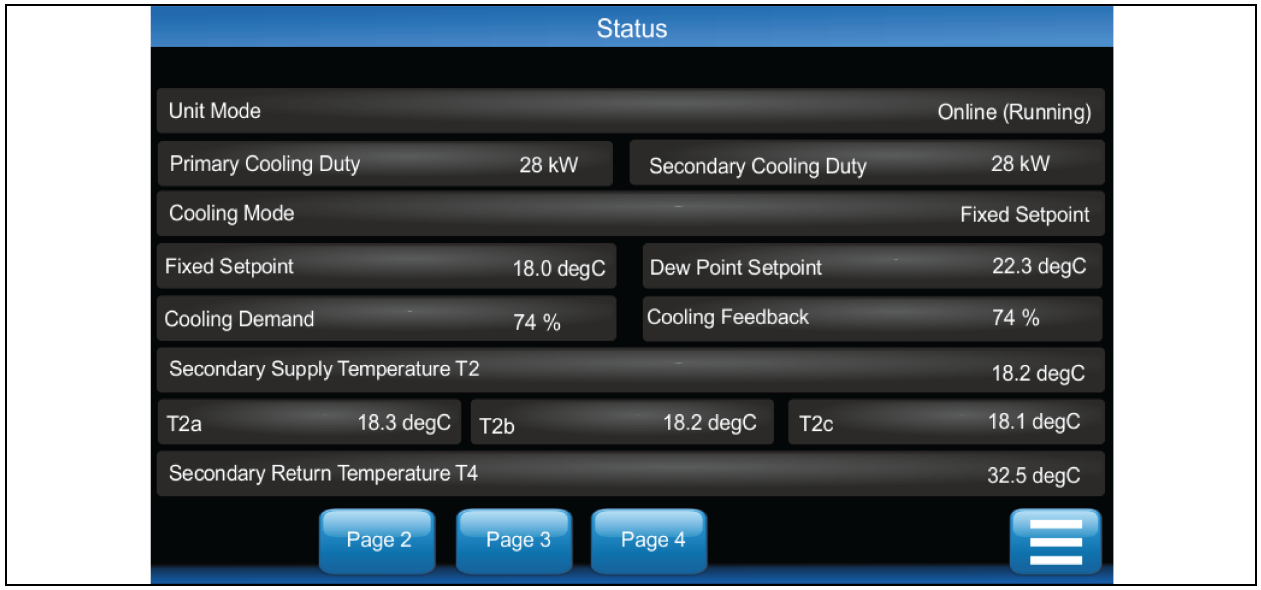
Item	Description
1	Return to Home screen
2	Service. Only visible when logged in at service or engineer level
3	Setup. Only visible when logged in

4.2.3 Status Screen

The Status screen displays comprehensive view only information on the operating condition of the Vertiv™ CoolChip CDU100kW unit.

NOTE: Information is not given for options that have not been configured.

Figure 4.3 Control System Status Screen



There are four information pages within the Status screen. Details for each page are shown in the tables Table 4.1 on the next page.

Table 4.1 Status Screen - Page 1

Item	Value
Unit Mode	• Standby • Online (running) • Fault • Shutdown
Unit Cooling Duty	__kW
Cooling Mode	• Off • Fixed setpoint • DW override
Fixed Setpoint	__°C
Dew Point Setpoint	__°C
Cooling Demand	__%
Valve Demand/Feedback	__%
Secondary Return Temperature T2	__°C
T2a	__°C

Table 4.1 Status Screen - Page 1 (continued)

Item	Value
T2b	__°C
T2c	__°C
Secondary Return Temperature T4	__°C

Table 4.2 Status Screen - Page 2

Item	Value
Primary Supply Temperature T1	__°C
Primary Return Temperature T5	__°C
Primary Flow Rate	__l/m
Primary Duty	--kW
Ambient Temperature	__°C
Ambient RH	__%
Dew Point	__°C

Table 4.3 Status Screen - Page 3

Item	Value
Secondary Flow Rate	_ _ l/m
Secondary Return Pressure PS1	_ _ bar
Pump Inlet Pressure PS2	_ _ bar
Secondary Supply Pressure PS3	_ _ bar
Unit Differential Pressure (PS3-PS1)	_ _ bar
Filter Differential Pressure (PS1-PS2_	_ _ bar
Pump 1 Speed	_ _ %
Pump 2 Speed	_ _ %

Table 4.4 Status Screen - Page 4

Item	Value
Pump 1 Hours Run	__hrs
Pump 2 Hours Run	__hrs
Valve Runtime 0 to 25%	__hrs
Valve Runtime 26 to 50%	__hrs
Valve Runtime 51 to 75%	__hrs
Valve Runtime 76 to 100%	__hrs
Elapsed Minutes	__minutes

Table 4.4 Status Screen - Page 4 (continued)

Item	Value
Controller Firmware Version	2.1b5
Serial Number	CTCN_____
Controller Hardware Revision	5.xB
SD Card Detect	Present
SD Card File System Status	OK
SD Card Used Space	_.__%

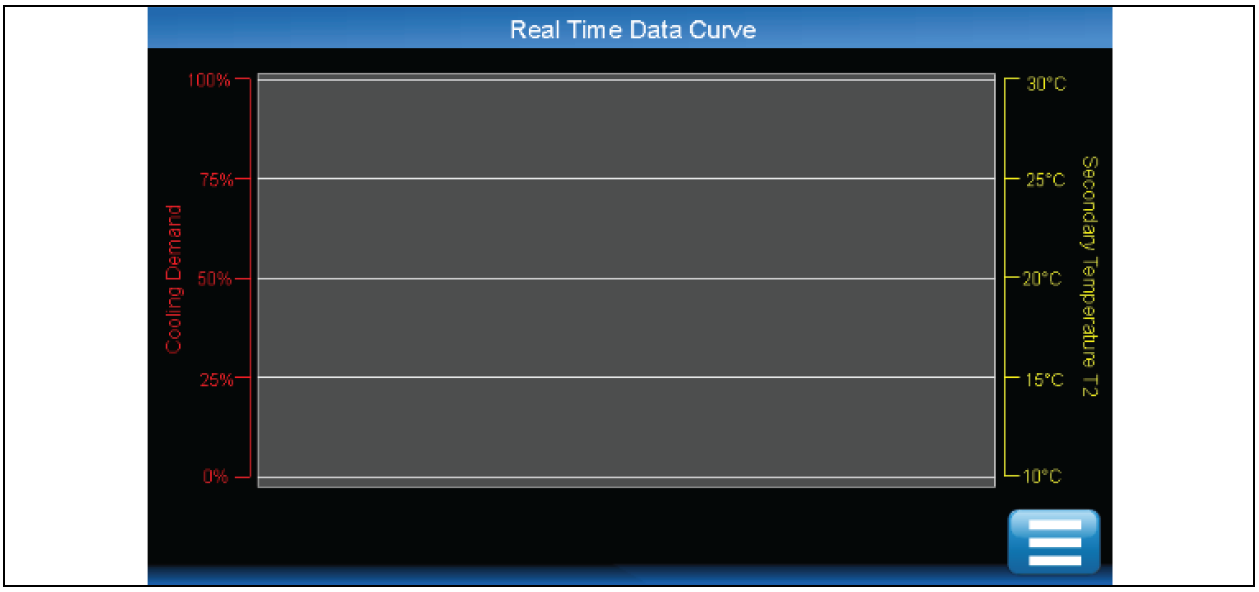
Table 4.5 Satus Screen - Page 5

Item	Value
Pump 1 Comms Status	
Pump 1 Mode	
Pump 1 Speed	__rpm
Pump 1 Voltage	V
Pump 1 Current	A
Pump 1 Temperature	°C
Drive 1 Temperature	°C
Drive 1 FW Version	
Pump 2 Comms Status	
Pump 2 Mode	
Pump 2 Speed	__rpm
Pump 2 Voltage	V
Pump 2 Current	A
Pump 2 Temperature	°C
Drive 2 Temperature	°C
Drive 2 FW Version	

4.2.4 Data Curves Screen (Real Time Update)

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).

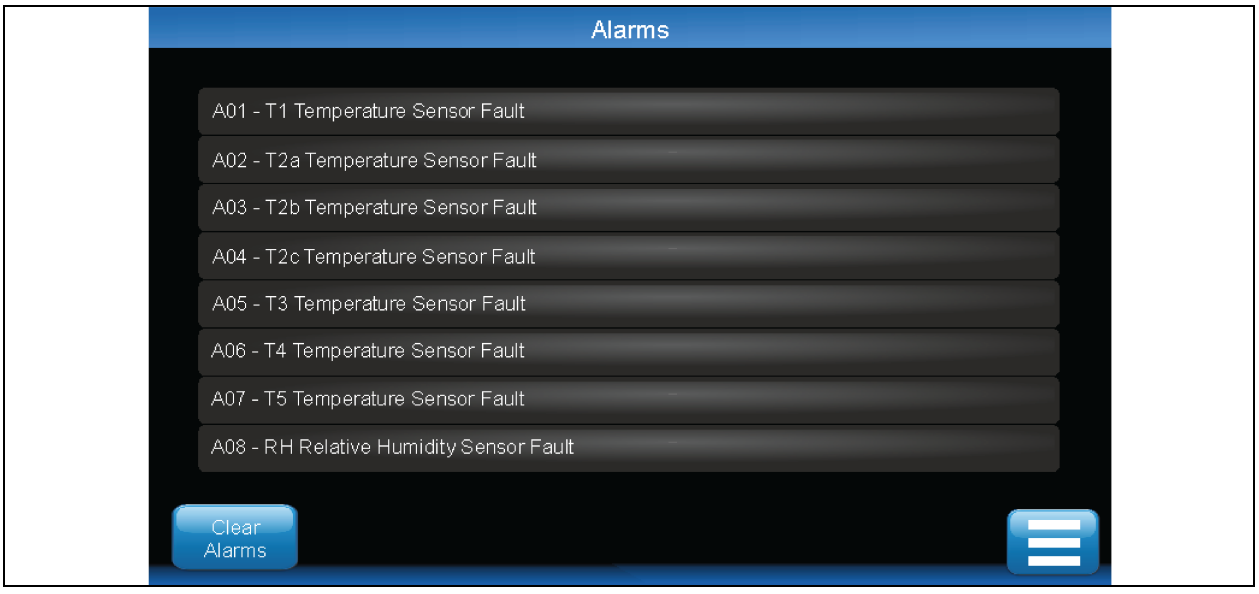
Figure 4.4 Control System Data Curves Screen



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 43 for a full list of alarms and further information.

Figure 4.5 Control System Alarms Screen

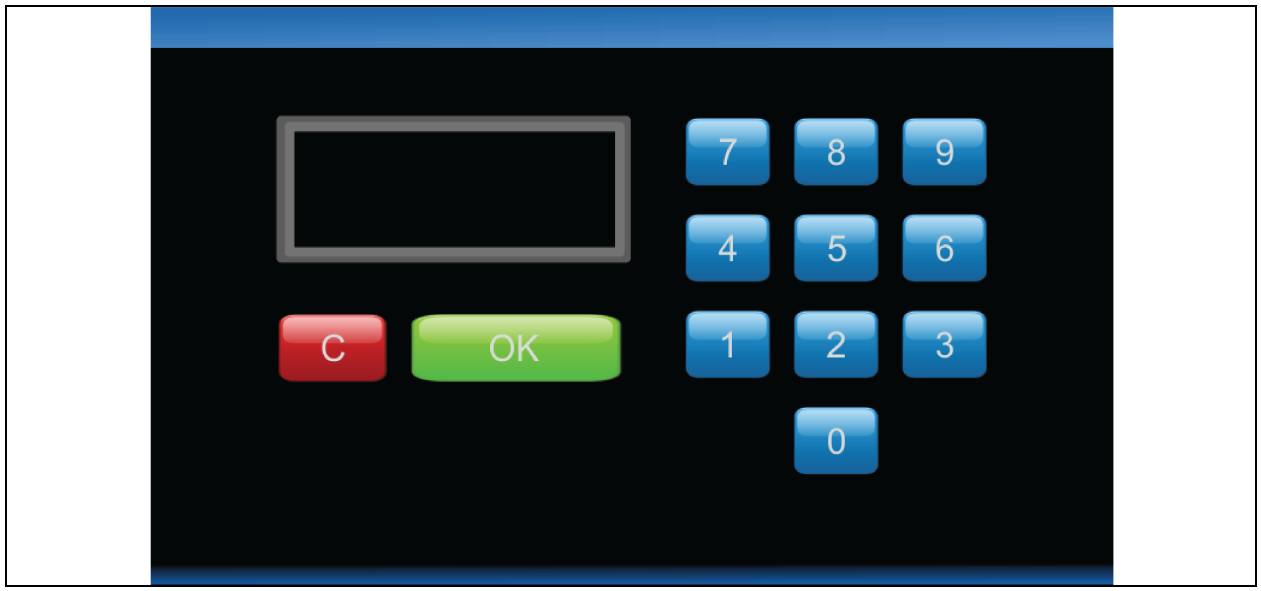


4.2.6 Login Screen

The Login screen provides further access to information and the ability to adjust various parameters and settings when logged in at the service or engineer level.

- No access code (User Level 1) provides access to Login, Status, Data Curves and Alarm pages.
- Code 1234 (User Level 2) provides read-only access to Setup, Configuration and Diagnostics menus.
- Code xxxx (Service Level) provides full read-only access to everything and write access to select configuration and service features.
- Code xxxx (Engineer Level) provides full read/write access to all features.
- Code xxxx (+Engineer Level) enter after Engineer Level code for Factory Setup.

Figure 4.6 Control System Login Screen

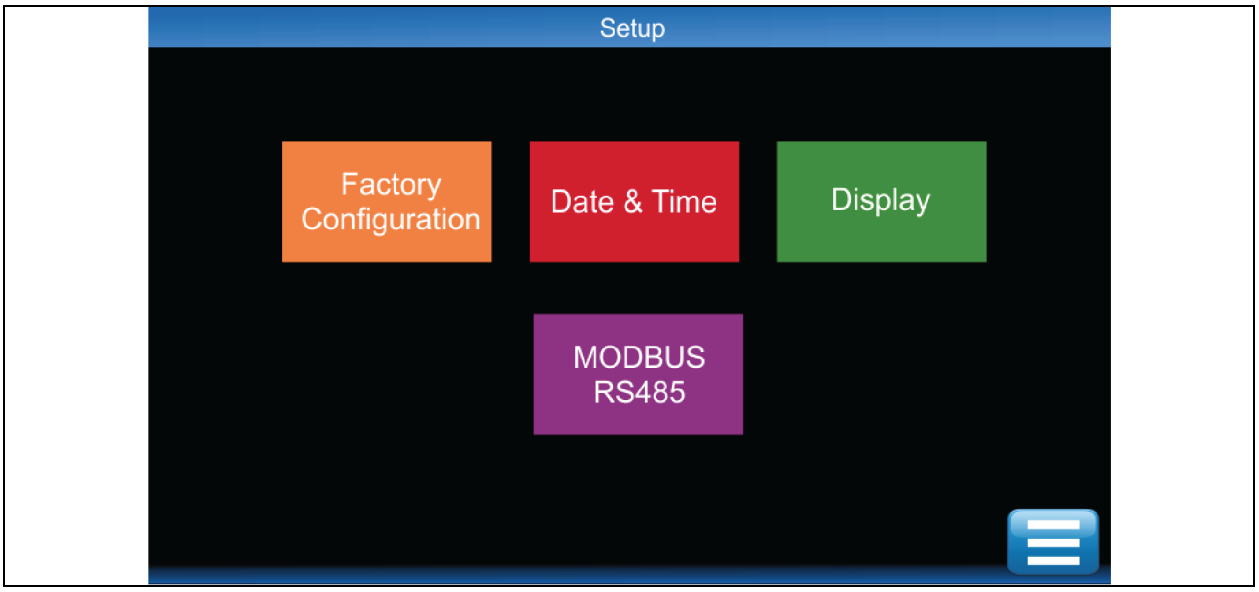


Login codes are available on request from the Vertiv. Entering an invalid code results in an Access Denied Message.

4.2.7 Setup Screen

The Setup screen is visible after logging in. Normally, you will not require to use the Setup screen because items modified here are set at the factory or during commissioning. There may be times you may need to make adjustments following a site upgrade.

Figure 4.7 Setup Screen



NOTE: Information under Factory Configuration can be viewed with the service and engineer access codes. A separate code from Vertiv is required to change items under Factory Configuration.

Table 4.6 Setup Screen - Factory Configuration

ID	Title	Description	Description
-	Serial Number	Select according to unit nameplate	CTCN01190

Table 4.7 Setup Screen - Date and Time (Page 1)

ID	Title	Description	Default	Range	Unit
	Date	Adjust date	-	dd/mm/yyyy	-
P021	Date Format	Select preferred format	yyyy/mm/dd	dd/mm/yyyy mm/dd/yyyy yyyy/mm/dd	-
	Time	Adjust time (24 hour clock)	--:--:--	hh:mm:ss	-
P022	Daylight Saving	Select the required daylight saving scheme	None	-	-
P023	NTP Synchronization	Network Time protocol synchronization	Disabled	Enabled Disabled	-

Table 4.7 Setup Screen - Date and Time (Page 1) (continued)

ID	Title	Description	Default	Range	Unit
P024	NTP Server IP Address	IP address of the NTP Server	0.0.0.0	-	-
P025	Time Zone Offset	Level Sensor response time, prior to alarm	00:00	-12 to 12	Hours
P026	NTP Sync Interval	Interval between NTP synchronizations	23	1 to 168	Hours

Table 4.8 Setup Screen - Date and Time (Page 2)

ID	Title	Description	Default	Range	Unit
P027	Logging Verbose Level	-	2	0—None 1—Failure 2—Failure and change 3—All	-

Table 4.9 Setup Screen - Display

ID	Title	Description	Default	Range	Unit
P030	Screen Saver/Logout Period	Elapsed time before screen saver launches or display auto logs out	30	0 to 60	Minutes
P031	Backing Period	Elapsed time before screen dims	10	0 to 60	Minutes
P032	Temperature Units	Select required temperature display units	-	-	°C
P033	Pressure Units	Select required pressure display units	-	-	bar
P034	Flow Rate Units	Select required fow rate display units	-	-	l/m

Table 4.10 Setup Screen - IP Connectivity

ID	Title	Description	Default	Range	Unit
P040	Interface A Enabled	Set to active or not	Enabled	Enabled Disabled	-
P041	Interface B Enabled	Set to active or not	Enabled	Enabled Disabled	-

Table 4.11 Setup Screen - IP Connectivity (Interface A)

ID	Title	Description	Default	Range	Unit
P050	MAC Address	View MAC address	_ _:_ _:_ _:_ _:_ _:_ _	Read only	-
P051	DHCP	Select as required	Disabled	Enabled Disabled	-
P052	IP Address	View IP address	_ _ _._ _ _._ _ _._ _ _	-	-
P053	Subnet Mask	Set subnet Mask	255.255.255.0	Configurable	-

Table 4.11 Setup Screen - IP Connectivity (Interface A) (continued)

ID	Title	Description	Default	Range	Unit
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	-

Table 4.12 Setup Screen - IP Connectivity (Interface B) Submenu

ID	Title	Description	Default	Range	Unit
P060	MAC Address	View MAC address	_ _:_ _:_ _:_ _:_ _:_ _	Read only	-
P061	DHCP	Select as required	Disabled	Enabled Disabled	-
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	-

Table 4.13 Setup Screen - Modbus and BACnet

ID	Title	Description	Default	Range	Unit
P073	Serial Protocol	Set required address	MODBUS RTU	-	-
P071	Baud Rate	Set required baud rate	9600	9600 to 38400	-

Table 4.14 Setup Screen - Modbus and BACnet (MODBUS)

ID	Title	Description	Default	Range	Unit
P070	MODBUS RTU Address	Set required address	1	1 to 243	-
P072	MODBUS Write Access	Write access to coils and holding registers	Yes	No Yes	-

Table 4.15 Setup Screen - Modbus and BACnet (BACnet)

ID	Title	Description	Default	Range	Unit
P074	Protocol	-	None	-	-
P075	Instance Number	-	600	0 to 4194302	-
P076	MSTP MAC Address	-	1	1 to 127	-
P077	MSTP Max Masters	-	127	1 to 127	-
P078	MSTP Info Frames	-	1	1 to 100	-
P079	Units	-	-	-	SI

Table 4.16 Setup Screen - Group Control

ID	Title	Description	Default	Range	Unit
P081	CDU Address	Unit address	1	1 to 4	-
P082	Number of CDUs in Group	Number of CDUs in group	1	1 to 4	-
P083	Number of Run CDUs	Number of run CDUs	1	1 to 4	-
P085	Rotation Frequency	Unit rotation frequency	Weekly	Weekly Monthly Never	-
P086	Rotation Day of Week	Rotation day	Monday	Sunday to Saturday	-
P087	Rotation Time of Day - Hours	Rotation hours	10	00 to 23	hrs.
P088	Rotation Time of Day - Minutes	Rotation minutes	00	00 to 59	mins.
P089	Unit Receive Timeout Period	Set require unit receive timeout	2500	50 to 10000	msecs.
P090	Unit Transmit Period	Set required unit transmit period	200	20 to 1000	msecs.

4.2.8 Configuration Screen

NOTE: This screen is only available once logged in.

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

Figure 4.8 Control System Configuration Screen

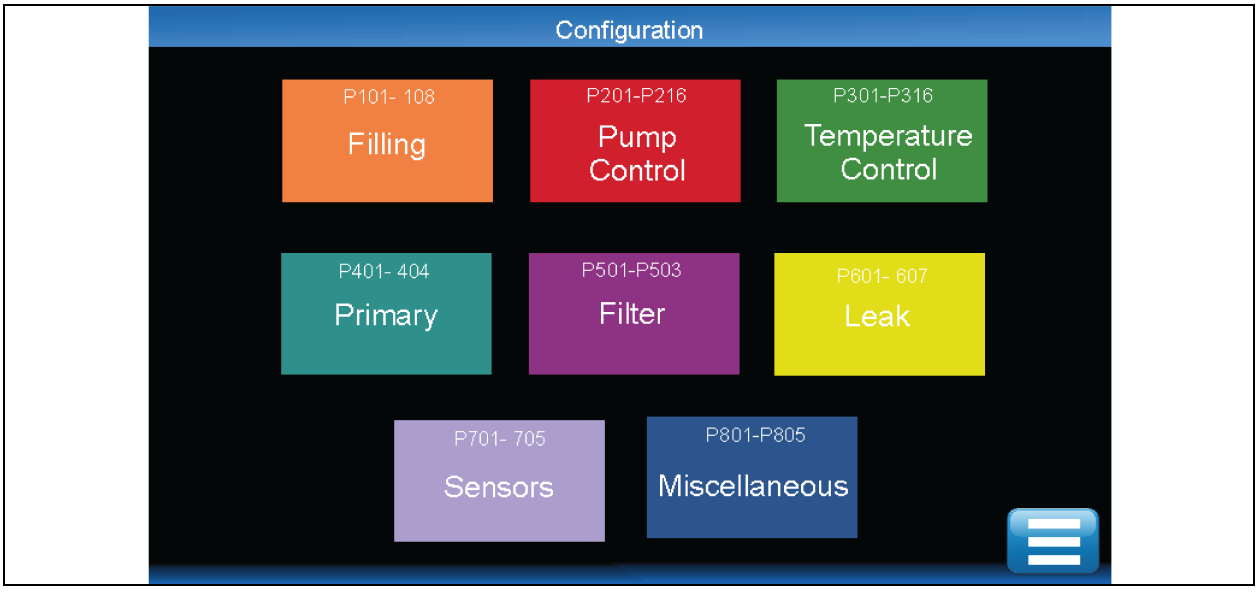


Table 4.17 Configuration Screen - Filling

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 online)	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 60	Seconds
P106	Fill Warning Delay Period	Delay prior to check make up alarm activated	5	0 to 60	Seconds
P107	Manual Fill Control	Select manual or automatic fill pump control	0	0—Automatic 1—Manual	-

Table 4.18 Configuration Screen - Pump Control (Page 1)

ID	Title	Description	Default	Range	Unit
P201	Control Type	Select pump speed controlled by flow or DP	Flow	Flow or DP	-
P202	Flow Setpoint	Set the required secondary flow rate	100	5 to 130	l/m
P203	Differential Pressure Setpoint	Set the required secondary differential pressure (DP)	1.0	0.1 to 4.0	Bar
P204	Low Flow %	Low flow alarm threshold (% of flow setpoint)	90	50 to 95	%
P205	Low DP %	Low DP alarm hysteresis	90	50 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	Maximum Pump Speed	Set maximum pump running speed	98	25 to 100	%

Table 4.19 Configuration Screen - Pump Control (Page 2)

ID	Title	Description	Default	Range	Unit
P209	Over-pressure Setpoint	Maximum system pressure, prior to alarm	6.0	2.0 to 7.0	Bar
P210	Over-pressure Action	Alarm only or shutdown and alarm	Alarm	Alarm or Alarm + shutdown	-
P211*	Startup Speed	Initial pump start fixed speed (0 = Auto)	0	0 to 100	%
P212*	Startup Period	Initial start speed hold period, prior control loop taking over	0	0 to 100	Seconds
P213*	Loop Refresh Period	Scan period for pump speed control loop	10	1 to 120	Seconds
P214*	Maximum Control Pressure	Maximum pump speed control loop pressure	4.0	1.0 to 8.0	Bar
P215*	Cooling Fan Run On Period	The period of time the fan will run on for after the unit is switched to standby	1	0 to 60	Minutes
* Parameter IDs are only accessible with the engineer login code.					

Table 4.20 Configuration Screen - Temperature Control (Page 1)

ID	Title	Description	Default	Range	Unit
P301	Temperature Setpoint	Set required secondary temperature setpoint	45.0	10.0 to 55.0	°C
P302	Control Mode	Select from Fixed Setpoint or fixed setpoint with dewpoint override	Fixed SP	-	-
P303	Dewpoint Offset	Minimum offset of setpoint from dewpoint temperature.	3.0	1.0 to 5.0	°C
P304	Secondary Low Temp Differential	Low temperature alarm offset below setpoint	2.0	1.0 to 10.0	°C
P305	Secondary High Temp Differential	High temperature alarm offset above setpoint	2.0	1.0 to 10.0	°C
P306	Secondary Temp Reset Hysteresis	Low/High temperature alarm reset point	1.0	0.5 to 5.0	°C
P307	Secondary High Temp Setpoint DW	High temperature alarm offset above setpoint when dewpoint or ambient tracking	20.0	15.0 to 25.0	°C
P309*	PID - Control Period	Scan period for control valve positioning	1	1 to 30	Seconds
* Parameter IDs are only accessible with the engineer login code.					

Table 4.21 Configuration Screen - Temperature Control (Page 2)

ID	Title	Description	Default	Range	Unit
P310*	PID - Proportional Band	Proportional band	12.0	1.0 to 25.0	°C
P311*	PID - Integral Reset	Integral reset time	18	0 to 999	Seconds
P312*	PID - Derivative	Derivative reset time	5	0 to 999	Seconds
P313	Demand/Actual Error	Control valve demand to feedback error for alarm	10	0 to 50	%
P314	Valve Check Period	Scan period for control valve position monitoring	15	1 to 120	Minutes
P315*	Valve Runtime	Control valve motor run time for control loop	40	10 to 180	Seconds
P316	Valve Minimum Position	Set the minimum valve position for control	0	0 to 80	%
P317	Valve Maximum Position	Set the maximum valve position for control	100	40 to 100	%
* Parameter IDs are only accessible with the engineer login code.					

Table 4.22 Configuration - Primary

ID	Title	Description	Default	Range	Unit
P401	Primary Flow Delay	Time delay prior to low flow alarm	5	1 to 120	Seconds
P402	Primary Low Temperature Setpoint	Low temp alarm threshold	4	2 to 40	°C
P403	Primary High Temperature Setpoint	High temp alarm threshold	30	6 to 60	°C
P404	Primary Temperature Reset Hysteresis	Low/High alarm reset from threshold	1	0.5 to 5.0	°C

Table 4.23 Configuration - Filter

ID	Title	Description	Default	Range	Unit
P504	Secondary Filter Dirty Setpoint	Differential pressure alarm threshold for filter dirty	0.2	0.2 to 1.0	Bar
P505	Secondary Filter Dirty Hysteresis	Alarm reset from threshold	0.1	0.1 to 0.5	Bar
P506	Secondary Filter Dirty Delay Period	Time delay prior to alarm	60	5 to 7200	Seconds

Table 4.24 Configuration - Leak Detection

ID	Title	Description	Default	Range	Unit
P601	Leak Detection Operation - Internal	Alarm only, or shutdown and alarm	Alarm	Alarm or Alarm+S/D	-
P602	Internal Threshold	Set sensitivity of leak tape	50	1 to 65	kohms
P603	Internal Delay Period	Time delay prior to alarm	10	5 to 60	Seconds
P604	Leak Detection Operation - Primary External	Alarm only, or shutdown and alarm	Alarm	Alarm or Alarm+S/D	-
P605	External Threshold	Polarity of digital signal from leak device	50	1 to 65	kohms
P606	External Delay Period	Alarm only, or shutdown and alarm	10	5 to 60	Seconds

Table 4.25 Configuration - Sensors

ID	Title	Description	Default	Range	Unit
P701	Secondary T2 Temperature Differential	Alarm threshold T2a/b/c temperature differential	1	0.1 to 10	°C
P702	Secondary T2 Period	Time delay before T2a/b/c differential alarm	1	0 to 120	Seconds
P703	PS1 Scaling	Set measurement range.	2	0—0 to 30 bar 1—0 to 15 bar 2— 1 to 8 bar 3—0 to 6.89 bar 4—0.69 to 6.89 bar	-
P704	PS2 Scaling	Set measurement range.	2	0—0 to 30 bar 1—0 to 15 bar 2— 1 to 8 bar 3—0 to 6.89 bar 4—0.69 to 6.89 bar	-
P705	PS3 Scaling	Set measurement range.	2	0—0 to 30 bar 1—0 to 15 bar 2— 1 to 8 bar 3—0 to 6.89 bar 4—0.69 to 6.89 bar	-

Table 4.26 Configuration - Rotation

ID	Title	Description	Default	Range	Unit
P801	Frequency	Unit rotation frequency	Weekly	Water or Water-Glycol	-
P802	Day of the week	Rotation day	Monday	Sunday to Saturday	-
P803	Time of Day - Hours	Rotation hours	8	0 to 23	Hours
P804	Time of Day - Minutes	Rotation minutes	40	0 to 59	Minutes

Table 4.27 Configuration - Miscellaneous (Page 1)

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 startup	20	1 to 120	Minutes
P903	Post Power Failure Options	Action to be taken following a power failure once power is restored	Standby	Run, Standby	-
P904	Room RH and T Sensor	Fitted or not	No	No or Yes	-

Table 4.27 Configuration - Miscellaneous (Page 1) (continued)

ID	Title	Description	Default	Range	Unit
P905	Data Logging Interval	time interval between loggings	0	0—60 Seconds 1—30 Seconds 2—10 Seconds 3—5 Seconds	
P906	Temperature Alarm Delay	Delay set to Alarms	10	0 to 120	Seconds
P907	Alarm Output Scheme	Alarm Outputs	0	0 to 1	%
P908	Display lockout following failed log ins	Displaying of lockouts incase of failed logins	No	No or Yes	

Table 4.28 Configuration - Miscellaneous (Page 1)

ID	Title	Description	Default	Range	Unit
P910	Secondary Loop Coolant Type	Coolant type in secondary loop	Water	Water or Water-Glycol	-
P911	Primary Loop Coolant Type	Coolant type in primary loop	Water	Water or Water-Glycol	-

4.2.9 Service Screen

NOTE: This screen is only available once logged in.

The Service screen (accessible only with service and engineer login codes) can be used to set some parameters and to assist in commissioning.

Figure 4.9 Control System Service Screen

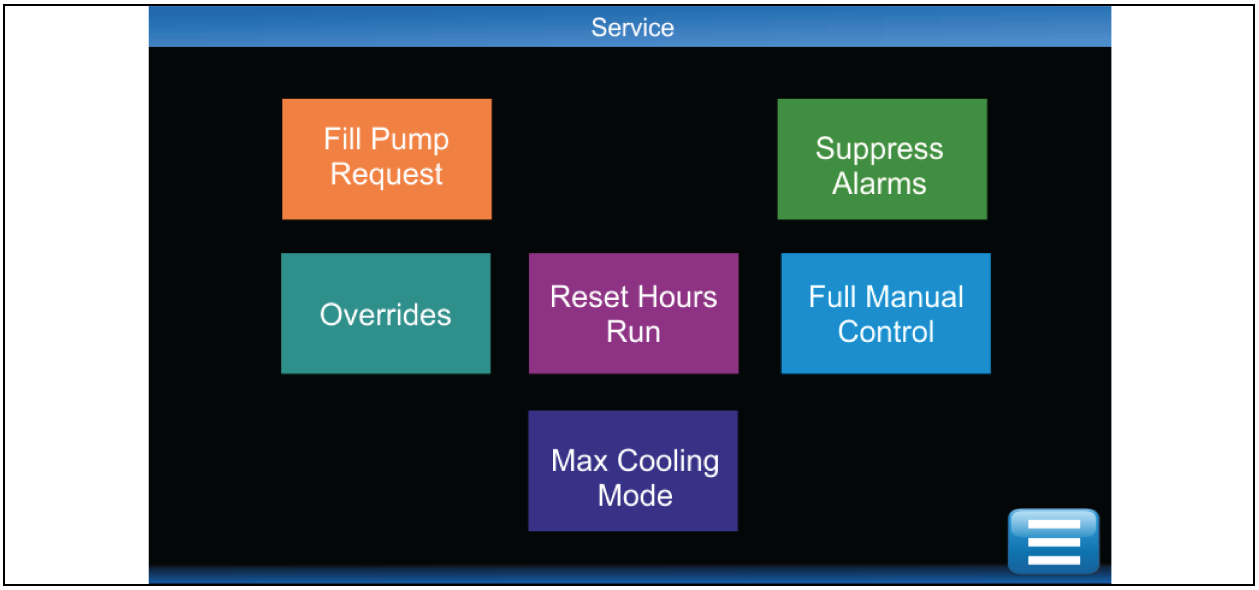


Table 4.29 Service - Fill Pump Request

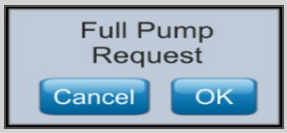
Screen Prompt	Explanation
	This fill function is used at commissioning only and will allow the fill pump to run without any time limit. Fill pump will still switch off automatically when unit reaches required static pressure.

Table 4.30 Service - Rotation

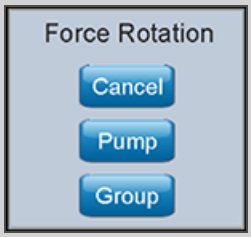
Screen Prompt	Explanation
	The Rotation function is used to force a pump changeover at an unscheduled time or to force a unit changeover when Group Control is active.

Table 4.31 Service - Suppress Alarms

Screen Prompt	Explanation
	Resets the alarm delay timer (normally only activated during startup) to stop nuisance alarms breaking through during manual operation.

Table 4.32 Service - Overrides

ID	Title	Description	Default	Range	Unit
S101	Pump 1 Speed	Set pump 1 speed (0%—no override)	0	1 to 100	%
S102	Pump 1 Speed	Set pump 2 speed (0%—no override)	0	1 to 100	%
S103	Cooling Valve	Set control valve position	0	1 to 100	%
S104	Fill Pump P3	Switch fill pump on	Auto (1)	Auto (1) Man (0)	-
S105	Alarm	Switch alarm output on or off	Auto (1)	Auto (1) Man (0)	-

Overrides allows for manual control of some functions of the unit for a limited time period (default is 15 minutes) while the unit is running in automatic mode. This function is provided for troubleshooting purpose.

Table 4.33 Service - Reset Hours Run

Screen Prompt	Explanation
	Resets the pump and valve run hours to zero. • S201—Pump 1 Run Hours • S202—Pump 2 Run Hours

Table 4.34 Service - SD Card

ID	Title	Description	Default	Range	Unit
-	File System Status	Shows the status of the system	OK	-	-
-	Card Detect	Shows the cards presence	Present	-	-
-	Used Space	Shows the amount of space used by SD Card	0.59	0 to 100	%

Table 4.35 Service - Secondary Pumps

ID	Title	Description	Default	Range	Unit
S401	Pump 1 Service Status	Allows pump to be set for in service or out of service. Selecting out of service prevents running during maintenance.	In Service	In Service Out of Service	-
S402	Pump 1 Speed	Allows pump to be set for in service or out of service. Selecting out of service prevents running during maintenance.	In Service	In Service Out of Service	-

Table 4.36 Service - Full Manual Control

ID	Title	Description	Default	Range	Unit
S301	Full Manual Control	Allows full manual control of all functions	Disabled	Disabled Enabled	-
S302	Pump 1 Speed	Set pump 1 speed	0	1 to 100	%
S303	Pump 2 Speed	Set pump 1 speed	0	1 to 100	%
S304	Cooling Valve	Switch cooling valve on or off	Off	On Off	-
S305	Fill Pump P3	Switch fill pump on or off	Off	On Off	-
S306	Alarm	Switch alarm output on or off	Off	On Off	-
S307	Cooling Fan	Switch cooling fan on or off	Off	On Off	-

4.2.10 Diagnostic Screen

NOTE: This screen is only available after you are logged in.

The Diagnostic Screen provides raw information and conversion factors for all Universal Inputs, Resistive Inputs, Digital Inputs, Digital Outputs, and Analog Outputs.

Figure 4.10 Control System Diagnostic Screen

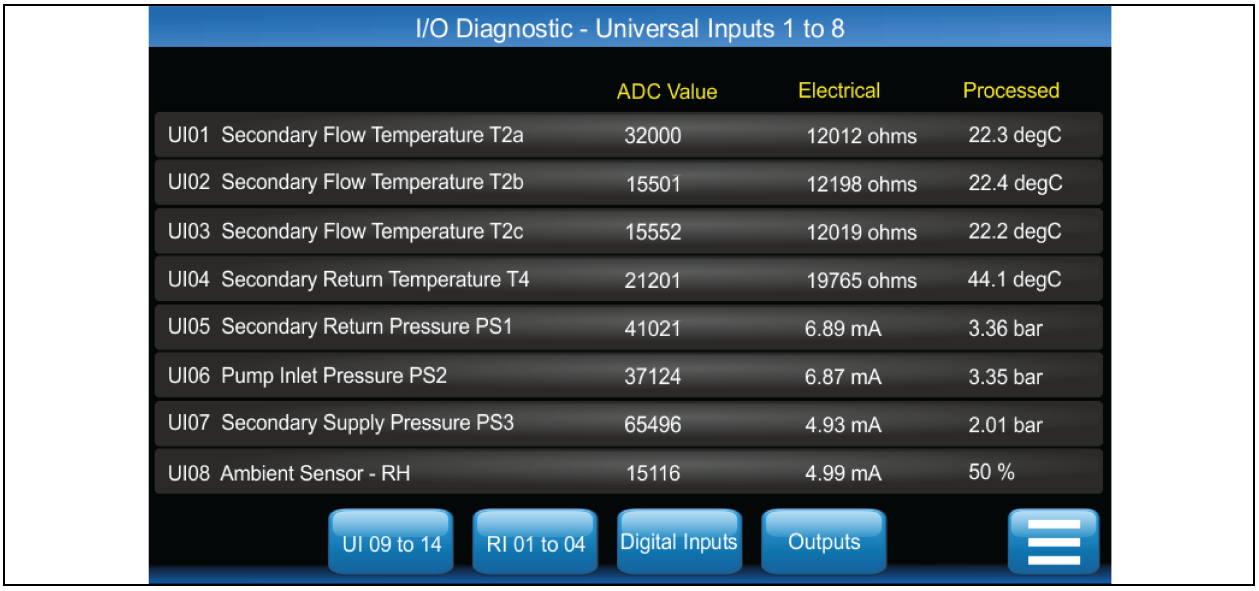


Table 4.37 I/O Diagnostics - Universal Inputs 1 to 8

ID	Description	ADC Value	Electrical		Processed	
UI01	Secondary Flow Temperature T2a	0	0	Ohms	0.00	°C
UI02	Secondary Flow Temperature T2b	0	0	Ohms	0.00	°C
UI03	Secondary Flow Temperature T2c	0	0	Ohms	0.00	°C
UI04	Secondary Return Temperature T4	0	0	Ohms	0.00	°C
UI05	Secondary Return Pressure PS1	0	0.00	mA	0.00	bar
UI06	Pump Inlet Pressure PS2	0	0.00	mA	0.00	bar
UI07	Secondary Supply Pressure PS3	0	0.00	mA	0.00	bar
UI08	Room Sensor - RH	0	0.00	mA	0.00	%

Table 4.38 I/O Diagnostics - Universal Inputs 9 to 14

ID	Description	ADC Value	Electrical		Processed	
UI09	Ambient Sensor - Temperature T3	0	0.00	mA	0.00	°C
UI10	Primary Flow Temperature T1	0	0.00	mA	0.00	°C
UI11	Primary Flow Rate	0	0.00	mA	0	l/m

Table 4.38 I/O Diagnostics - Universal Inputs 9 to 14 (continued)

ID	Description	ADC Value	Electrical		Processed	
UI12	Secondary Flow Rate	0	0.00	mA	0	l/m
UI13	Control Valve Feedback	0	0.00	V	0.00	%
UI14	Primary Return Temperature T5	0	0	Ohms	0.00	°C

Table 4.39 I/O Diagnostics - Resistive Inputs 1 to 4

ID	Description	ADC Value	Electrical		Processed	
RI01	-	0	0	ohms	-	-
RI02	Leak Tape - External	0	0	ohms	0	°C
RI03	Leak Tape - Internal	0	0	ohms	2	°C
RI04	-	0	0	ohms	0	°C

Table 4.40 I/O Diagnostics - Digital Inputs 1 to 6

ID	Description	State
DI01	Optical Level Sensor	1
DI02	-	0
DI03	-	0
DI04	-	0
DI05	-	0
DI06	-	0

Table 4.41 I/O Diagnostics - Digital and Analogue Outputs

ID	Description	Processed
DO01	Fill Pump	0
DO05	Pump Cooling Fan	1
DO03	Alarm Output	0
AO04	Cooling Valve	100%

4.2.11 Calibration Screen

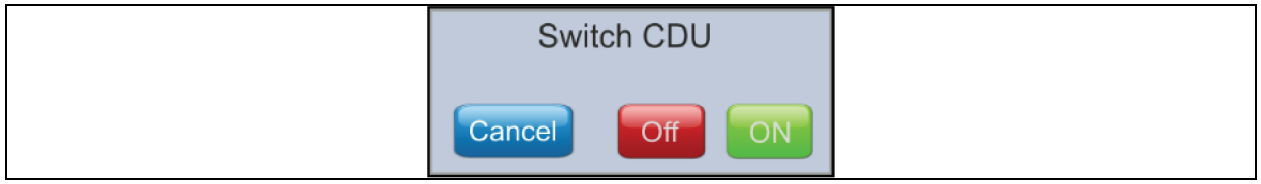
The touchscreen will enter calibration mode if the screen is pressed 20 times within a 4 second interval. To complete calibration follow the on screen instructions.

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 Home Screen on page 13), then press the *green ON* button, see **Figure 4.12** below.

Figure 4.12 Switch CDU



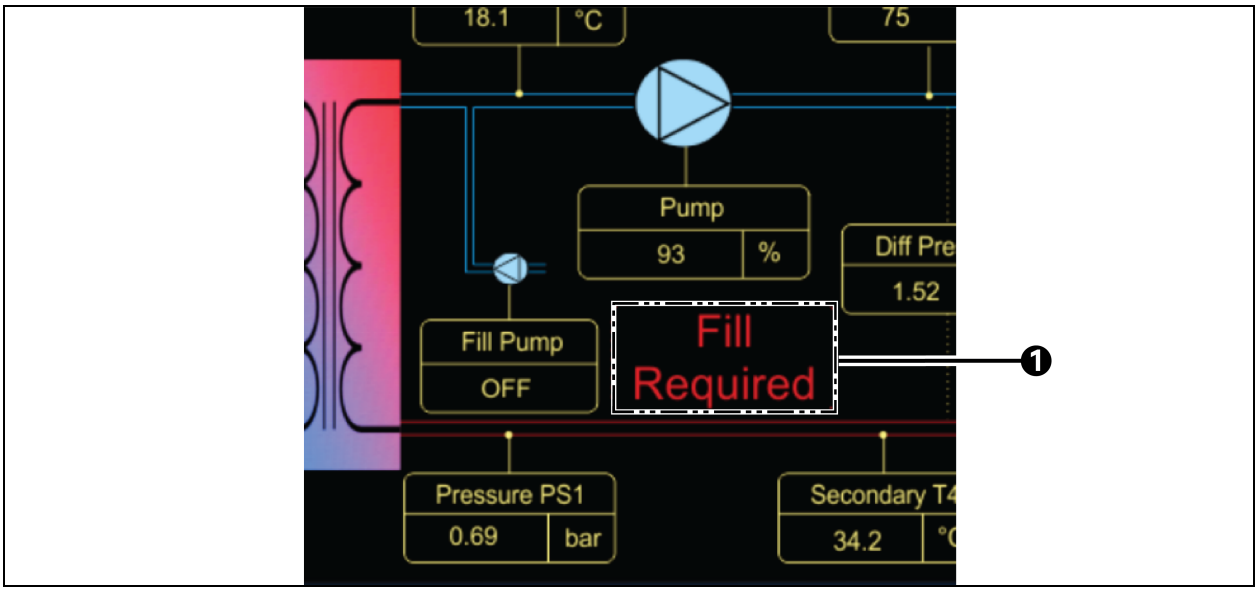
4.3.1 Secondary Circuit Operation

When the ON button is pressed, the Start/Stop icon on the Home screen changes from red to green. When the fluid level and static pressure are healthy, either the pump starts to increase in speed, arrows are displayed on the Home screen for primary and secondary circuits to signify that the unit is operational. Both pump speed and fan speed as a percentage of maximum are displayed.

Fluid level

- If the fluid level switch is not made or insufficient water is signified, then the pump will not be permitted to run and a Fill Pump Required request will be raised. See Figure 4.13 below.

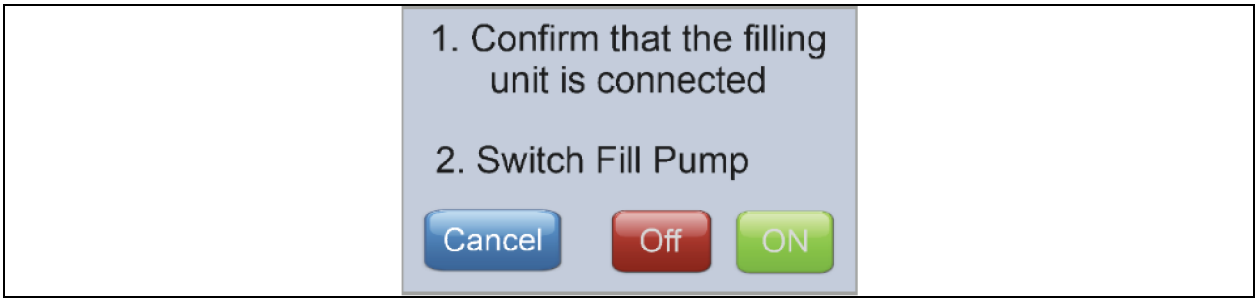
Figure 4.13 Fill Required Request



Item	Description
1	Fill Pump Required Request

- Press the fill pump required request icon, connect the filling unit (if not already connected) and then press *green ON* button.

Figure 4.14 Pump Request Button



- If the level switch has not activated within 1 minute of the fill pump operation, the fill pump will automatically stop, and an A16 - Insufficient fluid Level alarm will be triggered. This is a latched alarm and the system will not restart the unit until the event has been manually cleared.

The system pressure at the Vertiv™ CoolChip CDU100kW inlet (PS1) is continuously monitored to ensure that the system is always pressurized. See Status Screen - Page 3 on page 16.

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 pump from running, but will initialize a fill pump request (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 A30 - Check fluid Makeup 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 an A15 - fluid Makeup Empty alarm will be triggered. 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 threshold of 0.6 bar (9 psi), if default value, for more than 1 minute (set, non-adjustable), an A31 - System Low Pressure event will be triggered.

Figure 4.15 on the next page, Figure 4.16 on page 37, and Figure 4.17 on page 38 show the unit pressure/level monitoring and fill pump control during initial startup of the unit after commissioning (from a unit offline condition) and during normal running (unit online).

Figure 4.15 Vertiv™ CoolChip CDU100kW Pressure and Level Flow Chart (Initial Startup)

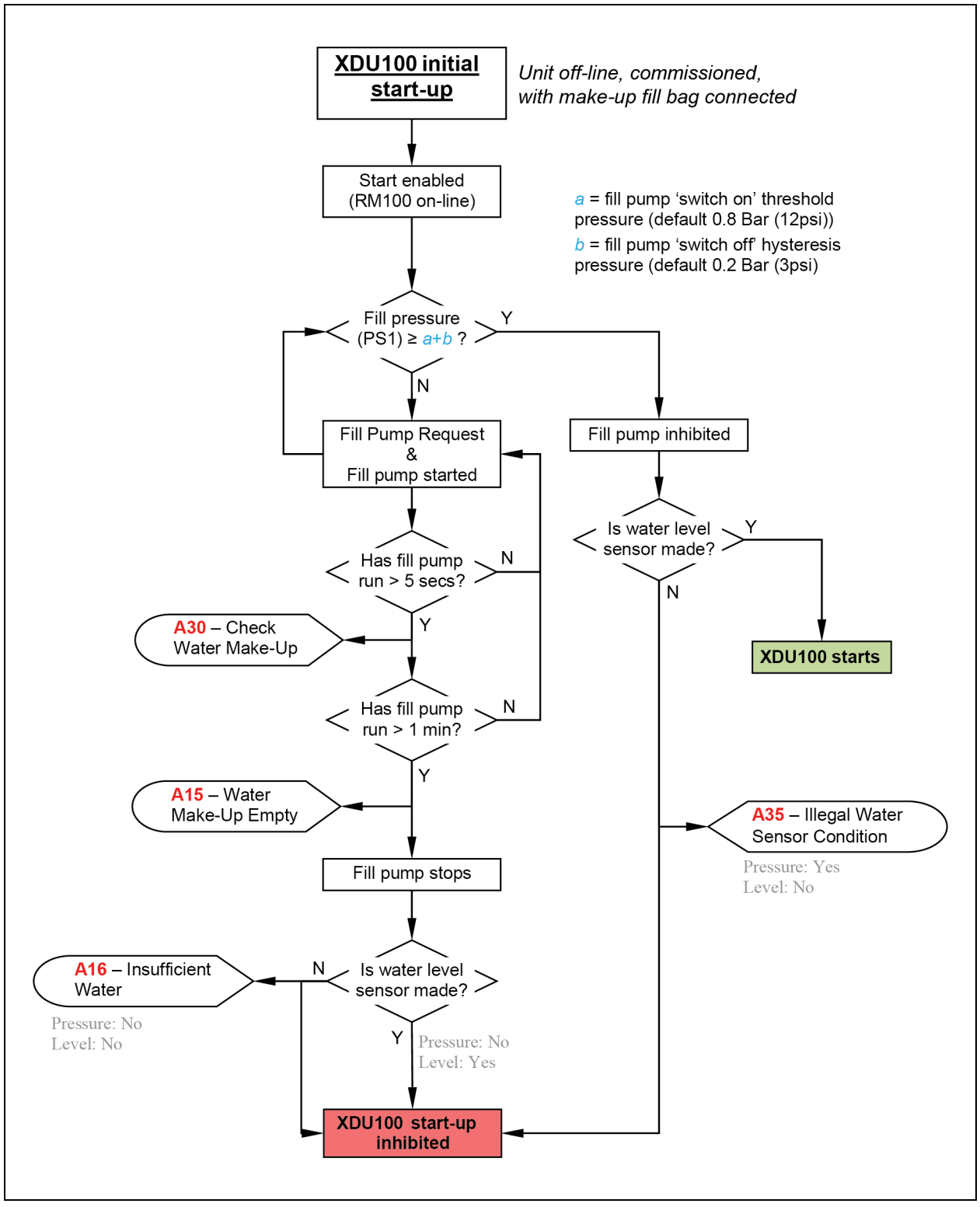


Figure 4.16 Vertiv™ CoolChip CDU100kW Fill Pressure and Level Flow Charge (When Running)

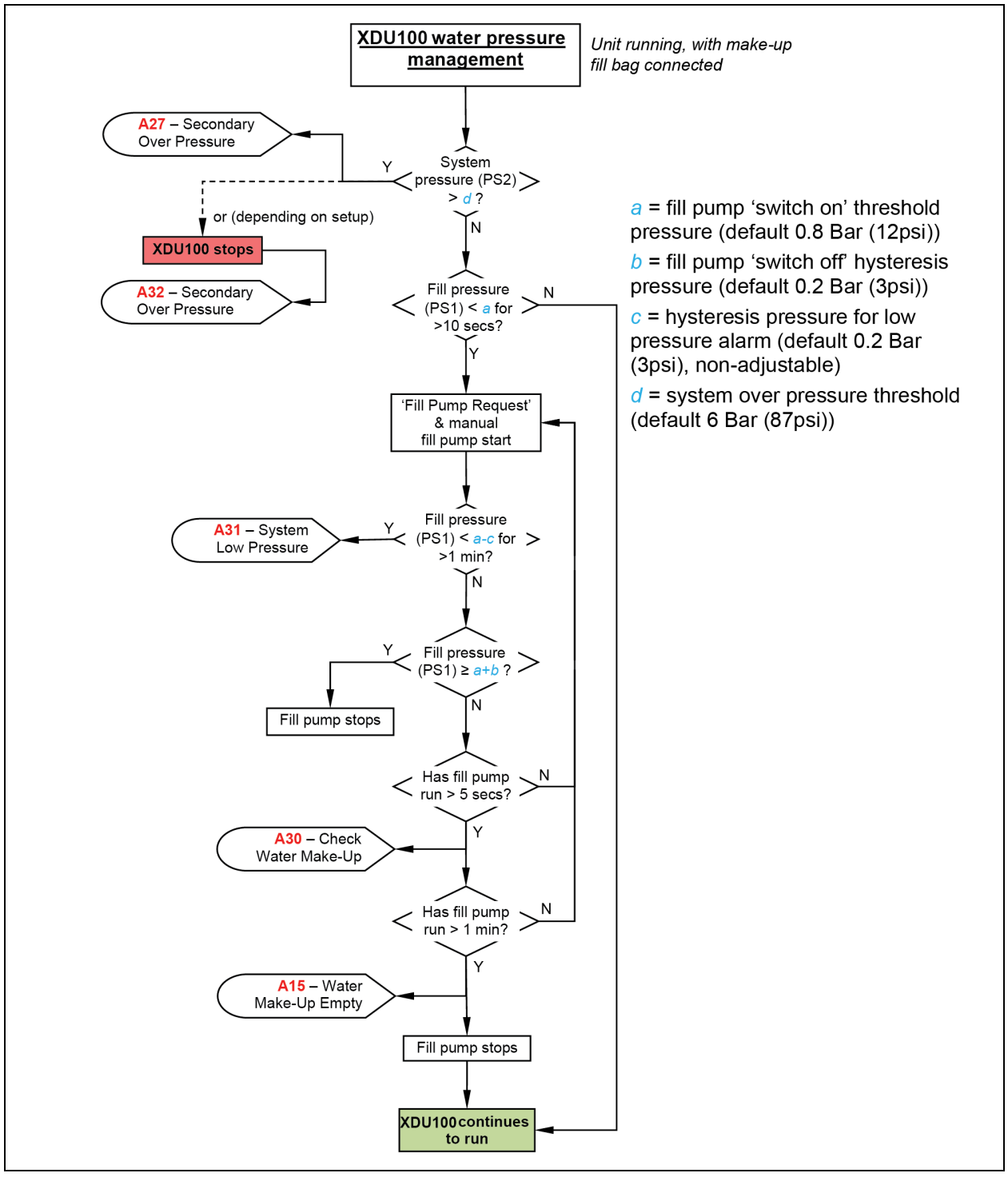
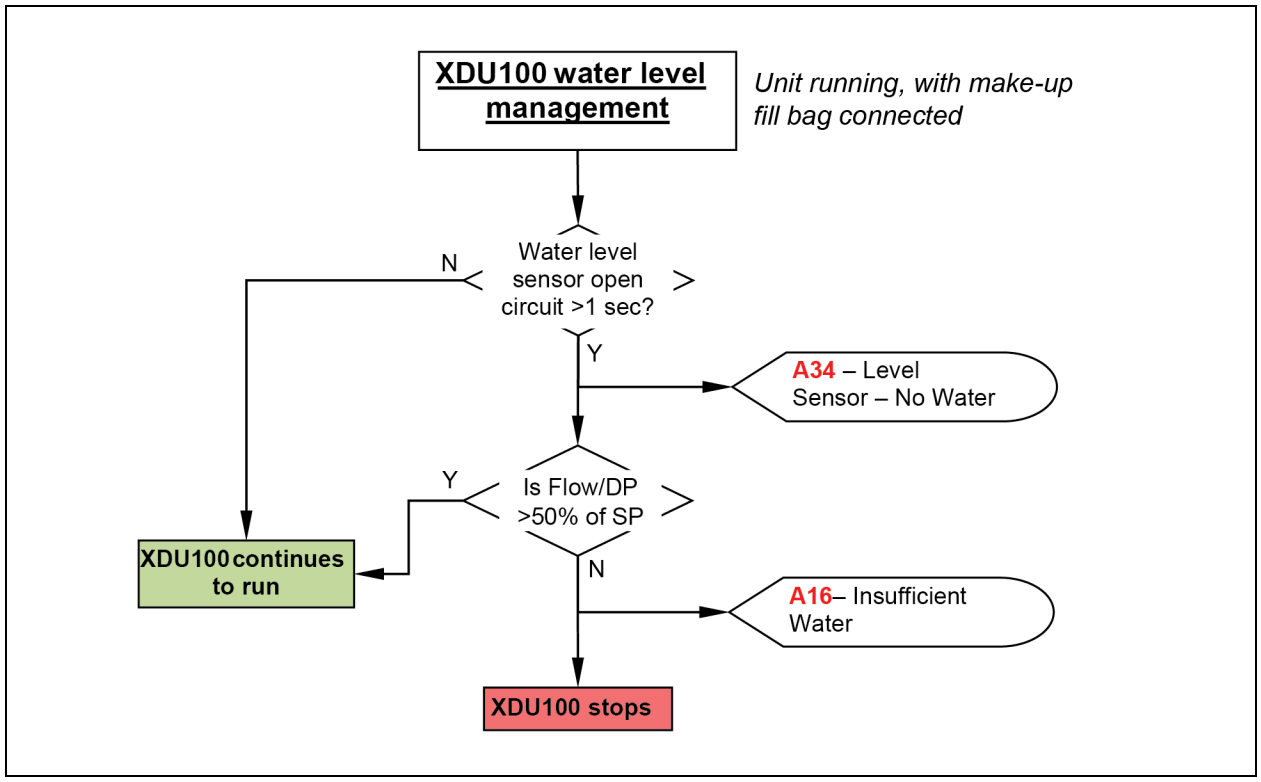


Figure 4.17 Vertiv™ CoolChip CDU100kW Water Level Management (When Running)



Pump flow/pressure performance (pump speed) can be controlled through either a flow or differential pressure control loop depending on configuration (see Configuration Screen - Pump Control (Page 1) on page 24).

Flow control

Monitors secondary flow with a calorimetric flow meter. During startup, the control loop increases the pump speed in stages until the flow matches the demand setpoint.

DP control

Monitors secondary differential pressure with sensors on the supply and return connections of CoolChip CDU100kW. During startup, the control loop increases the pump speed in stages until the DP matches the DP setpoint.

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

- If Pump fails to reach 90% (default) of the DP/flow demand in the default time period of 100 seconds, it is assumed there is a pump flow/pressure fault .and an A17 - Pump Fault alarm will be generated.
- The unit then continues to operate pump until faults are investigated and alarms are manually cleared.

The secondary water temperature is monitored at the central reservoir tank position. Three temperature sensors are positioned here to give extended component redundancy (T2a, T2b and T2c). The controller takes an average between all 3 readings as its input value.

- If the difference between the sensors exceeds a default 1.0 °C (2 °F), then an A40 (A41 or A42) - 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.

Fixed SP Control Mode

The secondary temperature should correspond to the desired setpoint. The default fixed setpoint is 18 °C (65 °F) and is used by the control loop to regulate the primary water control valve position to achieve and maintain the setpoint. The control valve position can be monitored on the Home screen or page 1 of the Status screen (Cooling 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).

NOTE: Dew Point Offset control will require the installation of an optional ambient temperature/humidity sensor.

- If the secondary temperature deviates by more than 2 °C (4 °F) below setpoint for 2 minutes or more, an A24 - Secondary Water Low Temp alarm is generated. This alarm remains 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, an A25 - Secondary Water High Temp alarm is generated. This alarm remains present until the temperature falls below the hysteresis value.
- 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.

Fixed SP + Dew Point Offset Control Mode

In Fixed SP + Dew Point Offset control mode, the setpoint can be overridden by a Dew Point condition, 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 CDU (or wherever the room tempearture/humidity senor has been located).

- Dew Point Offset - When activated, this is displayed on the Home screen under the Unit Mode heading.

  With this cooling mode, the CDU operates as per the fixed setpoint mode unless the dewpoint temperature rises to within 3 °C (6 °F) of this setpoint. When this happens, dewpoint override will be activated and the controller will re-adjust the fixed setpoint to keep it at least 3 °C (6 °F) above the dewpoint.

Filter Clog

Pressure sensors PS1 and PS2 are used to monitor the differential pressure across the secondary circuit filter and give pre-warning of potential filter clogging.

- If the differential pressure exceeds 0.2 bar (3 psi) for Filter 1, then an A38 - Secondary Filter Dirty alarm is generated.

Secondary flow rate is monitored with a calorimetric flow meter at the secondary outlet from the CDU. The flow can be read on the Home screen or on page 3 of the Status screen.

NOTICE

Flows below 4 l/m (1 gpm) are outside the range of the flow sensor and will not be displayed.

Primary circuit operation

The primary water temperature (T1) is monitored at the inlet to the Vertiv™ CoolChip CDU100kW cabinet. The nominal cooling performance of the CDU has been calculated on a chilled water temperature between 4 and 10 °C (40 and 50 °F).

- If the primary temperature falls below default 4 °C (40 °F), an A22 - Primary Water Low Temp alarm is generated. This alarm remains 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 A23 - Primary Water High Temp alarm is generated. This alarm remains 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 temperature PID control loop will be operational from when the Start/Stop button is pressed and the pump has ramped up to speed. If the secondary circuit temperature starts to rise above the setpoint, then Control Valve will start to open to allow more primary cooling water through the heat exchanger. The control valve will modulate from 0% (full bypass) to 100% (full flow through heat exchanger). The valve position can be monitored on the Home screen or Status screen, page 1. The demand signal to the valve is compared to a position feedback signal every 15 minutes (default) to check the healthy operation of the valve.

- If the feedback signal is more than 10% (default) different than the demand signal (allowing for the drive time of the actuator to respond to load changes), then an A20 - Valve Fault event will be generated. The valve will continue to operate until fault is rectified.

The Control Valve is a drive open/spring return device and in the event that the positioning signal is lost, it will return to a full bypass position (no cooling).

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

NOTE: The flow meter only reads the total primary flow through the Vertiv™ CoolChip CDU100kW unit. It does not monitor the flow rate through the heat exchanger.

- A A21 - Primary Water Low Flow alarm is generated if: The A25 - Secondary Water High Temperature alarm is active, there is not a A23 - Primary Water High Temperature alarm present and the demand to the operational control valve is at 100%.
- A A33 - Primary No Flow alarm can also be generated if: The A25 - Secondary Water High Temperature event is active, there is also a A23 - Primary Water High Temperature alarm present and the demand to the operational control valve is at 100%.

NOTE: Flows below 2 l/m (0.5 gpm) are outside the range of the flow sensor and are not displayed.

4.4 Temperature Control Loop Adjustment

In most applications, the default PID settings in the controller gives good overall temperature control. If it is necessary to change this, then it is recommended to use the Zeigler-Nichols manual tuning method.

NOTE: The Ziegler-Nichols method requires system to be operating under typical load conditions and initially causes the control loop to temporarily become unstable with wide temperature swing oscillations. It is important to ensure that this does not cause any damage to the equipment being cooled. Login 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 P311 and P312) to 0 seconds.

2. Increase the Proportional Band (Configuration - Temperature Control screen P308) to a higher value from the default of 12 °C (54 °F) to 20 °C (68 °F).
3. Check that the secondary supply temperature (T2) stabilizes.

NOTE: Temperature stabilizes at a higher temperature than the current setpoint. This offset is eradicated once the integral reset time is added back in.

4. If the temperature control is unstable, raise the proportional band to a higher value until the temperature stabilizes. Otherwise gradually decrease the proportional band in 1 °C increments 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 slowly 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 see high or sudden changing heat loads, PID control is 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 immediately break through at the top right corner of the Home screen, with the number of active alarms stated below.

Figure 4.18 Control Screen Alarm Indication

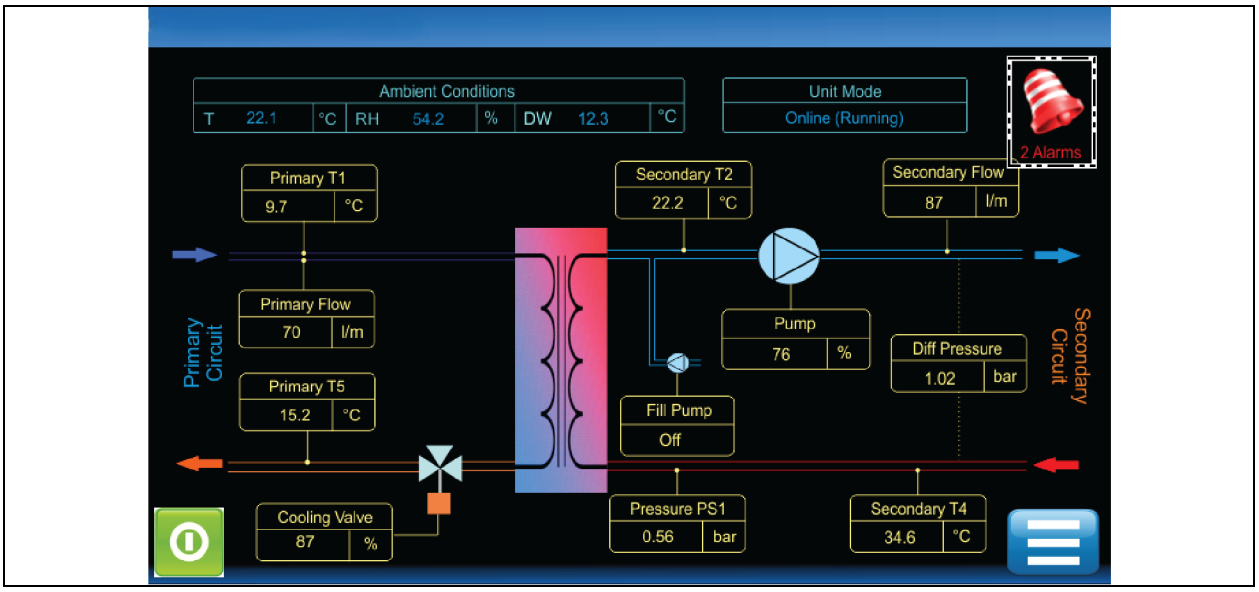
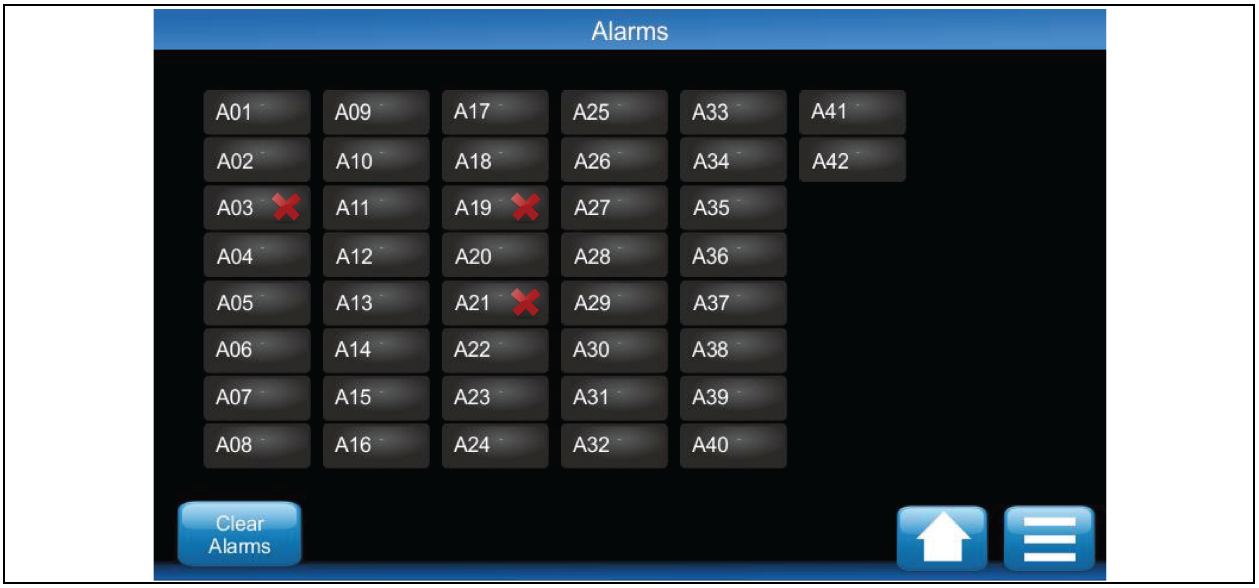
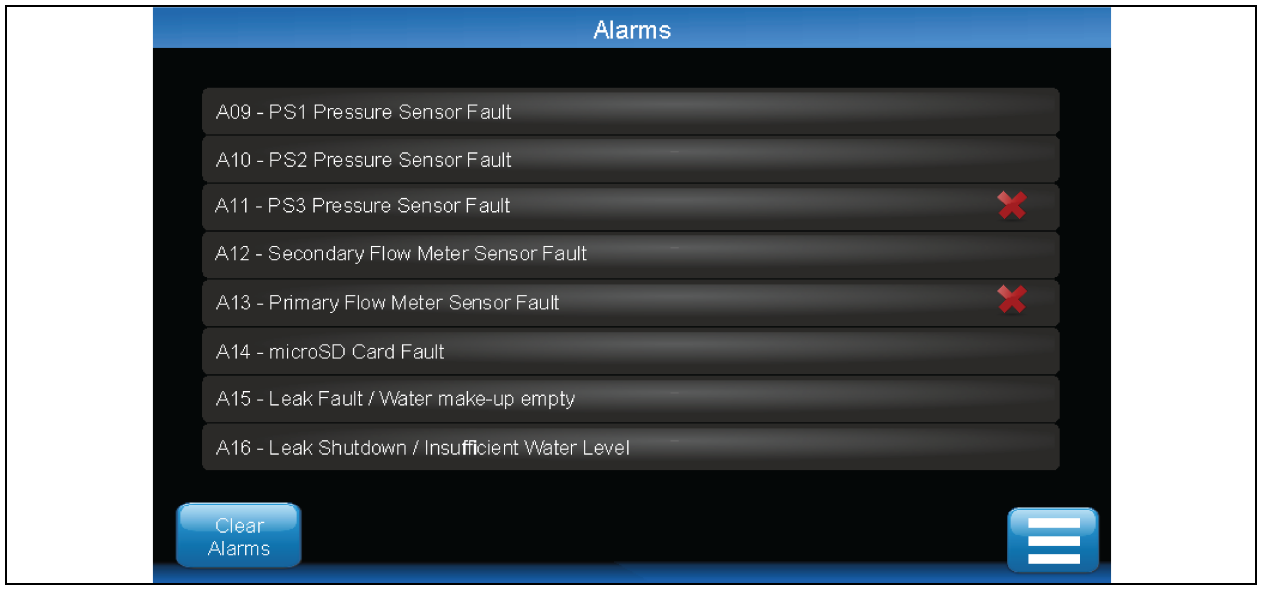


Figure 4.19 Control Screen Active Alarms



The alarm descriptions may be accessed by selecting the vertical columns where the alarms appear (as shown in **Figure 4.20** on the facing page).

Figure 4.20 Control Screen Alarm identification



Access the alarm descriptions by selecting the columns where the alarms appear.

Some alarms self-clear if the condition is transient. For example, a temperature goes over an alarm threshold then comes back to a healthy condition or when a fault has been rectified such as when a faulty sensor has been replaced.

Latching alarms needs to be cleared manually while logged on at the service level or higher by pressing Clear Alarms as shown in **Figure 4.18** on the previous page and **Figure 4.19** on the previous page.

The self clearing and latching alarms are identified in Troubleshooting Alarms below.

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

Alarms are events which may cause the unit to shut down and must be investigated immediately.

IMPORTANT! Table 4.42 on page 48 provides the full list of alarms. However, all are not necessarily active, depending on the unit configuration. For example, if the CDU has not been fitted and configured for a power meter, then the associated A39- Power Meter alarm is not active.
Alarms that are indicated with an asterisk beside the code number may not be active depending upon unit configuration.

Severity classifications are:

1. Unit shutdown. Shutdown IT immediately.
2. Urgent alarm. Immediate investigation required, prepare to shutdown IT, if required.
3. Non-urgent alarm. Investigate within 4 working days.
4. Information only. Respond at the next availability or at PPM.

These severity classifications are suggested only, customers may wish to assign their own ratings.

Table 4.42 Code Severity Classifications

Code	Description	Sev.	Self-clear	Latching	Shutdown	Delay
---	No display	3	---	---	---	---
Detail	Display not illuminated. Power failure on display board or controller I/O board.					
Action	Open upper electrical panel door to check that 24 VDC is available at controller I/O board. If there are no LEDs showing on processor board then check I/O board 24 V fuse FS1. If LEDs are on, check for wiring faults between I/O board and display.					
A01	T1 Primary Temperature Sensor Fault	3	✓	---	---	---
Detail	Reading from off coil air temperature sensor T1 is outside the normal range of -5 °C to 74 °C (23 °F to 165 °F) or disconnected.					
Action	Check sensor connections to the control board, check inline connections, replace sensor.					
A02	T2a Secondary Temperature Sensor Fault	3	✓	---	---	---
Detail	Reading from Secondary supply temperature sensor T2a is outside the normal range of 5 to 70 °C (41 to 158 °F) or disconnected.					
Action	Check sensor connections to the control board, check inline connections, replace sensor.					
A03	T2b Secondary Temperature Sensor Fault	3	✓	---	---	---
Detail	Reading from Secondary supply temperature sensor T2b is outside the normal range of 5 to 70 °C (41 to 158 °F) or disconnected.					
Action	Check sensor connections to the control board, check inline connections, replace sensor.					
A04	T2c Secondary Temperature Sensor Fault	3	✓	---	---	---
Detail	Reading from Secondary supply temperature sensor T2c is outside the normal range of 5 to 70 °C (41 to 158 °F) or disconnected.					
Action	Check sensor connections to the control board, check inline connections, replace sensor.					
A05*	T3 Room Temperature Sensor Fault	3	✓	---	---	---
Detail	Reading from fluid supply temperature sensor T3 is outside the normal range of 5 to 70 °C (41 to 158 °F) or disconnected.					
Action	Check sensor connections to the control board, check in-line connections, replace sensor.					
A06	T4 Secondary Temperature Sensor Fault	4	✓	---	---	---
Detail	Reading from fluid return temperature sensor T4 is outside the normal range of 5 to 70 °C (41 to 158 °F) or disconnected.					
Action	Check sensor connections to the control board, check inline connections, replace sensor.					
A07	T5 Primary Temperature Sensor Fault	4	✓	---	---	---
Detail	Reading from Primary return temperature sensor T5 is outside the normal range of 5 to 70 °C (41 to 158 °F) or disconnected.					
Action	Check sensor connections to the control board, check inline connections, replace sensor.					
A08*	RH Relative Humidity Sensor Fault	3	✓	---	---	---
Detail	Reading from Room humidity sensor RH 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 Setpoint mode - default 18 °C (65 °F).**					
Action	Check sensor connections to the control board, check inline connections, replace sensor.					
A09	PS1 Secondary Pressure Sensor Fault	3	✓	---	---	---
Detail	Reading from Secondary return pressure sensor PS1 (Fill pressure) is outside the normal range of -1 to 8 bar (-15 to 116 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**					
Action	Check sensor connections to the control board, check in-line connections, replace sensor.					

Table 4.42 Code Severity Classifications (continued)

Code	Description	Sev.	Self-clear	Latching	Shutdown	Delay
A10	PS2 Secondary Pressure Sensor Fault	3	✓	---	---	---
Detail	Reading from Secondary supply pressure sensor PS3 is outside the normal range of -1 to 8 bar (-15 to 116 psi) and min/max values only will be displayed **NOTE: For DP control, if system differential pressure PS1-PS2 is not valid, then pump speed will remain at last known demand.**					
Action	Check sensor connections to the control board, check in-line connections, replace sensor.					
A11	PS3 Pressure Sensor Fault	2	✓	---	---	---
Detail	Reading from Secondary supply pressure sensor PS3 is outside the normal range of -1 to 8 bar (-15 to 116 psi) and min/max values only will be displayed **NOTE: For DP control, if system differential pressure PS3-PS1 is not valid, then pump speed will remain at last known demand.**					
Action	Check sensor connections to the control board, check in-line connections, replace sensor.					
A12	Secondary Flow Meter Sensor Fault	2	✓	---	---	---
Detail	Secondary flow meter output is below 4mA.					
Action	Check sensor connections to the control board, check in-line connections, replace sensor.					
A13	Primary Flow Meter Sensor Fault	3	✓	---	---	---
Detail	Primary flow meter output is below 4mA.					
Action	Check sensor connections to the control board, check in-line connections, replace sensor.					
A14	Micro SD Card Fault	3	✓	---	---	---
Detail	The SD card has either been removed or physically damaged.					
Action	Replace the SD card					
A15	Leak Fault/Water Make up Empty	2	✓	---	---	---
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 A16 - Insufficient Water Level alarm).					
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.					
A16	Leak Shutdown/Insufficient Water	1	---	✓	---	---
Detail	On Initial Startup - if level sensor is 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. While Unit is Running - This will be in conjunction with a A34 - Level Sensor - No Water Detected alarm (refer to A34 for detail). If level sensor is not made and flow of DP is < 50% of flow/DP setpoint, then unit will shutdown after a 1 second delay					
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.					
A17	Pump Fault	2	---	✓	---	---
Detail	Pump 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.					
Action	Force Pump to run using the 'Auto Overrides' function and measure the current drawn by the pump. If higher than the full load current on the motor data plate, then pump must be replaced. If current drawn is OK, then replace the inverter - note any fault code on the inverter.					

Table 4.42 Code Severity Classifications (continued)

Code	Description	Sev.	Self-clear	Latching	Shutdown	Delay
A18	Pump Low Flow	2				
Detail	Pump 1 has not reached the flow rate (or differential pressure) setpoint in the specified time limit (default 100 secs)					
Action	Check that unit has been set for the correct system flow rate (or DP), check for system blockages, check inverter drive for faults.					
A19	Secondary Pump Flow Shutdown	1	---	✓	✓	---
Detail	Pump 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.					
Action	Pump 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.					
A20	Valve Fault	2	---	✓	---	---
Detail	Feedback signal from control valve is more than 10% (default) adrift from demand signal (sampled every 15 minutes (default) and allowing for 40 second (default) positioning time).					
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 (Diagnostics screen, Page 1)					
A21	Primary Water Low Flow	2	---	✓	---	✓
Detail	Will only activate when valve demand is at 100%, A25 - Secondary Water High Temp alarm is active and Primary water temperature is within specified limits (default 5 min. delay applies).					
Action	Check operation of control valve. Check chilled water supply flow rate. Ensure system heat load does not exceed the CoolChip CDU100kW capacity. Check that Primary flow is sufficient for heat load - refer to **Vertiv™ CoolChip CDU100kW Application and Planning Guide SL-71339**.					
A22	Primary Water Low Temperature	3	✓	---	---	✓
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 min. delay applies).					
Action	Check chilled water supply					
A23	Primary Water High Temperature	2	✓	---	---	✓
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 min. delay applies).					
Action	Check chilled water supply					
A24	Secondary Water Low Temperature	2	✓	---	---	✓
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).					
Action	Check operation of control valve					
A25	Secondary Water High Temperature	2	✓	---	---	✓
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) - (default 2 minute delay applies).					
Action	Check operation of control valve					
A26	Water Detected (Internal Leak)	1	---	✓	✓(or-)	---

Table 4.42 Code Severity Classifications (continued)

Code	Description	Sev.	Self-clear	Latching	Shutdown	Delay
Detail	Leak tape in unit drip tray has detected a substantial water leak. Event may be set for Alarm Only (default), or Alarm + Unit Shutdown.					
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.**					
A27	Secondory Over Pressure (Alarm)	2	✓	---	---	---
Detail	Pressure at PS3 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 Screen - Pump Control (Page 1) on page 24.					
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 vessels has not ruptured, relieve pressure at drain point. Remove heat exchanger and replace.					
A28	Water Detected (External Primary Leak)	1	---	✓	✓(or-)	---
Detail	The water detection tape installed under the floor to the Primary circuit (if fitted - optional extra) has detected a substantial water leak. Alarm may be set for Alarm Only (default), or Alarm + Unit Shutdown.					
Action	Identify and repair leak **NOTE: A leak of this magnitude that does not bring up any other alarms, would most likely be from the Primary circuit.**					
A29	Water Detected (External Secondary Leak)	1	---	✓	✓(or-)	---
Detail	The water detection tape installed under the floor to the Secondary circuit (if fitted - optional extra) has detected a substantial water leak. Alarm may be set for Alarm Only (default), or Alarm + Unit Shutdown.					
Action	Identify and repair leak **NOTE: A leak of this magnitude that does not bring up any other alarms, would most likely be from the Primary circuit.**					
A30	Check Water Make up Level	2	---	✓	---	---
Detail	Fill pump has run for more than 5 secs (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)					
Action	Check amount of fluid in make up container and re-fill if necessary with treated water (check system for any sign of leakage).					
A31	System Low Pressure	2	---	✓	---	✓
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).					
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.					
A32	Secondory Over Pressure (Alarm + Shutdown)	1	✓	---	✓	---
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 Screen - Pump Control (Page 1) on page 24.					
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 vessels has not ruptured, relieve pressure at drain point. Remove heat exchanger and replace.					
A33	Primary Water No Flow	2	---	✓	---	---
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).					
Action	Check that the chiller or facility water supply is operational and fault free					

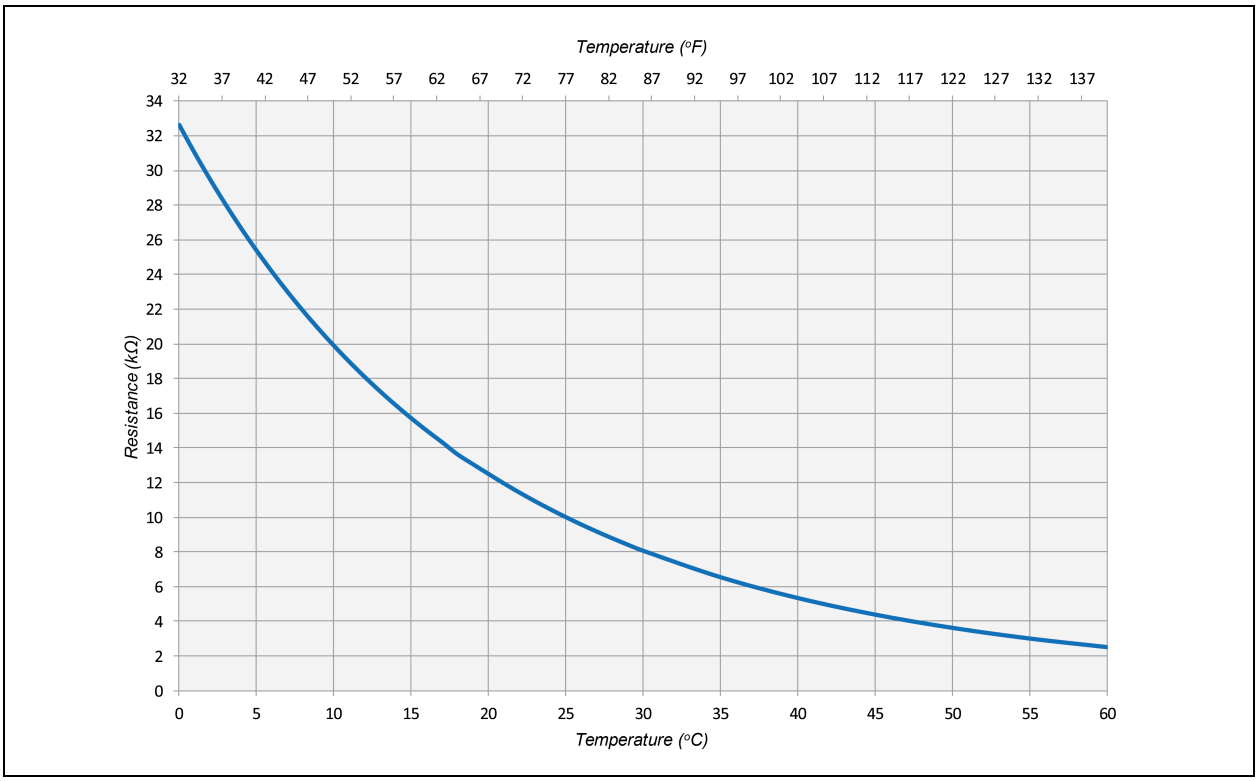
Table 4.42 Code Severity Classifications (continued)

Code	Description	Sev.	Self-clear	Latching	Shutdown	Delay
A34	Level Sensor - No Water Detected	2	✓	---	---	---
Detail	While Unit is Running only - if level sensor is 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 A16 - Leak Shutdown/Insufficient Water alarm (refer to A16 for detail) will be raised and unit will shutdown after a 1 second delay.					
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.					
A35	Illegal Water Sensor Condition	2	✓	---	---	---
Detail	On Initial Startup - if fill pressure has been achieved, but level sensors are not made.					
Action	Replace level sensor/s					
A36	Group Control Network Fault	2	✓	---	---	---
Detail	Not currently implemented					
Action	N/A					
A37	Group Control Insufficient Units	2	✓	---	---	---
Detail	Not currently implemented					
Action	N/A					
A38	Secondary Filter Dirty	2	✓	---	---	---
Detail	Differential pressure across Secondary filter is greater than 0.2 bar (3 psi), indicating that the filter must be cleaned (default 60 second delay applies).					
Action	Clean filter screen as described in the Maintenance Section					
A40	Secondary Temp T2a Diff Fault	3	✓	---	---	---
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.					
Action	Check T2a sensors against **Figure 4.21** on the facing page and replace if faulty.					
A41	Secondary Temp T2b Diff Fault	3	✓	---	---	---
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.					
Action	Check T2b sensors against **Figure 4.21** on the facing page and replace if faulty.					
A42	Secondary Temp T2c Diff Fault	3	✓	---	---	---
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.					
Action	Check T2c sensors against **Figure 4.21** on the facing page and replace if faulty.					
* Alarm may not be active depending on unit configuration.						

4.7 Temperature Sensor Graph

Figure 4.21 below may be used to check the validity of any of the temperature sensors used in the unit or the remote room sensor.

Figure 4.21 Temperature Sensor Resistance Graph

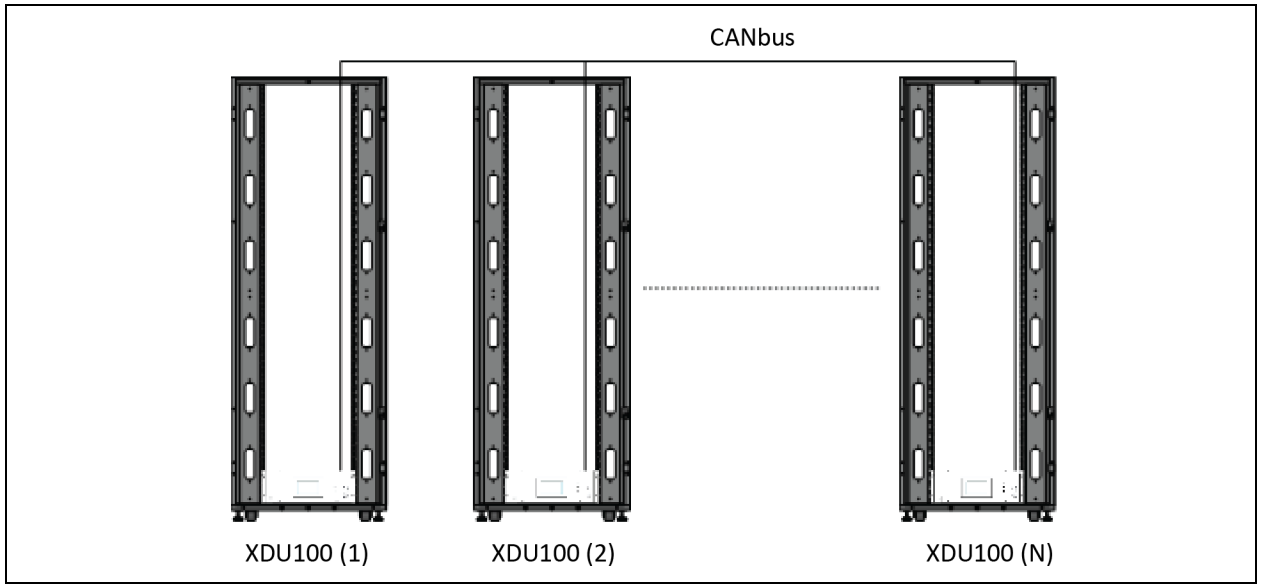


4.8 Group Control

This section should only be considered if there are more than one CoolChip CDU100kW units installed per system.

Groups of up to 8 Vertiv™ CoolChip CDU100kWs can be connected using a high speed, robust twisted pair CANbus network in order to provide coordinated control in larger installation and N+X redundancy.

Figure 4.22 CoolChip CDU100kW Group Control



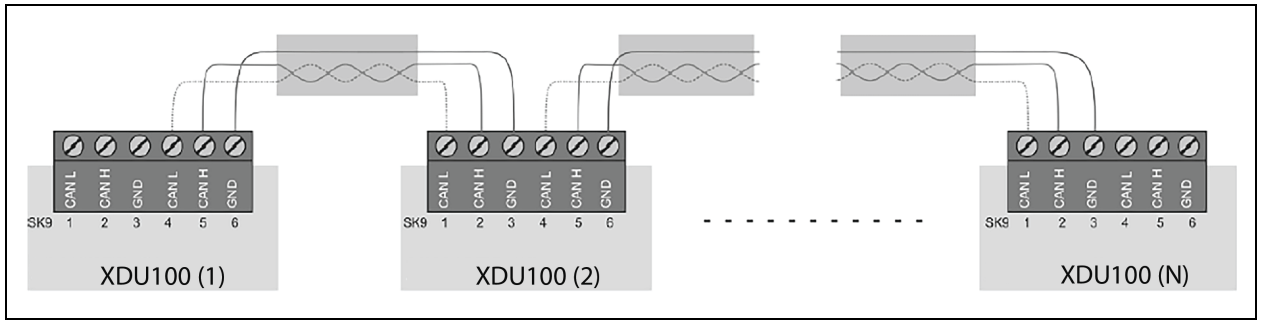
4.8.1 Group Control—Network Cabling

CANbus is used for communication between CoolChip CDU100kW units for group control. CANbus always requires at least 3 conductors: 2 signal wires (CAN Hand CAN L) and a 1 signal return path.

The CoolChip CDU100kW provides 2 CAN H, 2 CAN L and two ground terminals on sockets SK9, 1, 2 and 3 for In and terminals 4, 5 and 6 for Out.

Beldon 3106A, or equivalent (1 pair+1, shielded 22 AWG) is the recommended cable type to be used and pre-configured cable assemblies are provided with each unit if required.

Figure 4.23 Group Control Wiring Configuration

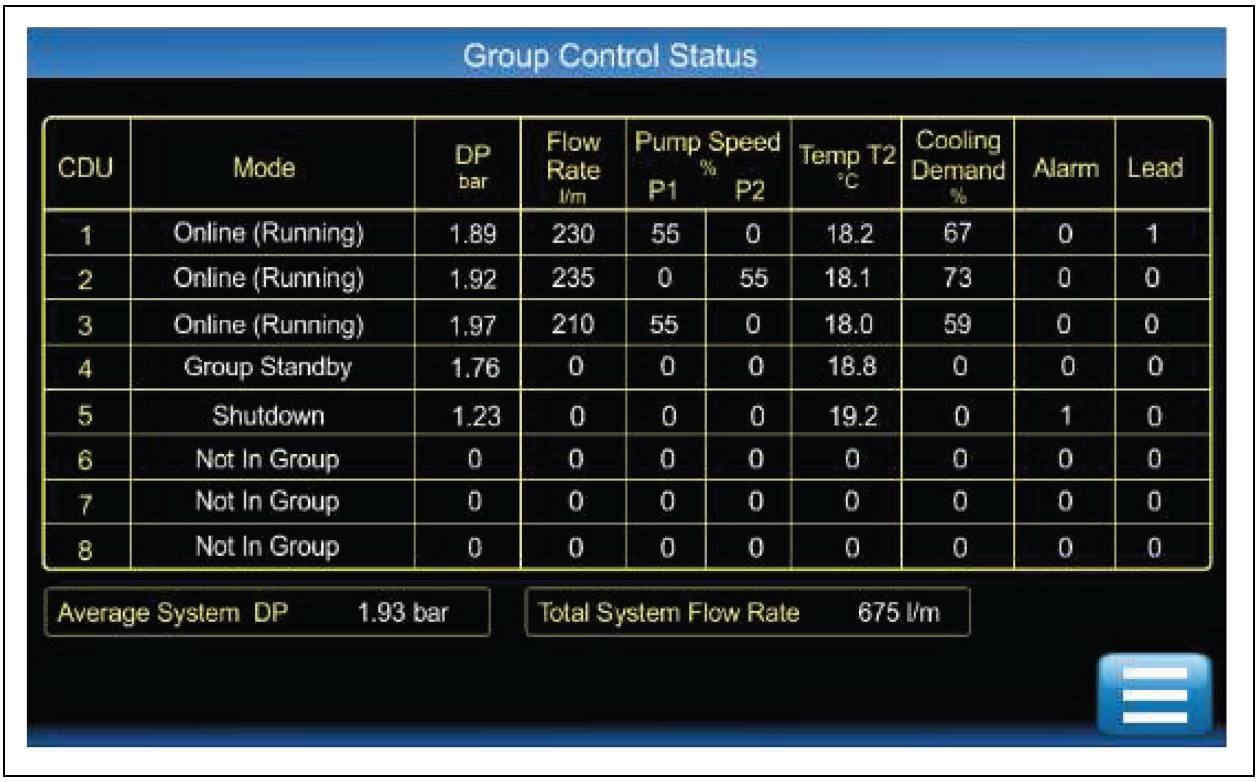


Units become self organizing when in group control. The lead unit is automatically selected which coordinates the running state of each unit in group based on:

- Configured level of redundancy
- System pressure requirements
- Alarm conditions

Changes to the group settings or system settings can be made via any CoolChip CDU100kW touchscreen user interface at any time and are automatically synced across the network.

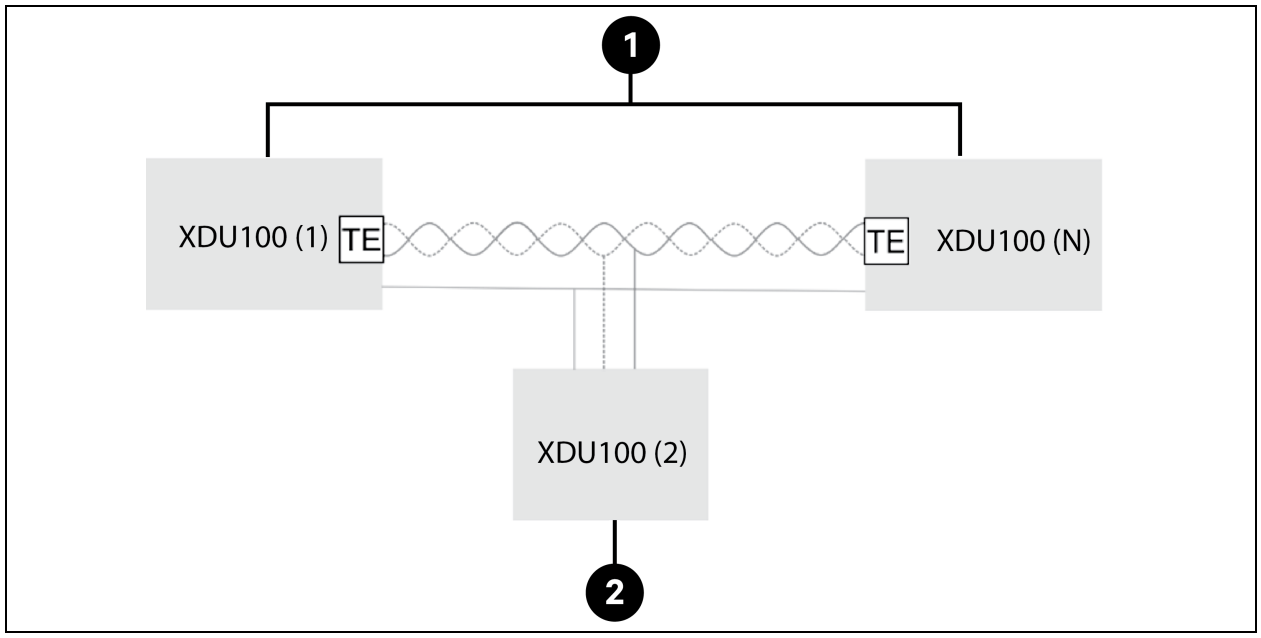
Figure 4.24 Group Control Status Screen



4.8.2 Group Control—Network Termination Resistors

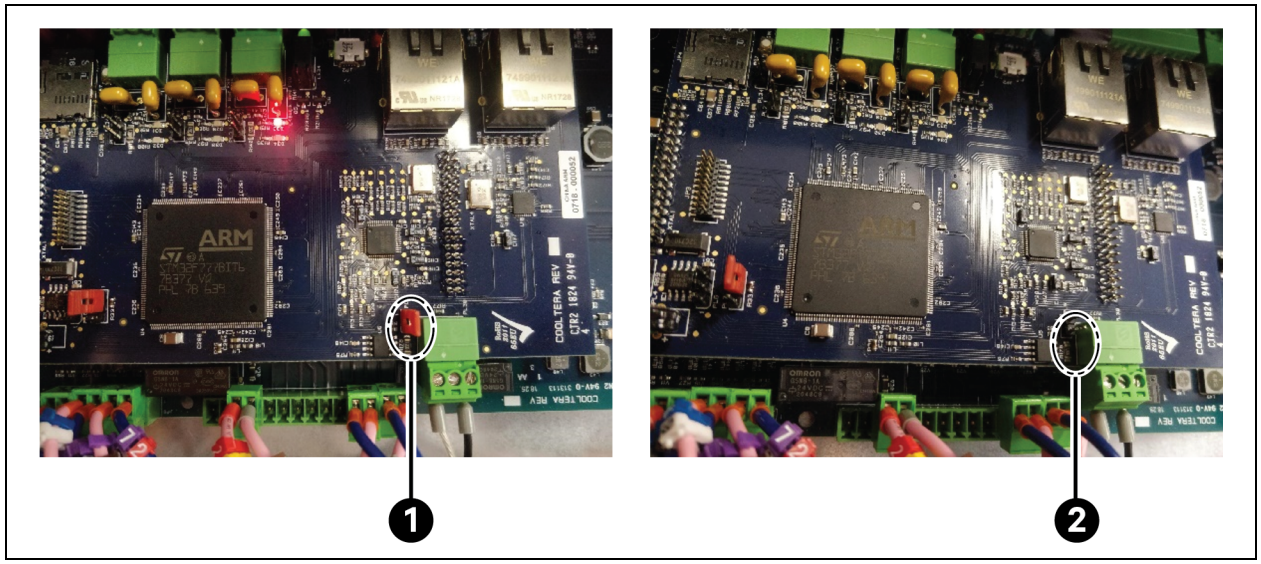
The CoolChip CDU100kW controller includes an onboard 120 ohm resistor which can be activated by fitting a hardware jumper. If only one CoolChip CDU100kW unit is installed, the resistor does not require activation. For a two unit installation, both units should have the termination resistors enabled. For three units and above, units 1 and n should have the termination resistors enabled, while units between should be disabled. Failure to disable the middle resistors could result in intermittent communications. See Figure 4.25 on the next page and Figure 4.26 on the next page for the location of the jumper to enable/disable the termination resistor (the jumper is fitted by default and must be removed if not required).

Figure 4.25 CANbus Network Termination Resistors



Item	Description
1	Units with termination enabled
2	Units with termination disabled

Figure 4.26 CANbus Network Termination Resistors



Item	Description
1	Jumper fitted = Termination resistor activated
2	Jumper not fitted = Termination resistor not activated

4.8.3 Group Control—Network Addresses

Each CoolChip CDU100kW must be given a unique address. A CoolChip CDU100kW network addresses should be allocated to each unit in ascending order, starting from 1.

The CoolChip CDU100kW network address is configured via Setup screen > Unit Address (P081). Configure each CoolChip CDU100kW so that it is aware of the other CoolChip CDU100kW devices on the network:

- Enter the total number of CoolChip CDU100kW units in the networked system via Setup screen > Group Control > Number of Units in Group (P082)
- Enter the number of run units via Setup screen > Group Control > Number of Run Units (P083)

4.8.4 Group Control—Start Sequence from Power Up

1. Power is available when the controller is active.
2. POST (power on system test) and Firmware initializes in less than 1 second—CANbus network activity and RS485 communications with inverters will be established within the 1 second period.
3. When the controller is initialized, it looks for messages from the other CoolChip CDU100kWs in the Group. Messages from CDUs are transmitted asynchronously every 100 milliseconds, so within 200 milliseconds messages will have been exchanged and the group demand shared.
4. When the group demand is shared, the inverters will be driven to the group demand instantly via RS485 Modbus RTU communication from the controller.
5. The inverters are programmed with 2 seconds ramp up period (2 seconds to 100%), so if the group demand is typically at 65% to 75%, ramp up will take 1.5 seconds. This ramp up period is designed to prevent a secondary discharge pressure over shoot on CoolChip CDU100kW (or pump) restart. It is also configurable via the F002 acceleration time parameter on the inverter.
6. Total startup time in Group Control mode is 1 second + 200 milliseconds + 1.5 seconds = 2.7 seconds to the required pump speed, pressure, and flow rate.

4.8.5 Group Control—Controls

When in group control, the lead CoolChip CDU100kW modulates its pump speed to maintain a differential pressure setpoint. The differential pressure setpoint default is an average over all the individual running CoolChip CDU100kW differential pressure readings. This can be changed to the differential pressure over all CoolChip CDU100kW in the group in Seh1p/Group Control/P094 regardless if they are running. All CoolChip CDU100kW units work in parallel and set their pump speeds to be identical with that of the lead CoolChip CDU100kW.

Each CoolChip CDU100kW modulates its own primary (facility) fan speeds to maintain a group wide IT supply fluid temperature setpoint. Each CoolChip CDU100kW also locally regulates temperature using the average of its individual temperature sensors.

4.8.6 Group Control—Unit Rotation and Standby Units

Unit rotation can be configured to be weekly, monthly, or never in the Setup screen under Group Control. Upon rotation, one of the standby units is switched on and one of the duty units is switched off. For example, if units 1, 2, 3, and 4 are running and 5 and 6 are off, after rotation units 2, 3, 4, and 5 will run while 1 and 6 off.

In the event that the load exceeds the capacity of the running units and there are standby units, the standby units will not kick in automatically. The configured number of duty units is selected based the max load. If this max load increases, then additional load has been added and the operator should increase the configured number of duty units.

4.8.7 Group Control—Failure Offset

Failure mode enable standby pumps to start in 75 ms and a 2 second ramp up when a CoolChip CDU100kW in the group is taken offline. This is to seamlessly maintain system differential pressure if a unit is lost without over/undershoots.

The failure offset is applicable only when a group of three or more CoolChip CDU100kW units are configured in N, meaning all CoolChip CDU100kW units are set to run with no CoolChip CDU100kW redundancy. Additionally, they are configured to activate the standby pump when an CoolChip CDU100kW failure or power-off occurs. The pump reduction (or failure) offset is applied to the system pump speed when there is a CoolChip CDU100kW failure (shutdown) or the unit is switched off. Starting the standby pumps in the running CoolChip CDU100kWs will result in more pumps running than when all CDUs are healthy and operational. To avoid spikes in differential pressure, P217 failure Pump Speed offset is applied to the system pump speed at the time of the CDU failure. P217 should be determined at commissioning.

4.8.8 Group Control—Failure Modes

When there is communication failure between units, a new lead CoolChip CDU100kW will be established for each new grouping of units. When communication is re-established, the original lead CoolChip CDU100kW will take control. See Figure 4.27 below. If only the lead CoolChip CDU100kW loses communication, the next CoolChip CDU100kW will take over the lead role. When the previous lead CoolChip CDU100kW communication is re-established, it will not take over the lead role again. See Figure 4.28 on the facing page.

Figure 4.27 General Communication Failure

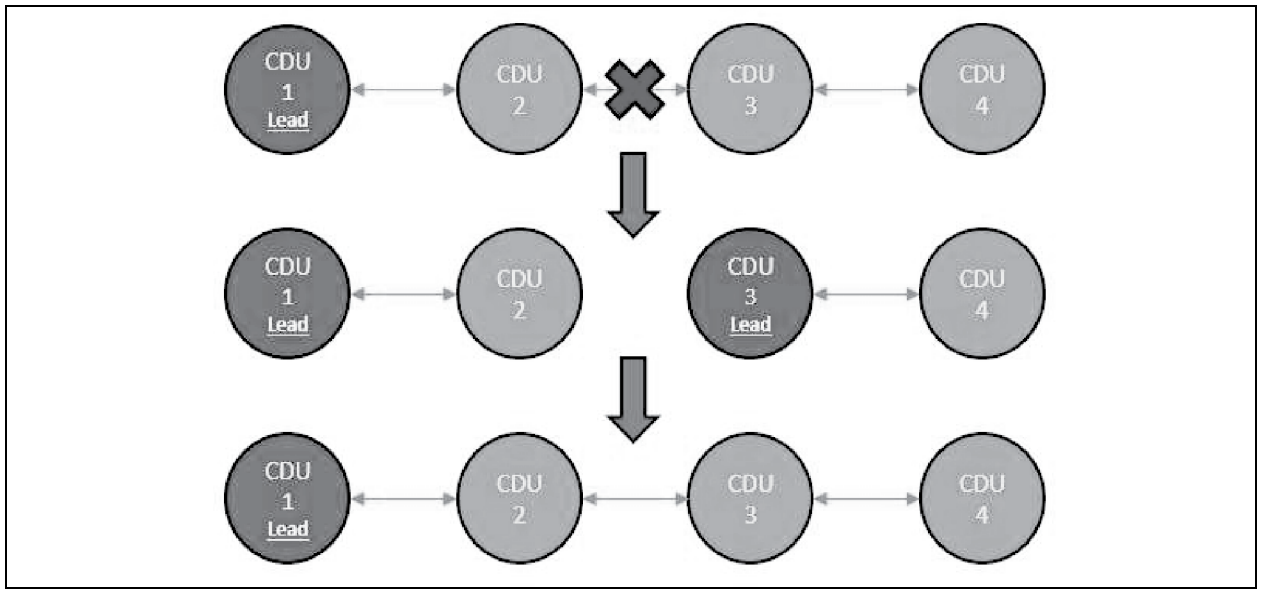
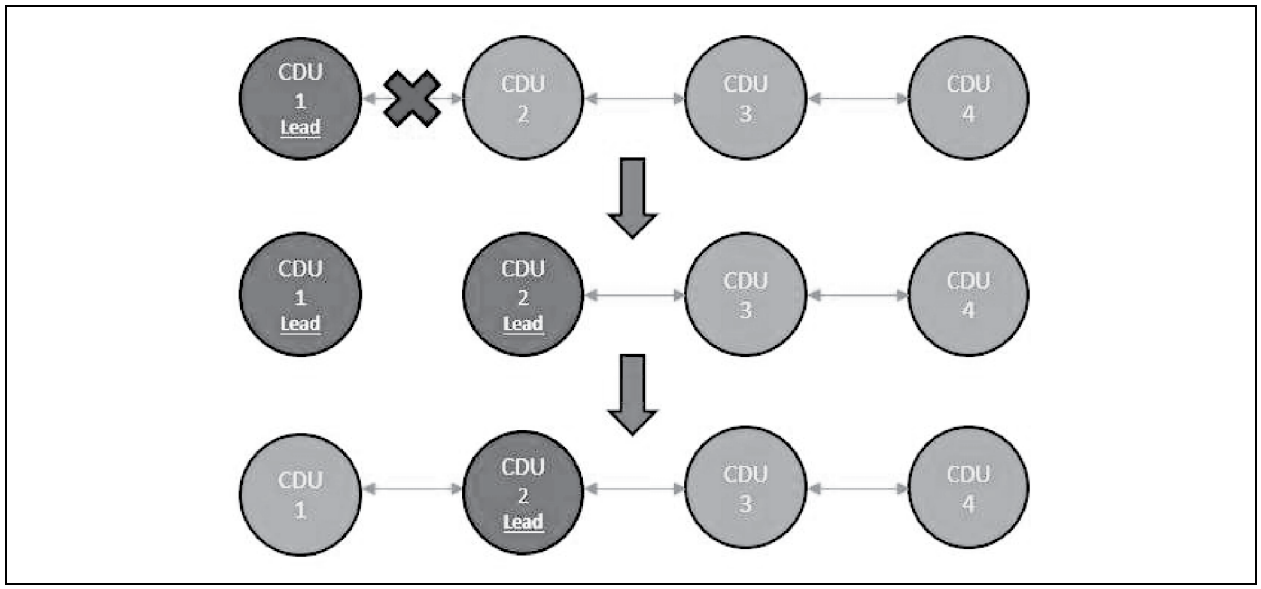


Figure 4.28 Lead Communication Failure



In the event of a sensor failure, all sensors related to control (PS1, PS2 and T2) are redundant at the Vertiv™ CoolChip CDU100kW level, so a single sensor failure will not impact the operation or the status of the CoolChip CDU100kW. So, if the lead CoolChip CDU100kW does have a sensor failure it will not result in a change of lead.

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5 Maintenance

5.1 General

The Vertiv™ CoolChip CDU100kW 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 Vertiv representative.

5.2 Fluid Specifications

Primary circuit

The CoolChip CDU100kW 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 approx. -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 must be filled with particulate free deionized fluid treated with suitable corrosion inhibitors and biocides.

Failure to use adequate fluid 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 Maintenance

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

Planned maintenance services first 3 months

- Check CoolChip CDU100kW valve operation, with necessary parameter adjustment
- Check valve demand and feedback
- Check for any current alarms, correct and clear
- Download historic alarm and event logs (refer to manufacturer for instructions)
- Check T2a, T2b and T2c difference less than 1.0 °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
- Check the maximum flow rate of primary circuit, and adjust if necessary
- Check the primary supply temperature
- Check the primary pressure
- Remove and clean secondary filter if necessary
- Check secondary (manifold and hose) is securely connected with no leakage
- Check the normal secondary flow rate

- Check the Vertiv™ CoolChip CDU100kW manual air vent is clear of air
- Check the expansion vessel static pressure is healthy
- Test the fill pump operation with override function
- Check the sync date and time
- Check firmware status and upgrade if necessary
- Take coolant sample and have tested for correct levels of inhibitors and biocides, if applicable

Planned Maintenance services first 6 months (in addition to 3 month maintenance)

- Simulate the CoolChip CDU100kW switch off, using backup CoolChip CDU100kW or parallel operation to meet the performance requirement
- Check the leakage detection
- Check remote communication functions correctly if applied

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

- Check drain points
- 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 inverter from 0% to 100%
- Visual and audio check the pump bearings when running
- Record current of pump
- Record pump run times
- Record valve run times

Planned maintenance services in every 24 months and after

- Drain the fluid and re-commission the secondary circuit, if necessary. Replace only with DEI fluid that has the correct treatment additives
- Change the secondary filter, if necessary

5.4 Secondary Filter Service

NOTE: The unit must be stopped before cleaning the filter and either partially or fully withdrawn from the rack.

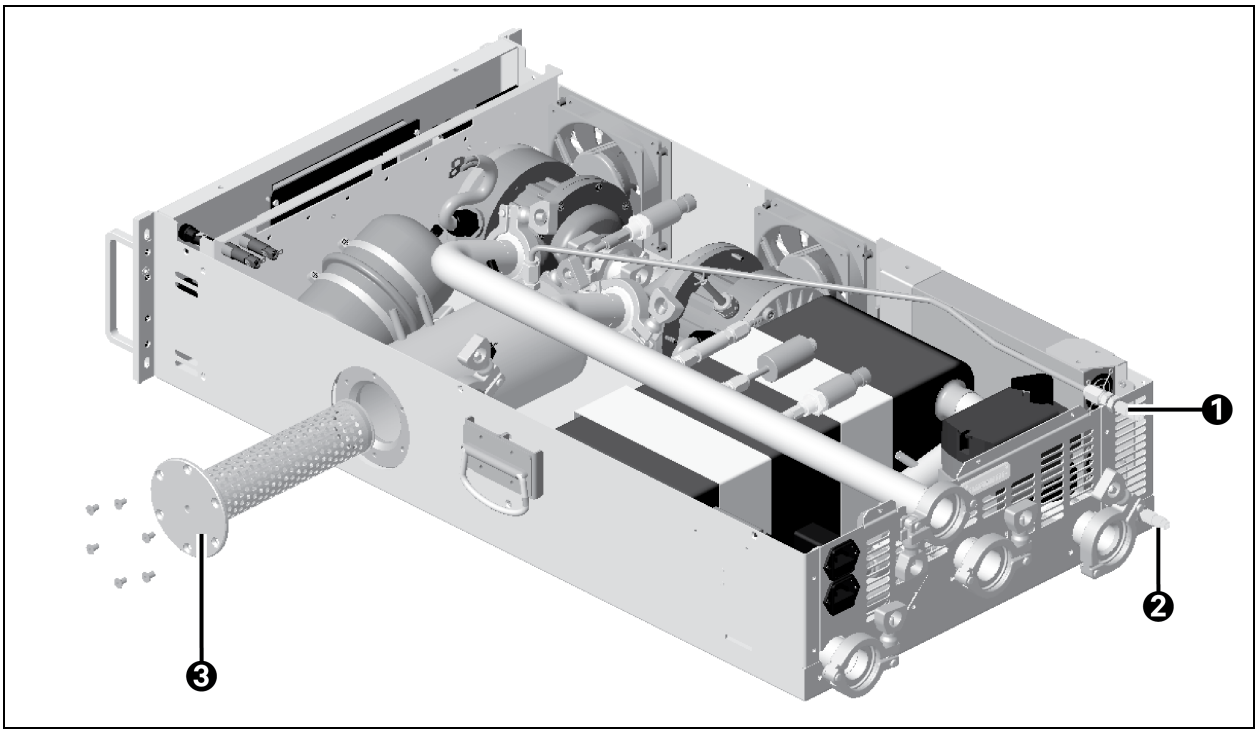
The secondary filter may be removed and cleaned following the procedure below:

- Stop the unit, isolate the unit from external secondary circuit (with isolation valves or quick release couplings), then drain the secondary circuit at the Schrader valve drain point located on the rear panel of the unit.

NOTE: After the pressure is released, this will be easier if the vent point is also opened. See Figure 5.1 on the facing page.

- Pull the unit forward from the rack far enough to gain access to the filter on the right side of the unit.

Figure 5.1 Servicing Secondary Filter



Item	Description
1	Secondary circuit vent point
2	Secondary circuit drain point
3	Remove retaining screws and withdraw filter from side of unit for cleaning

NOTE: This will require sufficient flexibility in the primary and secondary hoses connections (valves or QCs) will need to be isolated and disconnected first.

NOTE: After the water is drained from the secondary circuit, the filter can be removed from the filter housing by removing the 6 countersunk head retaining screws.

NOTE: The filter screen may be washed under a running tap from inside to outside. If available, a high-pressure water jet is preferable for more effective cleaning, although care should be taken not to damage the filter mesh.

Replacement is the reverse of above procedure. Ensure the fluid make up container is full, with additional treated fluid available. Re-filling will be as described in the Installation and Commissioning manual, by initiating a Fill Pump Request from the Service menu. Keep the manual air vent open when filling to allow air in the filter/reservoir tank to be purged out.

The fill pump will automatically stop when the reservoir tank is full and system is back to normal operating pressure.

5.5 Spare Parts

Contact Vertiv for spare parts requirements.

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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

1-800-543-2378

Liebert® Channel Products

1-800-222-5877

Liebert® AC and DC Power Products

1-800-543-2378

A.2 Locations

United States

Vertiv Headquarters

505 N Cleveland Ave

Westerville, OH 43082

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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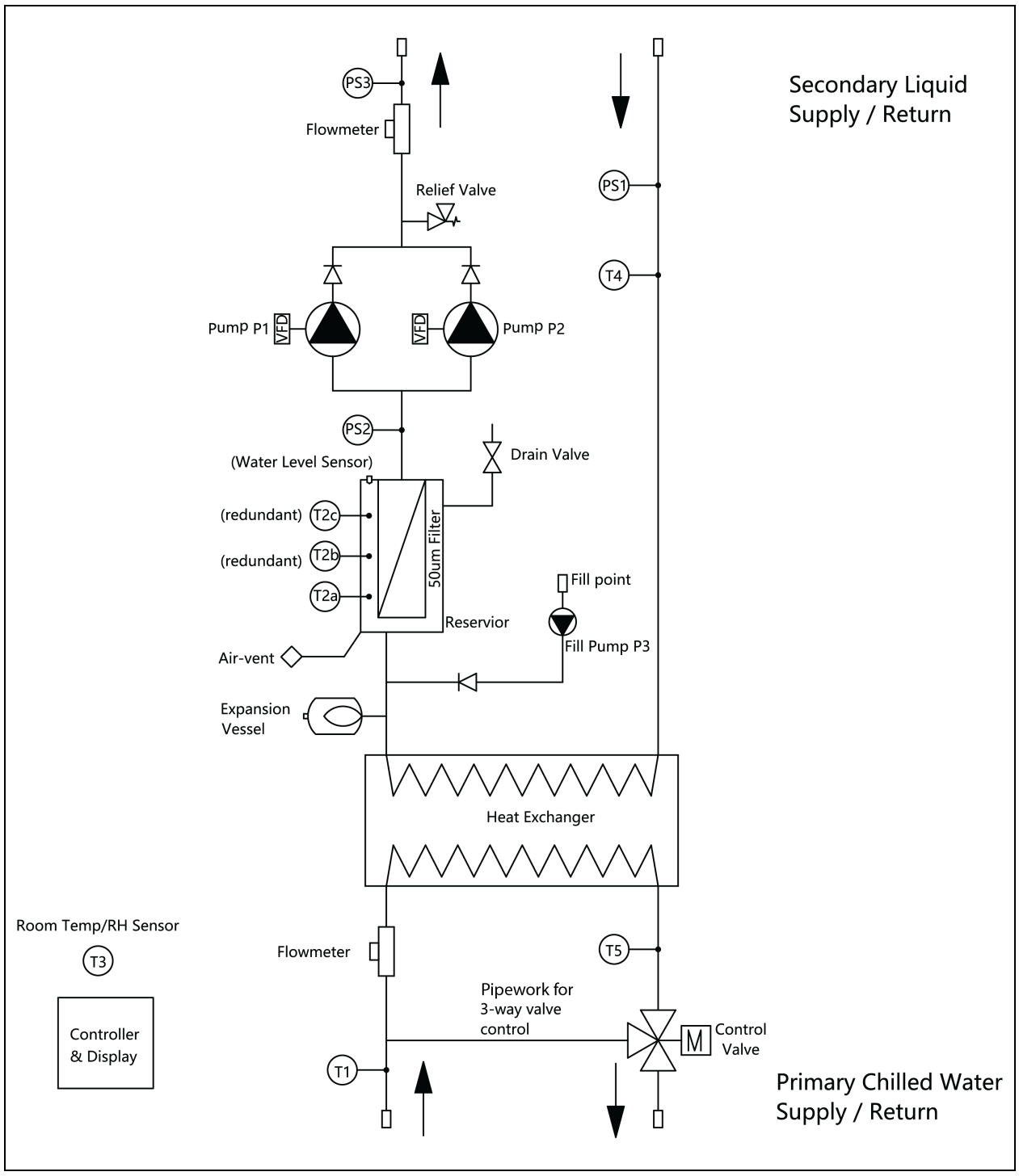
Appendix B: Piping Schematic

Figure B.1 Piping Schematic



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Appendix C: Notes

Appendix D: Disposal Information

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

Decommissioning 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. Approved lifting gear and power tools must be used and access to the work area must be restricted to authorized personnel.

The following steps are a guide only and must 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 an approved recycling facility.

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 https://www.facebook.com/vertiv/

 https://www.instagram.com/vertiv/

 https://www.linkedin.com/company/vertiv/

 https://www.x.com/Vertiv/

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