



CoolChip CDU 121

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 CDU 121.



CAUTION: Always check for water, wastewater, or any liquid accumulation on the floor or beneath the unit before and after operation or maintenance. Fluids can cause slip hazards and may damage the equipment. Ensure that the area is clean, dry, and free of obstructions to maintain a safe working environment.

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.

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.

NOTICE

Risk of improper storage can cause unit damage. Keep the unit upright, indoors and protected from dampness, freezing temperatures, and contact damage.

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 for clarification and advice. See [Technical Support and Contacts](#) on page 63.

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 0.5 bar (7.5 psi) nitrogen holding charge in the fluid circuit. This needs to be vented during the installation process. See the Vertiv™ CoolChip CDU 121 Installation and Commissioning Guide SL- 80277 for more information.

1.3 Application

This product is to be used indoors only and must be used only for the application it was designed for by Vertiv. 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. Disconnecting all AC sources must be done only 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 be obtained from Vertiv. The use of incorrect replacement parts may affect the operation or reliability of the unit and invalidate any warranty. See [Technical Support/Service in the United States](#) on page 1.



WARNING! Before any maintenance operations, make sure that the power supply unit is disconnected.

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, when installed and operated in accordance with this document, the Operation and Maintenance Guide, and the Installation and Commissioning Guide, comply with the Low Voltage Directive 2014/35/EU (applicable only to AC version units), and EMC Directive 2014/30/EU for CE marking, as well as the Electrical Equipment (Safety) Regulations S.I. 2026 No. 1101 (applicable only to AC version units) and the Electromagnetic Compatibility Regulations S.I. 2016 No. 1091 for UKCA marking. Additionally, this product is cULus listed for the appropriate voltage models, with certification under UL 62368-1, 3rd Edition, and CSA C22.2 No. 62368-1:19, 3rd Edition. Certificates are available upon request. File number: E202715.



2.2 Reach and RoHS Compliance

Vertiv certifies that all products manufactured and supplied by Vertiv are fully REACH and RoHS compliant in accordance with EN IEC 63000 and the directive 2011/65/EU revised directive (EU) 2015/863 and (EC) 1907/2006.

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3 Product Description

Please refer to the following submittals located in [Submittal Drawings](#) on page 65.

Table 3.1 Product Descriptive Submittals

Document Number	Title
20000653	CoolChip CDU Standard Features
20000657	CoolChip CDU Electrical Connection DC Unit
20000659	CoolChip CDU Component Location Diagram DC Version
20000660	Ship Loose Accessories AC and DC Version
20000703	CoolChip CDU Connection Location DC Version
20000704	CoolChip CDU Electrical Connection AC Unit
20000705	CoolChip CDU Component Location Diagram AC Version

3.1 General

This document describes the basic characteristics and operation of the Vertiv™ CoolChip CDU 121 and the required ongoing maintenance considerations.

The CoolChip CDU 121 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 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 [Vertiv™ CoolChip CDU 121 Application and Planning Guide SL-80276](#) for more information.

3.2 Vertiv™ CoolChip CDU 121 Model Number Nomenclature

Table 3.2 Vertiv™ CoolChip CDU 121 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	26
Model Nb	X	D	U	1	0	0	W	B	S	P	A	0	7	0	2	0	S	0	0	S	1	4	N	0	0	0

Table 3.3 Vertiv™ CoolChip CDU 121 Model Number Definitions

Digit	Feature	Value	Description
1,2,3	Family name	XDU	Product family
4,5,6	Unit model	121	Base model
7	Cooling Type	W	Liquid to liquid
8	Unit revision	B	Revision B
9	Voltage	Q	110 V - 120 V, 208 V - 240 V, 1 PH, 50/60 Hz
		D	46 V - 52 V DC
10	Power input	P	IEC power inlet, dual Input
		3	OCP v3 power connector, single input
11	Controller	A	Standard controller
12	Placeholder	0	Placeholder
13	Display	7	7-in. touchscreen display
14	Placeholder	0	Placeholder
15	Pump configuration	2	Two pumps
16	Placeholder	0	Place holder
17	Primary connection	S	1 1/2-in. sanitary flange
		F	FD83
18	Placeholder	0	Placeholder
19	Placeholder	0	Placeholder
20	Secondary connection	S	1 1/2-in. sanitary flange
		F	FD83
21	Secondary filtration	1	Fitted (50 micron)
		2	Fitted (25 micron)
22	Pressure relief valve	3	3 bar pressure relief valve
		4	4 bar pressure relief valve
23	Reservoir	N	Internal SS reservoir w/ fluid level detection
24	Packaging	0	Standard
25	Placeholder	0	Place holder
26	ETO	0	Standard configuration
		S	Special feature authorization

There are two versions of the CDU 121. Refer to **Table 3.4** on the facing page

- The form of power input is different. Specifically, the AC version's power input is a 220 V to 48 V power module, and the DC version's power input is a 48 V busbar.
- The overall dimensions are basically the same, except that the DC version cabinet has an additional busbar bracket at the right rear.
- Except for the power input components, the other electrical components and refrigeration components are the same, and the internal installation is basically the same.

Table 3.4 CDU 121 Models

Model Description	Model Number	Remarks
XDU100 AC Version Standard	XDU100WBQPA07020S00S14N000	110 V - 120 V, 208 V - 240 V, 1 PH, 50/60 Hz
XDU100 DC Version Standard	XDU100WBD3A07020S00S14N000	46 V- 52 V DC

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4 Operation

4.1 Controller Overview

The Vertiv™ CoolChip CDU 121 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.

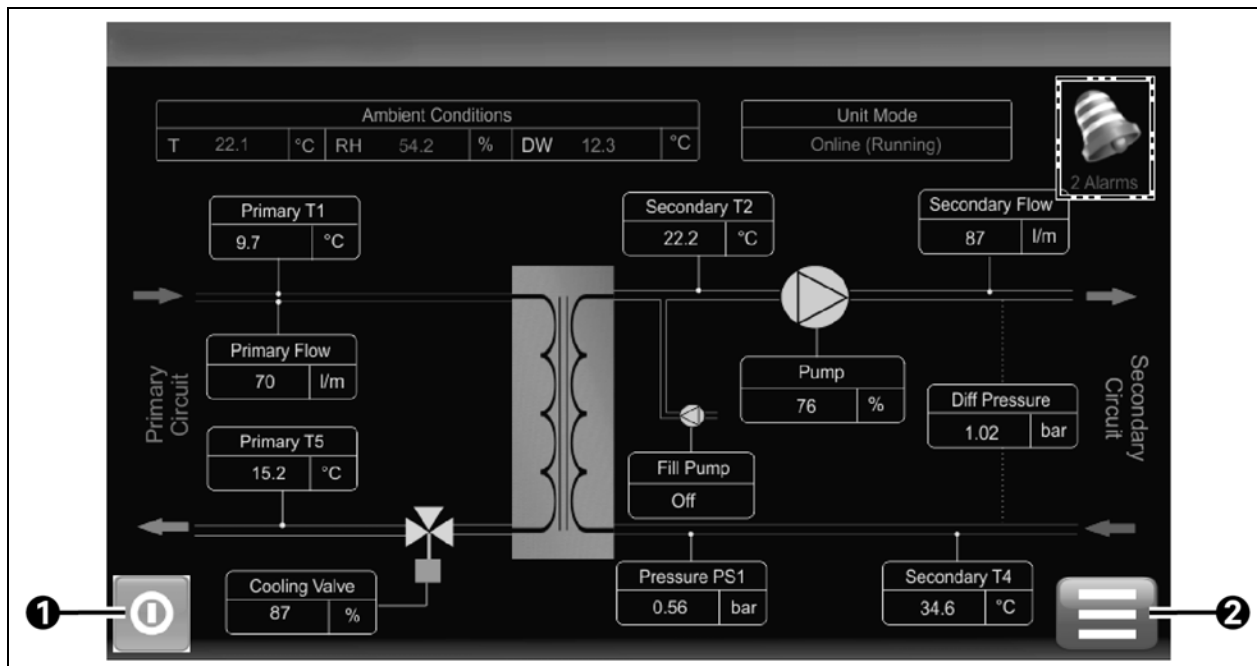
When power is first applied to the unit, the touchscreen will illuminate and the pump inverter drives will energize. After a short initialization period during which the company logo is presented, the display defaults to the Home screen, as shown in **Figure 4.1** below.

4.2 User Interface

4.2.1 Home Screen

The Home screen displays a schematic representation of the Vertiv™ CoolChip CDU 121, 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. Displays the Main Menu screen

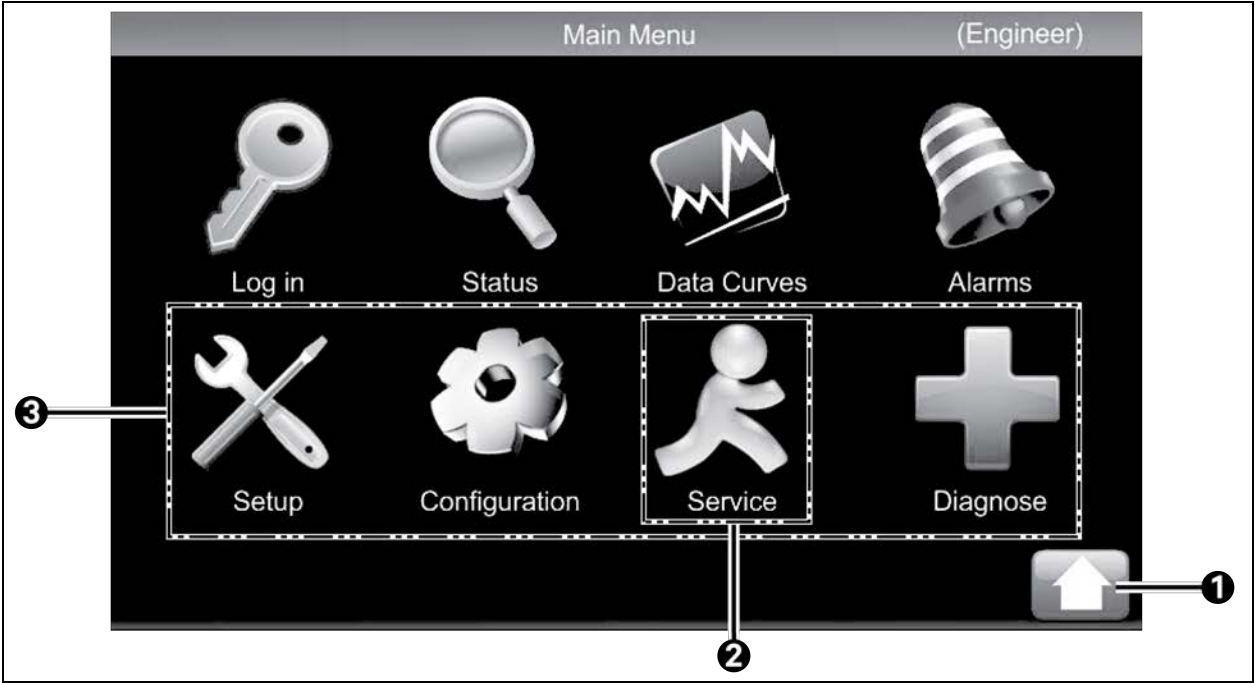
4.2.2 Main Menu

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 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



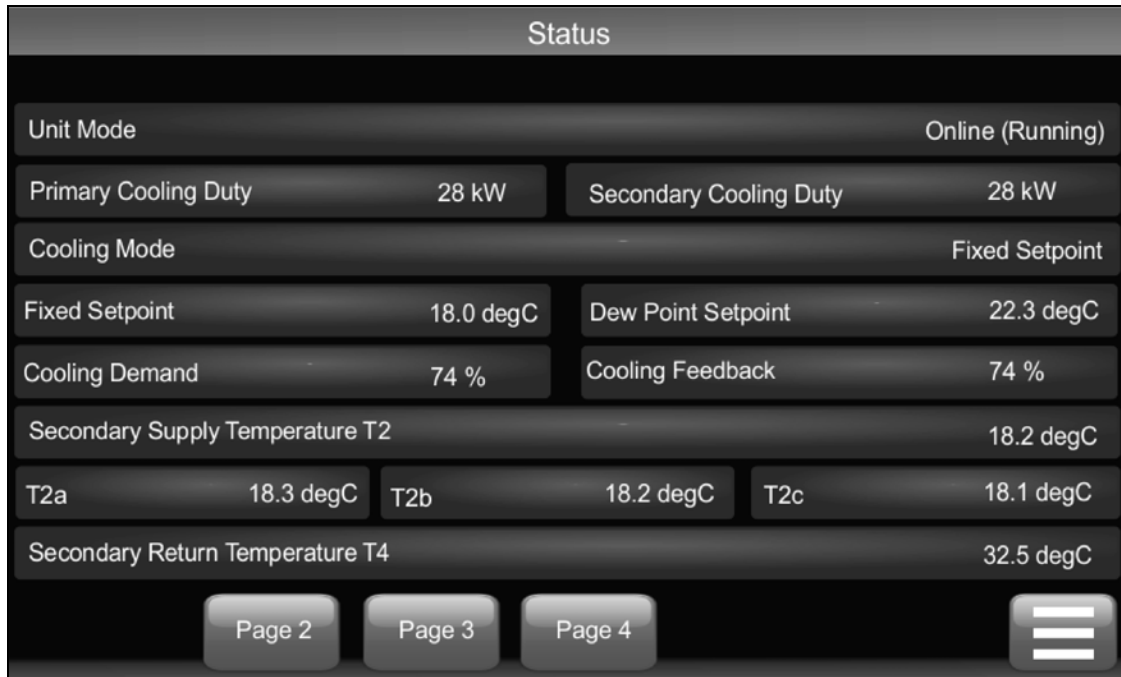
Item	Description
1	Return to Home screen
2	Service. Only visible when logged in at service or engineer level
3	Setup. Only visible when logged in

4.2.3 Status Screen

The Status screen displays comprehensive view only information on the operating condition of the Vertiv™ CoolChip CDU 121 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** below.

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 / ___ °F
Dew Point Setpoint	___ °C / ___ °F
Cooling Demand	__%
Valve Demand/Feedback	__%
Secondary Return Temperature T2	___ °C / ___ °F

Table 4.1 Status Screen—Page 1 (continued)

Item	Value
T2a	___ °C / ___ °F
T2b	___ °C / ___ °F
T2c	___ °C / ___ °F
Secondary Return Temperature T4	___ °C / ___ °F

Table 4.2 Status Screen—Page 2

Item	Value
Primary Supply Temperature T1	___ °C / ___ °F
Primary Return Temperature T5	___ °C / ___ °F
Primary Flow Rate	__ l/m
Primary Duty	___ kW
Ambient Temperature	___ °C / ___ °F
Ambient RH	__%
Dew Point	____ °C / ___ °F

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

Table 4.4 Status Screen—Page 4 (continued)

Item	Value
Valve Runtime 26 to 50%	__hrs
Valve Runtime 51 to 75%	__hrs
Valve Runtime 76 to 100%	__hrs
Elapsed Minutes	__minutes
Controller Firmware Version	2.1b5 (example)
Serial Number	SKG
Controller Hardware Revision	5.xB (example)
SD Card Detect	Present
SD Card File System Status	OK
SD Card Used Space	___%
Pump 1 Comms Status	
Pump 1 Mode	
Pump 1 Speed	__ rpm
Pump 1 Voltage	V
Pump 1 Current	A
Pump 1 Temperature	___°C / ___°F
Drive 1 Temperature	___°C / ___°F
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 / ___°F
Drive 2 Temperature	___°C / ___°F
Drive 2 FW Version	

Table 4.5 Status Screen—Page 5t

Item	Value
Pump 1 Comms Status	
Pump 1 Mode	
Pump 1 Speed	__rpm

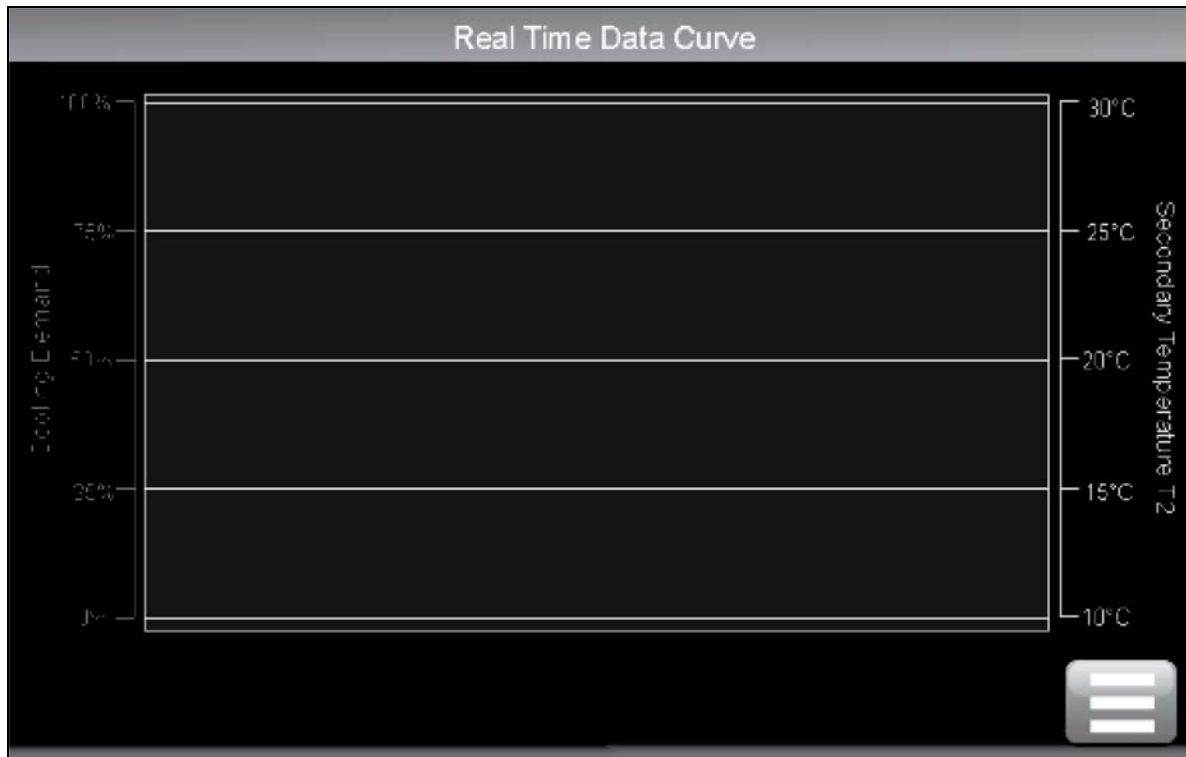
Table 4.5 Status Screen—Page 5t (continued)

Item	Value
Pump 1 Voltage	V
Pump 1 Current	A
Pump 1 Temperature	___ °C / ___ °F
Drive 1 Temperature	___ °C / ___ °F
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 / ___ °F
Drive 2 Temperature	___ °C / ___ °F
Drive 2 FW Version	

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. The time span of display is 3 minutes.

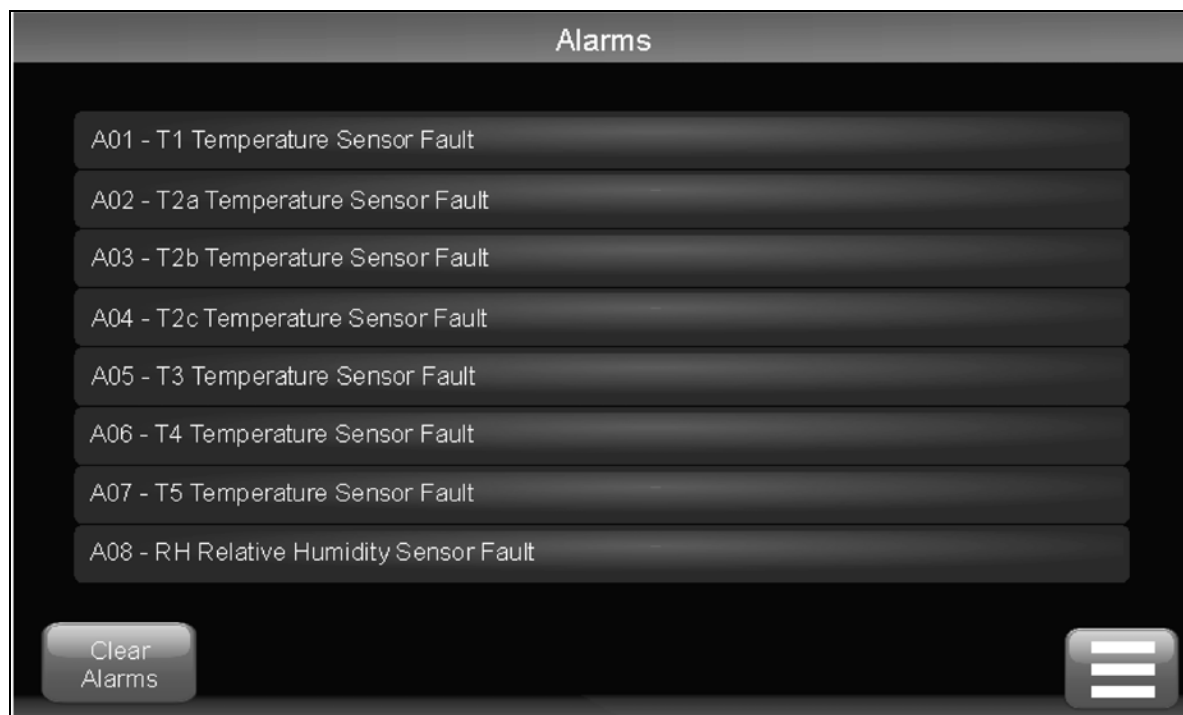
Figure 4.4 Control System Data Curves Screen



4.2.5 Alarm Screen

The Alarm screen can be used to view new or active s and to acknowledge these events. Refer to [Troubleshooting Alarms](#) on page 41 for a full list of alarms and further information.

Figure 4.5 Control System Alarm 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 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.

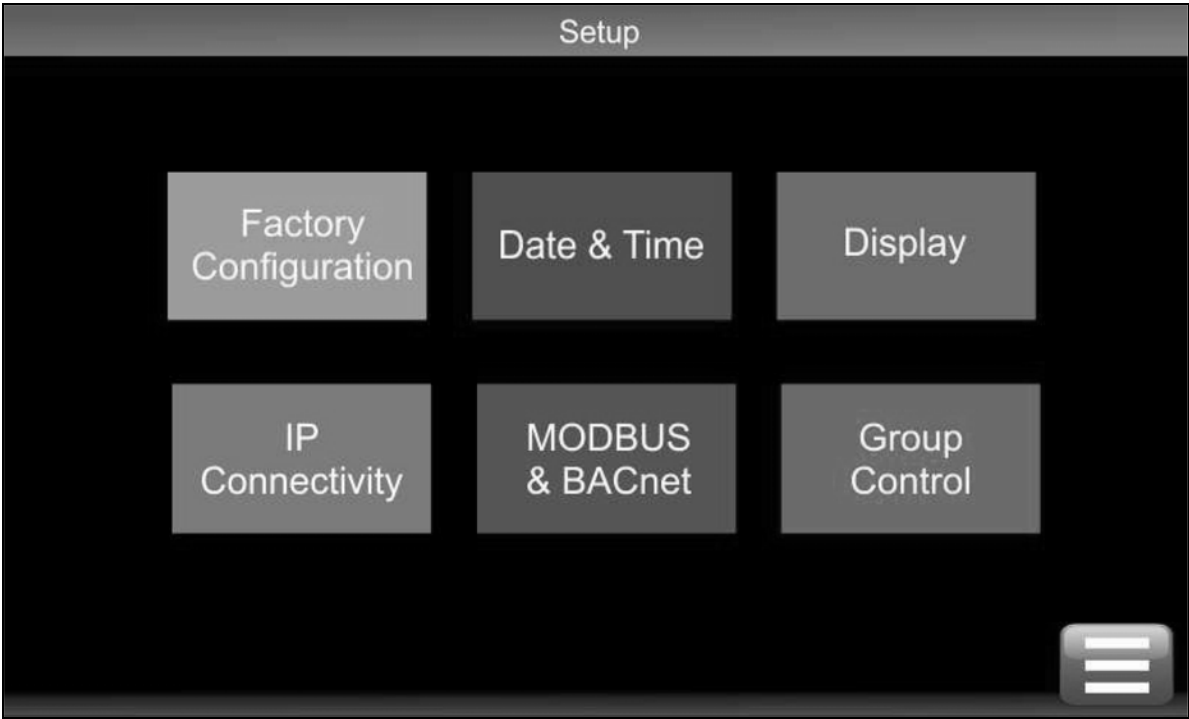
Figure 4.6 Control System Login Screen

Login codes are available on request from 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 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	21F01327732xxxxxxxxx

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	—	—

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

ID	Title	Description	Default	Range	Unit
P023	NTP Synchronization	Network Time protocol synchronization	Disabled	Enabled Disabled	—
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	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/___°F
P033	Pressure Units	Select required pressure display units	—	—	bar
P034	Flow Rate Units	Select required flow 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	—
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	—
P084	Control Reference	Control group control host	0	0 to 3	—
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	CDU Receive Timeout Period	Set require unit receive timeout	2500	50 to 10000	msecs.
P090	CDU 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

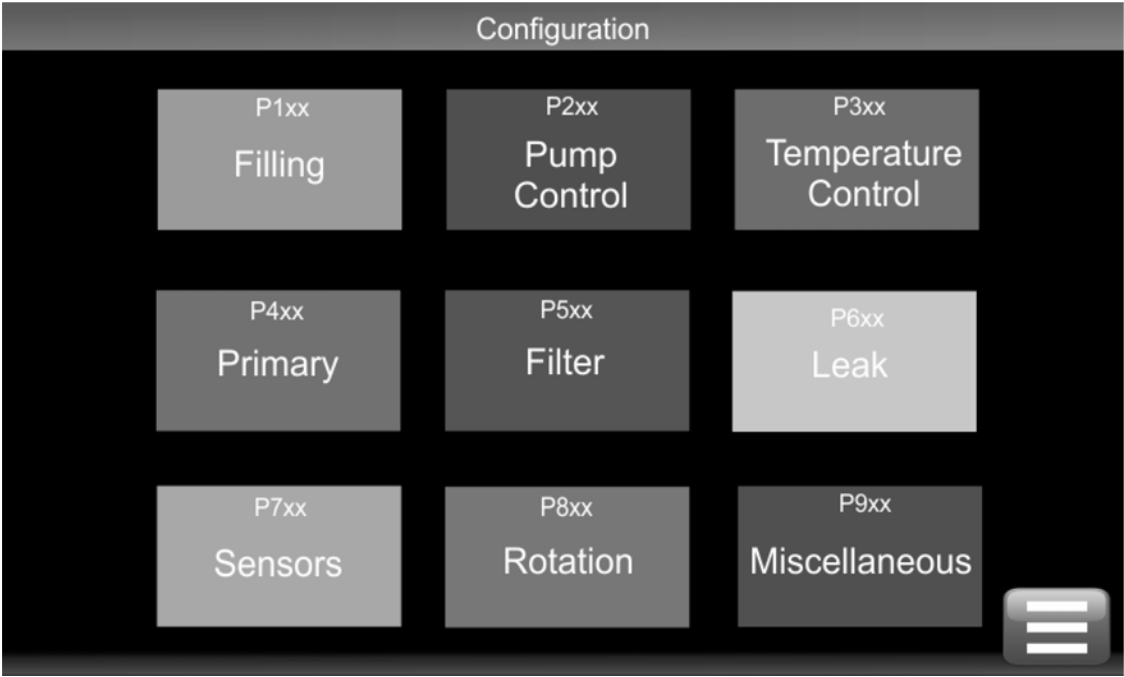


Table 4.17 Configuration Screen—Filling

ID	Title	Description	Default	Range	Unit
P101	Filling	Fill Pressure	2.21	2.2	Bar
P102	Filling	Fill Hys	0.2	0.2	Bar
P103	Filling	Pump Run Period	1	1	min
P104	Filling	Float Switch Delay	1	1	sec
P105	Filling	Fill Delay	10	10	sec
P106	Filling	Warning Delay	5	5	sec
P107	Filling	Manual Fill Pump Scheme	1	1	enum

Table 4.18 Configuration Screen—Pump Control (Page 1)

ID	Title	Description	Default	Range	Unit
P201	Pump Control	Secondary Flow Control Method	0	0	enum
P202	Pump Control	Flow Setpoint	50	50	l/m
P203	Pump Control	Flow Setpoint 2 DP	0.3	0.3	Bar
P204	Pump Control	Low Flow Inv %	90	90	%
P205	Secondary Pumps	Low DP	90	90	%
P206	Pump Control	Low Flow/DP Delay	100	200	secs
P207	Pump Control	Minimum Pump Speed	30	30	%
P208	Pump Control	Maximum Pump Speed	100	100	%

Table 4.19 Configuration Screen—Pump Control (Page 2)

ID	Title	Description	Default	Range	Unit
P209	Pump Control	Over Pressure Setpoint	6	6	Bar
P210	Pump Control	Over Pressure Action	1	1	enum
P211	Pump Control	Start Speed	0	0	%
P212	Pump Control	Start Period	0	0	secs
P213	Pump Control	Loop Refresh	10	10	secs
P214	Pump Control	Control Pressure Sensitivity	4	4	Bar
P215	Pump Control	Cooling Fan Run On Period	10	10	mins

Table 4.20 Configuration Screen—Pump Control (Page 3)

ID	Title	Description	Default	Range	Unit
P219	Pump Control	Twin Pump Control	0	0	enum
P220	Pump Control	Twin Pump Maximum Speed	70	70	%

Table 4.21 Configuration Screen—Temperature Control (Page 1)

ID	Title	Description	Default	Range	Unit
P301	Temperature Control	Temperature Set Point	18	18	C°
P302	Temperature Control	Control Mode	0	0	enum
P303	Temperature Control	DW Offset	3	3	C°
P304	Temperature Control	Secondary Low Temperature Differential	2	2	C°
P305	Temperature Control	Secondary High Temperature Differential	2	2	C°

Table 4.21 Configuration Screen—Temperature Control (Page 1) (continued)

ID	Title	Description	Default	Range	Unit
P306	Temperature Control	Secondary Temperature Reset Hysteresis	1	1	C°
P316	Temperature Control	Secondary High Temperature DW	20	20	C°
P307	Temperature Control	PID - Control Period	2	2	secs

Table 4.22 Configuration Screen—Temperature Control (Page 2)

ID	Title	Description	Default	Range	Unit
P308	Temperature Control	PID Proportional Band	25	25	C°
P309	Temperature Control	PID - Integral Reset	130	130	secs
P310	Temperature Control	PID - Derivative	0	0	secs
P311	Temperature Control	Demand/Actual Error	10	10	%
P312	Temperature Control	Valve Check interval	15	15	mins
P313	Temperature Control	Valve Runtime	40	40	secs
P314	Temperature Control	Valve Minimum Position	0	0	%
P315	Temperature Control	Valve Maximum Position	100	100	%

Table 4.23 Configuration Screen—Temperature Control (Page 3)

ID	Title	Description	Default	Range	Unit
P320	Temperature Control	Deadband Above	0	0	C°
P321	Temperature Control	Deadband Below	0	0	C°

Table 4.24 Configuration—Primary

ID	Title	Description	Default	Range	Unit
P401	Primary	Primary Flow Delay	5	5	mins
P402	Primary	Primary Low Temperature Setpoint	4	4	C°
P403	Primary	Primary High Temperature Setpoint	11	11	C°
P404	Primary	Temperature Reset Hysteresis	1	1	C°

Table 4.25 Configuration—Filter

ID	Title	Description	Default	Range	Unit
P501	Filters	Secondary Filter Dirty Setpoint	0.4	0.4	Bar
P502	Filters	Secondary Filter Dirty Hysteresis	0.1	0.1	Bar
P503	Filters	Secondary Filter Dirty Delay	60	60	secs

Table 4.26 Configuration—Leak Detection

ID	Title	Description	Default	Range	Unit
P601	Leak	Leak Detection Op - Internal	1	1	enum
P602	Leak	Internal Threshold	50	50	ohm
P603	Leak	Internal Delay period	10	10	secs
P604	Leak	Leak Detection Op - External	1	1	enum
P605	Leak	External Threshold	50	50	ohm
P606	Leak	External Delay period	10	10	secd

Table 4.27 Configuration—Sensors

ID	Title	Description	Default	Range	Unit
P701	Sensors	Secondary T2 Temperature Differential	1	1	C°
P702	Sensors	Secondary T2 Period	10	40	secs
P703	Sensors	PS1 Scaling	2	2	enum
P704	Sensors	PS2 Scaling	2	2	enum
P705	Sensors	PS3 Scaling	2	2	enum
P706	Sensors	Sec Flow Sensor Full Range	150	150	l/m

Table 4.28 Configuration—Rotation

ID	Title	Description	Default	Range	Unit
P801	Changeover	Frequency	0	0	enum
P802	Changeover	Day of Week	1	1	enum
P803	Changeover	Hours	10	10	hours
P804	Changeover	Minutes	0	0	mins

Table 4.29 Configuration—Miscellaneous (Page 1)

ID	Title	Description	Default	Range	Unit
P901	Miscellaneous	Manual Override Period	15	15	mins
P902	Miscellaneous	Alarm Delay Period	20	20	mins
P903	Miscellaneous	Post-Power Failure Operation	1	1	enum
P904	Miscellaneous	Room RH&T Sensor	1	1	enum
P905	Miscellaneous	Data Logging Interval	0	0	enum
P906	Miscellaneous	Temperature Alarm Delay	10	10	secs
P907	Miscellaneous	Alarm Output Scheme	0	0	
P908	Miscellaneous	Display->Display Lockout	0	0	enum

Table 4.30 Configuration—Miscellaneous (Page 2)

ID	Title	Description	Default	Range	Unit
P910	Miscellaneous	Secondary Loop Coolant Type	0	0	enum
P911	Miscellaneous	Primary Loop Coolant Type	0	0	enum
P912	Miscellaneous	Restore Op State Max Period	300	300	secs

4.2.9 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 4.9 Control System Diagnostic Screen

I/O Diagnostic - Universal Inputs 1 to 8				
		ADC Value	Electrical	Processed
UI01	Secondary Flow Temperature T2a	32000	12012 ohms	22.3 degC
UI02	Secondary Flow Temperature T2b	15501	12198 ohms	22.4 degC
UI03	Secondary Flow Temperature T2c	15552	12019 ohms	22.2 degC
UI04	Secondary Return Temperature T4	21201	19765 ohms	44.1 degC
UI05	Secondary Return Pressure PS1	41021	6.89 mA	3.36 bar
UI06	Pump Inlet Pressure PS2	37124	6.87 mA	3.35 bar
UI07	Secondary Supply Pressure PS3	65496	4.93 mA	2.01 bar
UI08	Ambient Sensor - RH	15116	4.99 mA	50 %
UI 09 to 14 RI 01 to 04 Digital Inputs Outputs				

Table 4.31 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/°F
UI02	Secondary Flow Temperature T2b	0	0	ohms	0.00	°C/°F
UI03	Secondary Flow Temperature T2c	0	0	ohms	0.00	°C/°F
UI04	Secondary Return Temperature T4	0	0	ohms	0.00	°C/°F
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 4.32 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/°F
UI10	Primary Flow Temperature T1	0	0.00	mA	0.00	°C/°F
UI11	Primary Flow Rate	0	0.00	mA	0	l/m

Table 4.32 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 4.33 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/°F
RI03	Leak Tape - Internal (field supplied)	0	0	ohms	2	°C/°F
RI04	—	0	0	ohms	0	°C/°F

Table 4.34 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 4.35 I/O Diagnostics - Digital and Analogue Outputs

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

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 11), then press the *green ON* button, see **Figure 4.10** below.

Figure 4.10 Switch CDU

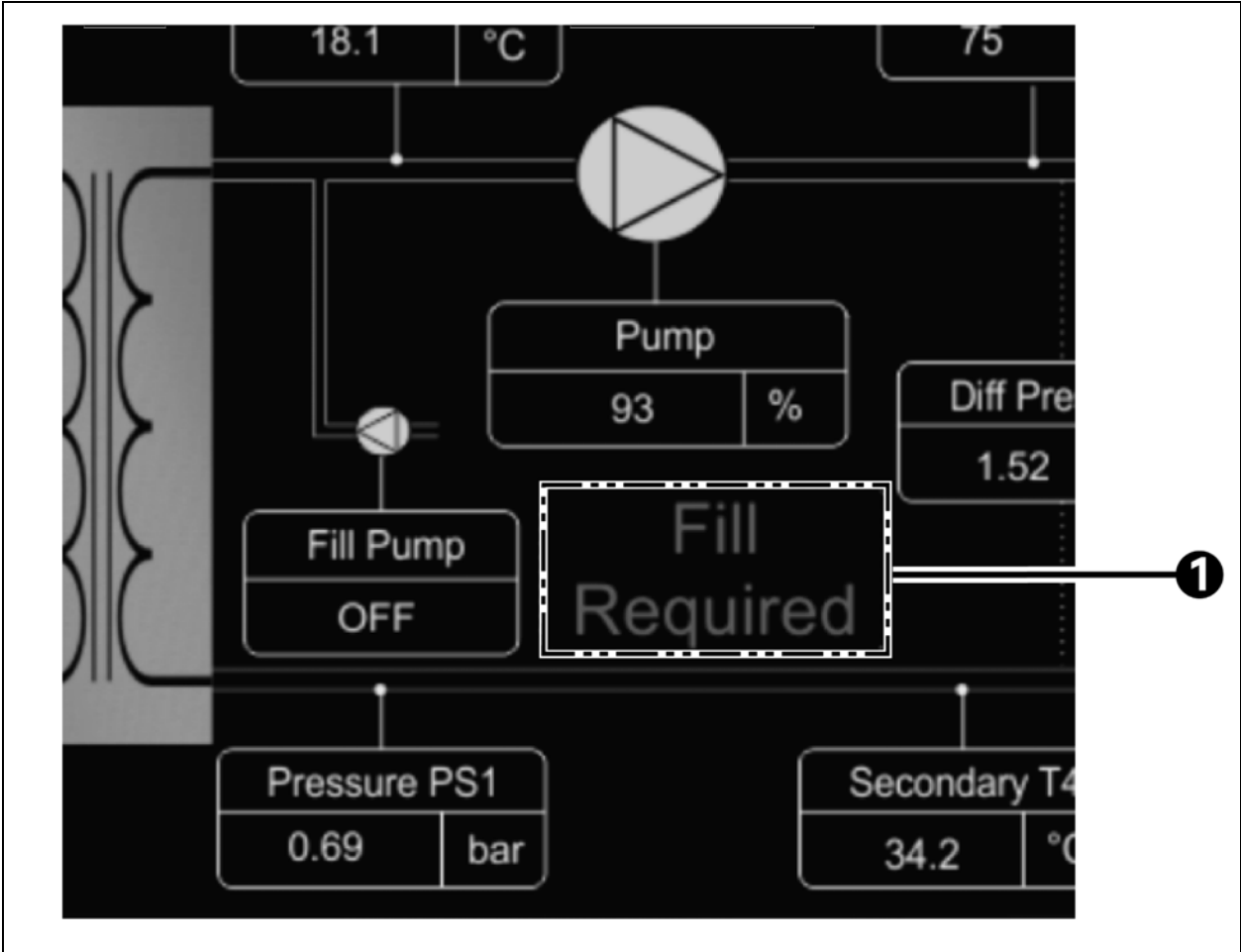


When the ON button is pressed, the Start/Stop icon on the Home screen changes from red to green. When the fluid level and static pressure are healthy, either the pump starts to increase in speed, arrows are displayed on the Home screen for primary and secondary circuits to signify that the unit is operational.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

4.3.1 Fluid Level

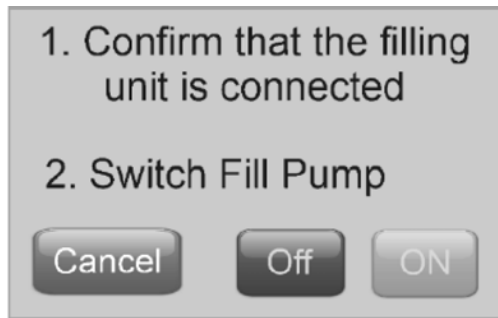
- If the fluid level switch is not made or insufficient fluid is signified, then the pump will not be permitted to run and a Fill Pump Required request will be raised. See **Figure 4.11** below.

Figure 4.11 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 4.12 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 will be triggered. This is a latched and the system will not restart the unit until the event has been manually cleared.

The system pressure at the Vertiv™ CoolChip CDU 121 inlet (PS1) is continuously monitored to ensure that the system is always pressurized. See [Status Screen—Page 3](#) on page 14.

4.3.2 Static Pressure

- Once the unit is running, a low system pressure below the default 1.1 bar (16 psi) at PS1 will not stop the pump 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 Make Up Level 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 Make Up Empty will be triggered. This is a latched 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 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 4.13 on the next page, **Figure 4.14** on page 35 **Figure 4.15** on page 36 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 4.13 Vertiv™ CoolChip CDU 121 Pressure and Level Flow Chart (Initial Startup)

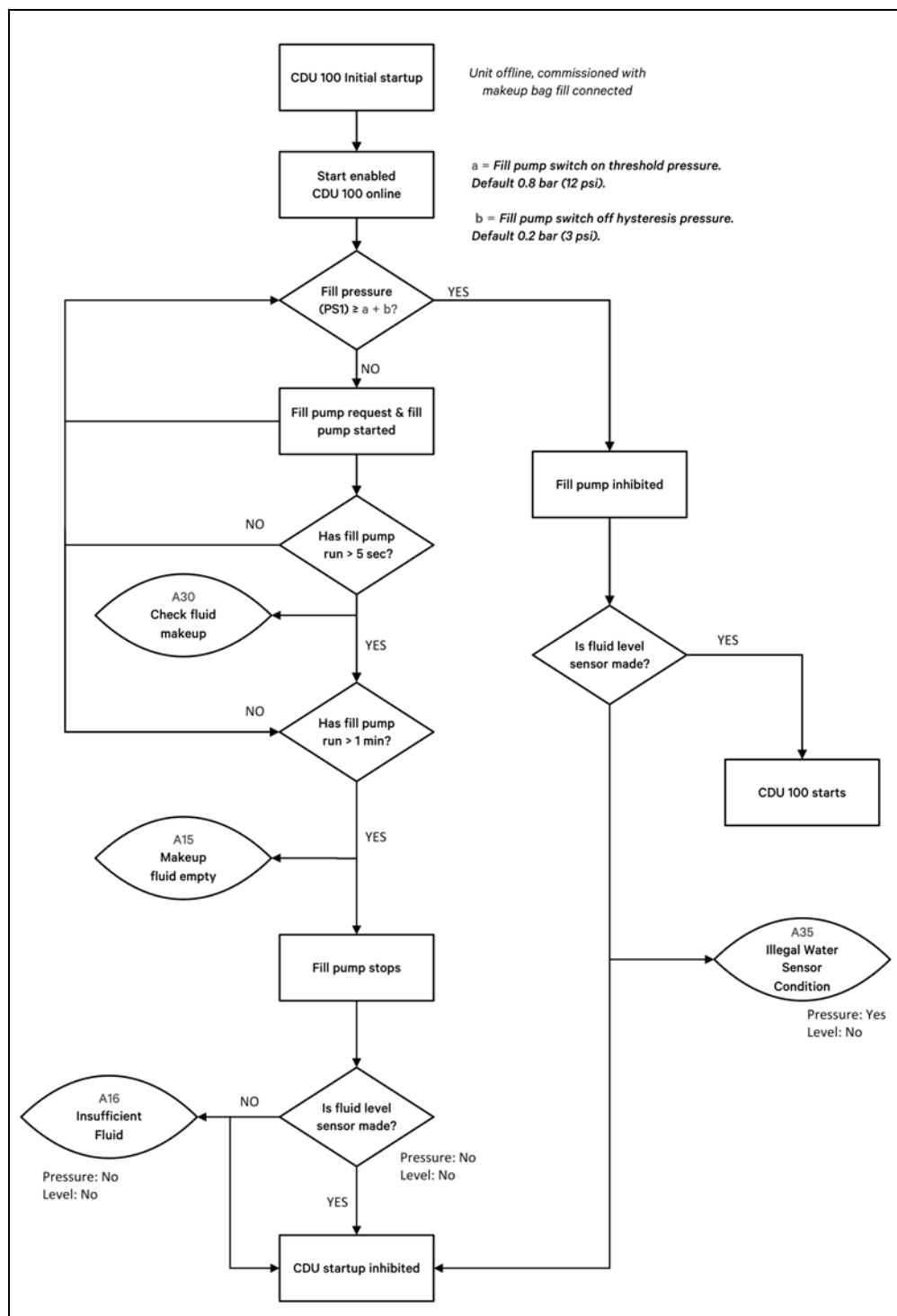


Figure 4.14 Fill Pressure and Level Flow Charge (When Running)

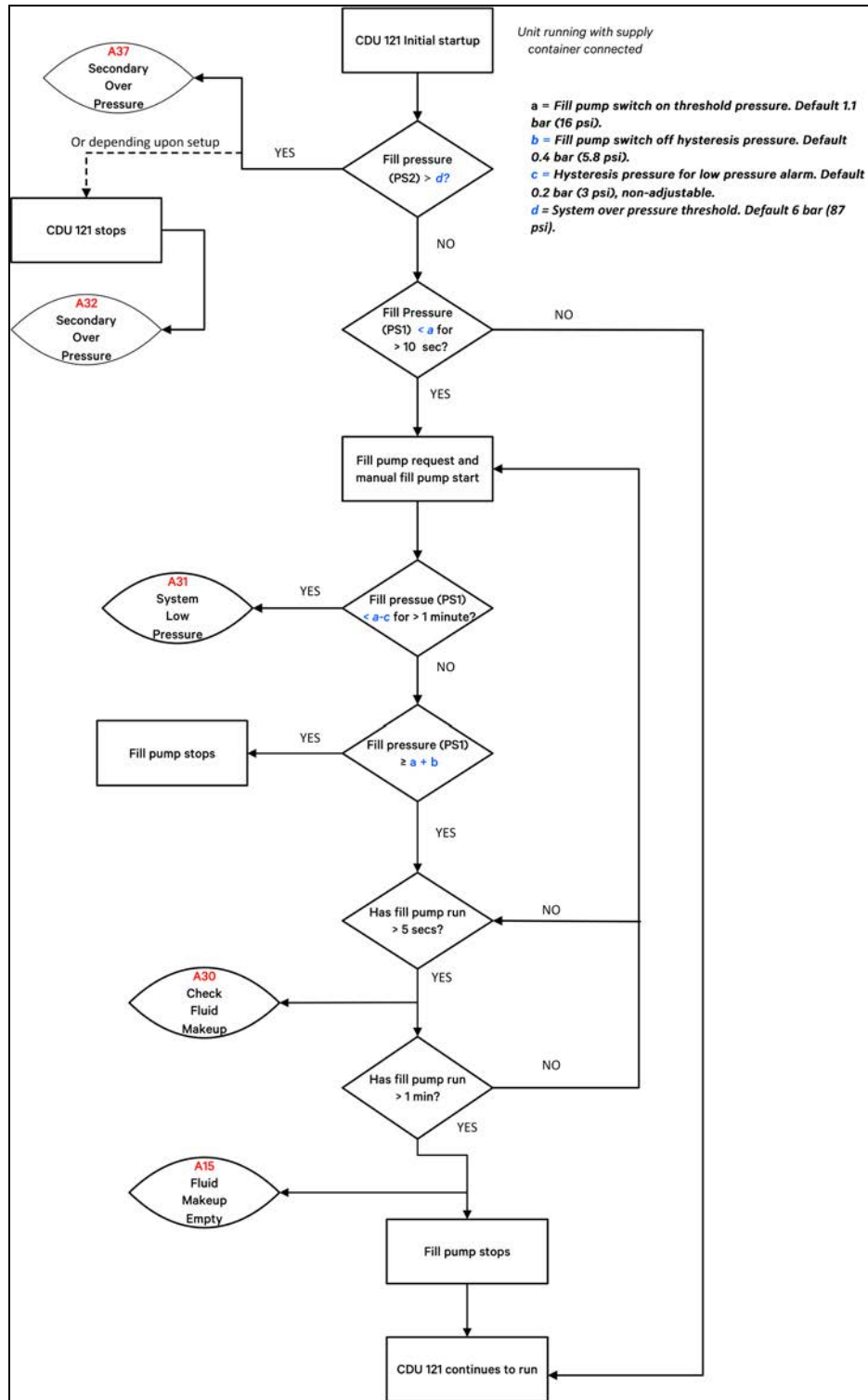
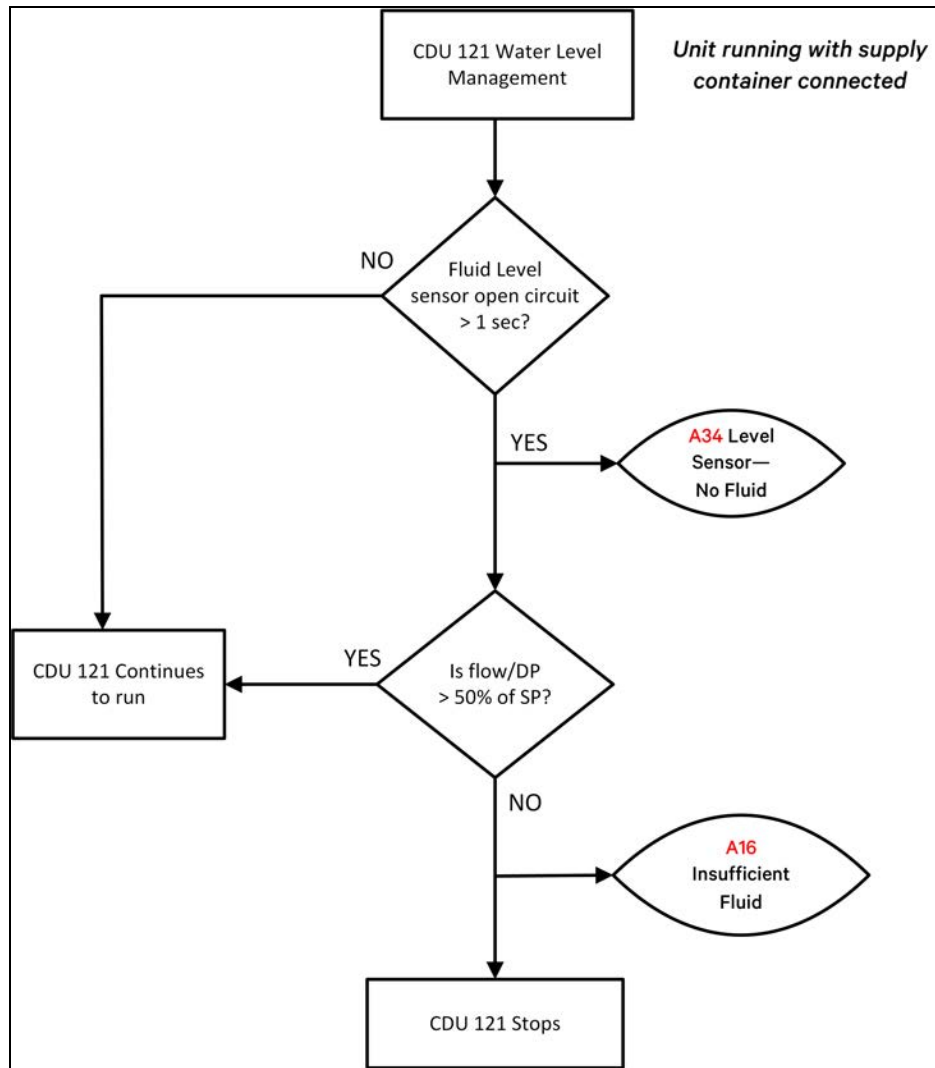


Figure 4.15 Fluid Level Management (When Running)

Pump flow/pressure performance (pump speed) can be controlled through either a flow or differential pressure control loop depending on configuration (see **Table 4.18** on page 25).

4.3.3 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 CDU 121. 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 demand in the default time period of 100 seconds, it is assumed there is a pump flow/pressure fault and an A17 - Pump Fault will be generated.

- The unit then continues to operate pump until faults are investigated and s are manually cleared.

The secondary fluid 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 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 temperature sensors go open circuit, then an A02 (A03 or A04) - T2a (T2b or T2c) Secondary Temperature Sensor Fault 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 45 °C (113 °F) and is used by the control loop to regulate the primary fluid 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 s 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 Fluid Low Temp is generated. This 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 Fluid High Temp is generated. This remains present until the temperature falls below the hysteresis value.
- The high and low temperature s 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 temperature/humidity sensor 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 0.4 bar (5.8 psi) for Filter 1, then an A38 - Secondary Filter Dirty 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.

Primary Circuit Operation

The primary fluid temperature (T1) is monitored at the inlet to the Vertiv™ CoolChip CDU 121 cabinet.

- If the primary temperature falls below default 4 °C (40 °F), an A22 - Primary Fluid Low Temp is generated. This remains present until the temperature rises above the default 1 °C (2 °F) reset hysteresis.
- If the primary temperature rises above default 30 °C (86 °F), an A23 - Primary Fluid High Temp is generated. This remains present until the temperature falls below the default 1 °C (2 °F) reset hysteresis.
- The high and low temperature s are ignored for a default 20 minute period on startup to allow the system time to settle without generating nuisance s.

The temperature PID control loop is operational 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 the control valve starts to open to allow more primary cooling fluid 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](#) on page 11 or [Status Screen](#) on page 13. 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. In the event the positioning signal is lost, it returns 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 CDU 121 unit. It does not monitor the flow rate through the heat exchanger.

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

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 occurs, a flashing bell icon immediately break through at the top right corner of the Home screen, with the number of active s stated below.

Figure 4.16 Control Screen Indication

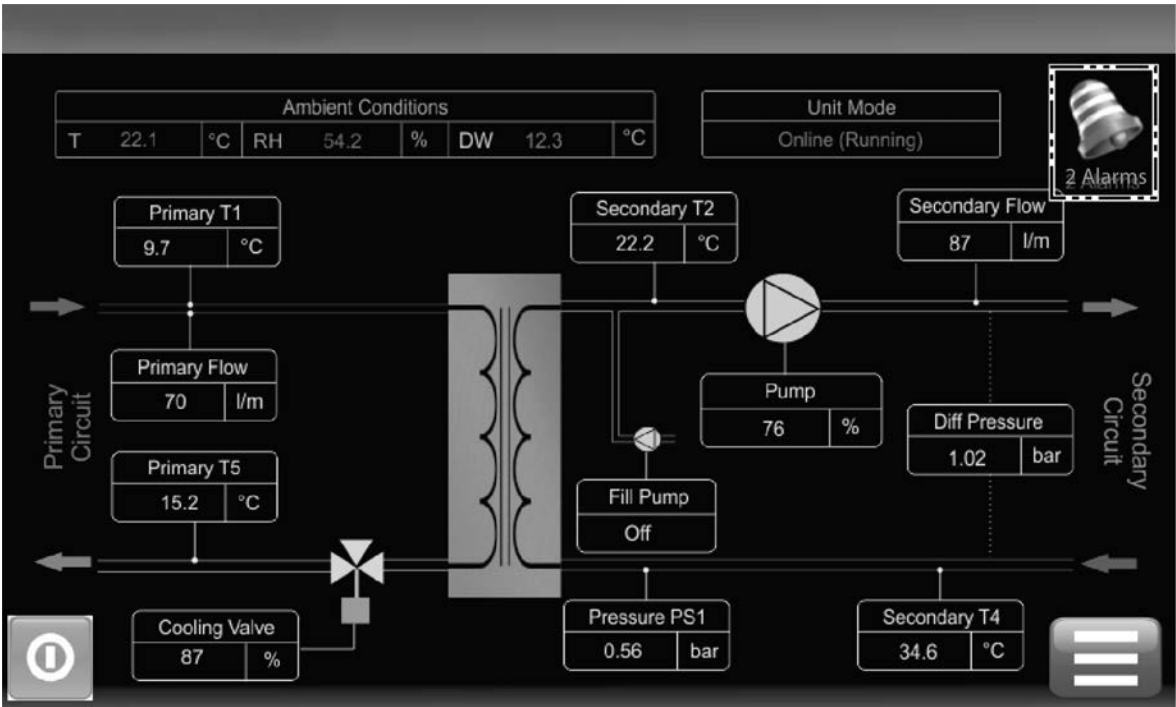


Figure 4.17 Control Screen Active Alarms



The descriptions may be accessed by selecting the vertical columns where the s appear (as shown in Figure 4.18 on the facing page).

Figure 4.18 Control Screen identification



Access the descriptions by selecting the columns where the **s** appear.

Some alarms self-clear if the condition is transient. For example, a temperature goes over an 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 **s** needs to be cleared manually while logged on at the service level or higher by pressing Clear **s** as shown in **Figure 4.17** on the previous page and **Figure 4.18** above.

The self clearing and latching **s** are identified in [Troubleshooting Alarms](#) below.

All alarmss are automatically logged in an 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 4.36 on the next page provides the full list of alarmss. 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 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 . Immediate investigation required, prepare to shutdown IT, if required.
3. Non-urgent . 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 4.36 Code Severity Classifications

Code	Description	Severity	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*					
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	3	✓	—	—	—
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	3	✓	—	—	—
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	3	✓	—	—	—
Detail	Reading from Room humidity sensor RH is outside the normal range of 5 to 100% RH or disconnected .8 °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 4.36 Code Severity Classifications (continued)

Code	Description	Severity	Self-Clear	Latching	Shutdown	Delay
A10	PS2 Secondary Pressure 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	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 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	3	✓	—	—	—
Detail	Secondary flow meter output exceeds range.					
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 exceeds range.					
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	Fluid 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 P101 has not been achieved. Also activated when level switch remains open and system pressure has not been achieved (accompanied by an A16 - Insufficient Fluid Level).					
Action	Check the make up fluid container is full, tubes are free of air locks, container is properly connected, and fill pump is operational. Check system for leaks.					
A16	Insufficient Fluid Level	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 Fluid Detected (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 fluid 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 1 Fault	2	✓	—	—	—
Detail	Pump is drawing excessive current, or inverter has been subjected to over/under voltage. 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.					
A18	Pump 2 Fault	2				

Table 4.36 Code Severity Classifications (continued)

Code	Description	Severity	Self-Clear	Latching	Shutdown	Delay
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	Pump Shutdown	1	—	✓	—	—
Detail	Pump is drawing excessive current, or inverter has been subjected to over/under voltage. 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. 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. See 28					
A21	Primary Fluid Low Flow	2	—	✓	—	—
Detail	Will only activate when valve demand is at 100%, A25 - Secondary Fluid High Temp is active, and Primary Fluid temperature is within specified limits. (A default 5 minute delay applies.)					
Action	Check operation of control valve. Check chilled fluid supply flow rate. Ensure system heat load does not exceed the CoolChip CDU100 capacity. Check that Primary flow is sufficient for heat load. Refer to the Vertiv™ CoolChip CDU 121 Application and Planning Guide #SL-80276 .					
A22	Primary Fluid Low Temperature	3	✓	—	—	✓
Detail	Primary fluid temperature has dropped below the default 4 °C (40°F) threshold. will cancel when temperature rises to 5 °C (42 °F) or more. (A default 2 minute delay applies).					
Action	Check chilled fluid supply					
A23	Primary Fluid High Temperature	2	✓	—	—	✓
Detail	Primary fluid temperature has risen above the default 30 °C (86 °F) threshold. will cancel when temperature falls to 29 °C (84.2 °F) or less. (A default 2 minute. delay applies).					
Action	Check chilled fluid supply.					
A24	Secondary Fluid Low Temperature	2	✓	—	—	✓
Detail	Secondary Fluid Low Temperature					
Action	Secondary fluid temperature has dropped by more than 2 °C (4 °F) below setpoint (default). will cancel when temperature rises to 1 °C (2 °F) below setpoint or higher. If Dew Point Offset is active, then this will only activate when at or below dew point for a period of 3 minutes or more. A default 2 minute delay applies.					
A25	Secondary Fluid High Temperature	2	✓	—	—	✓
Detail	Secondary fluid temperature has risen by more than 2 °C (4 °F) above setpoint (default). will cancel when temperature falls to 1 °C (2 °F) above setpoint or lower. If Dew Point Offset is active, then this will activate at a pre-set default value of 20 °C (70 °F). A default 2 minute delay applies.					
Action	Check operation of control valve					
A26	Fluid Detected (Internal Leak)	1	—	✓	✓ (or 0) —	✓
Detail	Leak tape in unit drip tray has detected a substantial fluid leak. Event may be set for Only (default) or + Unit Shutdown.					

Table 4.36 Code Severity Classifications (continued)

Code	Description	Severity	Self-Clear	Latching	Shutdown	Delay
Action	Identify and repair leak. NOTE: A leak of this magnitude does not bring up any other s would likely be from the primary circuit.					
A27	Secondary Over Pressure O	2	✓	—	—	—
Detail	Pressure at PS3 has increased above the set value of 6 bar (87 psi) (default). This is only active if unit has been configured for only. See Table 4.18 on page 25					
Action	Most likely cause is excessive heat build-up in the system or a breach between Primary and Secondary circuits within the plate heat exchanger. Check for High Temp s, check bladder in expansion vessels has not ruptured, relieve pressure at drain point. Remove heat exchanger and replace.					
A28	Fluid Detected (Internal Leak)	1	—	✓	✓ (or —)	—
Detail	The fluid detection tape installed under the floor to the Primary circuit (if fitted, optional extra) has detected a substantial fluid leak. may be set for Only (default) or + 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	Fluid 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 fluid leak. may be set for Only (default), or + Unit Shutdown					
Action	Identify and repair leak. NOTE: A leak of this magnitude that does not bring up any other s would most likely be from the Primary circuit.					
A30	Check Fluid 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 1.1 bar (16 psi) for more than 10 seconds, while unit is running in automatic/online mode)					
Action	Check amount of fluid in mak-up container and re-fill if necessary with treated fluid. 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/online 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	Secondary Over Pressure (+ Shutdown)	1	✓	—	✓	—
Detail	Pressure at PS2 has increased above the set value of 6 bar (87 psi) (default). This is active if the unit has been configured for + Shutdown only. See Configuration Screen on page 24.					
Action	Most likely cause is excessive heat build-up in the system or a breach between Primary and Secondary circuits within the plate heat exchanger. Check for High Temp s, check bladder in expansion vessels has not ruptured, relieve pressure at drain point. Remove heat exchanger and replace.					
A33	Primary Fluid No Flow	2	—	✓	—	—
Detail	Activates only when Valve Demand is at 100%, A32 - Secondary Fluid High Temp and A30 - Primary High Temp s are active. (A default 5 minute delay applies).					

Table 4.36 Code Severity Classifications (continued)

Code	Description	Severity	Self-Clear	Latching	Shutdown	Delay
Action	Check that the chiller or facility water supply is operational and fault free.					
A34	Level Sensor—No Fluid Detected	2	✓	—	—	—
Detail	While Unit is Running: If level sensor is open circuit for more than 1 second, this will be raised, provided that flow or DP (depending on control function set) is >50% of flow/DP setpoint. If flow/DP is below this threshold, then an A16 - Leak Shutdown/Insufficient Fluid will be raised and unit will shutdown after a 1 second delay. Refer to A16 for detail.					
Action	Check that fluid 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 Fluid Sensor Condition	2	✓	—	—	—
Detail	On Initial Startup: if fill pressure has been achieved, but level sensors are not made.					
Action	Replace level sensors					
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 0.4 bar (5.8 psi), indicating that the filter must be cleaned. Default 60 second delay applies.					
Action	Clean filter screen as described in Maintenance on page 55.					
A40	Secondary Temp T2a Diff Fault	3	✓	—	—	—
Detail	Difference between Secondary temperature 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 T2b sensors against Figure 4.19 on page 48 and replace if faulty.					
A41	Secondary Temp T2b Diff Fault	3	✓	—	—	—
Detail	Difference between Secondary temperature. 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 4.19 on page 48 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 4.19 on page 48 and replace if faulty..					
A43	Pump 1 Communication Fault	2	✓	—	—	—
Detail	Loss of communication between controller and Pump 1 inverter drive via RS485/Modbus interface					
Action	Check communication cables, verify inverter power, check for protocol errors					

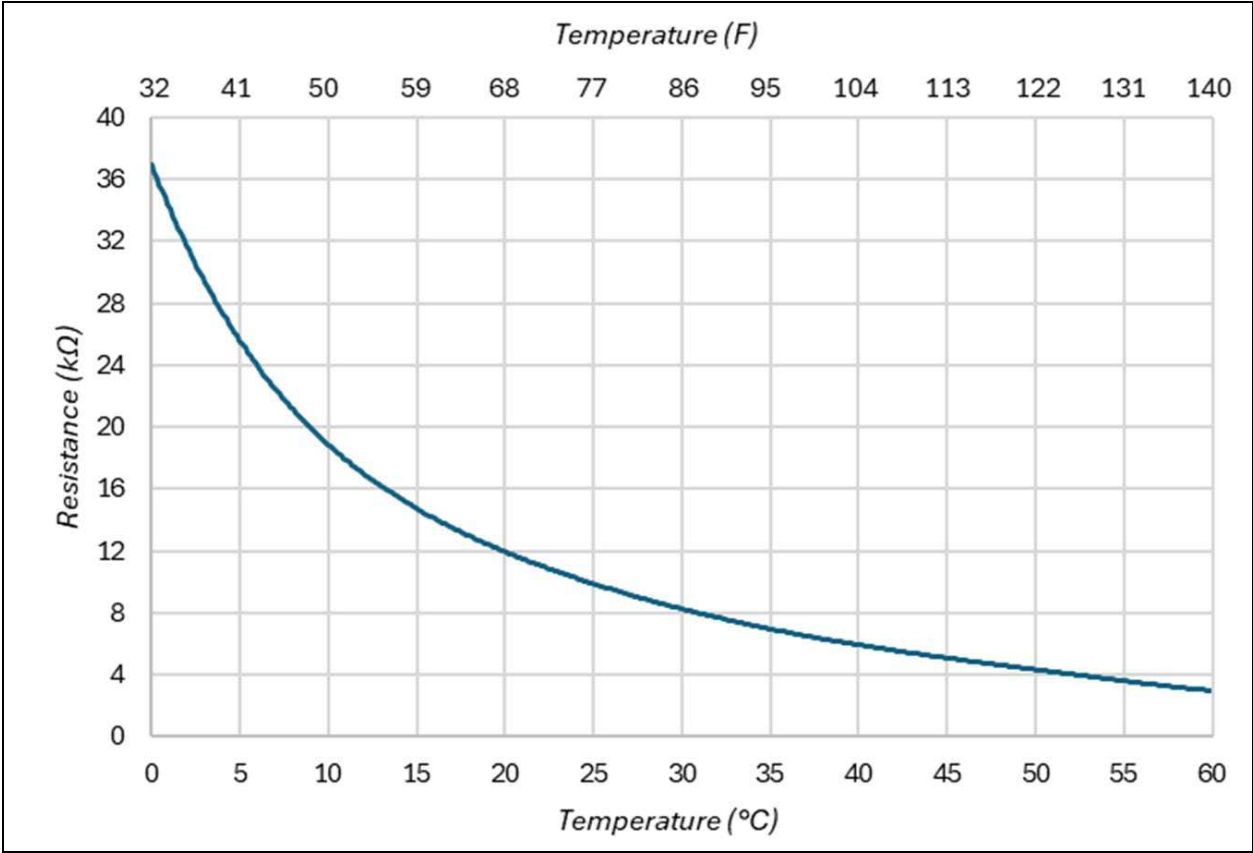
Table 4.36 Code Severity Classifications (continued)

Code	Description	Severity	Self-Clear	Latching	Shutdown	Delay
A44	Pump 2 Communication Fault	2	✓	—	—	—
Detail	Loss of communication between controller and Pump 2 inverter drive via RS485/Modbus interface					
Action	Check communication cables, verify inverter power, check for protocol errors					
A45	Pump 1 Low Flow	2	✓	—	—	—
Detail	Pump 1 operating but not achieving required flow rate setpoint within specified time limit					
Action	Check for system blockages, verify pump mechanical condition, check inverter drive operation					
A46	Pump 2 Low Flow	3	✓	—	—	—
Detail	Pump 2 operating but not achieving required flow rate setpoint within specified time limit					
Action	Check for system blockages, verify pump mechanical condition, check inverter drive operation					
A47	microSD Card Full					
Action	microSD card storage capacity has reached maximum, preventing further data logging					
Detail	Replace microSD card or clear historical data					
* may not be active depending upon unit configuration.						

4.7 Temperature Sensor Graph

Figure 4.19 below may be used to check the validity of any of the temperature sensors used in the unit or the remote room sensor.

Figure 4.19 Temperature Sensor Resistance Graph

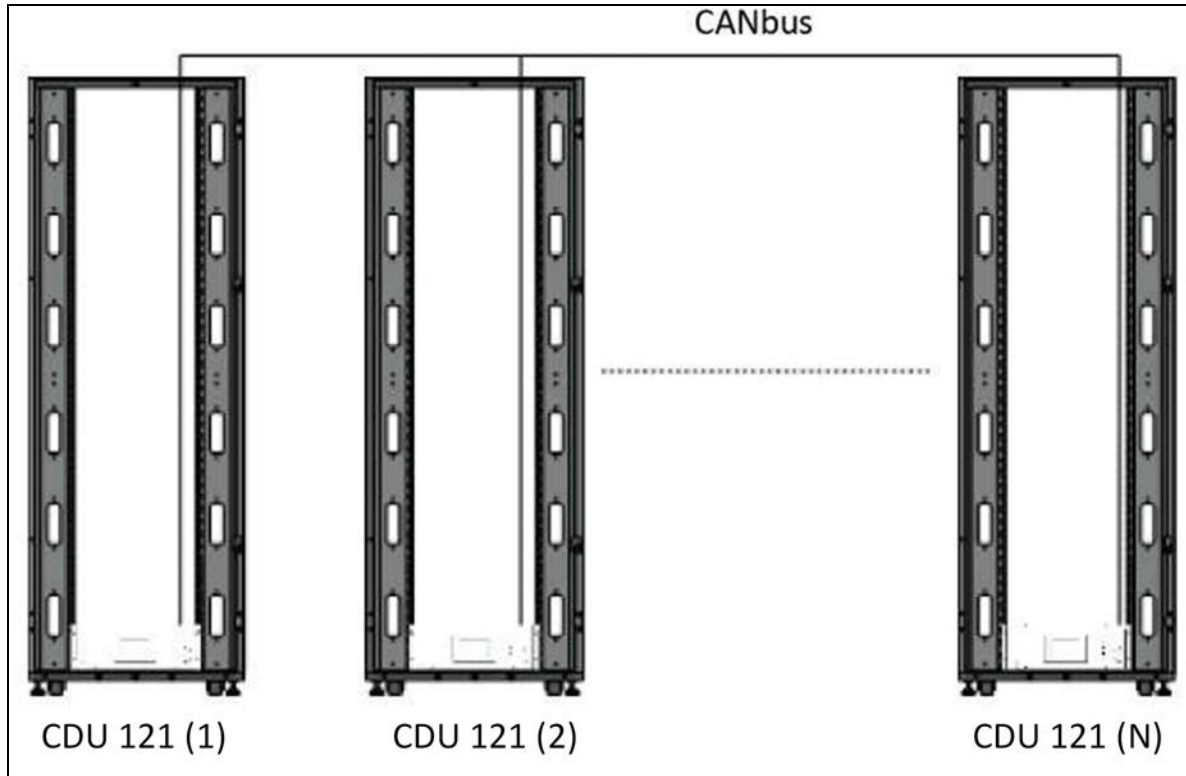


4.8 Group Control

This section should only be considered if there are more than one Vertiv™ CoolChip CDU 121 units installed per system.

Groups of up to 4 Vertiv™ CoolChip CDU 121s 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 4.20 Vertiv™ CoolChip CDU 121 Group Control



4.8.1 Group Control—Network Cabling

CANbus is used for communication between CoolChip CDU 121 units for group control. CANbus always requires at least 3 conductors: 2 signal wires (CAN H and CAN L) and a 1 signal return path.

The CoolChip CDU 121 provides 1 CAN L, 1 CAN H and 1 ground terminal on sockets SK1, 10, 11 and 12.

Belden 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.

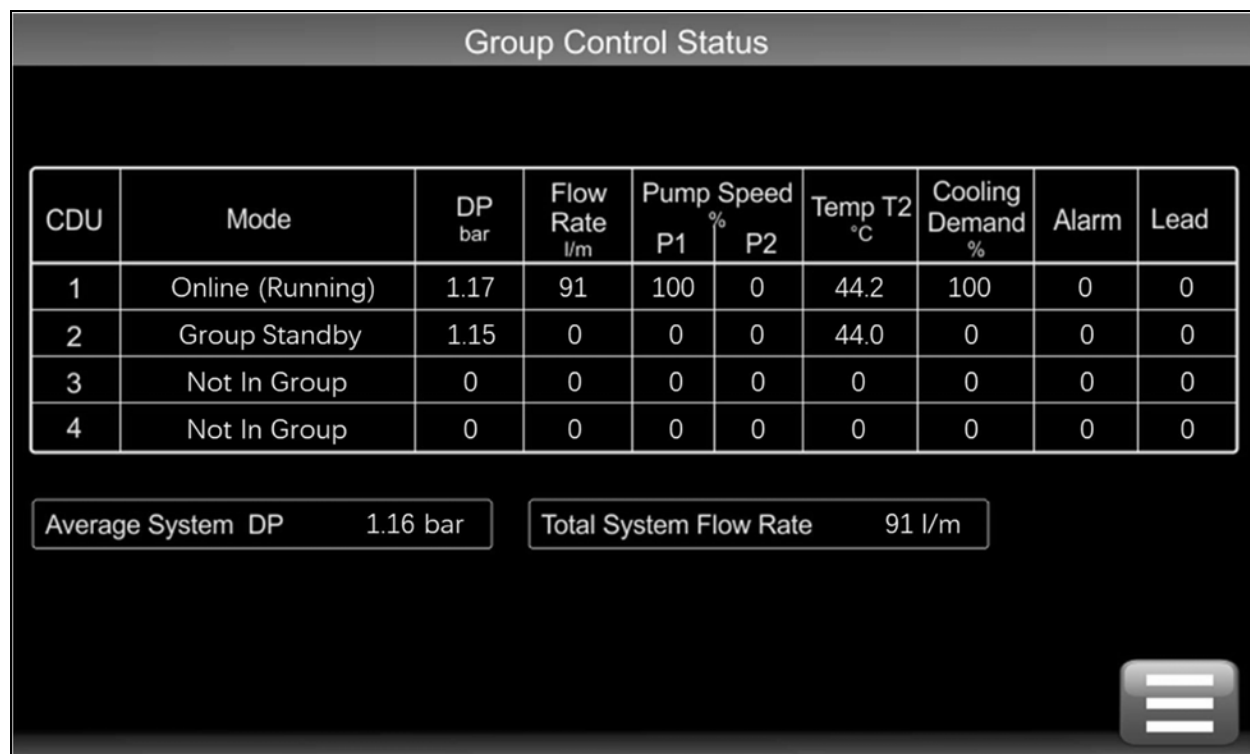
Figure 4.21 Group Control Wiring Configuration

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
- conditions

Changes to the group settings or system settings can be made via any CoolChip CDU 121 touchscreen user interface at any time and are automatically synced across the network.

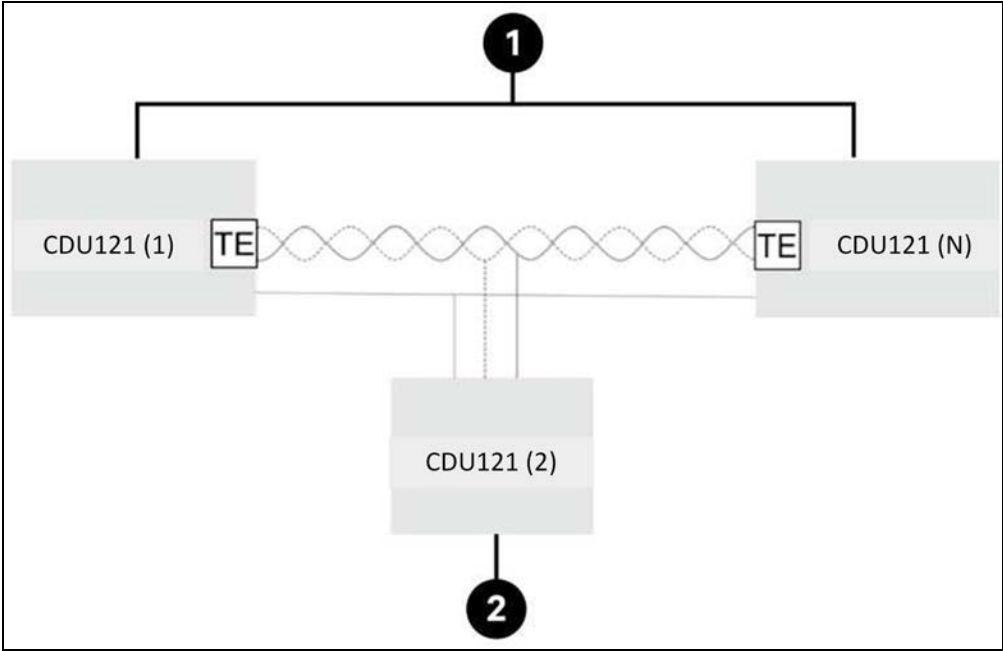
Figure 4.22 Group Control Status Screen



4.8.2 Group Control—Network Termination Resistors

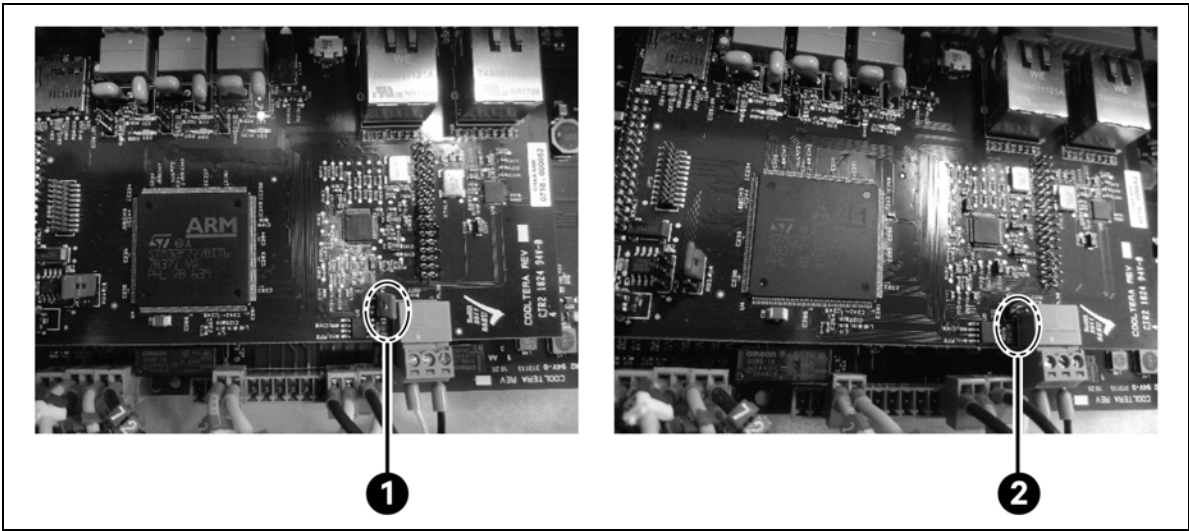
The CoolChip CDU 121 controller includes an onboard 120 ohm resistor which can be activated by fitting a hardware jumper. If only one CoolChip CDU 121 unit is installed, the resistor does not require activation. For a two unit installation, both units should have the termination resistors enabled. For 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 4.23** on the facing page and **Figure 4.24** on the facing 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 4.23 CANbus Network Termination Resistors



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

Figure 4.24 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 CDU 121 must be given a unique address. A CoolChip CDU 121 network addresses should be allocated to each unit in ascending order, starting from 1.

The CoolChip CDU 121 network address is configured via Setup screen > Unit Address (P081). Configure each CoolChip CDU 121 so that it is aware of the other CoolChip CDU 121 devices on the network:

- Enter the total number of CoolChip CDU 121 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 CDU 121s 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 CDU 121 (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 CDU 121 modulates its pump speed to maintain a differential pressure setpoint. The differential pressure setpoint default is an average over all the individual running CoolChip CDU 121 differential pressure readings. This can be changed to the differential pressure over all CoolChip CDU 121 in the group in Seh1p/Group Control/P094 regardless if they are running. All CoolChip CDU 121 units work in parallel and set their pump speeds to be identical with that of the lead CoolChip CDU 121.

Each CoolChip CDU 121 modulates its own primary (facility) fan speeds to maintain a group wide IT supply fluid temperature setpoint. Each CoolChip CDU 121 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 CDU 121 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 CDU 121 units are configured in N, meaning all CoolChip CDU 121 units are set to run with no CoolChip CDU 121 redundancy. Additionally, they are configured to activate the standby pump when an Vertiv™ CoolChip CDU 121 failure or power-off occurs. The pump reduction (or failure) offset is applied to the system pump speed when there is a CoolChip CDU 121 failure (shutdown) or the unit is switched off. Starting the standby pumps in the running Vertiv™ CoolChip CDU 121s 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 CDU 121 will be established for each new grouping of units. When communication is re-established, the original lead CoolChip CDU 121 will take control. See **Figure 4.25** below. If only the lead CoolChip CDU 121 loses communication, the next CoolChip CDU 121 will take over the lead role. When the previous lead CoolChip CDU 121 communication is re-established, it will not take over the lead role again. See **Figure 4.26** on the next page.

Figure 4.25 General Communication Failure

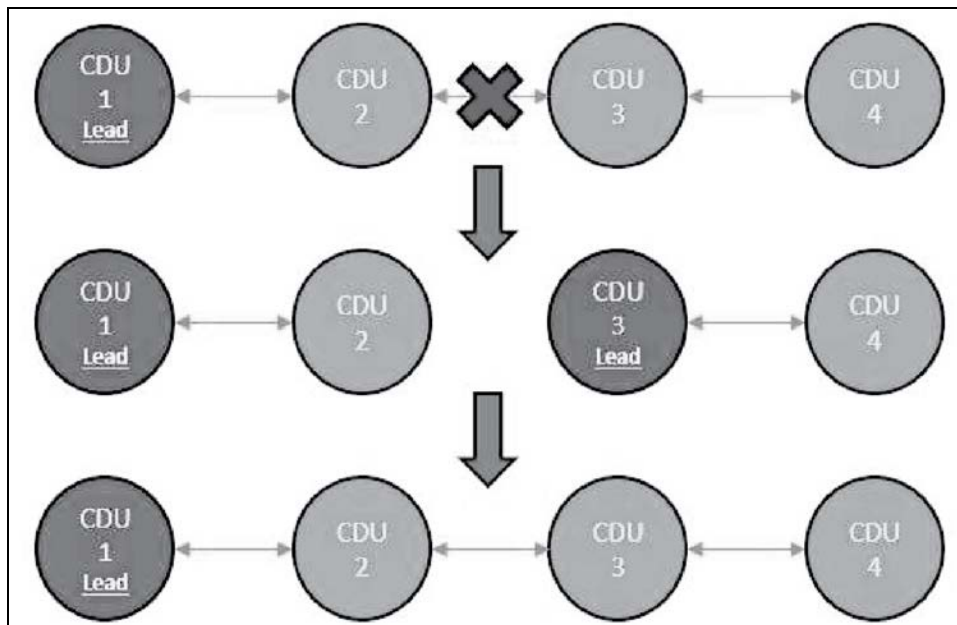
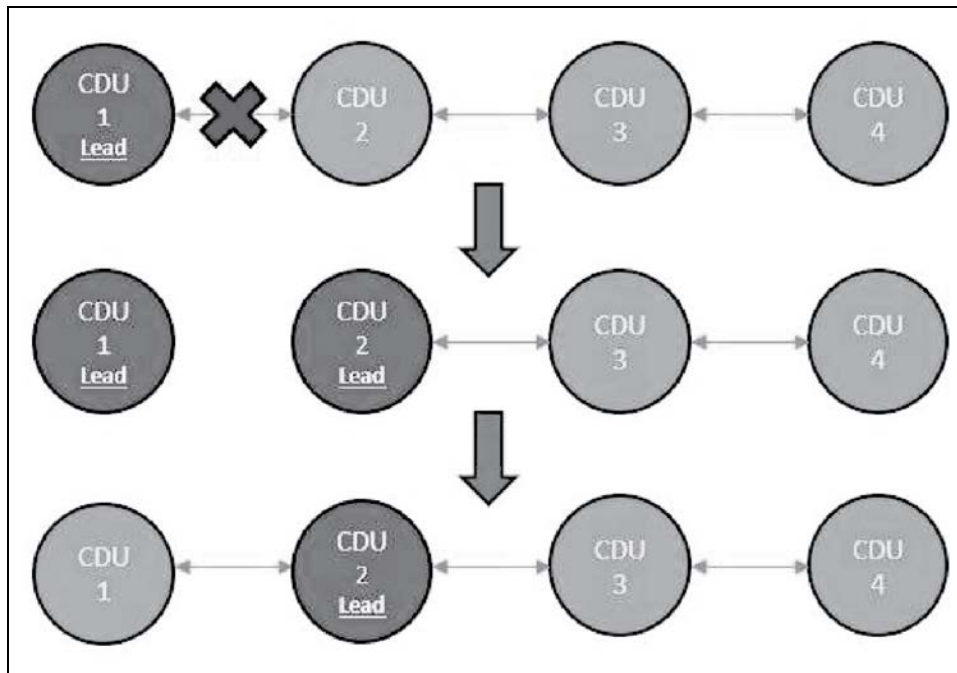


Figure 4.26 Lead Communication Failure

In the event of a sensor failure, all sensors related to control (PS1, PS2 and T2) are redundant at the CoolChip CDU 121 level, so a single sensor failure will not impact the operation or the status of the CoolChip CDU 121. So, if the lead CoolChip CDU 121 does have a sensor failure it will not result in a change of lead.

5 Maintenance

5.1 General

The CoolChip CDU 121 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

5.2.1 Primary Circuit

The CoolChip CDU 121 is designed for use with a facility supply of plain water or up to 40% glycol/water. If a higher concentration of glycol is used, then the cooling capacity of the unit may have to be de-rated, contact Vertiv..

5.2.2 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. In the first year, planned maintenance service can be operated in conjunction with [Routine Maintenance](#) on the next page..

Planned maintenance services first 3 months

- Check CoolChip CDU 121 valve operation, with necessary parameter adjustment
- Check valve demand and feedback
- Check for any current s, correct and clear
- Download historic and event logs. See [Accessing and Downloading Log Files \(Remote Log Retrieval\)](#) on page 81.
- Check that T2a, T2b and T2c difference is 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 that the 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 CDU 121 switch off, using backup CoolChip CDU 121 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

5.4 Routine Maintenance

Routine maintenance is scheduled maintenance carried out to ensure proper system operating and avoid any unscheduled breakdown and downtime.

5.4.1 Monthly Maintenance

Table 5.1 Monthly Maintenance

Item	Issue	Resolution
Filter	Check that the filter is not dirty, clogged or damaged.	Clean or replace the filter.
Pump	Check that the pump is free from rust.	Remove the rust.
	Check that the pump is cosmetically intact and free of cracks and fluid leaks..	Retighten the joints or replace the pump.
	Check that the pump works properly without abnormal noise or vibration.	Contact technical support engineers. Professional personnel are required to shut down the unit for maintenance.
Plate heat exchanger	Check that the plate heat exchanger does not leak.	Replace the plate heat exchanger.

Table 5.1 Monthly Maintenance (continued)

Item	Issue	Resolution
Plate heat exchanger	Check that the plate heat exchanger does not leak	Replace the plate heat exchanger.
	Check that the thermal insulation foam of the plate heat exchanger is intact.	Repair or replace the damaged thermal insulation foam part.
Built-in Tank	Check that the built-in tank is free from corrosion and damage	Repair corroded and damaged parts of the built-in tank.
	Check whether the built-in tank is out of liquid.	When the liquid level is too low, replenish the fluid to the normal level in time.
Piping in the unit	Check that all valves at the pipe can be opened and closed properly to ensure smooth operation.	Restore all valves at the pipe to the normal operating status.
	Check that the pipe does not leak, rust, or deform.	Close related valves, drain the pipe, check for the leakage point, and repair or replace the damaged components.
	Check that the pipe does not vibrate or generate noise abnormally.	Tighten the supports.
Monitoring	Check that the screen is not erratic, black, or blank.	Replace the screen.
	Check that no alarm is displayed.	Locate the fault or contact technical support engineers.

5.4.2 Yearly Maintenance

Table 5.2 Yearly Maintenance

Item	Issue	Resolution
Fill Pump	Check that the coolant filling pump can be started properly, the coolant filling function is normal, and there is no abnormal noise or vibration..	Contact Vertiv technical support.
Expansion Vessel	Check that the expansion vessel chamber pressure is zero.	If the spool at the expansion vessel connection is leaking, replace the spool.
	Check that the expansion vessel chamber pressure is low (0 to 0.8 bar).	Fill the pressure of the expansion vessel to 0.8 bar.
	Check that the expansion vessel chamber pressure is high (> 0.8 bar).	Check that the three-way valve at the bottom of the expansion vessel is connected to the unit piping.
Working Fluid Sampling	Check that the secondary working fluid in the secondary circuit meets liquid quality requirements. See Liquid Quality Requirements on page 71.	Replace the secondary working fluid.
Pressure Relief Valve	Check the pressure relief valve is not damaged or leaking.	Tighten threads, replace gasket or replace the pressure relief valve.

Table 5.2 Yearly Maintenance (continued)

Item	Issue	Resolution
Temperature Sensor	Check that the sensor is not corroded or damaged.	If the sensor is corroded or damaged, replace it immediately and apply thermally conductive silicone again.
Pressure Sensor	Check that the sensor is not corroded or damaged.	If the sensor is corroded or damaged, replace it immediately.
Electrical Control	Checking circuit connectors for tightness. Check fuses and relays.	Tighten the connector or replace the device.

5.5 Secondary Filter Service

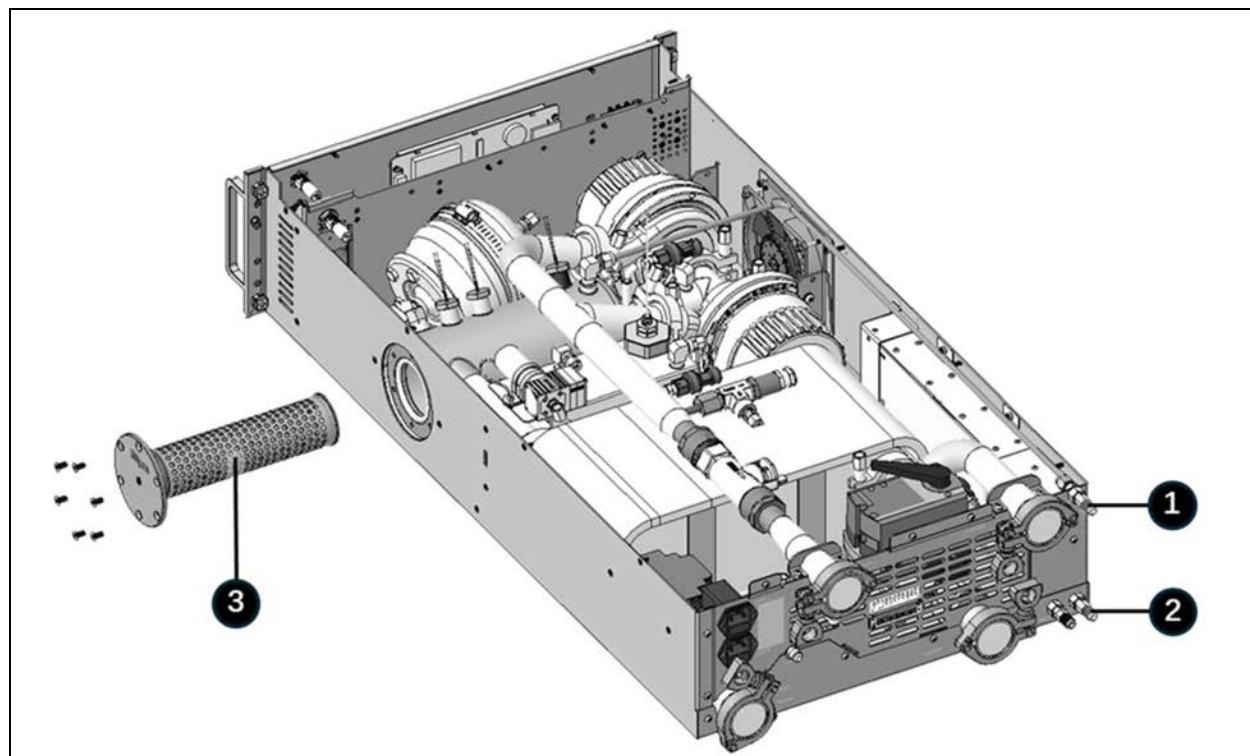
NOTE: The unit must be stopped before cleaning the filter and either partially or fully withdrawn from the rack.

The secondary filter may be removed and cleaned following this procedure:

1. Stop the unit.
2. Isolate the unit from external secondary circuit (with isolation valves or quick release couplings).
3. Drain the secondary circuit at the Schrader valve drain point located on the rear panel of the unit.

NOTE: After the pressure is released, the will be easier of the vent point is also opened.

4. Pull the unit forward from the rack far enough to gain access to the filter on the right side of the unit. See **Figure 5.1** below.

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 fluid is drained from the secondary circuit, the filter element can be removed from the unit by removing the 6 countersunk head retaining screws with the aid of the bolt in the clamp.

NOTE: The filter screen may be washed under a running water tap from inside to outside of the filter. 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 the above procedure. Ensure the fluid make up container is full, with additional treated fluid available. Re-filling will be 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.

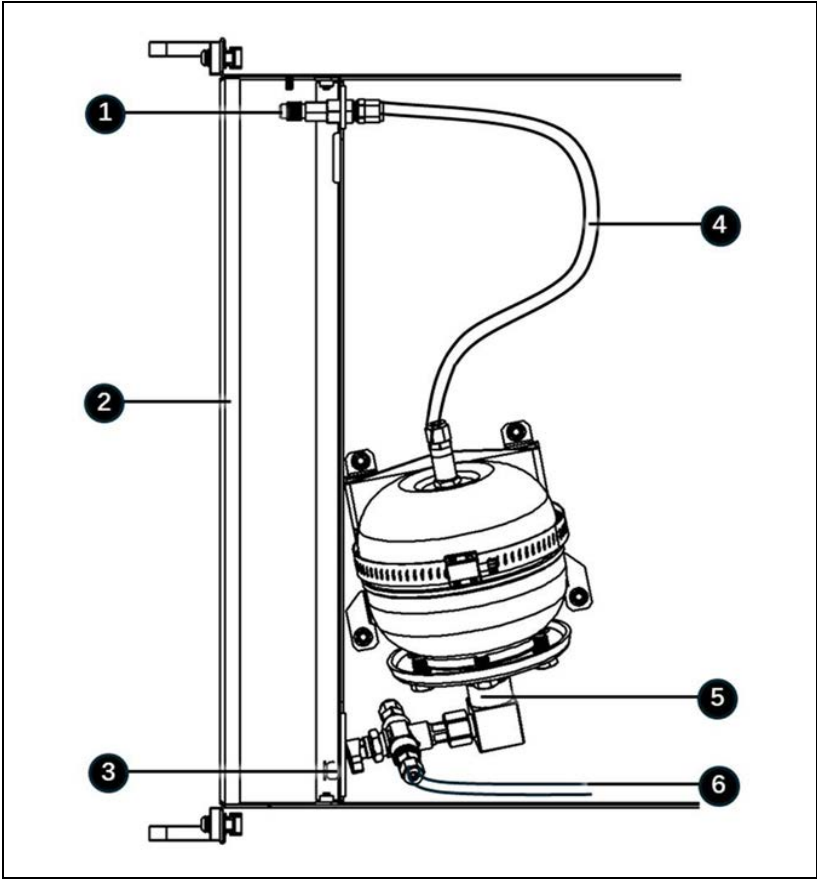
The fill pump will automatically stop when the reservoir tank is full, and the system is back to normal operating pressure.

5.6 Expansion Vessel Service

- Remove the front panel of the unit and connect the accessory drain valve to the bottom drain port of the expansion vessel.
- Manually rotate the flow switch of the expansion vessel to connect the coolant inside the expansion vessel to the drain valve. If the expansion vessel is normal and there is air pressure inside, the coolant will be discharged through the drain valve immediately.
- Connect the pressure measurement/air filling tooling to the air filling port on the top of the expansion vessel and check the air pressure between the bladder and the shell of the expansion vessel.
- If the internal air pressure of the expansion vessel is 0, consider whether the expansion tank is damaged.
- If the internal air pressure of the expansion vessel is less than 0.8 bar, then increase the air pressure to 0.8 bar by means of the pressure measurement/air filling tooling.
- Remove the pressure measurement/air filling tooling after filling is completed.
- Manually rotate the flow switch at the bottom of the expansion vessel to reconnect the expansion vessel to the system. Remove the drain valve and reset the display panel.

NOTE: The preset pressure of the expansion vessel is 0.8 bar, and the maximum pressure drop is 10 bar.

Figure 5.2 Servicing Expansion Vessel



Item	Description
1	Air filling port
2	Front panel of unit
3	Bottom drain port
4	Hose connecting expansion vessel and air filling port
5	Flow switch
6	Hose connecting flow switch and unit piping

5.7 Spare Parts

Contact Vertiv for spare parts requirements. Fuse specifications are provided in

Table 5.3 Fuse Specifications

Component	Technical Data	CDU121 AC Unit Qty	CDU121 DC Unit Qty
Fuse (FS3)	0.5A, 250Vac / 125Vdc	1	1
Fuse (FS2 & F3)	2A, 250Vac / 125Vdc	2	2
Fuse (FS1)	1.6A, 250Vac	1	1
Fuse (F4 & F5)	10A, 250Vac / 125Vdc	2	?? Need Value
Fuse (F2 & F1)	25A, 150Vdc	2	2

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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: Submittal Drawings

Submittal drawings referenced in this document are listed below and are presented in the order as mentioned within this document on the following pages.

Table B.1 Submittals

Document Number	Title
20000653	CoolChip CDU Standard Features
20000657	CoolChip CDU Electrical Connection DC Unit
20000659	CoolChip CDU Component Location Diagram DC Version
20000660	Ship Loose Accessories AC and DC Version
20000703	CoolChip CDU Connection Location DC Version
20000704	CoolChip CDU Electrical Connection AC Unit
20000705	CoolChip CDU Component Location Diagram AC Version

STANDARD FEATURES

Product description -

The Vertiv™ CoolChip CDU121 in-rack coolant distribution unit (CDU) provides effective separation of the facility fluid circuit and secondary fluid network via a liquid-to-liquid heat exchanger for single rack direct-to-chip cooling applications.

Twin pumps -

With single pump redundancy, provide maximum flow up to 120 liter/minute at external pressure drop of 1.15 Bar.

Controller -

Enables running in group control for multiple units via CANbus, to enable N+X redundancy design for larger installations. Provides data, alarm and system logging over the full product lifetime recorded to an on-board SD card.

Communications -

Modbus RS485, TCP/IP & BACnet communication with data center monitoring systems.

Alarms -

Provide full alarm monitoring for real-time status of the IT equipment and the local environment.

Redundancy -

Redundant pumps, inverters, critical temperature sensors, power supplies and ethernet communication ports.

Hygienic connections -

Sanitary flange and clamps enable easy installation, maintenance and retrofit of pipework parts.

Flow control -

Differential pressure control mode or flow rate control mode to suit various application requirements.

Display/HMI -

The Vertiv™ CoolChip CDU121 is provided with a 7" touch screen display with easily navigable intuitive menu structure.

Temperature and RH sensor - Room temperature and humidity are constantly monitored and utilized to determine dew point in the room for CDU dew point control mode.

Reservoir - Reservoir tank is used for system make up and to maintain system threshold pressure.

Water tanks and expansion tanks -

This unit is equipped with a built-in water tank with a capacity of 1.5 liters for convenient water replenishment. The expansion vessel can be maintained without stopping the unit.

Optional accessories -

This equipment is available with pressure relief valves of 3 bar or 4 bar for selection. Filters of 50µm or 25µm are available for selection.

ELECTRICAL CONNECTION

DC UNIT

For DC Input

The cable assembly busbar clip is used to connect the ORv3 busbar to achieve standardized connection of the OCP power distribution architecture. It is installed at the tail of the unit and the cable assembly is connected to the unit load.

Communication Options:

Ethernet redundant communication ports RJ45 (2) are provided on the bottom of the unit control panel, labeled ETHA & ETHB. Cat5e shielded cable should be used when wiring to these ports
Modbus over IP, Webserver, SNMP, CanBus, BACnet, Redfish, TCP/IP, SSH, DMTF compliant
RS-485 Modbus (terminals 8 & 9 on connector SK1).

Group Control Networking Cabling:

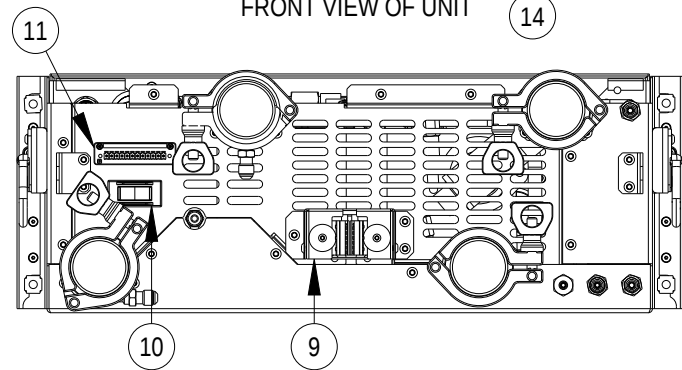
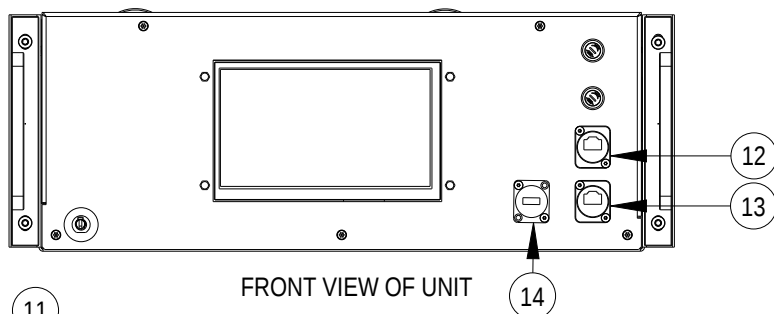
CANbus is used for communication between 4 CoolChip CDU121 units.
CANbus (terminals 10, 11 & 12 on connector SK1) cable requires 3 conductors terminals.
2 signal wires (CAN H and CAN L).
1 signal return path (GND).

Cable Type:

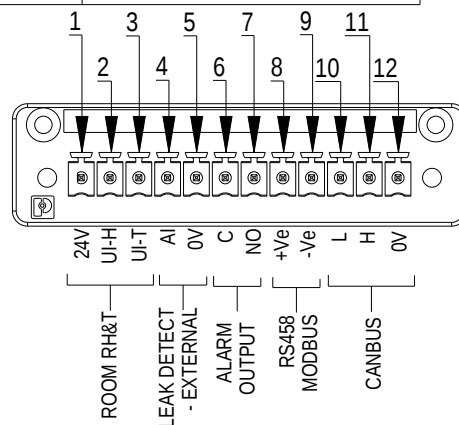
Beldon 3106A, or equivalent (1 pair +1, shielded 22AWG) is the recommended cable type to be used and pre-configured cable assemblies are provided with each CDU121 unit.

Leak Detection Tape:

A Leak detection tape (optional) can be connected to terminals 4 & 5 on SK1 for leak detection under the floor.



ITEM	DESCRIPTION
9	BUSBAR CLIP
10	BREAKER
11	TERMINAL POSITION FOR SK1
12	ETHERNET A
13	ETHERNET B
14	USB



NOTES :

1. FACTORY PROVIDE 10A FUSE FOR 110-120V AC AND 200-240V AC INPUTS.

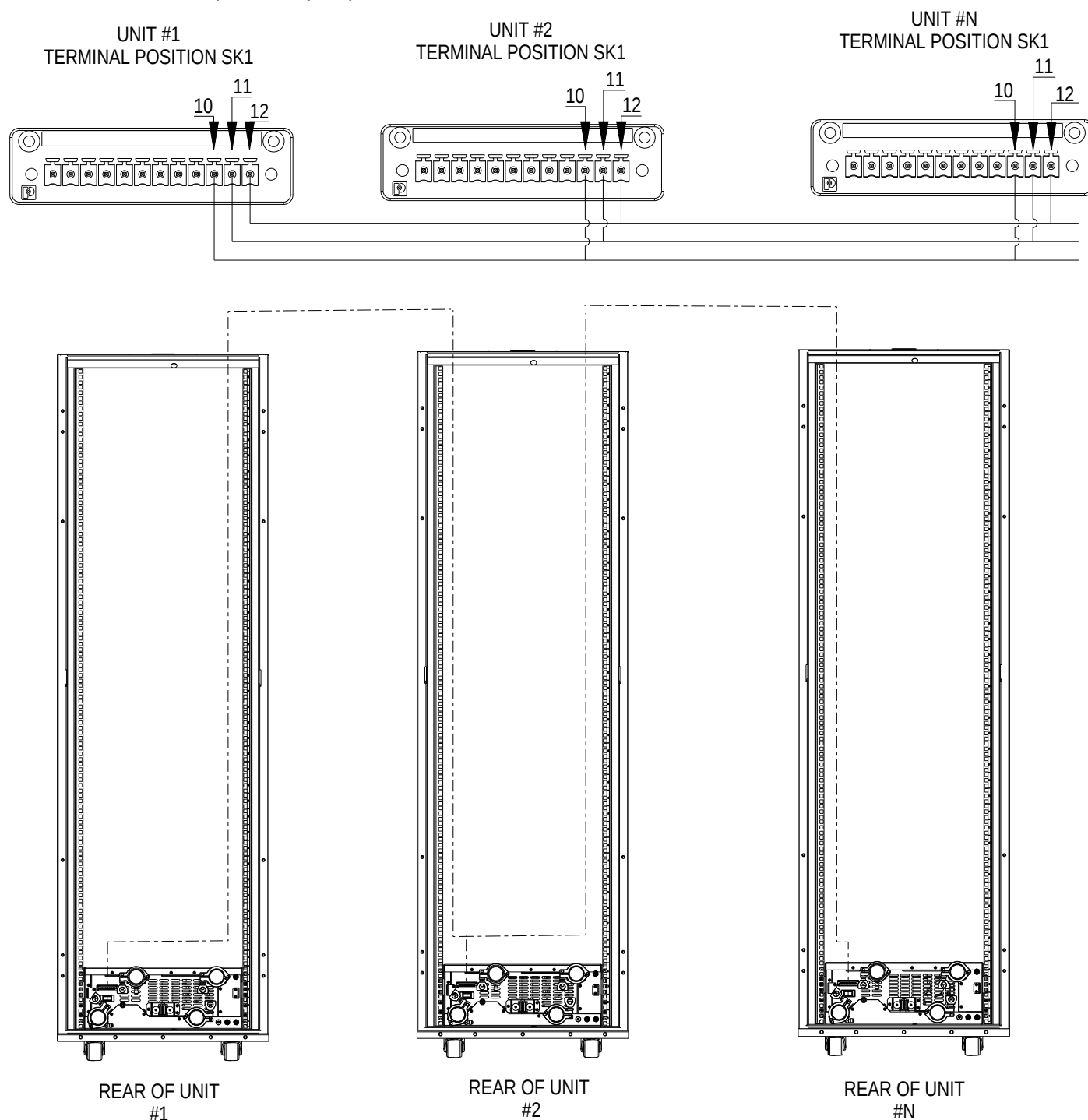
TERMINAL POSITION FOR SK1

ELECTRICAL CONNECTION

DC UNIT COMMUNICATION WIRING

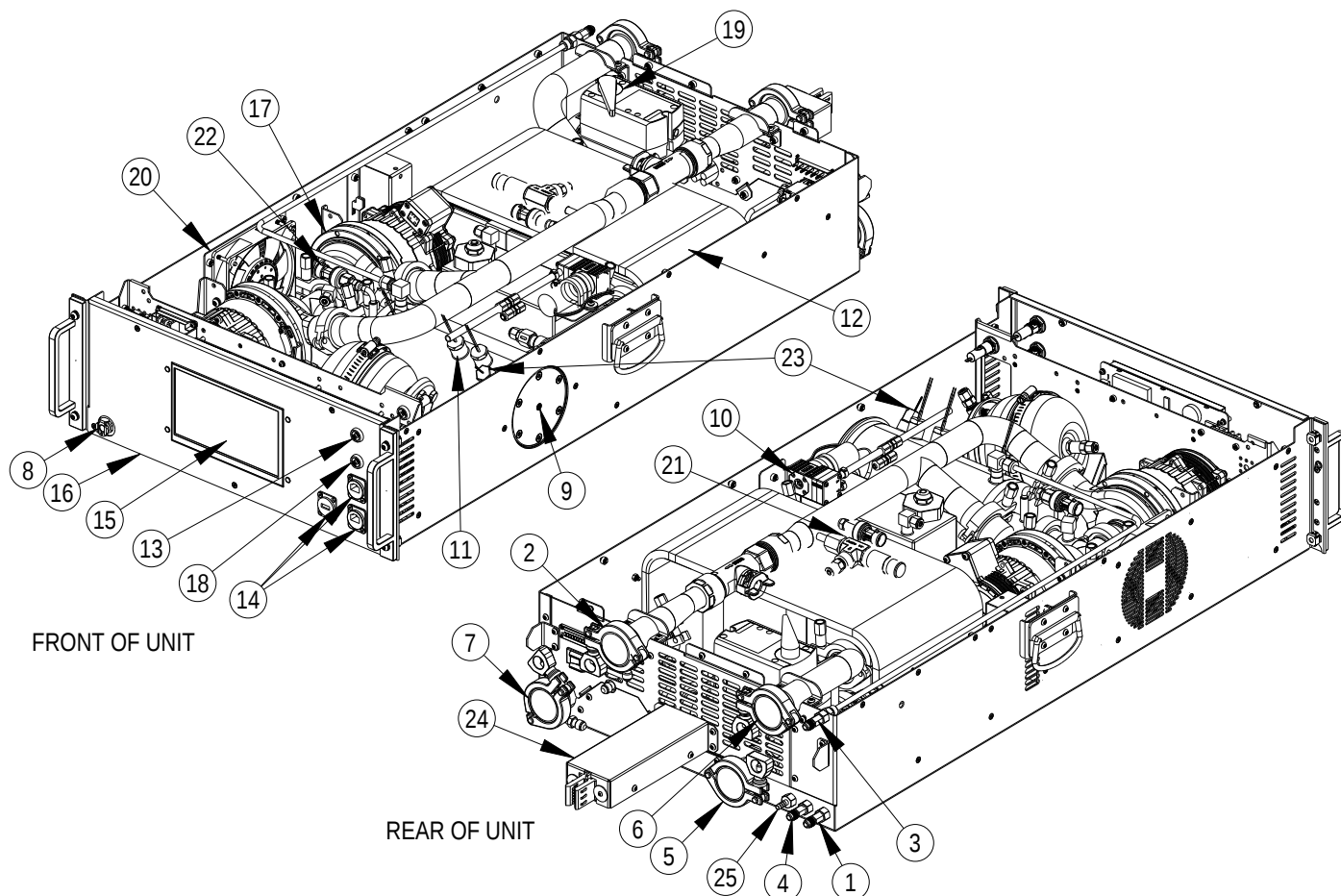
Connection Diagram for CANbus

Standard units can be connected/grouped/ teamed up to 4 units in a single group. More units can be connected upon factory request.



COMPONENT LOCATION DIAGRAM

DC VERSION



ITEM	DESCRIPTION
1	RESERVOIR/SECONDARY CIRCUIT DRAIN
2	SECONDARY CIRCUIT SUPPLY
3	RESERVOIR/SECONDARY CIRCUIT VENT
4	BUILT IN TANK VENT, NORMALLY OPEN
5	PRIMARY CIRCUIT RETURN
6	SECONDARY CIRCUIT RETURN
7	PRIMARY CIRCUIT SUPPLY
8	WATER MAKE UP CONNECTION
9	SECONDARY FILTER
10	FILL PUMP
11	SECONDARY SUPPLY TEMPERATURE SENSOR(REDUNDANCY)
12	HEAT EXCHANGER

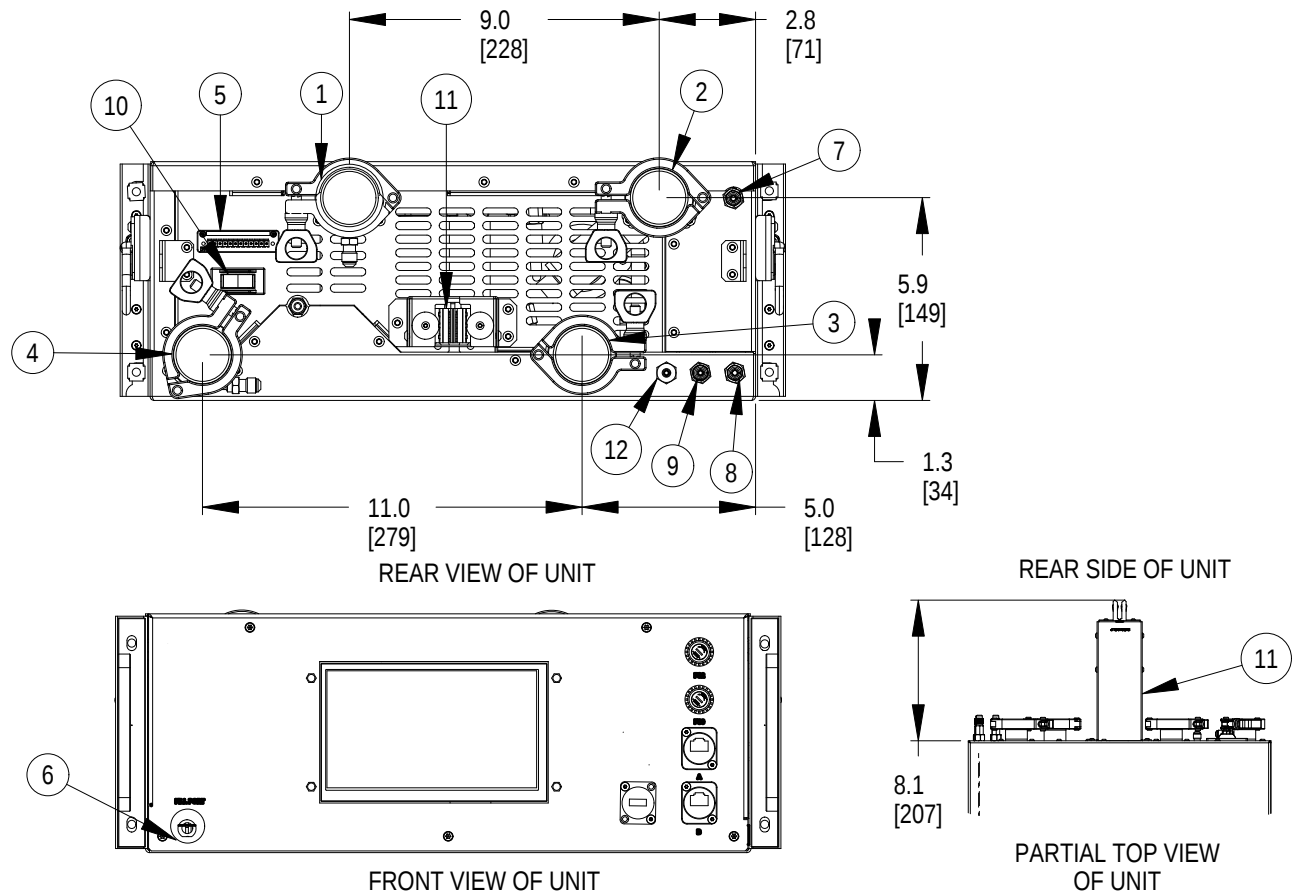
ITEM	DESCRIPTION
13	FUSE FS2 FOR FILL PUMP
14	DUAL ETHERNET (RJ45) AND USB CONNECTIONS
15	CONTROLLER 7-INCH TOUCHSCREEN DISPLAY
16	REMOVABLE FRONT PANEL
17	SECONDARY CIRCUIT PUMPS
18	FUSE FS3 FOR DISPLAY
19	PRIMARY 3-WAY CIRCUIT CONTROL VALVE & ACTUATOR
20	COOLING FAN
21	PRESSURE RELIEF VALVE
22	PRESSURE SENSORS
23	LEVEL SENSOR
24	DC BUSBAR CLIP
25	PRESSURE RELIEF VALVE VENT

COOLCHIP CDU

SHIP LOOSE ACCESSORIES AC & DC VERSION

Sr. No	Description	Unit	Quantity for AC Unit	Quantity for DC Unit
1	Main Unit Coolchip CDU121	Each	1	1
2	Filling hoses, with quick-disconnect male connector	Each	1	1
3	Temperature and humidity sensor	Each	1	1
4	Side handle (stainless steel 304) for rac installation	Each	2	2
5	Exhaust and drain tool valve	Each	1	1
6	CoolChip CDU121 Installation and Commissioning Guide (printed)	Each	1	1
7	CoolChip CDU121 Installation and Planning Guide (printed)	Each	1	1
8	CoolChip CDU121 Installation and Maintenance Guide (printed)	Each	1	1
9	CoolChip CDU121 AC/DC Wiring Diagram (printed)	Each	1	1
10	Fixing Nut (for rack installation)	Each	4	4
11	Fixing Bolt (for rack installation)	Each	4	4
12	AC Power cord C13-C14, 15m (length), color black	Each	2	-
13	DC busbar clip fixing screw	Each	-	7
14	DC busbar clip bracket	Each	-	1
15	DC busbar clip shell (96.6 mm length)	Each	-	1

CONNECTION LOCATION DC VERSION



ITEM	DESCRIPTION	CONNECTION SIZE
1	SECONDARY CIRCUIT SUPPLY	1.5IN SANITARY FLANGE
2	SECONDARY CIRCUIT RETURN	1.5IN SANITARY FLANGE
3	PRIMARY CIRCUIT RETURN	1.5IN SANITARY FLANGE
4	PRIMARY CIRCUIT SUPPLY	1.5IN SANITARY FLANGE
5	CONNECTORS FOR EXTERNAL TEMPERATURE/HUMIDITY SENSOR, EXTERNAL LEAK DETECTION TAPE RS485 AND CANbus COMMUNICATIONS	12 WAY CONNECTOR STRIP (SK1)
6	WATER MAKE-UP CONNECTION	1/4IN X HOSE BARB 1/8IN ID, CUT-OFF TYPE RS-PMCD-BS32 WITH 3.24MM ID
7	RESERVOIR/SECONDARY CIRCUIT VENT	SCHRADER VALVE M8
8	RESERVOIR/SECONDARY CIRCUIT DRAIN	SCHRADER VALVE M8
9	BUILT-IN TANK CIRCUIT VENT	M8 NORMALLY OPEN
10	CIRCUIT BREAKER	-
11	48V DC POWER INPUT	BUSBAR CLIP
12	PRESSURE RELIEF VALVE VENT	BARBED CONNECTOR (NORMALLY OPEN)

ELECTRICAL CONNECTION

AC UNIT

For AC Input:

The dual power cord feature allows the unit to be powered by two separate power sources.

The CDU will be supplied with two (2) detachable 6 ft (1.82 m) power cords that attach to two (2) IEC power inlets in the rear of the unit. Each power cord has a IEC 320-C14 plug at the opposite end.

Communication Options:

Ethernet redundant communication ports RJ45 (2) are provided on the bottom of the unit control panel, labeled ETHA & ETHB. Cat5e shielded cable should be used when wiring to these ports

Modbus over IP, Webserver, SNMP, CanBus, BACnet, Redfish

RS-485 Modbus (terminals 8 & 9 on connector SK1).

Group Control Networking Cabling:

CANbus is used for communication between 4 CoolChip CDU121 units.

CANbus (terminals 10, 11 & 12 on connector SK1) cable requires 3 conductors terminals.

2 signal wires (CAN H and CAN L).

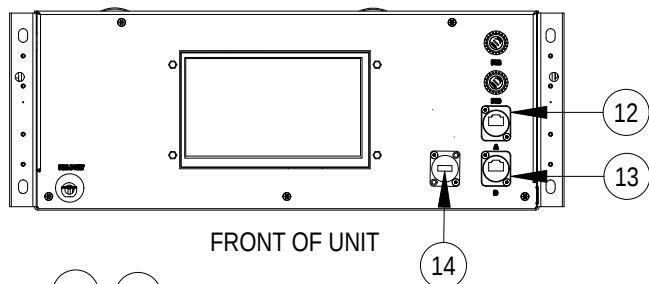
1 signal return path (GND).

Cable Type:

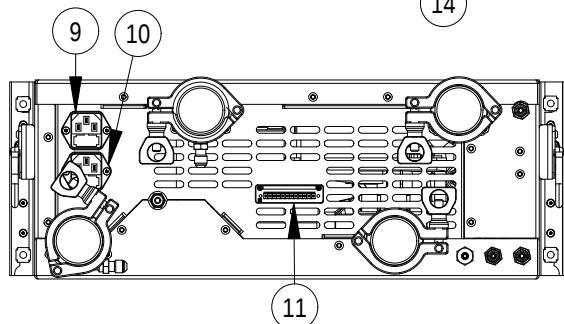
Beldon 3106A, or equivalent (1 pair +1, shielded 22AWG) is the recommended cable type to be used and pre-configured cable assemblies are provided with each CDU121 unit.

Leak Detection Tape:

A Leak detection tape (optional) can be connected to terminals 4 & 5 on SK1 for leak detection under the floor.

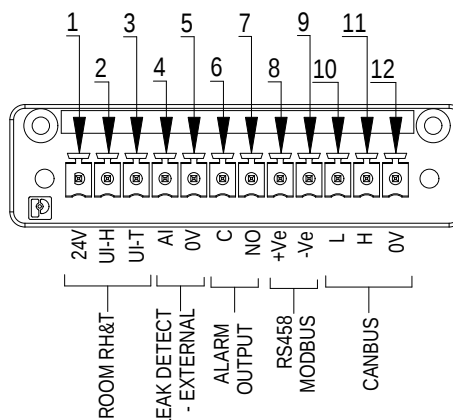


FRONT OF UNIT



REAR OF UNIT

ITEM	DESCRIPTION
9	IEC POWER INLETS A
10	IEC POWER INLETS B
11	TERMINAL POSITION FOR SK1
12	ETHERNET A
13	ETHERNET B
14	USB



TERMINAL POSITION FOR SK1

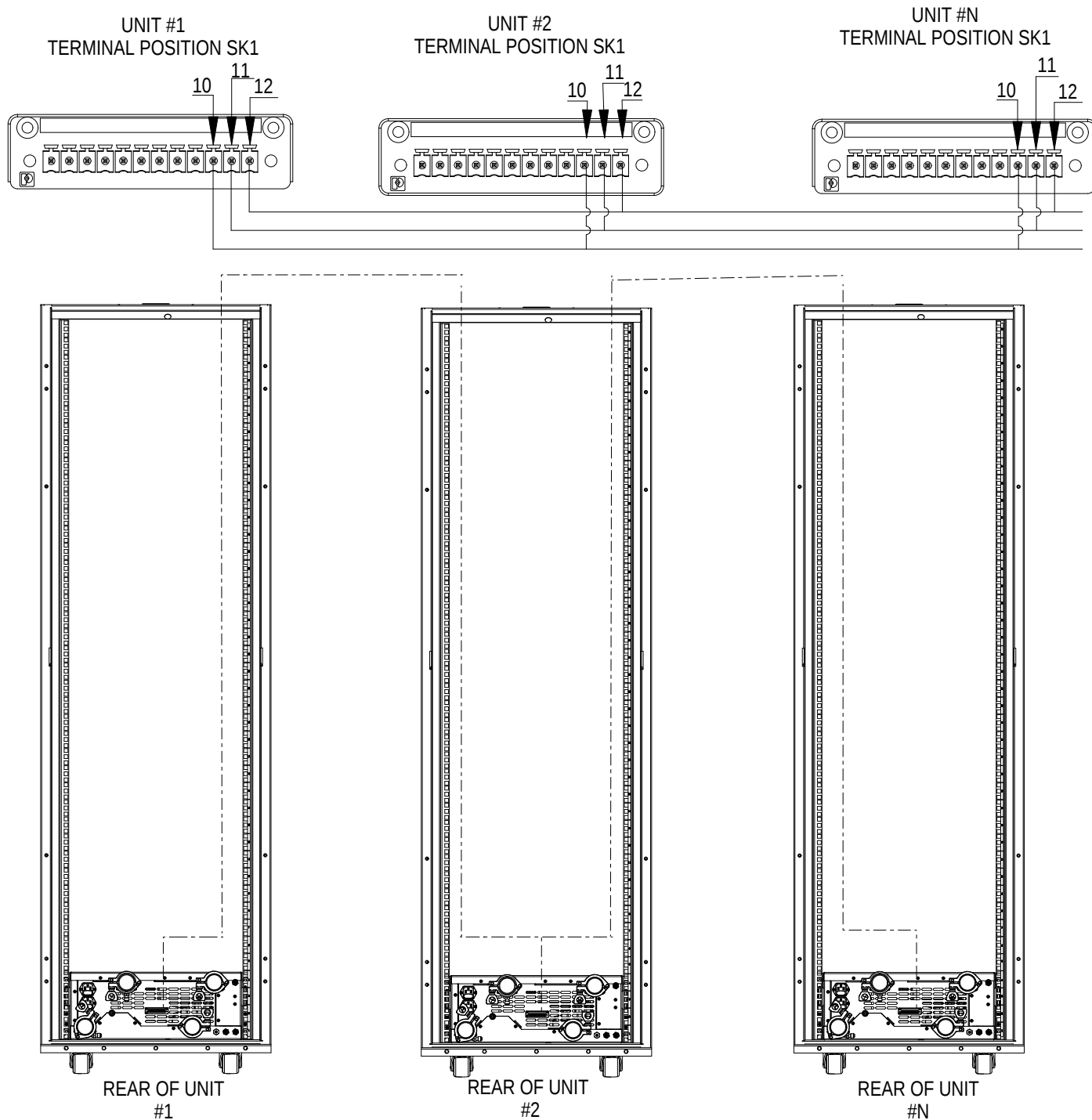
NOTES :

1. FACTORY PROVIDE 10A FUSE FOR 110-120V & 208-240V INPUT.

ELECTRICAL CONNECTION AC UNIT COMMUNICATION WIRING

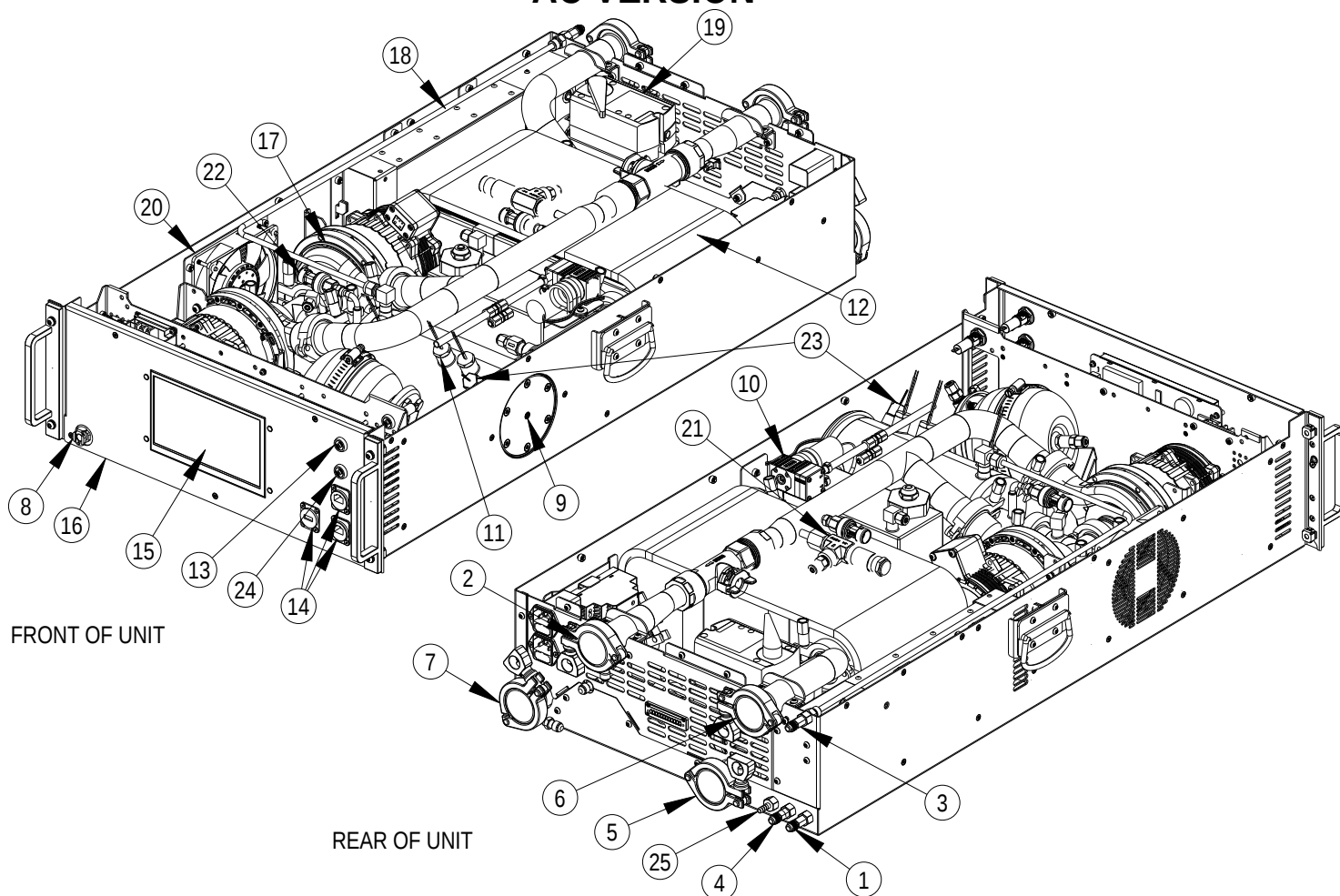
Connection Diagram for CANbus

Standard units can be connected/grouped/ teamed up to 4 units in a single group. More units can be connected upon factory request.



COMPONENT LOCATION DIAGRAM

AC VERSION



ITEM	DESCRIPTION
1	RESERVOIR/SECONDARY CIRCUIT DRAIN
2	SECONDARY CIRCUIT SUPPLY
3	RESERVOIR/SECONDARY CIRCUIT VENT
4	BUILT IN TANK VENT, NORMALLY OPEN
5	PRIMARY CIRCUIT RETURN
6	SECONDARY CIRCUIT RETURN
7	PRIMARY CIRCUIT SUPPLY
8	WATER MAKE UP CONNECTION
9	SECONDARY FILTER
10	FILL PUMP
11	SECONDARY SUPPLY TEMPERATURE SENSOR(REDUNDANCY)
12	HEAT EXCHANGER

ITEM	DESCRIPTION
13	FUSE FS2 FOR FILL PUMP
14	DUAL ETHERNET (RJ45) AND USB CONNECTIONS
15	CONTROLLER 7-INCH TOUCHSCREEN DISPLAY
16	REMOVABLE FRONT PANEL
17	SECONDARY CIRCUIT PUMPS
18	PUMP 48 VDC POWER SUPPLY
19	PRIMARY 3-WAY CIRCUIT CONTROL VALVE & ACTUATOR
20	COOLING FAN
21	PRESSURE RELIEF VALVE
22	PRESSURE SENSORS
23	LEVEL SENSOR
24	FUSE FS3 FOR DISPLAY
25	PRESSURE RELIEF VALVE VENT

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Appendix C: Notes

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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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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Appendix E: Liquid Quality Requirements

Table E.1 Liquid Quality Requirements

Item	Unit	Primary Circuit	Secondary8.0 - 9.0 Circuit
PH (25°C)		7.5 - 10	8.0 - 9.0
Turbidity	NTU	≤ 10	≤ 10
Conductivity (25°C)	μs/cm	≤ 2000	≤ 10
Cl ion	mg/L	≤ 250	≤ 25
Calcium ion (in CaCO ₃)	mg/L	≤ 300	
Total alkalinity (in CaCO ₃)	mg/L	≤ 500	
Dissolved oxygen	mg/L	≤ 0.1	
Organic phosphorus (in P)	mg/L	≤ 0.5	
SO ₄ ²⁻	mg/L	–	≤ 5
Cu ⁺ /Cu ²⁺	mg/L	–	≤ 5
Cu ⁺ /Cu ²⁺	mg/L	–	≤ 1
Al ³⁺	mg/L	–	≤ 100
Total number of bacterial colonies	CFU/mL	–	≤ 100

NOTE: If the water quality does not meet the requirements, it will affect the performance and service life of the unit and may cause equipment damage in severe cases.'

NOTE: Vertiv is not responsible for the loss caused by the user's water quality.

NOTE: Please drain the fluid from the system if it is not used for a long time.

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Appendix F: Vertiv™ CoolChip CDU 121 BACNet Object List

F.1 Binary Values

Table F.1 Binary Values

Instance Number	Object Name
200	Unit Common
201	A01: T1 Temperature Sensor Fault
202	A02: T2a Temperature Sensor Fault
203	A04: T2c Temperature Sensor Fault
204	A04: T2c Temperature Sensor Fault
205	A05: T3 Temperature Sensor Fault
206	A06: T4 Temperature Sensor Fault
207	A07: T5 Temperature Sensor Fault
208	A08: RH Relative Humidity Sensor Fault
209	A09: PS1 Pressure Sensor Fault
210	A10: PS2 Pressure Sensor Fault
211	A11: PS3 Pressure Sensor Fault
212	A12: Secondary Flow Meter Sensor Fault
213	A13: Primary Flow Meter Sensor Fault
214	A14: MicroSD Card Fault
215	A15: Fluid Make Up Empty
216	A16: Insufficient Fluid Level
217	A17: Pump 1 Fault
218	A18: Pump 2 Fault
219	A19: Sec Pump Shutdown
220	A20: Valve Fault
221	A21: Primary Fluid Low Flow
222	A22: Primary Fluid Low Temp
223	A23: Primary Fluid High Temp
224	A24: Secondary Fluid Low Temp
225	A25: Secondary Fluid High Temp
226	A26: Fluid Detected (Internal Leak)
227	A27: Sec Over Pressure
228	A28: Fluid Detected (External Leak)

Table F.1 Binary Values (continued)

Instance Number	Object Name
229	A29: n/u
230	A30: Check Fluid Make Up Level
231	A31: System Low Pressure
232	A32: Secondary Overpressure
233	A33: Primary Fluid No Flow
234	A34: Level Sensor – No Fluid Detected
235	A35: Illegal Fluid Sensor Condition
236	A36: Group Control Network Fault
237	A37: Group Control Insufficient Units Available
238	A38: Secondary Filter Dirty
239	A39: n/u
240	A40: Secondary Temperature T2a Diff Fault
241	A41: Secondary Temperature T2b Diff Fault
242	A42: Secondary Temperature T2c Diff Fault
243	A43: Pump 1 Communication Fault
244	A44: Pump 2 Communication Fault
245	A45: Pump 1 Low Flow
246	A46: Pump 2 Low Flow
247	A47: SD Card Full
248	Status: Fill Required

For all binary value objects, the present value conveys an status.

- A value of 1 indicates the presence of an condition.
- A value of 0 indicates the health (no) condition.'

F.2 Multi-state Values

Table F.2 Multi-state Values

Instance Number	Object Name	Data Values
100	Unit Mode	0 = Not configured 1 = Tank filling 2 = Shutdown—network 3 = Full manual control 4 = Standby 5 = Online (running) 6 = Online (filling) 7 = Filling 8 = Shutdown—fault 9 = Group standby
101	Group Control Mode	1 = Standalone 2 = Primary 3 = Secondary 3 = Independent (due to network fault)

F.3 Analog Values

NOTE: Units of measurement (SI or Imperial) are configurable via [Setup > Modbus and BACnet > BACnet > P079 Units](#).

RO: Read only

RW: Read write

Table F.3 Analog Values

Instance Number	Object Name	Units	Access
0	Pump 1 Speed	%	RO
1	Pump 2 Speed	%	RO
2	Control Valve (Cooling) Demand	%	RO
3	Control Valve Feedback	%	RO
4	Primary Supply Temperature T1	C / °F	RO
5	Secondary Supply Temperature T2a	C / °F	RO
6	Secondary Supply Temperature T2b	C / °F	RO
7	Secondary Supply Temperature T2c	C / °F	RO
8	Secondary Supply Temperature T2	C / °F	RO
9	Room Temperature T3	C / °F	RO

Table F.3 Analog Values (continued)

Instance Number	Object Name	Units	Access
10	Room Relative Humidity RH	% RH	ROS
11	Dew Point DW	C / °F	RO
12	Secondary Return Temperature T4	C / °F	RO
13	Secondary Return Pressure PS1	Bar/PSI	RO
14	Pump Inlet Pressure PS2	Bar/PSI	RO
15	Secondary Supply Pressure PS3	Bar/PSI	RO
16	Secondary Differential Pressure (PS3 – PS1)	Bar/PSI	RO
17	Filter Differential Pressure (PS1 – PS2)	Bar/PSI	RO
18	Primary Flow Rate	lpm/US gpm	RO
19	Secondary Flow Rate	lpm/US gpm	RO
20	Secondary Duty	kW	RO
21	Temperature Setpoint	C / °F	RO
22	System (Group) Average Secondary Differential Pressure	Bar/PSI	RO
23	System (Group) Total Secondary Flow Rate	lpm/US gpm	RO
24	Primary Return Temperature T5	C / °F	RO
25	Primary Duty	kW	RO
26	Number of Active s	—	RO
27	P301 Cooling Setpoint	C / °F	RW
28	P203 DP Setpoint	Bar/PSI	RW
29	P202 Flow Setpoint	lpm/US gpm	RW

Appendix G: Vertiv™ CoolChip CDU 121 MODBUS Register Table

G.1 Discrete Inputs

Table G.1 Discrete Inputs

Register Number	Description	RM060 Code
1	(0 = Inactive, 1 = Active)	—
2	: T1 Temperature Sensor Fault	A01
3	: T2a Temperature Sensor Fault	A02
4	: T2b Temperature Sensor Fault	A03
5	: T2c Temperature Sensor Fault	A04
6	: T3 Temperature Sensor Fault	A05
7	: T4 Temperature Sensor Fault	A06
8	: T5 Temperature Sensor Fault	A07
9	: RH Relative Humidity Sensor Fault	A08
10	: PS1 Pressure Sensor Fault	A09
11	: PS2 Pressure Sensor Fault	A10
12	: PS3 Pressure Sensor Fault	A11
13	: Secondary Flow Meter Sensor Fault	A12
14	: Primary Flow Meter Sensor Fault	A13
15	: microSD Card Fault	A14
16	: Fluid Make Up empty	A15
17	: Insufficient Fluid Level	A16
18	: Pump 1 Fault	A17
19	: Pump 2 Fault	A18
20	: Sec Pump Flow Shutdown	A19
21	: Valve Fault	A20
22	: Primary Fluid Low Flow	A21
23	: Primary Fluid Low Temperature	A22
24	: Primary Fluid High Temperature	A23
25	: Secondary Fluid Low Temperature	A24
26	: Secondary Fluid High Temperature	A25
27	: Fluid Detected (Internal Leak)	A26
28	: Sec Over Pressure	A27
29	: Fluid Detected (External Leak)	A28

Table G.1 Discrete Inputs (continued)

Register Number	Description	RM060 Code
30	Not used	
31	: Check Fluid Make Up Level	A30
32	: System Low Pressure	A31
33	: Secondary Overpressure	A32
34	: Primary Fluid No Flow	A33
35	: Level Sensor – No Fluid Detected	A34
36	: Illegal Fluid Sensor Condition	A35
37	: Group Control Network Fault	A36
38	: Group Control Insufficient Number Of Units	A37
39	: Secondary Filter Dirty	A38
40	Not Used	
41	: Sec Temp T2a Diff Fault	A40
42	: Sec Temp T2b Diff Fault	A41
43	: Sec Temp T2c Diff Fault	A42
44	: Pump 1 Communications Fault	A43
45	: Pump 2 Communications Fault	A44
46	: Pump 1 Low Flow	A45
47	Status : Fill Required	—
48	: SD Card Full	A47
49 ¹	: Pump 2 Low Flow	A46
¹ Available on firmware, versions 1.2 and above.		

Access to the Discrete Inputs table is provided by MODBUS function code 02 -- Read Input.

For all discrete input registers which may contain an status, a value of 1 indicates the presence of the condition. A value of 0 indicates the healthy (no) condition.

G.2 Input Registers

Table G.2 Input Registers

Register Number	Description	Units	Scaling	Data Type
1	Mode: 0 = Not configured 1 = Shutdown—remote start/stop 3 = Full manual control 4 = standby 5 = Online 6 = Filling 7 = Shutdown—fault 9 = Group standby 10 = Online—maximum cooling mode	N/A	1	Unsigned
2	Group Control Mode: 0 = Standalone 1 = Primary 2 = Secondary 3 = Independent (due to network fault)	N/A	1	Unsigned
3	Pump 1 Speed	%	1	Unsigned
4	Pump 2 Speed	%	1	Unsigned
5	Control Valve (Cooling) Demand	%	1	Unsigned
6	Control Valve Feedback	%	1	Unsigned
7	Primary Temperature T1	°C/°F	0.1	Signed
8	Secondary Supply Temperature T2a	°C/°F	0.1	Signed
9	Secondary Supply Temperature T2b °C	°C/°F	0.1	Signed
10	Secondary Supply Temperature T2c			
11	Secondary Supply Temperature T2	°C/°F	0.1	Signed
12	Room Temperature T3	°C/°F	0.1	Signed
13	Room Relative Humidity RH	% RH	0.1	Unsigned
14	Dew Point DW	°C/°F	0.1	Signed
15	Secondary Return Temperature T4	°C/°F	0.1	Signed
16	Primary Return Temperature T5	°C/°F	0.1	Signed
17	Secondary Return Pressure PS1	Bar/psi	0.01	Signed
18	Pump Inlet Pressure PS2	Bar/psi	0.01	Signed
19	Secondary Supply Pressure PS3	Bar/psi	0.01	Signed
20	Unit Differential Pressure (PS3 – PS1)	Bar/psi	0.01	Signed

Table G.2 Input Registers (continued)

Register Number	Description	Units	Scaling	Data Type
21	Secondary Filter Differential Pressure (PS1 – PS2)	Bar/psi	0.01	Signed
22	Primary Flow Rate	lpm/US gpm	1	Unsigned
23	Secondary Flow Rate	lpm/US gpm	1	Unsigned
24	Secondary Duty	kW	1	Unsigned
25	Primary Duty	kW	1	Unsigned
26	Temperature Setpoint	°C/°F	0.1	Signed
27	Software Version	—	—	Unsigned

Access to the Input Register table is provided by MODBUS function code 04 -- Read Input Registers.

G.3 Coils

Table G.3 Coils

Register Number	Description
1	Remote Shutdown: - To switch on the CDU, write OFF - To switch off the CDU, write ON

Read access to the Coil table is provided by MODBUS function code 01 -- Read Coil Status.

Write access to the Coil table is provided by MODBUS function code 05 -- Write Single Coil,

G.4 Holding Registers

Table G.4 Holding Registers

Register Number ²	Description	Units	Scaling	Data Type
1	Secondary Temperature Setpoint (P301)	°C/°F	0.1	Unsigned
2	Secondary DP Setpoint (P203)	Bar/psi	0.1	Unsigned
3	Secondary Flow Setpoint (P202)	lpm/US gpm	1	Unsigned

² Available on firmware versions 2.0 and above.

By default, the holding register table is read-only. Read-write access may be enabled via the PO72 Write Access parameter, accessible via the touchscreen interface.

Read access to the Holding Register table is provided by MODBUS function code 03 -- Read Holding Registers.

For write access, MODBUS function code 06 -- Present Single Register is supported.

An attempt to write a holding register value when read-only access is active will result in an exception code being returned.

Appendix H: Accessing and Downloading Log Files (Remote Log Retrieval)

```
C:\dev\xdu\100>ssh adminA@169.254.75.221 "getconfig"
adminA@169.254.75.221's password:
Unit Serial Number : FWTEST0123
Firmware Version : 3.0b10
Target Hardware : Rev 5.xB (STM32F746 MCU, Internal ADC)
```

```
Interface A
```

```
-----
```

```
IP Address : 169.254.75.221
Subnet Mask : 255.255.255.0
Default Gateway : 0.0.0.0
DNS Server 1 : 0.0.0.0
DNS Server 2 : 0.0.0.0
MAC Address : 70-B3-D5-DD-61-52
Hostname : CTCN15247-A
```

```
C:\dev\xdu\100>sftp adminA@169.254.75.221:"/FWTEST0123/FWTEST0123_Log.txt"
adminA@169.254.75.221's password:
Connected to 169.254.75.221.
Fetching /FWTEST0123/FWTEST0123_Log.txt to FWTEST0123_Log.txt
FWTEST0123_Log.txt 100% 7703 67.8KB/s 00:00
```

```
C:\dev\xdu\100>sftp adminA@169.254.75.221:"/FWTEST0123/FWTEST0123_SysLog.txt"
adminA@169.254.75.221's password:
Connected to 169.254.75.221.
Fetching /FWTEST0123/FWTEST0123_SysLog.txt to FWTEST0123_SysLog.txt
FWTEST0123_SysLog.txt100% 100%77KB 102.0KB/s 100% 00:00
```

```
C:\dev\xdu\100>sftp adminA@169.254.75.221:"/FWTEST0123/FWTEST0123_Parameters.txt"
adminA@169.254.75.221's password:
Connected to 169.254.75.221.
Fetching /FWTEST0123/FWTEST0123_Parameters.txt to FWTEST0123_Parameters.txt
FWTEST0123_Parameters.txt 100% 5633 47.4KB/s 00:00
```

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SL-80278_REVA_10-25