Lenovo Neptune DWC RM100 in-rack Coolant Distribution Unit (CDU)

OPERATION & MAINTENANCE GUIDE

INFORMATION ABOUT THIS GUIDE

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GENERAL STATEMENT

Product Standards and Approvals

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

ROHS 2 Compliance

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

ISO 9001

Cooltera Ltd is an ISO 9001: 2015 registered company for Quality Management, certificate no. 14135144.

Contents

Safety Information 5
Safety Notices 5
Safety Instructions 5
1. Product Description 7
1.1 General 7
1.2 Product Views 8
2. Operation 10
2.1 Controller Overview 10
2.2 User Interface 10
2.2.1 HOME Screen 10
2.2.2 Main MENU Screen 10
2.2.3 STATUS Screen 11
2.2.4 DATA CURVES Screen (real time update) 12
2.2.5 ALARM Screen 12
2.2.6 LOG-IN Screen 13
2.2.7 SETUP Screen 14
2.2.8 CONFIGURATION Screen 16
2.2.9 SERVICE Screen 18
2.2.10 DIAGNOSTICS Screen 20
2.2.11 CALIBRATION Screen 21
2.3 Automatic Operation 21
2.3.1 Secondary Circuit Operation 21
2.3.2 Primary Circuit Operation 27
2.4 Temperature Control Loop Adjustment 28
2.4.1 PI Control 28
2.4.2 PID Control 28
2.5 Alarm Management 28
2.6 Trouble Shooting (Alarms) 30
2.7 Temperature Sensor Graph 35
3. Maintenance 36
3.1 General 36
3.2 Fluid Specifications 36
3.3 Planned Maintenance 36
3.3.1 Special tools/equipment 36
3.3.2 Visual checks for damage & leakage 36
3.3.3 General settings 37
3.3.4 Controller checks 38
3.3.5 Communication checks 38
3.3.6 Sensor checks 38

3.3.7 Fluid checks 38
3.3.8 Functional checks 38
3.4 Secondary Filter Service 39
3.5 Spare Parts 39
4. Additional Information 41
4.1 Wiring Diagram (WD00003-01) 41
4.2 Pipe Schematic (SC00002-01) 48
4.3 Warranty & Contact Details 50

Figures

Fig.1 – Front View of RM100 8
Fig.2 – Rear View of RM100 (with hose connection detail) 9
Fig.3 – Control System Home Screen 10
Fig.4 – Control System main Menu Screen 11
Fig.5 – Control System Status Screen 11
Fig.6 – Control System Data Curves Screen 13
Fig.7 – Control System Alarms Screen 13
Fig.8 – Control System Log-in Screen 14
Fig.9 – Control System Setup Screen 14
Fig.10 – Control System Configuration Screen 16
Fig.11 – Control System Service Screen 18
Fig.12 – Control System Diagnostics Screen 20
Fig.13 – Control System Calibration Screen 21
Fig.14 – Control System On/Off Button 21
Fig.15 – Fill Required Warning 21
Fig.16 – Fill Pump Manual Activation 22
Fig.17 – Fill Pressure & Level Flow Chart (at initial start) 22
Fig.18 – Fill Pressure & Level Flow Chart (when running) 23
Fig.19 – Water Level Management Flow Chart (when running) 24
Fig.20 – Control System Alarm Indication 27
Fig.21 – Control System Active Alarms 28
Fig.22 – Control System Alarm Identification 28
Fig.23 – Temperature Resistance Chart 34
Fig.24 – Servicing Secondary Filter 36

Safety Information

Safety Notices

This manual contains Warnings, Cautions and Notices concerning the safe use of this product. See documentation below.

WARNING! Indicates a potential hazardous situation which, if not avoided, could result in death, serious injury or serious equipment damage. It is important not to proceed until all stated conditions are met and clearly understood.

CAUTION! Indicates a potential hazardous situation which, if not avoided, could result in minor to moderate injury or equipment damage. It is important not to proceed until all stated conditions are met and clearly understood.

NOTICE! Indicates instructions that must be followed to avoid damage to the FS400 or other equipment.

Safety Instructions

General

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

Before any maintenance work being carried out, ensure:

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

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

Installation / 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.

Application

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

Warranty

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

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

Replacement Parts

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

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

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.

Documentation

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

1. Product Description

1.1 General

This document describes the basic characteristics & operation of the RM100 Coolant Distribution Unit (CDU) and the required ongoing maintenance considerations.

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

The Secondary circuit 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) via a low pressure drop plate heat exchanger.

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

The Primary cooling source can be a chilled water system (either dedicated or from building system), fluid cooler, cooling tower or dry air cooler, depending on the desired Secondary temperature and heat transfer duty (refer to **Sections 2.6 & 2.7** of **Application & Planning Guide** for more information).

1.2 Product Views

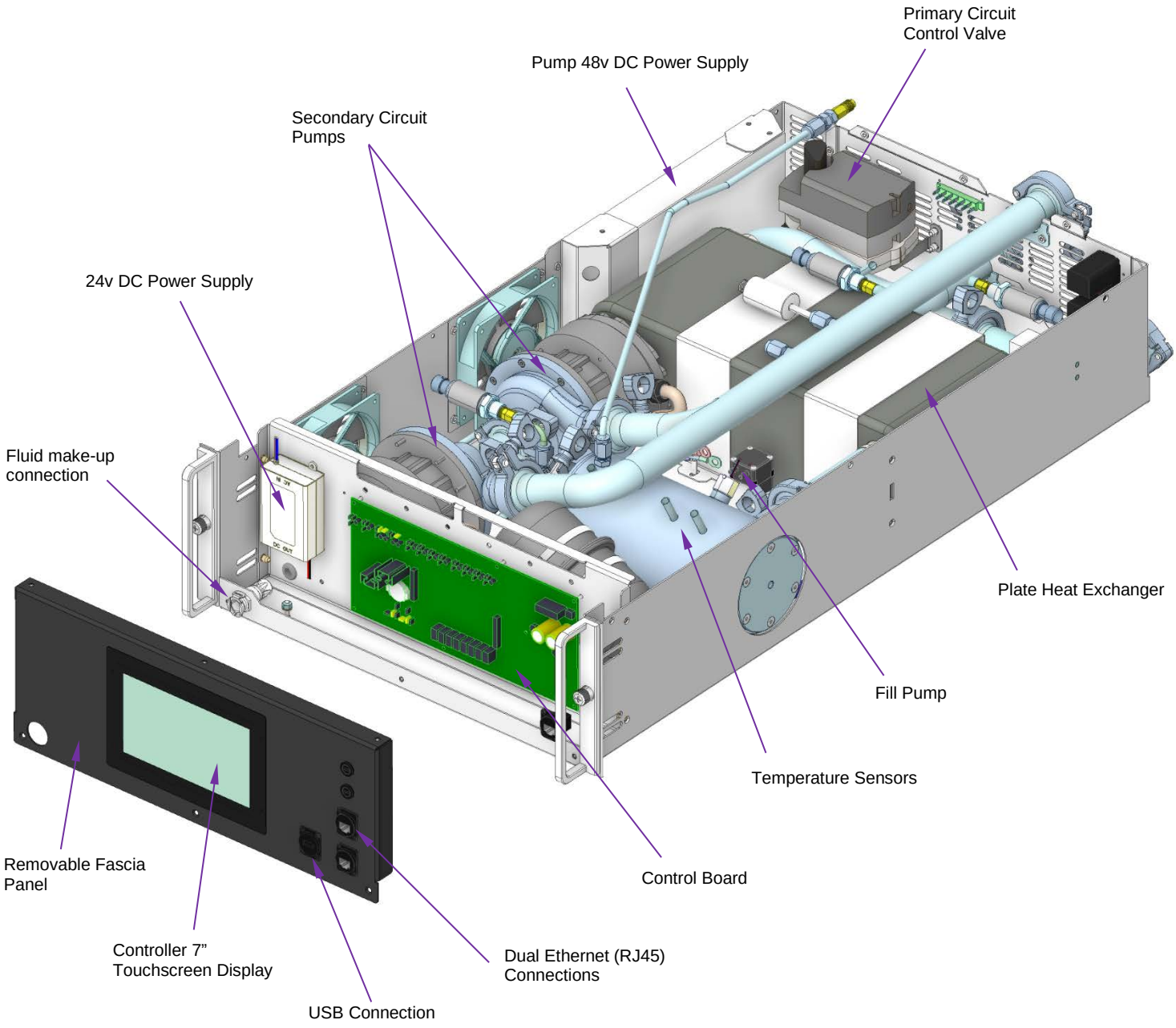
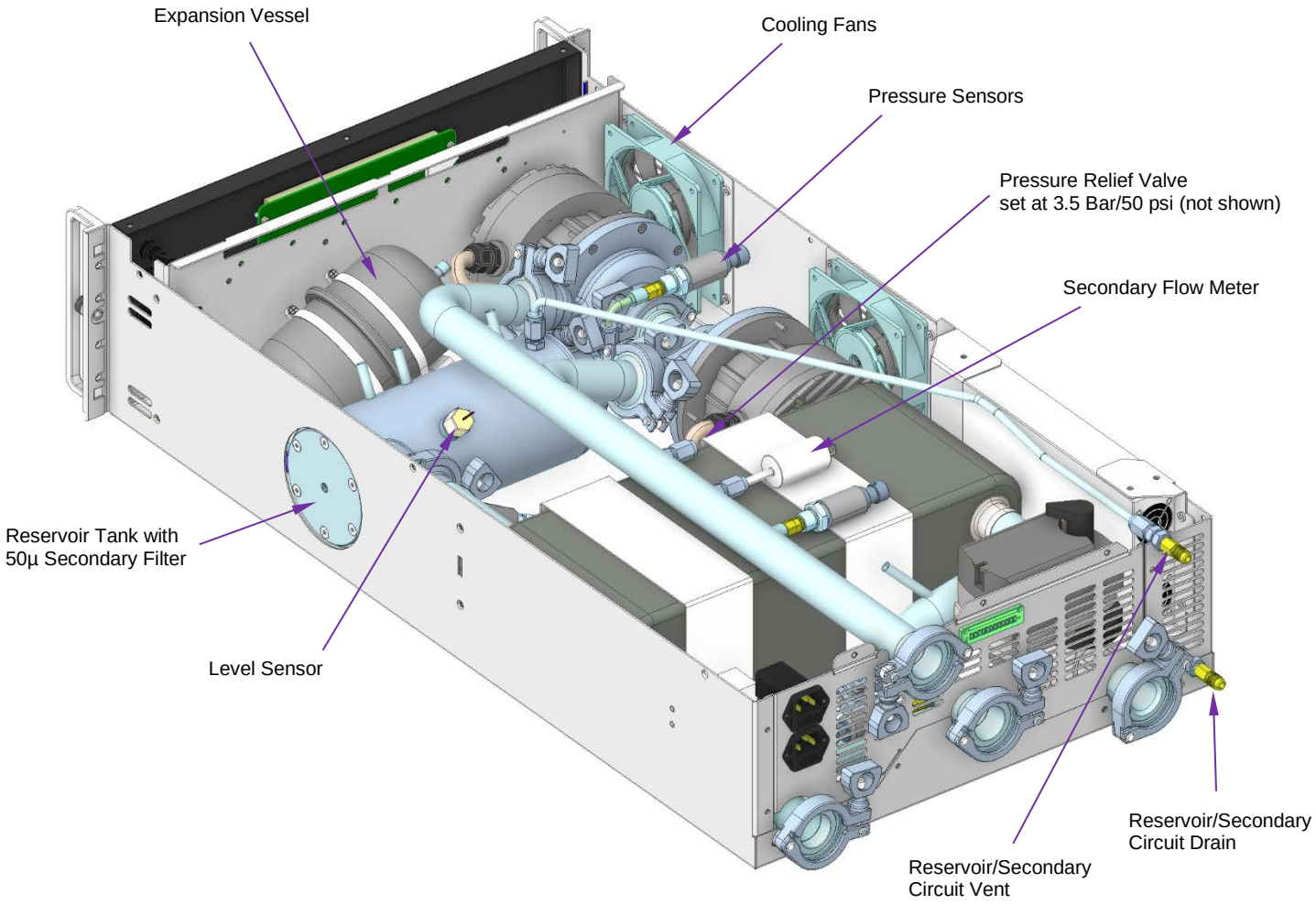


Fig.1 *- Front View of RM100 (top cover panel removed)*



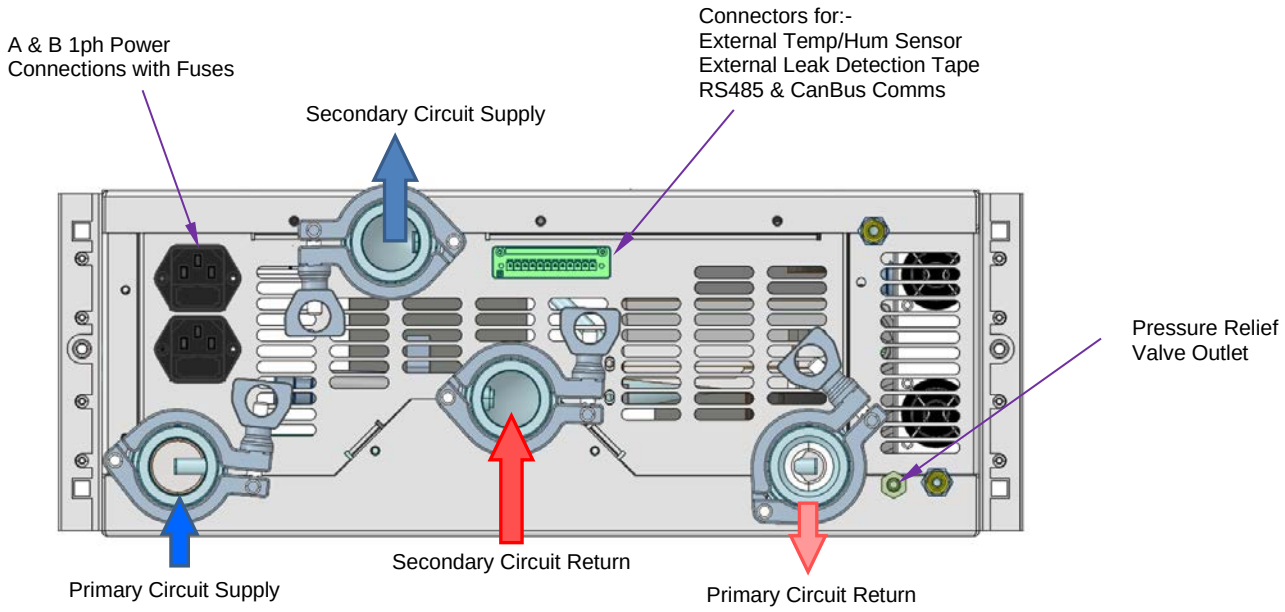


***Fig.2** - Rear View of RM100 (with hose connection detail)*

2. Operation

2.1 Controller Overview

The RM100 controller is designed to monitor and control the supply of cooling water to IT equipment in unattended data centre environments. Secondary circuit cooling water is closely controlled to a defined temperature and at a controlled differential pressure (or flow rate), for optimum management of heat rejection.

When power is first applied to the unit, the touchscreen will illuminate, and the pump drive will energize. After a short initialisation period, the display will default to the Home screen, as shown below.

2.2 User Interface

2.2.1 HOME Screen

The Home screen displays a schematic representation of the CDU, showing essential temperatures, pressures, flows etc. for both Primary & Secondary circuits, plus the product code identification, installed software version and date/time.

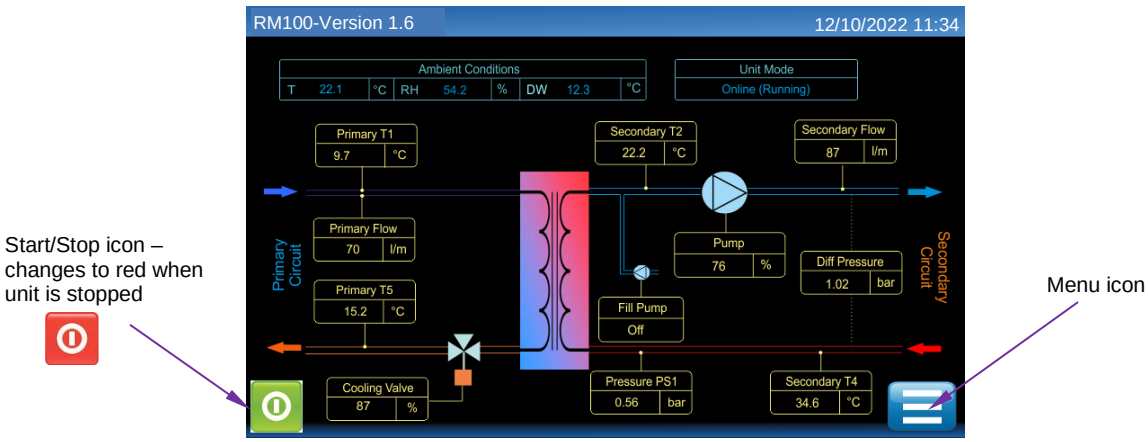


Fig.3 *– Control System Home screen*

Pressing the Menu icon in the bottom right hand corner will display the following Main Menu screen…

2.2.2 Main MENU Screen

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

NOTICE! Some Control System menus may not be visible if the user has not Logged-in and visibility will also depend on the Log-in access level used.

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

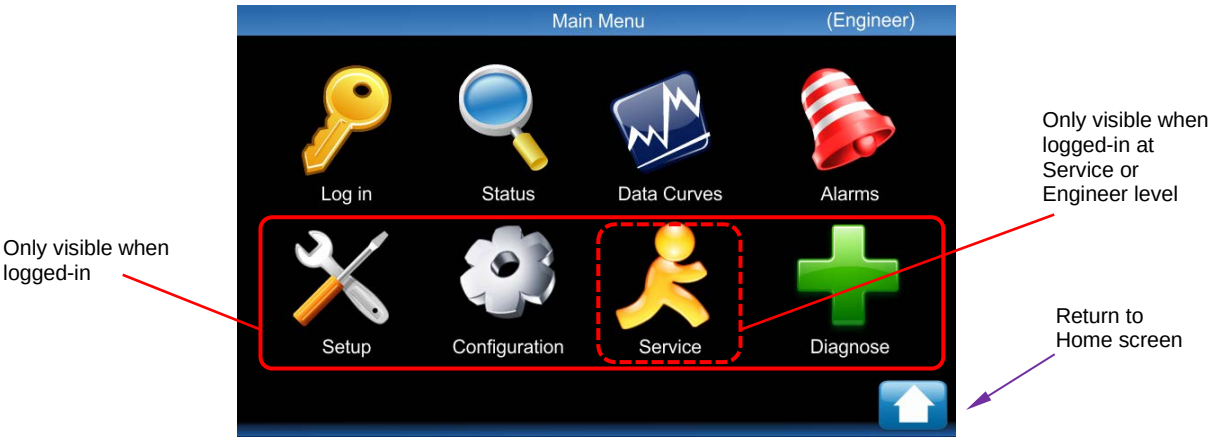


***Fig.4** – Control System main Menu screen*

2.2.3 STATUS Screen

The Status screen displays comprehensive viewable only information on the operating condition of the RM100 unit.

NOTICE! If the unit has not been configured for certain options, then corresponding values will not be shown. e.g. Room temp/hum etc. will show '-101'

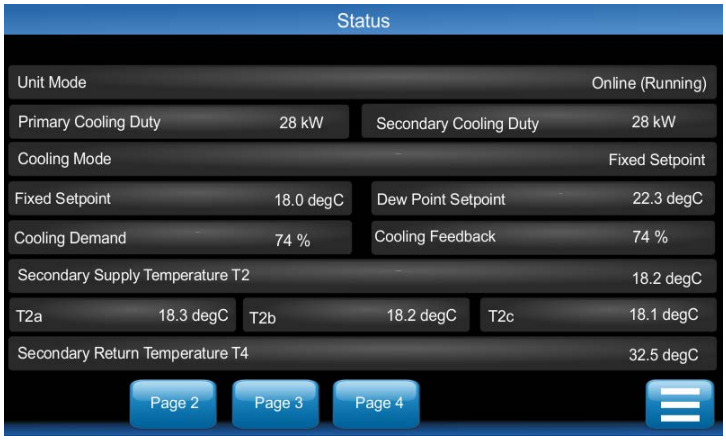


***Fig.5** – Control System Status screen*

There are 4 information pages within the 'Status' screen and the details for each page are shown in the tables below.

Status – Page 1 ***(as shown)***					
Unit Mode				(Standby / On-line (running) / Fault / Shutdown)	
Primary Cooling Duty	_ _ kW		Secondary Cooling Duty	_ _ kW	
Cooling Mode				(Off / Fixed Setpoint / DW Override)	
Fixed Setpoint	_ _ °C		Dew Point Setpoint	_ _ °C	
Cooling Demand	_ _ %		Cooling Feedback	_ _ %	
Secondary Return Temperature T2				_ _ °C	
T2a	_ _ °C	T2b	_ _ °C	T2c	_ _ °C
Secondary Return Temperature T4				_ _ °C	

Status – Page 2			
Primary Supply Temperature T1			_ _ °C
Primary Return Temperature T5			_ _ °C
Primary Flow Rate			_ _ l/m
Ambient Temperature	_ _ °C	Ambient RH	_ _ %
Dew Point			_ _ °C

Status – Page 3			
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	_ _ %

Status – Page 4			
Pump 1 Hours Run	_ _ Hrs	Pump 2 Hours Run	_ _ Hrs
Valve Runtime 0 to 25%	_ _ Hrs	Valve Runtime 26 to 50%	_ _ Hrs
Valve Runtime 51 to 75%	_ _ Hrs	Valve Runtime 76 to 100%	_ _ Hrs
Elapsed Minutes	_ _ mins	Controller Software Version	_ _
MicroSD Used Space			_ _ %

Status – Page 5			
Pump 1 Comms Status	_ _	Pump 2 Comms Status	_ _
Pump 1 Mode	_ _	Pump 2 Mode	_ _
Pump 1 Speed	_ _ rpm	Pump 2 Speed	_ _ rpm
Pump 1 Voltage	_ _ V	Pump 2 Voltage	_ _ V
Pump 1 Current	_ _ A	Pump 2 Current	_ _ A
Pump 1 Temperature	_ _ °C	Pump 2 Temperature	_ _ °C
Drive 1 Temperature	_ _ °C	Drive 2 Temperature	_ _ °C

2.2.4 DATA CURVES Screen (real time update)

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

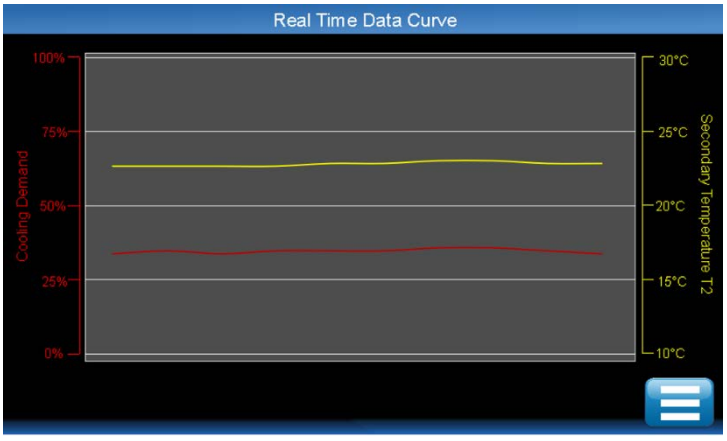


Fig.6 *– Control System Data Curves screen*

2.2.5 ALARM Screen

The Alarm screen can be used to view new or active Alarms and to acknowledge these events. Refer to **Section 2.6** for a full list of Alarms & further information.

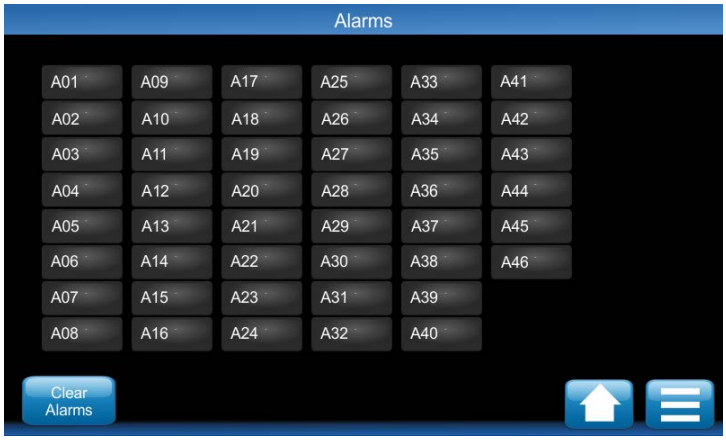


Fig.7 *– Control System Alarms screen*

2.2.6 LOG-IN Screen

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

No access code (User Level 1) – provides access to Login, Status, Data Curves and Alarm pages
Code **1234** (User Level 2) – provides Read Only access to Setup, Configuration and Diagnose menus
Code **5699** (Service Level) – provides full read only access to everything and write access to select configuration and service features
Code **xxxx** (Engineer Level) – full read/write access to all features
Code **xxxx** (+Engineer Level) – enter after Eng. Level code for Factory Setup

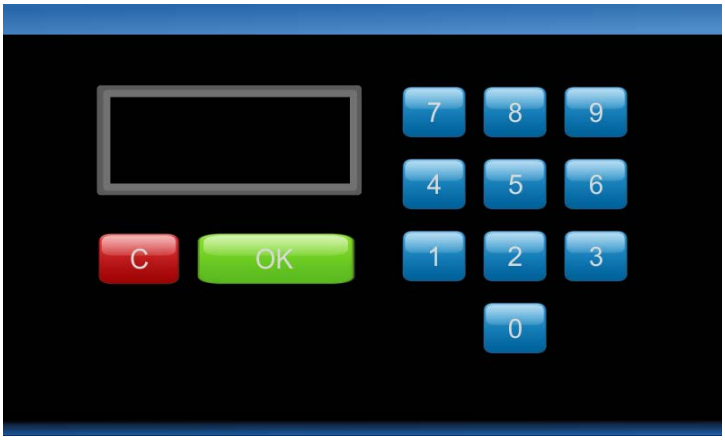


Fig.8 *– Control System Log-in screen*

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

NOTICE! The following menu screens will only be visible once Logged-in

2.2.7 SETUP Screen

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

NOTICE! Information under 'Factory Configuration' (ringed in red below) can be viewed with Service & Engineer access codes, but to make changes will require a further special code

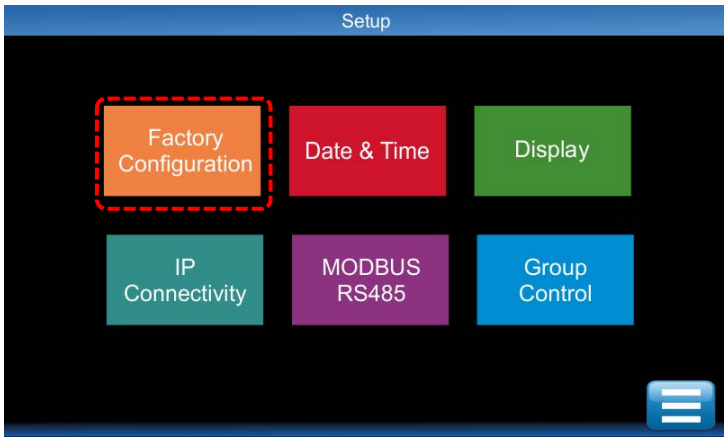


Fig.9 *– Control System Setup screen*

Setup - Factory Configuration			
ID	**Title**	**Description**	**Range**
P001	Primary Return Temp T5 Fitted	Select according to unit build	Yes - No

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

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

Setup - IP Connectivity					
ID	**Title**	**Description**	**Default**	**Range**	**Unit**
P040	Interface #1 Enabled	Set to active or not *(see below for sub-menu details)*	Enabled	Enable - Disable	-
P041	Interface #2 Enabled	Set to active or not *(see below for sub-menu details)*	Enabled	Enable - Disable	-
P042	Failover Mode	Set to Redundant or Independent IP addresses	Disabled	Enable - Disable	-

Setup – IP Connectivity (Interface 1) sub-menu					
ID	**Title**	**Description**	**Default**	**Range**	**Unit**
P050	MAC Address	View MAC address	_ _:_ _:_ _:_ _:_ _:_ _	Read only	-
P051	DHCP	Select as required	Disabled	Enable - Disable	-
P052	IP Address	Set IP address	192.168.11.170	Configurable	-
P053	Subnet Mask	Set Subnet Mask	255.255.255.0	Configurable	-
P054	Default Gateway	Set Gateway address	0.0.0.0	Configurable	-
P055	Preferred DNS Server	Set DNS address	0.0.0.0	Configurable	-
P056	Alternative DNS Server	Set DNS address	0.0.0.0	Configurable	-
P057	SNMPv2 Access	enable SNMPv2 access	No	Yes – No	-
P058	TELNET Access	enable TELNET access	No	Yes – No	-
P059	ftp Access	enable ftp access	No	Yes – No	-

Setup – IP Connectivity (Interface 2) sub-menu					
ID	**Title**	**Description**	**Default**	**Range**	**Unit**
P060	MAC Address	View MAC address	_ _:_ _:_ _:_ _:_ _:_ _	Read only	-
P061	DHCP	Select as required	Disabled	Enable - Disable	-
P062	IP Address	Set IP address	192.168.11.170	Configurable	-
P063	Subnet Mask	Set Subnet Mask	255.255.255.0	Configurable	-
P064	Default Gateway	Set Gateway address	0.0.0.0	Configurable	-
P065	Preferred DNS Server	Set DNS address	0.0.0.0	Configurable	-
P066	Alternative DNS Server	Set DNS address	0.0.0.0	Configurable	-
P067	SNMPv2 Access	enable SNMPv2 access	No	Yes – No	-
P068	TELNET Access	enable TELNET access	No	Yes – No	-
P069	ftp Access	enable ftp access	No	Yes – No	-

Setup - Modbus RS485					
ID	**Title**	**Description**	**Default**	**Range**	**Unit**
P070	Modbus Slave Address	Set required address	1	1 to 247	-
P071	Baud Rate	Set required baud rate	9600	9600 to 38400	-

Setup - Group Control					
ID	**Title**	**Description**	**Default**	**Range**	**Unit**
P081	Unit Address		1	1 to 8	-
P082	Number of Units in Group		1	1 to 8	-
P083	Number of Run Units		1	1 to 8	-
P084	Control Reference				
P085	Rotation Frequency		Weekly	Weekly, Monthly, Never	-
P086	Rotation Day of Week		Mon.	Sun. to Sat.	-
P087	Rotation Time of Day - Hours		10	00 to 23	hrs
P088	Rotation Time of Day - Minutes		00	00 to 59	mins
P089	CDU Receive Timeout Period		0		msecs
P090	CDU Transmit Period		1		msecs
P091	Baud Rate Index		0		

2.2.8 CONFIGURATION Screen

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

NOTICE! Parameter ID's shown in 'red' text will only be accessible with the Engineer log-in code.

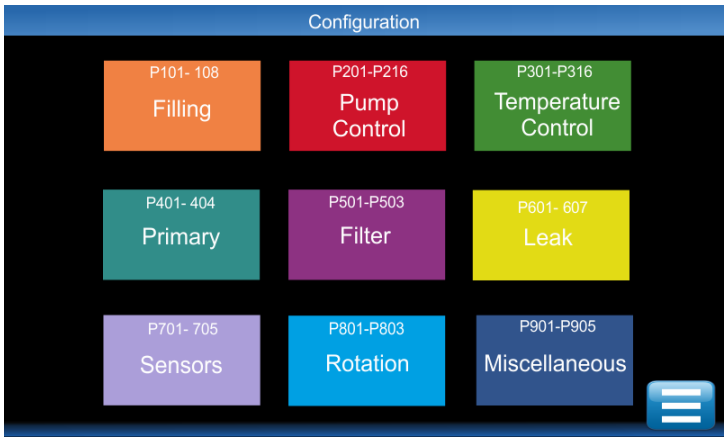


***Fig.10** – Control System Configuration screen*

Configuration - Filling					
ID	**Title**	**Description**	**Default**	**Range**	**Unit**
P101	Fill Pressure	Start threshold for fill pump	0.8	0.3 to 1.0	Bar
P102	Fill Hysteresis	Stop hysteresis for fill pump	0.2	0.1 to 0.5	Bar
P103	Fill Pump Run Period	Time for level sensor to make, or fill pressure to be satisfied, prior to alarm *(when unit is on-line)*	1	1 to 15	min
P104	Level Sensor Delay	Level Senor response time, prior to alarm	1	1 to 6	secs
P105	Fill Start Delay Period	Delay prior to pump start after initiate signal	10	1 to 60	secs
P106	Fill Warning Delay Period	Delay prior to 'check make-up' alarm activated	5	0 to 60	secs
P107	Manual Fill Control	Select Manual or Automatic Fill pump control 0 = Manual; 1 = Automatic	1	0 or 1	-

Configuration – Pump Control					
ID	**Title**	**Description**	**Default**	**Range**	**Unit**
P201	Control Type	Select pump speed controlled by flow or DP	Flow	Flow or DP	-
P202	Flow Setpoint	Set the required Secondary flow rate	50	5 to 130	l/m
P203	Differential Pressure Setpoint	Set the required Secondary differential pressure (DP)	0.3	0.1 to 4.0	Bar
P204	Low Flow %	Low flow alarm threshold *(% of flow setpoint)*	90	50 to 95	%
P205	Low DP Hys	Low DP alarm hysteresis	0.5	0.1 to 3	bar
P206	Low Flow/DP Delay	Time delay prior to low Flow/DP alarm	100	1 to 300	secs
P207	Minimum Pump Speed	Set minimum pump running speed	10	10 to 70	%
P211	Over-pressure Setpoint	Maximum system pressure, prior to alarm	6.0	2.0 to 7.0	Bar
P212	Over-pressure Action	Alarm only, or shutdown & alarm	Alarm	Alarm or Alarm+S/D	-
P213	Start-up Speed	Initial pump start fixed speed *(0 = Auto)*	0	0 to 100	%
P214	Start-up Period	Initial start speed hold period, prior control loop taking over	0	0 to 100	secs
P215	Loop Refresh Period	Scan period for pump speed control loop	10	1 to 120	secs
P216	Maximum Control Pressure	Maximum pump speed control loop pressure	4.0	1.0 to 8.0	Bar
P217	DP Setpoint – Max Cooling Mode	DP Setpoint used when operating in Max Cooling mode	2.5	1 to 5.0	Bar
P216	Cooling Fan Run On Period	The period of time the fan will run on for after the unit is switched to standby	10	0 to 60	mins

Configuration – Temperature Control					
ID	**Title**	**Description**	**Default**	**Range**	**Unit**
P301	Temperature Setpoint	Set required Secondary temperature setpoint	18.0	10.0 to 55.0	°C
P302	Control Mode	Select from Fixed Setpoint or Fixed Setpoint with Dewpoint Override	FSDO	FS, FSDO	-
P303	Dewpoint Offset	Minimum offset of setpoint from dewpoint temp.	3.0	1.0 to 5.0	°C
P304	Ambient Offset	Minimum offset of setpoint from ambient temp.	3.0	-10 to 10	°C
P305	Sec. Low Temp Diff.	Low temp alarm offset below setpoint	2.0	1.0 to 10.0	°C
P306	Sec. High Temp Diff	High temp alarm offset above setpoint	2.0	1.0 to 10.0	°C
P307	Sec. Temp Reset Hysteresis	Low/High temp. alarm reset point	1.0	0.5 to 5.0	°C
P308	Sec. High Temp Setpoint DW	High temp alarm offset above setpoint when dewpoint or ambient tracking	20.0	15.0 to 25.0	°C
P309	PID – Control Period	Scan period for control valve positioning	1	1 to 30	secs
P310	PID – Proportional Band	Proportional band	12.0	1.0 to 25.0	°C
P311	PID – Integral Reset	Integral reset time	18	0 to 999	secs
P312	PID – Derivative	Derivative reset time	5	0 to 999	secs
P313	Demand/Actual Error	Control valve demand to feedback error for alarm	10	0 to 50	%
P314	Valve Check Period	Scan period for control valve position monitoring	15	1 to 120	mins
P315	Valve Runtime	Control valve motor run time for control loop	40	10 to 180	secs
P316	Max Cooling Mode Temp Setpoint	The temperature setpoint used when operating in Max Cooling Mode	18.0	10.0 to 55.0	°C

Configuration – Primary					
ID	**Title**	**Description**	**Default**	**Range**	**Unit**
P401	Pri. Flow Delay	Time delay prior to low flow alarm	15	1 to 120	mins
P402	Pri. Low Temp Setpoint	Low temp alarm threshold	4	2 to 40	°C
P403	Pri. High Temp Setpoint	High temp alarm threshold	11	6 to 60	°C
P404	Pri. Temp Reset Hysteresis	Low/High alarm reset from threshold	1	0.5 to 5.0	°C

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

Configuration – Leak Detection					
ID	**Title**	**Description**	**Default**	**Range**	**Unit**
P601	Leak Detection Operation - Internal	Alarm only, or shutdown & alarm	Alarm	Alarm or Alarm+S/D	-
P602	Internal Threshold	Set sensitivity of leak tape	50	1 to 85	kohms
P603	Internal Delay Period	Time delay prior to alarm	30	5 to 60	secs
P604	Leak Detection Operation – Primary External	Alarm only, or shutdown & alarm	Alarm	Alarm or Alarm+S/D	-
P607	Leak Detection Operation – Secondary External	Alarm only, or shutdown & alarm	Alarm	Alarm or Alarm+S/D	-

Configuration – Sensors					
ID	**Title**	**Description**	**Default**	**Range**	**Unit**
P701	Secondary T2 Temperature Differential	Alarm threshold T2a/b/c temperature differential	1	0.1 to 10	°C
P702	Secondary T2 Period	Time delay before T2a/b/c differential alarm	30	0 to 120	secs
P703	PS1 Scaling	Set measurement range. 0 = 0 to 30bar, 1 = 0 to 15bar, 2 = -1 to 8 bar.	2	0 to 2	-

Configuration – Sensors (continued)					
ID	**Title**	**Description**	**Default**	**Range**	**Unit**
P704	PS2 Scaling	Set measurement range. 0 = 0 to 30bar, 1 = 0 to 15bar, 2 = -1 to 8 bar.	2	0 to 2	-
P705	PS3 Scaling	Set measurement range. 0 = 0 to 30bar, 1 = 0 to 15bar, 2 = -1 to 8 bar.	2	0 to 2	-
P706	Thermistor Type	Set thermistor type	1	1	

Configuration – Rotation					
ID	**Title**	**Description**	**Default**	**Range**	**Unit**
P801	Frequency		Weekly	Daily, Weekly, Never	-
P802	Day of the Week		Monday	Sun. to Sat.	-
P803	Time of Day – Hours		10	00 to 23	hrs
P804	Time of Day – Minutes		00	00 to 59	mins

Configuration – Miscellaneous					
ID	**Title**	**Description**	**Default**	**Range**	**Unit**
P901	Manual Override Period	Time delay before controls revert to Auto mode	15	1 to 120	mins
P902	Alarm Delay	Alarm suppression on start-up	20	1 to 120	mins
P903	Post Power Failure Options	Action to be taken following a power failure once power is restored	Run	Run, Standby	-
P904	Room RH&T Sensor	Remote RH&T sensor fitted	Yes	Yes – No	-
P905	Data Logging Interval	Set logging interval 0 = 60s 1 = 30s 2 = 10s 3 = 5s	0	0 to 3	-
P906	Temperature Alarm Delay	Time delay before temperature alarm activates	10	0 to 1220	secs

2.2.9 SERVICE Screen

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

NOTICE! The 'Full Manual Control' option (Service ID's shown in red text) will only be accessible with the Engineer log-on code.

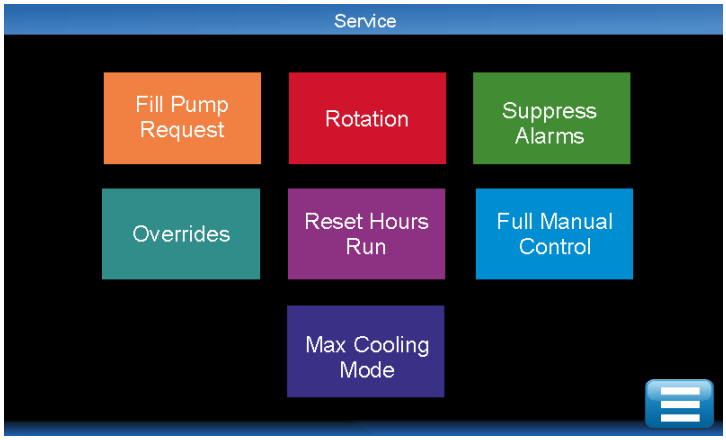


***Fig.11** – Control System Service screen*

Service - Fill Pump Request	
	This fill function is used at commissioning only and will allow the fill pump to run without any time limit. Fill pump will still switch Off automatically when unit reaches required static pressure

Service - Rotation	
	Used to force a pump changeover at an unscheduled time.

Service - Suppress Alarms	
	Resets the alarm delay timer (normally only activated during start-up) to stop nuisance alarms breaking through during manual operation

Service - Overrides

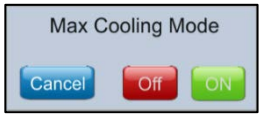
ID	Title	Description	Default	Range	Unit
-	Pump 1 Speed	Set pump drive control speed	0	1 to 100	%
-	Pump 2 Speed	Set pump drive control speed	0	1 to 100	%
-	Fill Pump P3	Switch fill pump on	Auto (1)	Auto (1) – Man (0)	-
-	Cooling Valve	Set control valve position	0	1 to 100	%
-	Audible Alarm	Switch alarm output on or off	Auto (1)	Auto (1) – Man (0)	-

'Overrides' allows the user to manually control some functions of the unit for a limited time period while running in automatic mode, for the purposes of troubleshooting etc. (see Installation & Commissioning manual for more information).

Service – Reset Run Hours	
	Resets the pump and valve run hours to zero.

Service – Full Manual Control

ID	Title	Description	Default	Range	Unit
-	Full Manual Control	Set unit to full manual control	0	0 to 1	
-	Pump 1 Speed	Set pump drive control speed	0	1 to 100	%
-	Pump 2 Speed	Set pump drive control speed	0	1 to 100	%
-	Fill Pump P3	Switch fill pump on	Auto (1)	Auto (1) – Man (0)	-
-	Cooling Valve	Set control valve position	0	1 to 100	%
-	Audible Alarm	Switch alarm output on or off	Auto (1)	Auto (1) – Man (0)	-
-	Cooling Fan	Switch pump cooling fan on or off	Auto (1)	Auto (1) – Man (0)	-

Service – Max Cooling Mode	
	The function of this mode is to instantly provide the maximum possible cooling in an emergency situation

2.2.10 DIAGNOSTICS Screen

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

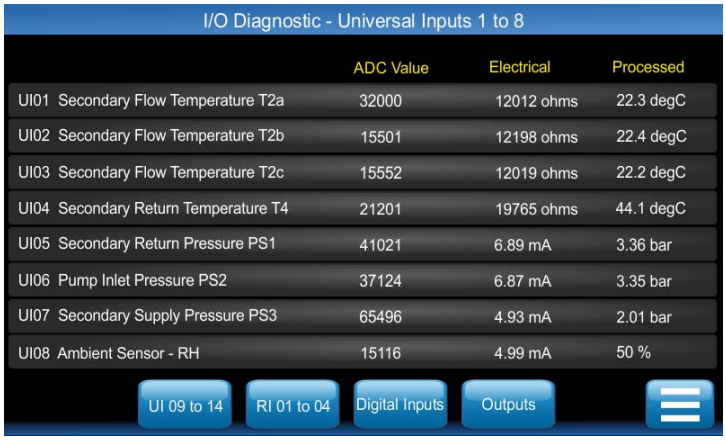


Fig.12 *– Control System Diagnostics screen*

I/O Diagnostics – Universal Inputs 1 to 8						
ID	**Description**	**ADC Value**	**Electrical**		**Processed**	
UI01	Secondary Flow Temp. T2a	0	0	Ohms	0.00	degC
UI02	Secondary Flow Temp. T2b	0	0	Ohms	0.00	degC
UI03	Secondary Flow Temp. T2c	0	0	Ohms	0.00	degC
UI04	Secondary Return Temp. T4	0	0	Ohms	0.00	degC
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	%

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	degC
UI10	Primary Flow Temperature T1	0	0.00	mA	0.00	degC
UI11	Primary Flow Rate	0	0.00	mA	0	l/m
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	degC

I/O Diagnostics – Resistive Inputs 1 to 4					
ID	**Description**	**ADC Value**	**Electrical**		**Processed**
RI01					
RI02	Leak Tape - CDU	0	0	Ohms	0
RI03	Leak Tape – External Primary	0	0	Ohms	0
RI04	Leak Tape – External Secondary	0	0	Ohms	0

I/O Diagnostics – Digital Inputs 1 to 6			
ID	**Description**		**State**
DI01	Optical Level Sensor		0
DI02	Drive Status		0
DI03			
DI04			
DI05			
DI06			

I/O Diagnostics – Digital and Analogue Outputs			
ID	**Description**		**State**
DO01	Fill Pump		0
DO03	Pump Cooling Fan		0
DO04	Alarm Output		0
AO04	Cooling Valve		%

2.2.11 CALIBRATION Screen

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

Fig.13 *– Control System Calibration screen*

2.3 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 Section 2.2.1), then select the ON button as below.

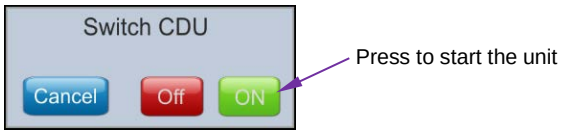


Fig.14 *– Control System On/Off Button*

When the ON button is pressed, the icon on the Home screen will change from Red to Green and providing the fluid level & static pressure are healthy, either main pump P1 or P2 (pump with the least run hours) will start to increase in speed. Animated arrows will show on the Home screen to signify the fluid circuit is operational and the pump speed as a percentage of maximum will be displayed.

2.3.1 Secondary Circuit Operation

Secondary Circuit Static Pressure

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

- *If, on initial start-up, the system pressure is below the default 0.8Bar (12PSI) static pressure at PS1, then the main pump will not be permitted to run and a 'Fill Required' will be raised, as indicated below.*

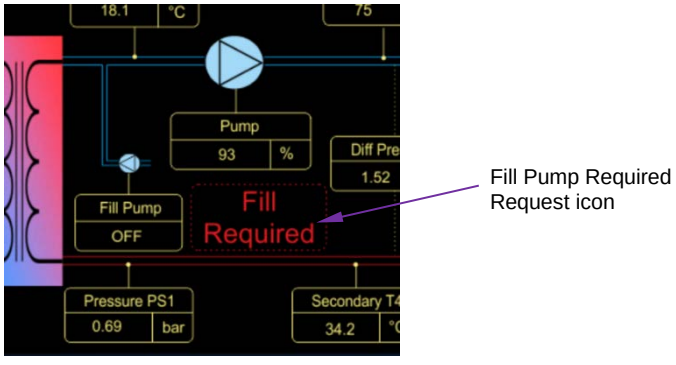


Fig.15 *– Fill Required Warning*

- *The operator will need to press the 'Fill Required' icon, which will then display the message shown in Fig.16 to ensure that the filling hose (with container of fluid) or the flexible make-up container is connected before the fill pump is activated by pressing the ON button.*

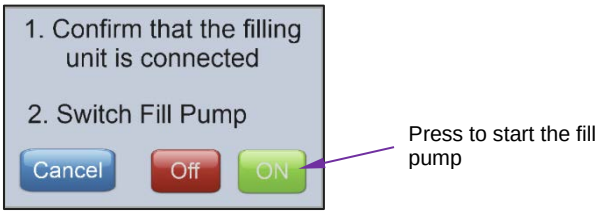


***Fig.16** – Fill Pump Manual Activation*

- *Once the unit is running, a low system pressure below the default 0.8Bar (12PSI) at PS1 will not stop the main pump from running but will initialise a 'Fill Required' (after a default 10 second delay) to request the PS1 pressure is raised to the default of 1.0Bar (15PSI).*
- *If fill pump has been running for more than 5 seconds, an 'A30 - Check Water Make-up Level' alarm will also be generated. This is a latched alarm and will need to be manually cleared but will not stop the unit from running.*
- *If the fill pump runs for more than 1 minute (default) and PS1 pressure has still not reached 1.0Bar (15PSI), then the fill pump will stop and an 'A15 - Water Make-up Empty' alarm will be generated. This is a latched alarm and will need to be manually cleared but will not stop the unit from running.*
- *If inlet pressure drops to 0.2Bar (3PSI) (set, non-adjustable) below fill pump activation threshold (i.e. to 0.6Bar (9PSI), if default value) for more than 1 minute (set, non-adjustable), a 'A31 System Low Pressure' event will be generated. This is a latched alarm and will need to be manually cleared but will not stop the unit from running.*

Secondary Circuit Fluid Level

- *While the unit is running, if the fluid level sensor is open circuit for more than 1 second, an 'A34 – Level Sensor-No Water Detected' alarm will be generated. Provided the flow or DP is still greater than 50% of setpoint, the unit will continue to run.*
- *If flow or DP is below 50% of set point, then the unit will stop and an 'A16 – Insufficient Water' alarm will be generated. This is a latched alarm and will need to be manually cleared but will not stop the unit from running.*

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

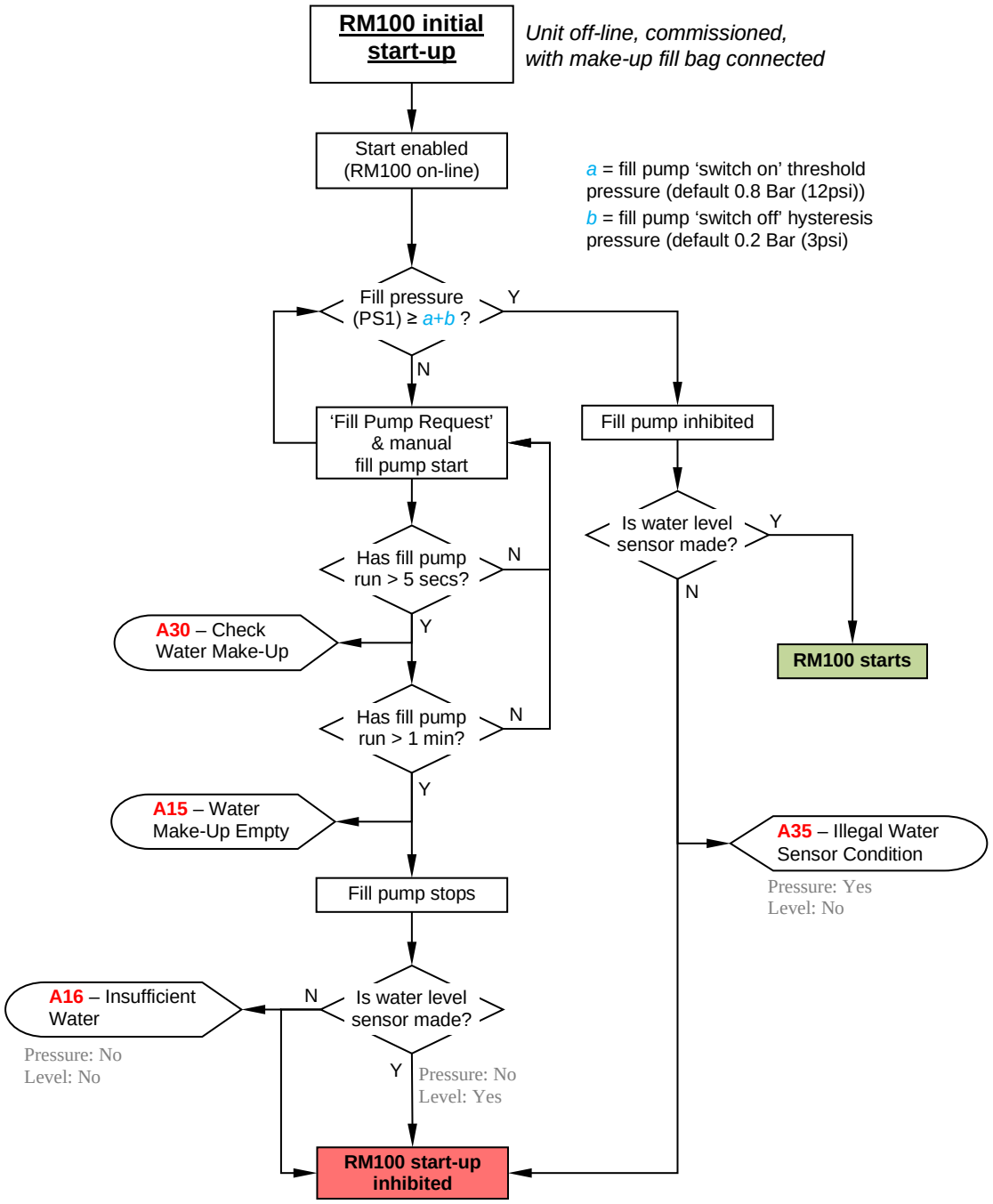


Fig.17 *– Fill Pressure & Level Flow Chart (at initial start)*

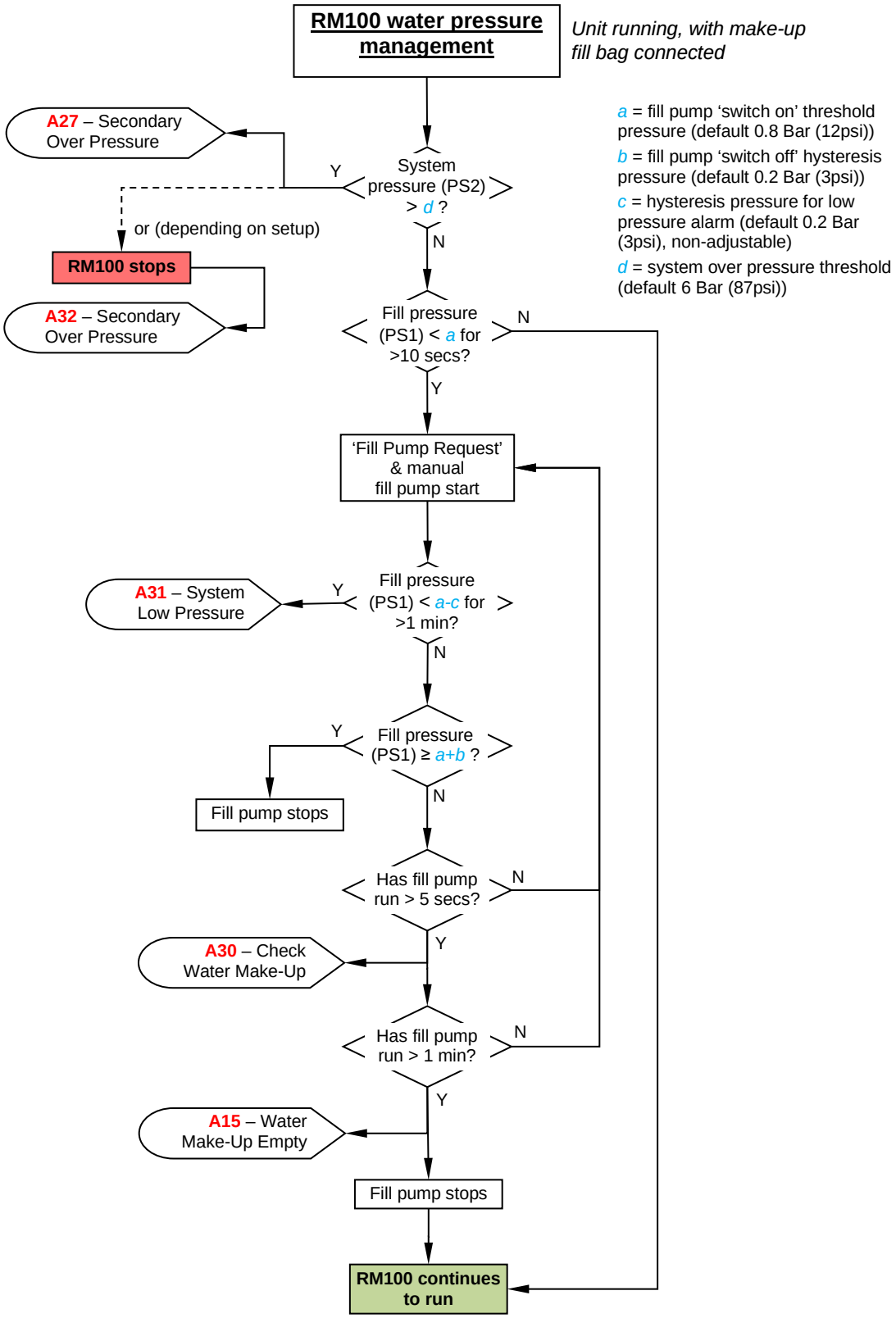


***Fig.18** – Fill Pressure & Level Flow Chart (when running)*

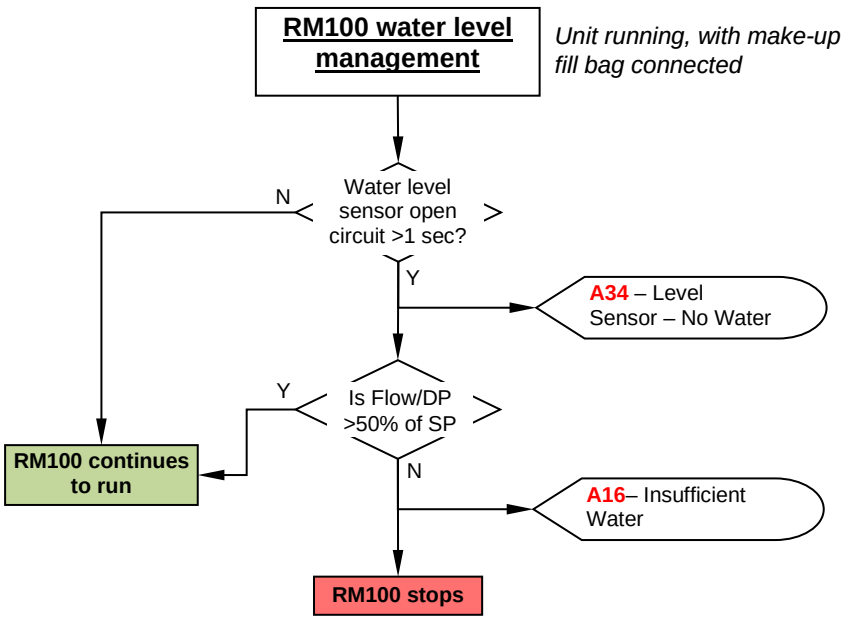


Fig.19 *– Water Level Management Flow Chart (when running)*

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

Flow Control

Monitors the Secondary flow with a calorimetric flow meter and on start-up, the control loop will increase the pump speed in stages until the flow matches the demand setpoint.

DP Control

Monitors the Secondary differential pressure with sensors on the supply & return connections of the CDU and on start-up, the control loop will increase 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 1 fails to reach 90% (default) of the flow/DP demand in a default time period of 100secs, then it is assumed there is a pump flow/pressure fault. The pump will ramp down to a stop and Pump 2 will be initialised. At the same time, an 'A17 – Pump 1 Fault' alarm will be generated.*
- *If Pump 2 also fails to reach 90% of the set DP/flow demand within the time limit, an 'A18 – Pump 2 Fault' alarm will be generated.*
- *The unit will then continue to operate with Pump 2 until faults are investigated and alarms manually cleared.*
- *The above assumes Pump 1 is the initial operating pump, the reverse would apply if Pump 2 was the operating pump.*

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

NOTICE! Each time the unit is stopped and re-started, it will select the initial operating pump that has the lowest accrued run time hours.

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

- *If the difference between the sensors exceeds a default 1.0°C (2°F), then an 'A40 (A41 or A42) - Secondary Temp T2a (T2b or T2c) Diff Out of Limits' alarm will be raised (after a default 30 second delay) and the controller will only read & average the two remaining healthy sensors.*
- *If any of the T2 temp. sensors go open circuit, then an 'A02 (A03 or A04) – T2a (T2b or T2c) Secondary Temperature Sensor Fault' alarm will be raised (no time delay) and the controller will only read & average the two remaining healthy sensors.*

Temperature sensor (T4) monitors the secondary circuit return temperature and is used in conjunction with the flow rate to calculate the heat transfer duty.
The secondary temperature should correspond to the desired set point (default 18°C (65°F)) and is used by the control loop to regulate the primary water control valve to achieve and maintain the set point. The control valve position can be monitored on the Home screen or page 1 of the Status screen (Cooling Demand/Feedback). High and low temperature alarms are set at a default value of 2°C (4°F) either side of set point (floating with set point) for both 'Fixed SP' and 'Fixed SP + Dew Point Offset control modes, with a default hysteresis of 1°C (2°F).

NOTICE! Fixed SP + Dew Point Offset control will require the installation of an optional ambient temp/hum sensor.

- *If the secondary temperature deviates by more than 2°C (4°F) below set point for 2 minutes or more, a 'A24 - Secondary Water Low Temp' alarm will be generated. This alarm will remain present until the temperature rises above the hysteresis value.*
- *If the secondary temperature deviates by more than 2°C (4°F) (default) above set point for 2 minutes or more, a 'A25 - Secondary Water High Temp' alarm will be generated. This alarm will remain present until the temperature falls below the hysteresis value.*
- *The high and low temperature alarms are ignored for a period of 20 minutes (default) on start up to allow the system time to settle without generating nuisance alarms.*

In 'Fixed SP + Dew Point Offset' control mode, the set point can be overridden by a Dew Point condition when there is a risk of condensation at the IT equipment. The room temperature and relative humidity are constantly monitored & used to calculate the anticipated dew point adjacent to the CDU (or wherever the room temp/hum senor has been located).

- Dew Point Offset – *When activated, this will be displayed on the Home screen under the Unit Mode heading.*
  W*ith this cooling mode, the CDU will operate as per 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.*

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

- *If the filter differential pressure exceeds 0.2Bar (3PSI) for, then an 'A38 – Secondary Filter Dirty' alarm is generated.*

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

NOTICE! Flows below 4L/M (1USgpm) are outside the range of the flow sensor and will not be displayed.

2.3.2 Primary Circuit Operation

The primary water temperature (T1) is monitored at the inlet to the RM100 cabinet. The nominal cooling performance of the CDU has been calculated on a chilled water temperature between 4 and 10°C (40 and 50°F).

- *If the primary temperature falls below default 4°C (40°F), an 'A22 - Primary Water Low Temp' alarm will be generated. This alarm will remain present until the temperature rises above the default 1°C (2°F) reset hysteresis.*
- *If the primary temperature rises above default 11°C (52°F), an 'A23 - Primary Water High Temp' alarm will be generated. This alarm will remain present until the temperature falls below the default 1°C (2°F) reset hysteresis.*
- *The high and low temperature alarms are ignored for a default 20-minute period on start up to allow the system time to settle without generating nuisance alarms.*

The temperature PID control loop will be operational from when the Start/Stop button is pressed and the pump has ramped up to speed. If the secondary circuit temperature rises above the set point, then Control Valve will start to open to allow more primary cooling water through the heat exchanger. The control valve will modulate from 0% (full by-pass) to 100% (full flow through heat exchanger) if a 3-way valve is fitted, or from 0% (no flow) to 100% (full flow through heat exchanger) if a 2-way valve is fitted. The valve position can be monitored on the Home screen or page 1 of the Status screen. 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 from the demand signal (allowing for the drive time of the actuator to respond to load changes), then a 'A20 - Valve Fault' event will be generated. The valve will continue to operate until fault is rectified.*

The Control Valve is a drive open/spring return device and in the event of the positioning signal being lost, it will return to a full by-pass position (3-way valve), or closed position (2-way valve), i.e. 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.

NOTICE! The flow meter will only read the 'total' primary flow through the RM100 unit, it does not monitor the flow rate through the heat exchanger, unless a 2-way control valve is used

- *An 'A21 – Primary Water Low Flow' alarm is generated if: - The 'A25 – Secondary Water High Temperature' alarm is active, demand to the control valve is at 100%, but Primary water temperature is within normal limits.*
- *An 'A33 - Primary No Flow' alarm can also be generated if: - The 'A25 - Secondary Water High Temperature' event is active, demand to the control valve is at 100% and there is a 'A23 - Primary Water High Temperature' alarm present.*

NOTICE! Flows below 2L/M (0.5USgpm) are outside the range of the flow sensor and will not be displayed.

2.4 Temperature Control Loop Adjustment

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

NOTICE! This method requires the system to be operating under typical load conditions and will initially cause the control loop to temporarily become unstable with wide temperature swing oscillations. It is important to ensure that this will not cause any damage to the equipment being cooled.
Log-on 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 & P312) to 0 seconds.
2. Increase the Proportional Band (Configuration – Temperature Control screen P310) to a higher value from the default, e.g. 20°C
3. Check that secondary supply temperature (T2) stabilises. *Note: temperature will stabilise at a higher temperature than the current set point. This offset will be eradicated once the Integral reset time is added back in.*
4. If temperature control is un-stable, raise the Proportional Band to a higher value until temperature stabilises, otherwise gradually decrease the Proportional Band in 1°C steps until the supply temperature (T2) starts to oscillate at a constant rate.
5. Measure the frequency of the oscillation time (peak to peak) in seconds (t).

2.4.1 PI Control

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

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

2.4.2 PID Control

For systems that will see high or sudden changing heat loads, PID control will generally be preferable: -

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).

Set the Derivative Reset Time to 0.125 x the oscillation time (t).

2.5 Alarm Management

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

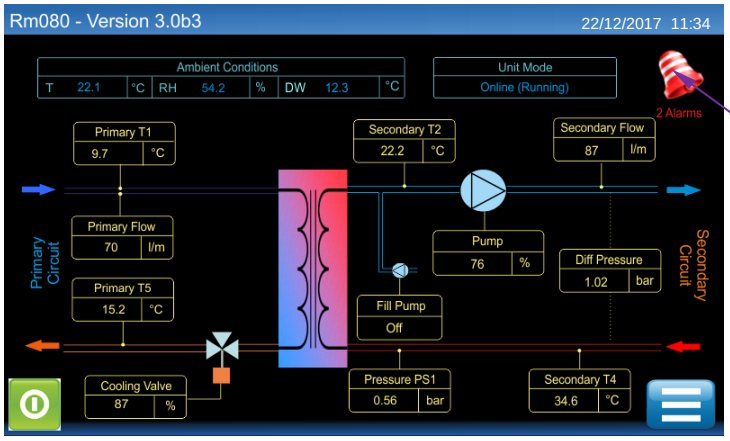


Fig.20 *– Control Screen Alarm indication*

Pressing the alarm bell icon will bring up the alarm page (as shown below) which will identify which alarms are active.

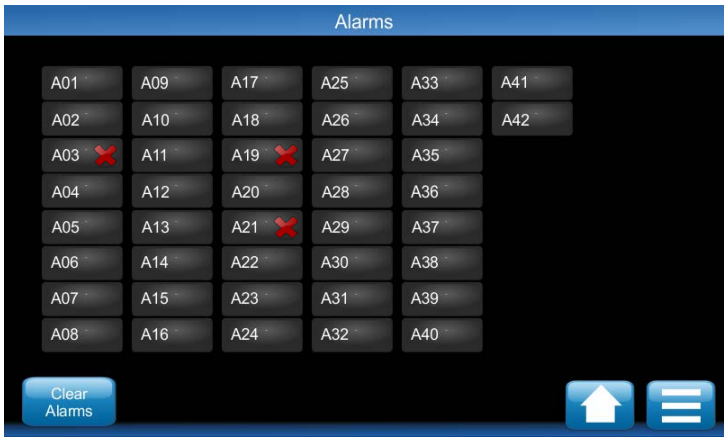


Fig.21 *– Control Screen Active alarms*

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

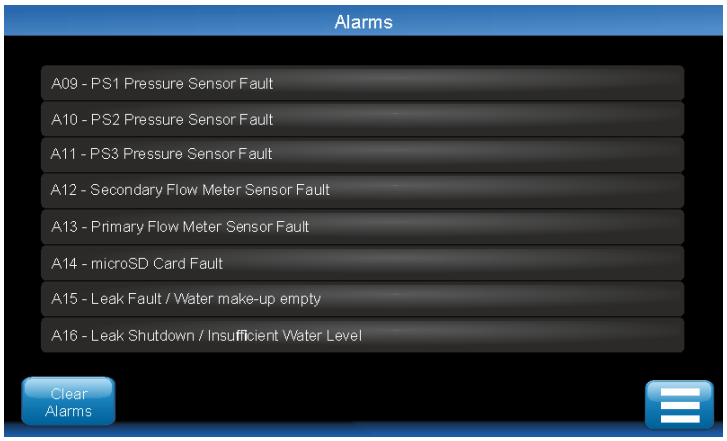


Fig.22 *– Control Screen Alarm identification*

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

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

The self-clearing and latching alarms are identified in **Section 2.6**

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

2.6 Trouble Shooting (Alarms)

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

NOTICE! This is the full list of all Alarms, however not all will necessarily be active depending on unit configuration, e.g. if the CDU has not been fitted & configured for a Power Monitor, then the associated A39 – Power Meter alarm will not be active, etc.

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

Severity Classification (Sev.): -

1	– Unit shutdown (shutdown IT immediately)
2	– Urgent alarm (immediate investigation required, prepare to shut down IT if required)
3	– Non urgent alarm (investigate within 4 working days)
4	– Information only (respond when required or at PPM)

The above Severity Classifications are suggested only, customers may wish to assign their own ratings.

Code	Description	Sev.	Self-clear	Latching	Shutdown	Delay
----	**No Display**	**3**	-	-	-	-
Detail:	Display not illuminated. Power failure on display board or controller I/O board.					
Action:	Open upper electrical panel door to check that 24v DC is available at controller I/O board. If there are no LEDs showing on processor board then check I/O board 24v fuse FS1. If LEDs are on, check for wiring faults between I/O board and display.					
A01	**T1 Primary Temperature Sensor Fault**	**3**	✓	-	-	-
Detail:	Reading from Primary temperature sensor T1 is outside the normal range of -5 to 74°C (23 to 165°F) or disconnected.					
Action:	Check sensor connections to the control board, check in-line 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 74°C (41 to 165°F) or disconnected.					
Action:	Check sensor connections to the control board, check in-line 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 74°C (41 to 165°F) or disconnected.					
Action:	Check sensor connections to the control board, check in-line 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 74°C (41 to 165°F) or disconnected.					
Action:	Check sensor connections to the control board, check in-line connections, replace sensor.					
A05*	**T3 Room Temperature Sensor Fault**	**3**	✓	-	-	-
Detail:	Reading from Room temperature sensor T3 is outside the normal range of 5 to 74°C (41 to 165°F) or disconnected.					
Action:	Check sensor connections to the control board, check in-line connections, replace sensor.					

Code	Description	Sev.	Self-clear	Latching	Shutdown	Delay
A06	**T4 Secondary Temperature Sensor Fault**	**4**	✓	-	-	-
Detail:	Reading from Secondary return temperature sensor T4 is outside the normal range of 5 to 74°C (41 to 165°F) or disconnected.					
Action:	Check sensor connections to the control board, check in-line connections, replace sensor.					
A07	**T5 Primary Temperature Sensor Fault**	**4**	✓	-	-	-
Detail:	Reading from Primary return temperature sensor T5 is outside the normal range of 5 to 74°C (41 to 165°F) or disconnected.					
Action:	Check sensor connections to the control board, check in-line connections, replace sensor.					
A08*	**RH Relative Humidity Sensor Fault**	**3**	✓	-	-	-
Detail:	Reading from Room humidity sensor RH is outside the normal range of 5 to 100% RH or disconnected. *[Note: if in Fixed Set Point + DW Offset mode, unit will revert to Fixed Set Point mode – default 18°C (65°F)].*					
Action:	Check sensor connections to the control board, check in-line connections, replace sensor.					
A9	**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 know demand].*					
Action:	Check sensor connections to the control board, check in-line connections, replace sensor.					
A10	**PS2 Secondary Pressure Sensor Fault**	**3**	✓	-	-	-
Detail:	Reading from Secondary filter outlet pressure sensor PS2 is outside the normal range of -1 to 8 bar (-15 to 116 PSI) and min/max values only will be displayed *[Note: if filter differential pressurePS1-PS2 is not valid, then pump speed will remain at last know demand].*					
Action:	Check sensor connections to the control board, check in-line connections, replace sensor.					
A11	**PS3 Secondary Pressure Sensor Fault**	**2**	✓	-	-	-
Detail:	Reading from Secondary supply pressure sensor PS3 is outside the normal range of -1 to 8 bar (-15 to 116 PSI) and min/max values only will be displayed *[Note: for DP control, if system differential pressure PS3-PS1 is not valid, then pump speed will remain at last know demand].*					
Action:	Check sensor connections to the control board, check in-line connections, replace sensor.					
A12	**Secondary Flow Meter Sensor Fault**	**2**	✓	-	-	-
Detail:	Secondary flow meter output is below 4mA.					
Action:	Check sensor connections to the control board, check in-line connections, replace sensor.					
A13	**Primary Flow Meter Sensor Fault**	**3**	✓	-	-	-
Detail:	Primary flow meter output is below 4mA.					
Action:	Check sensor connections to the control board, check in-line connections, replace sensor.					
A14	**Micro SD Card Fault**	**3**	✓	-	-	-
Detail:	The SD card has either been removed or physically damaged.					
Action:	Replace the SD card					
A15	**Leak Fault / Water Make-up Empty**	**2**	-	✓	-	-
Detail:	Fill pump has been running for more than 1 minute (default), when level sensor is made, but minimum system pressure level has not been achieved. Also activated when level switch remains open and system pressure has not been achieved (accompanied by an 'A16 - Insufficient Water Level' alarm).					
Action:	Check the make-up water container is full, tubes are free of air locks, container is properly connected and fill pump is operational. Check system for leaks.					

Code	Description	Sev.	Self-clear	Latching	Shutdown	Delay
A16	**Leak Shutdown / Insufficient Water**	**1**	-	✓	✓	-
Detail:	On Initial Start-up – if level sensor is not made, fill pressure has not been achieved & fill pump has been running for more than 1 minute, then unit will not start or shutdown immediately. While Unit is Running – This will be in conjunction with a 'A34 – Level Sensor – No Water Detected' alarm (refer to A34 for detail). If level sensor is not made and flow of DP is < 50% of flow/DP setpoint, then unit will shut down after a 1 sec. delay					
Action:	Check that water make-up container is properly connected (or filling wand is fully immersed, if used). Check system for leaks. Check there is no trapped air in fill pump hoses and system is fully vented. Check auto air vents are open.					
A17	**Pump 1 Fault**	**2**	-	✓	-	-
Detail:	Pump 1 is drawing excessive current, or speed controller has been subjected to over/under voltage. Alarm will only appear after speed controller has gone into fault condition; Pump 2 will then run.					
Action:	Replace Pump 1					
A18	**Pump 2 Fault**	**2**	-	✓	-	-
Detail:	Pump 2 is drawing excessive current, or speed controller has been subjected to over/under voltage. Alarm will only appear after speed controller has gone into fault condition; Pump 1 will then run.					
Action:	Replace Pump 2					
A19	**Secondary Pump Flow Shutdown**	**1**	-	✓	✓	-
Detail:	An A17 & A18 – Pump Fault and/or an A43 & A44 – Pump Comms Fault have been generated.					
Action:	Check running current of pumps, check speed controllers for faults. Faults will need to be rectified & alarms cleared before unit can be started again					
A20	**Valve Fault**	**2**	-	✓	-	-
Detail:	Feedback signal from control valve is more than 10% (default) adrift from demand signal (sampled every 15 mins (default) and allowing for 40 second (default) positioning time).					
Action:	Check the wiring connections to the actuator. Try to set the actuator position using the 'Auto Overrides' function. Check the cooling valve demand % and feedback signals (Diagnostics AO04 & UI13)					
A21	**Primary Water Low Flow**	**2**	-	✓	-	✓
Detail:	Will only activate when valve demand is at 100%, 'A25 - Secondary Water High Temp' alarm is active and Primary water temperature is within specified limits (default 5 min. delay applies).					
Action:	Check operation of control valve. Check primary water supply flow rate. Ensure system heat load does not exceed the RM100 capacity (i.e. check that Primary flow is sufficient for heat load – refer to RM100 Application & Planning Guide					
A22	**Primary Water Low Temperature**	**3**	✓	-	-	✓
Detail:	Primary water temperature has dropped below the default 4°C (40°F) threshold. Alarm will cancel when temperature rises to 5°C (42°F) or more (default 2 min. delay applies).					
Action:	Check chilled water supply					
A23	**Primary Water High Temperature**	**2**	✓	-	-	✓
Detail:	Primary water temperature has risen above the default 11°C (52°F) threshold. Alarm will cancel when temperature falls to 10°C (50°F) or less (default 2 min. delay applies).					
Action:	Check chilled water supply					
A24	**Secondary Water Low Temperature**	**2**	✓	-	-	✓
Detail:	Secondary water temperature has dropped by more than 2°C (4°F) below set point (default). Alarm will cancel when temperature rises to 1°C (2°F) below set point or higher. If Dew Point Offset is active, then this alarm will only activate when at or below dew point for a period of 3 minutes or more (default 2 minute delay applies).					
Action:	Check operation of control valve					

Code	Description	Sev.	Self-clear	Latching	Shutdown	Delay
A25	**Secondary Water High Temperature**	**2**	✓	-	-	✓
Detail:	Secondary water temperature has risen by more than 2°C (4°F) above set point (default). Alarm will cancel when temperature falls to 1°C (2°F) above set point or lower. If Dew Point Offset is active, then this alarm will activate at a pre-set default value of 20°C (70°F) – see Configuration/Temperature Control/P308 (default 2 minute delay applies).					
Action:	Check operation of control valve					
A26	**Water Detected (Internal Leak)**	**1**	-	✓	✓ **(or -)**	-
Detail:	Leak tape in unit drip tray has detected a substantial water leak. Event may be set for 'Alarm Only' (default), or 'Alarm + Unit Shutdown'.					
Action:	Identify and repair the leak (Note: A leak of this magnitude that does not bring up any other alarms, would most likely be from the Primary circuit.					
A27	**Sec. Over Pressure (Alarm)**	**2**	✓	-	-	-
Detail:	Pressure at PS3 has increased above the set value of 6Bar (87PSI) (default). This alarm is only active if unit has been configured for alarm only (See Configuration/Pump Control/P211).					
Action:	Most likely cause will be excessive heat build-up in the system, or a breach between Primary and Secondary circuits within the plate heat exchanger. Check for High Temp alarms, check bladder in expansion vessel(s) has not ruptured, relieve pressure at drain point. Remove heat exchanger and replace.					
A28*	**Water Detected (External Primary Leak)**	**1**	-	✓	✓**(or -)**	-
Detail:	The water detection tape installed under the floor to the Primary circuit (if fitted – optional extra) has detected a substantial water leak. Alarm may be set for 'Alarm Only' (default), or 'Alarm + Unit Shutdown'.					
Action:	Identify and repair leak (note: a leak of this magnitude that does not bring up other alarms will most likely be from the Primary chilled water circuit.					
A29*	**Water Detected (External Secondary Leak)**	**1**	-	✓	✓**(or -)**	-
Detail:	The water detection tape installed under the floor to the Secondary circuit (if fitted – optional extra) has detected a substantial water leak. Alarm may be set for 'Alarm Only' (default), or 'Alarm + Unit Shutdown'.					
Action:	Identify and repair leak (note: a leak of this magnitude that does not bring up other alarms will most likely be from the Primary chilled water circuit.					
A30	**Check Water Make-up Level**	**2**	-	✓	-	-
Detail:	Fill pump has run for more than 5 secs (fill pump will run when pressure at PS1 drops fill below the activation threshold - default 0.8 bar (12PSI) for more than 10 seconds, while unit is running in automatic/on-line mode)					
Action:	Check amount of fluid in make-up container and re-fill if necessary with treated water (check system for any sign of leakage).					
A31	**System Low Pressure**	**2**	-	✓	-	✓
Detail:	Pressure at PS1 has dropped more than 0.2Bar (3PSI) (set, non-adjustable) below fill pump activation threshold for more than 1 minute (set, non-adjustable, applicable when unit is running in automatic/on-line mode).					
Action:	Check amount of fluid in make-up container and re-fill if necessary. Ensure fill pump hoses are free of air locks, container is properly connected and fill pump is operational. Check system for leaks.					
A32	**Sec. Over Pressure (Alarm + Shutdown)**	**1**	✓	-	✓	-
Detail:	Pressure at PS3 has increased above the set value of 6Bar (87PSI) (default). This alarm is only active if unit has been configured for alarm + shutdown only (See Configuration - Pump Control).					
Action:	Most likely cause will be excessive heat build-up in the system, or a breach between Primary and Secondary circuits within the plate heat exchanger. Check for High Temp alarms, check bladder in expansion vessel(s) has not ruptured, relieve pressure at drain point. Remove heat exchanger and replace.					

Code	Description	Sev.	Self-clear	Latching	Shutdown	Delay
A33	**Primary Water No Flow**	**2**	-	✓	-	-
Detail:	Will only activate when Valve Demand is at 100%, A32 - Secondary Water High Temp and A30 - Primary High Temp alarms are active (default 5 minute delay applies).					
Action:	Check that the chiller or facility water supply is operational and fault free					
A34	**Level Sensor – No Water Detected**	**2**	✓	-	-	-
Detail:	While Unit is Running only – if level sensor is open circuit for more than 1 sec. then this alarm will be raised, providing flow or DP (depending on control function set) is >50% of flow/DP setpoint. If flow/DP is below this threshold, then 'A16 - Leak Shutdown/Insufficient Water' alarm (refer to A16 for detail) will be raised & unit will shut down after a 1 sec. delay.					
Action:	Check that water make-up container is properly connected (or filling wand is fully immersed, if used). Check system for leaks. Check there is no trapped air in fill pump hoses and system is fully vented. Check auto air vents are open.					
A35	**Illegal Water Sensor Condition**	**2**	✓	-	-	-
Detail:	On Initial Start-up – if fill pressure has been achieved, but level sensor is not made.					
Action:	Replace level sensor/s					
A36	**Group Control Network Fault**	**2**	✓	-	-	-
Detail:	Comms failure between CDUs on network					
Action:	Check wiring & terminations					
A37	**Group Control Insufficient Units**	**2**	✓	-	-	-
Detail:	Group control cannot bring a redundant unit on-line because it's either in a fault condition, has locally been put into standby mode, or has a comms. failure					
Action:	Check status of redundant unit, check wiring & terminations					
A38	**Secondary Filter Dirty**	**2**	✓	-	-	-
Detail:	Differential pressure across Secondary filter is greater than 0.2Bar (3PSI), indicating that the filter should be cleaned (default 60 second delay applies).					
Action:	Clean filter screen as described in the Maintenance Section					
A39*	**Power Meter Communications Fault**		✓	-	-	-
Detail:	(not currently supported)					
Action:	n/a					
A40	**Secondary Temp T2a Diff Fault**	**3**	✓	-	-	-
Detail:	Difference between Secondary temp. sensor T2a is more than default 1°C (2°F) adrift from T2b & T2c, for a period of 30 seconds (default) or more. Controller will read the average of T2b & T2c only.					
Action:	Check T2a sensors against temperature sensor resistance chart in Section 2.7 and replace if faulty.					
A41	**Secondary Temp T2b Diff Fault**	**3**	✓	-	-	-
Detail:	Difference between Secondary temp. sensor T2b is more than default 1°C (2°F) adrift from T2a & T2c, for a period of 30 seconds (default) or more. Controller will read the average of T2a & T2c only.					
Action:	Check T2b sensors against temperature sensor resistance chart in Section 2.7 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 & T2b, for a period of 30 seconds (default) or more. Controller will read the average of T2a & T2b only.					
Action:	Check T2c sensors against temperature sensor resistance chart in Section 2.7 and replace if faulty.					
A43	**Pump 1 Communications Fault**	**2**	✓	-	-	-
Detail:	Controller unable to communicate with Pump 1 speed controller. Pump 1 will stop and Pump 2 will then run					
Action:	Check all cables & connections. Replace pump					
A44	**Pump 2 Communications Fault**	**2**	✓	-	-	-
Detail:	Controller unable to communicate with Pump 2 speed controller. Pump 2 will stop and Pump 1 will then run					
Action:	Check all cables & connections. Replace pump					

Code	Description	Sev.	Self-clear	Latching	Shutdown	Delay
A45	**Pump 1 Low Flow**	**2**	-	✓	-	-
Detail:	Pump 1 has not reached the differential pressure (or flow rate) setpoint and is running at 100% in the specified time limit (default 30 secs). Pump 1 will then stop and Pump 2 will run.					
Action:	Check that unit has been set for the correct system flow rate (or DP), check for system blockages, check speed controller for faults, check non-return valve on Pump 2 is not sticking open. Reduce flow setting (or DP).					
A46	**Pump 2 low Flow**	**2**	-	✓	-	-
Detail:	Pump 2 has not reached the differential pressure (or flow rate) setpoint and is running at 100% in the specified time limit (default 30 secs). Pump 2 will then stop and Pump 1 will run.					
Action:	Check that unit has been set for the correct system flow rate (or DP), check for system blockages, check speed controller for faults, check non-return valve on Pump 1 is not sticking open. Reduce flow setting (or DP).					
A47	**MicroSD Card Full**	**2**	✓	-	-	-
Detail:	MicroSD card has reached capacity					
Action:	Replace card					

2.7 Temperature Sensor Graph

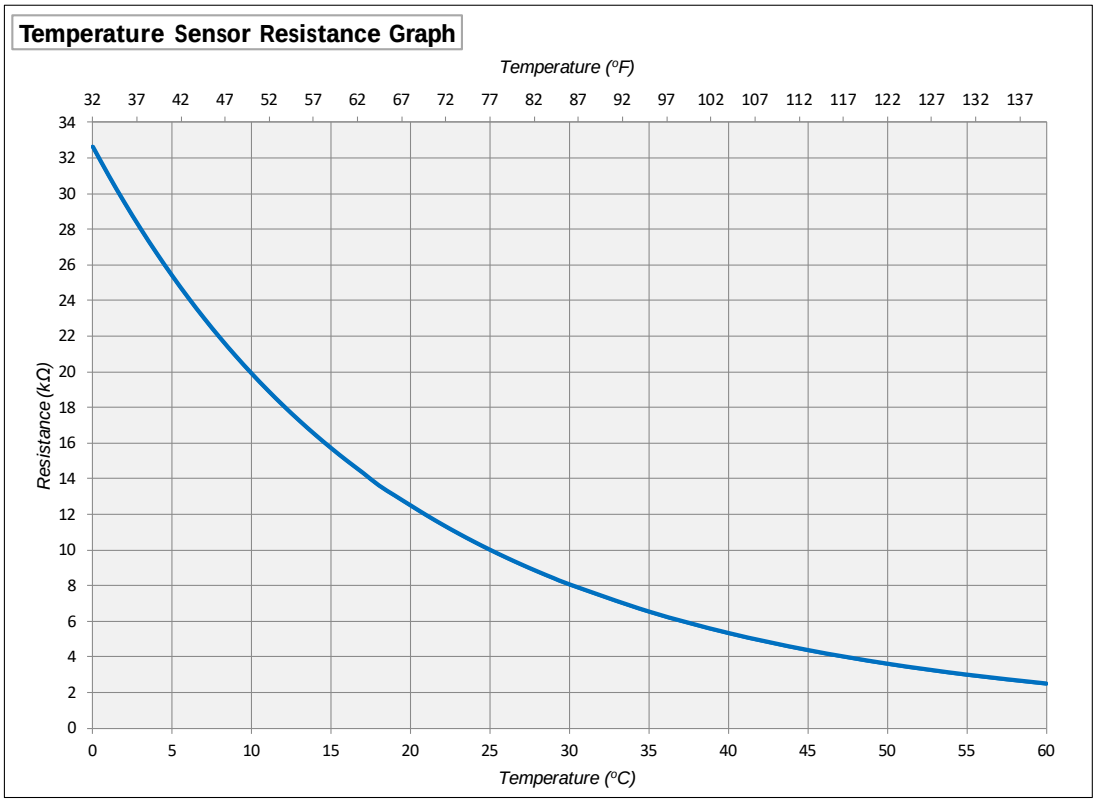


Fig.23 *– Temperature Sensor Resistance Graph*

The chart above may be used to check the validity of any of the temperature sensors used in the unit or the remote room sensor.

3. Maintenance

3.1 General

The CDU should be cleaned on a regular basis and checked for leaks and malfunctions.
Maintenance should only be carried out by personnel qualified to work on this type of equipment.

For information on Maintenance or Service Support, contact the supplier - detail in Section 4.3

3.2 Fluid Specifications

Primary Circuit

The RM100 CDU is designed for use with a facility supply of plain water or up to 20% glycol/water. A 20% glycol concentration will give protection to approx. -9°C (16°F). If a higher concentration of glycol is used, then the cooling capacity of the unit may have to be de-rated (contact manufacturer for advice).

Secondary Circuit

The secondary circuit should be filled with particulate free deionized water treated with suitable corrosion inhibitors and biocides, or Recochem OAT PG-25 computer coolant.

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

Attention:

There is some residual water remaining in the CDU secondary circuit after Lenovo manufacturing integration, test, and draining. Before filling the CDU secondary circuit and rack for the first time, be sure to flush/rinse the entire secondary loop with clean, bacteria free water (distilled or deionized preferred). After draining the rinsing fluid, proceed with filling the CDU secondary circuit and rack with water which complies with the Lenovo Water Quality Specification and comes with the appropriate concentrations of corrosion inhibitor and biocide.

3.3 Planned Maintenance

Planned maintenance services should be carried out every 6 months following installation & commissioning.

3.3.1 Special tools/equipment

- Surface temperature measurement device
- Air temperature measurement device
- Clamp-on ammeter
- Drain tube (supplied with unit)
- Fluid sample kit (for fluid analysis)
- Micro-SD card reader and computer

3.3.2 Visual checks for damage & leakage

- Pipework and hoses
- All temperature, level, flow and pressure sensors
- Expansion vessel and Schrader valves
- Vent & drain points
- Pump clamped connections
- Pipe/hose clamped connections

- Check running pump for abnormal noise
- Record any damage to unit

3.3.3 General settings

- Record unit serial no. on maintenance check list
- Record values from controller display home page

3.3.4 Controller checks

(setpoints and alarm actions, group control etc. – download logs)

- Check the sync date and time of the units
- Check for any current alarms, take appropriate action as detailed in this guide
- Download complete contents of RM100 folder from micro-SD card. This folder contains historic alarm log, system log, parameter log & data log files
- Record parameters from the parameter log file that have been changed from default since commissioning (signified by asterix(*) adjacent to parameter ID in log file) – verify with customer why values have changed from commissioned value

3.3.5 Communication checks

- Check with customer that remote communications function correctly with no reported issues

3.3.6 Sensor checks

- Check all fluid temperature sensors are consistent with surface temperature measurement device readings. Check pressure & flow sensor readings are consistent with other units in the group (if multiple units) and with commissioned values

3.3.7 Fluid checks

- Take secondary circuit fluid sample as directed by fluid management partner and sent to approved lab. for analysis and report recommendations
- Take action on any previous fluid report recommendations
- Check supplementary filling operation with manual override if not automatically engaged when taking fluid sample
- Check flexible make-up container is full and properly connected (if used)
- Record fluid filter DP readings (PS3a and PS3b difference with PS2)
- Isolate, remove and clean fluid filter(s) if necessary, and record new readings

3.3.8 Functional checks

(may require unit shutdown – check with customer before continuing)

- Check controller & display firmware status & upgrade if necessary
- Carry out audible/visual checks on operational & standby pumps
- Override operational pump speed to 100% and record temperature, current & voltage from Status screen (ensure PS3 does not exceed high pressure alarm setpoint). Carry out audible checks on pump
- Override redundant pump speed to 100% and record temperature, current & voltage from Status screen, then set override back to 0%
- Check all the cable connections and terminals for signs of damage/loose wire connection

3.4 Secondary Filter Service

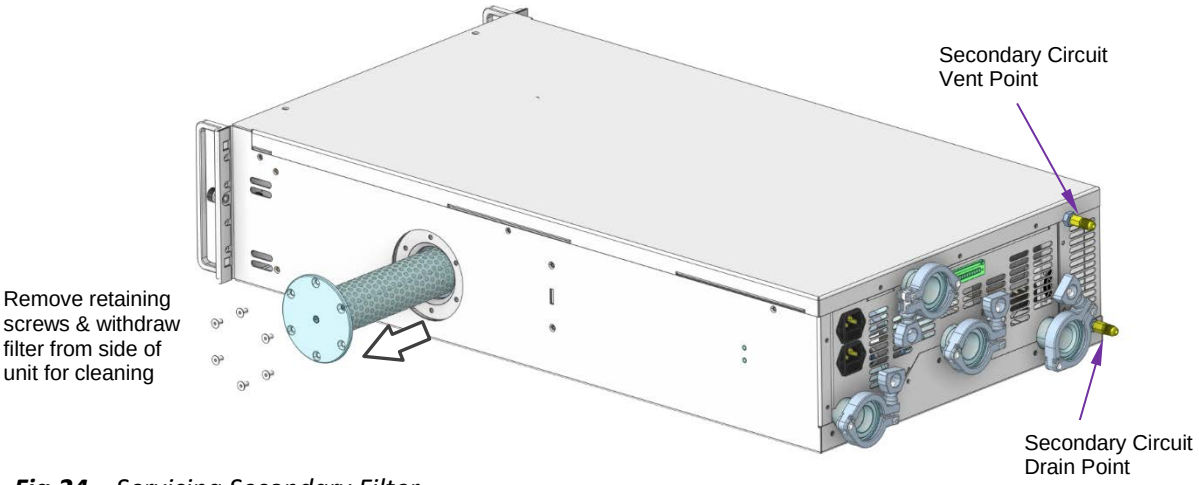


***Fig.24** – Servicing Secondary Filter*

NOTICE! The unit will need to be stopped before cleaning the filter and either partially of fully withdrawn from the rack

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

- Stop the unit, isolate the unit from external secondary circuit (with isolation valves or quick release couplings), then drain the secondary circuit at the Schrader valve drain point located on the rear panel of the unit (Note: once the pressure is released, this will be easier if the vent point is also opened – see diagram above).
- Pull the unit forward from the rack far enough to gain access the filter on the right-hand side of the unit. **Note:** this will require sufficient flexibility in the Primary & Secondary hoses connected to the rear of the unit. If this is not possible, then the hose connections (valves or QC's) will need to be isolated & disconnected first.
- Once the water has been drained from the Secondary circuit, the filter can be removed from the filter housing, by removing the 6 x countersunk hd. retaining screws.
- The filter screen may now be washed under a running tap from inside to outside. If available, a high-pressure water jet is preferable for more effective cleaning, although care should be taken not to damage the filter mesh.

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

3.5 Spare Parts

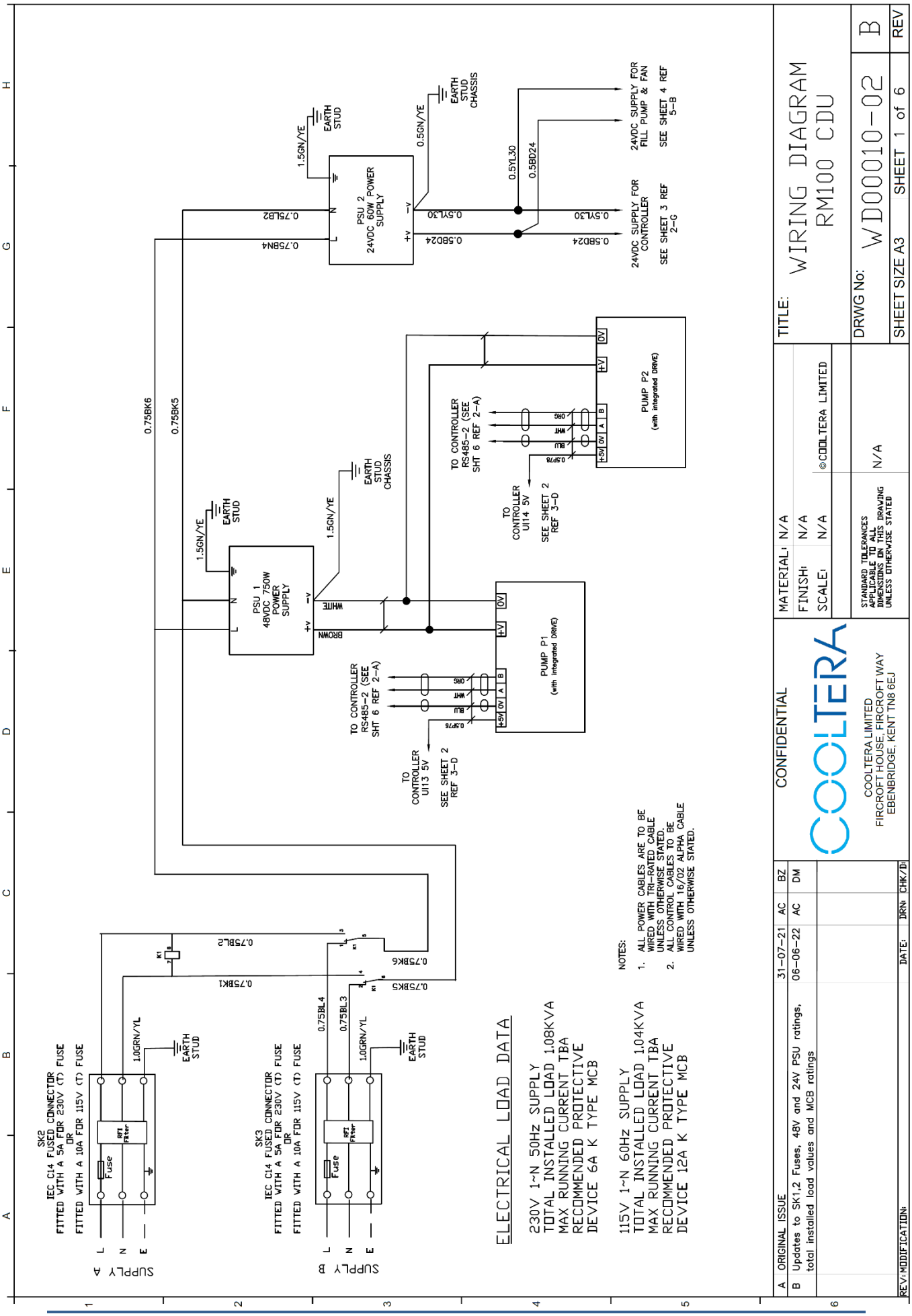
Contact supplier spare parts requirements.

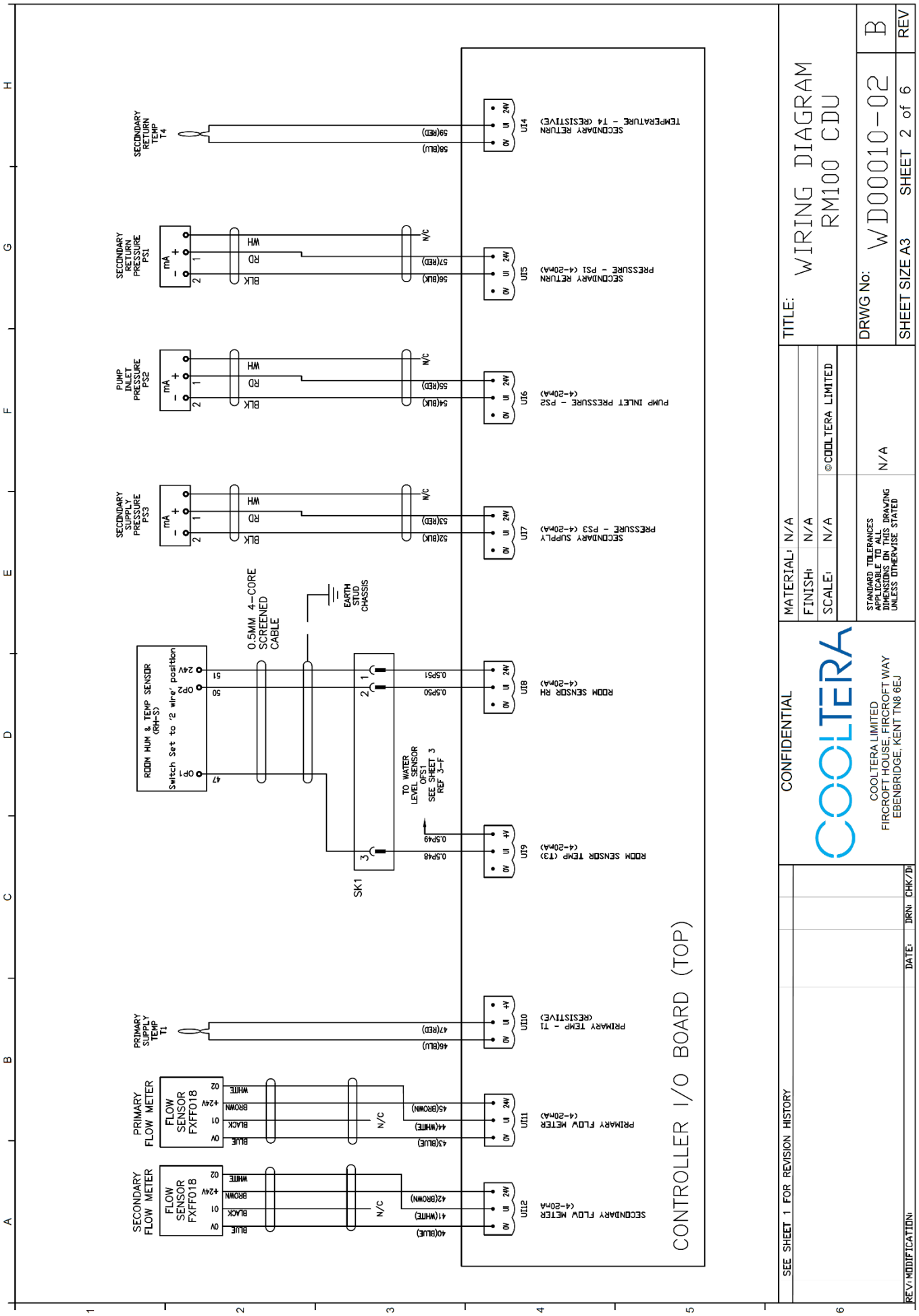
Part No.	Description
SP00001-21	Main Pump Assembly 48v DC
SP00006-02	Control Valve Actuator
SP00007-01	Controller Board Assembly
SP00008-01	Controller Touchscreen Display
SP00009-02	Fill Pump

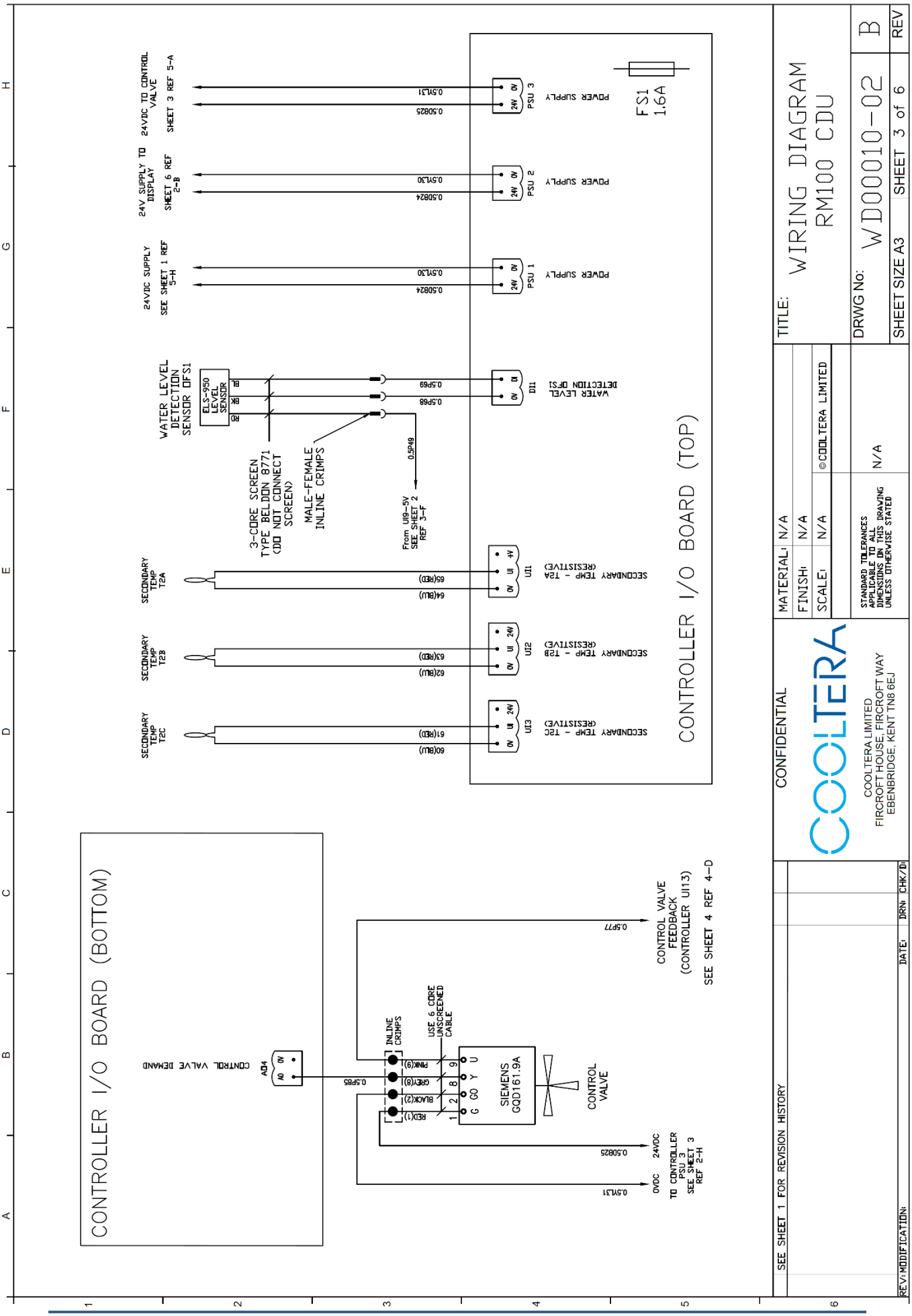
Part No.	Description
SP00010-01	Temperature Sensor
SP00012-01	Flow Meter Sensor
SP00013-01	Pressure Sensor (-1 to 8 bar)
SP00014-nn	Power Supply 48V
SP00014-nn	Power Supply 24v
SP00016-03	Level Sensor Optical
SP00020-02	Make-up Container
SP00023-03	Secondary 50µ Filter
SP00024-nn	Pressure Relief Valve
SP00025-03	Axial Cooling Fan
SP00031-nn	Filling Wand
SP000nn-nn	Power Cable
SPK0002-nn	Hygienic Seal Kit
SPK0001-08	Fuse Kit (230v)
SPK0001-09	Fuse Kit (110v)

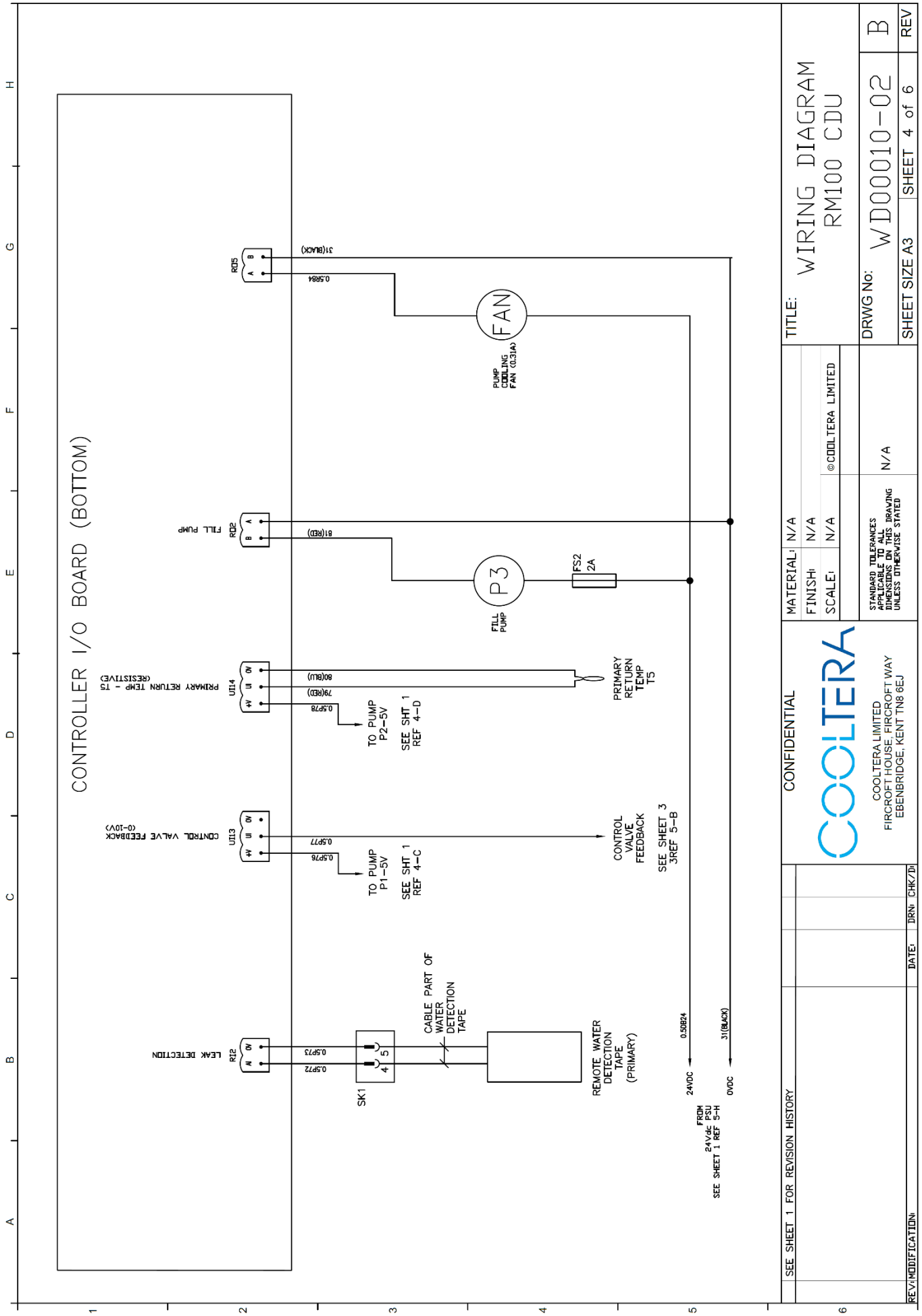
4. Additional Information

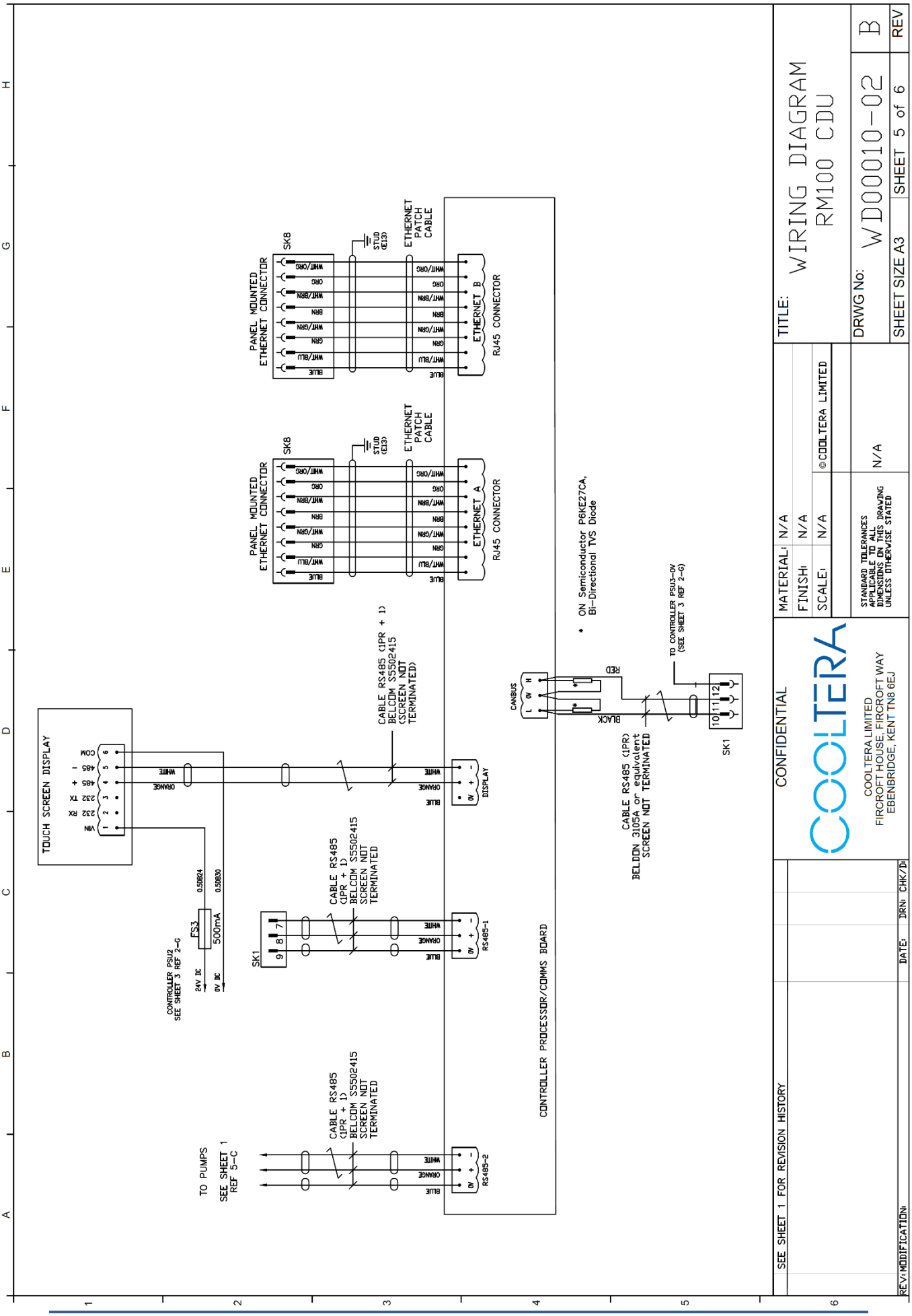
4.1 Wiring Diagram (WD00003-01)

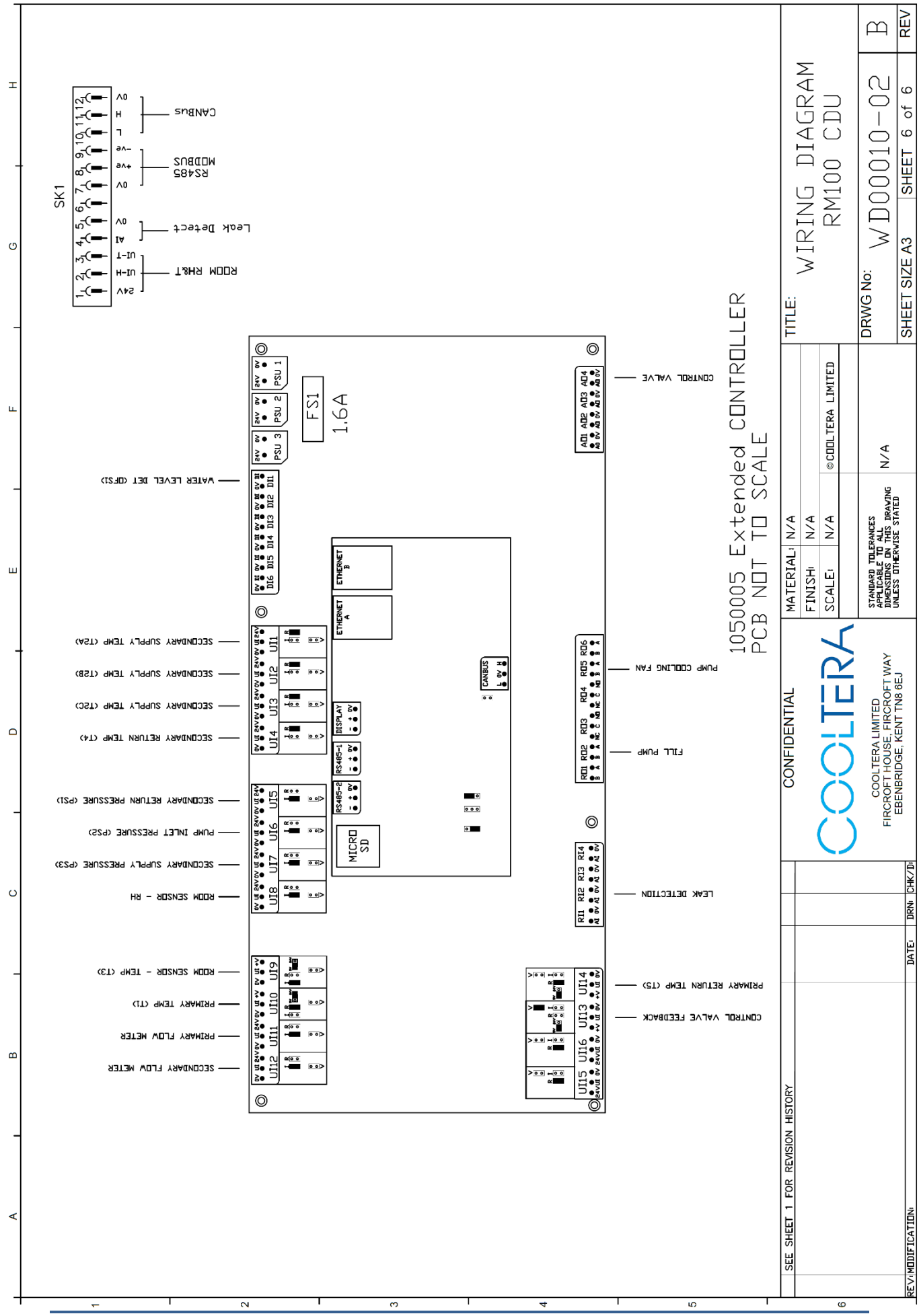

WIRING DIAGRAM
RM100 CDU
DRWG No: WD00010-02
B
SHEET SIZE A3
SHEET 1 of 6
REV
CONFIDENTIAL
COOLTERA
COOLTERA LIMITED
FIRCROFT HOUSE, FIRCROFT WAY
EBENBRIDGE, KENT TN8 6EJ
MATERIAL: N/A
FINISH: N/A
SCALE: N/A
©COOLTERA LIMITED
STANDARD TOLERANCES APPLICABLE TO ALL DIMENSIONS ON THIS DRAWING UNLESS OTHERWISE STATED
N/A
A ORIGINAL ISSUE 31-07-21 AC BZ
B Updates to SK1,2 Fuses, 48V and 24V PSU ratings, total installed load values and MCB ratings 06-06-22 AC DM
REV: MODIFICATION: DATE: DRN CHK/Di
ELECTRICAL LOAD DATA
230V 1~N 50Hz SUPPLY
TOTAL INSTALLED LOAD 1.08KVA
MAX RUNNING CURRENT TBA
RECOMMENDED PROTECTIVE DEVICE 6A K TYPE MCB
115V 1~N 60Hz SUPPLY
TOTAL INSTALLED LOAD 1.04KVA
MAX RUNNING CURRENT TBA
RECOMMENDED PROTECTIVE DEVICE 12A K TYPE MCB
NOTES:
1. ALL POWER CABLES ARE TO BE WIRED WITH TRI-RATED CABLE UNLESS OTHERWISE STATED.
2. ALL CONTROL CABLES TO BE WIRED WITH 16/02 ALPHA CABLE UNLESS OTHERWISE STATED.
SUPPLY A
SUPPLY B
SK2 IEC C14 FUSED CONNECTOR FITTED WITH A 5A FOR 230V (T) FUSE OR FITTED WITH A 10A FOR 115V (T) FUSE
SK3 IEC C14 FUSED CONNECTOR FITTED WITH A 5A FOR 230V (T) FUSE OR FITTED WITH A 10A FOR 115V (T) FUSE
PSU 1 48VDC 750W POWER SUPPLY
PSU 2 24VDC 60W POWER SUPPLY
PUMP P1 (with integrated DRIVE)
PUMP P2 (with integrated DRIVE)
TO CONTROLLER RS485-2 (SEE SHT 6 REF 2-A)
TO CONTROLLER U113 5V
TO CONTROLLER U114 5V
SEE SHEET 2 REF 3-D
24VDC SUPPLY FOR CONTROLLER
24VDC SUPPLY FOR FILL PUMP & FAN
SEE SHEET 3 REF 2-G
SEE SHEET 4 REF 5-B
EARTH STUD
EARTH STUD CHASSIS


CONTROLLER I/O BOARD (TOP)
SECONDARY RETURN TEMP T4
SECONDARY RETURN PRESSURE PS1
PUMP INLET PRESSURE PS2
SECONDARY SUPPLY PRESSURE PS3
PRIMARY SUPPLY TEMP T1
PRIMARY FLOW METER
SECONDARY FLOW METER
FLOW SENSOR FXFF018
ROOM HUM & TEMP SENSOR (RH-S)
Switch Set to '2 wire' position
0.5MM 4-CORE SCREENED CABLE
EARTH STUD CHASSIS
TO WATER LEVEL SENSOR OFS1 SEE SHEET 3 REF 3-F
SK1
SECONDARY RETURN TEMPERATURE - T4 (RESISTIVE)
SECONDARY RETURN PRESSURE - PS1 (4-20mA)
PUMP INLET PRESSURE - PS2 (4-20mA)
SECONDARY SUPPLY PRESSURE - PS3 (4-20mA)
ROOM SENSOR RH (4-20mA)
ROOM SENSOR TEMP (T3) (4-20mA)
PRIMARY TEMP - T1 (RESISTIVE)
PRIMARY FLOW METER (4-20mA)
SECONDARY FLOW METER (4-20mA)
TITLE: WIRING DIAGRAM RM100 CDU
DRWG No: WD00010-02
B
SHEET SIZE A3
SHEET 2 of 6
REV
MATERIAL: N/A
FINISH: N/A
SCALE: N/A
©COOLTERA LIMITED
STANDARD TOLERANCES APPLICABLE TO ALL DIMENSIONS ON THIS DRAWING UNLESS OTHERWISE STATED
N/A
CONFIDENTIAL
COOLTERA
COOLTERA LIMITED
FIRCROFT HOUSE, FIRCROFT WAY
EBENBRIDGE, KENT TN8 6EJ
SEE SHEET 1 FOR REVISION HISTORY
REV: MODIFICATION: DATE: DRN: CHK'D:

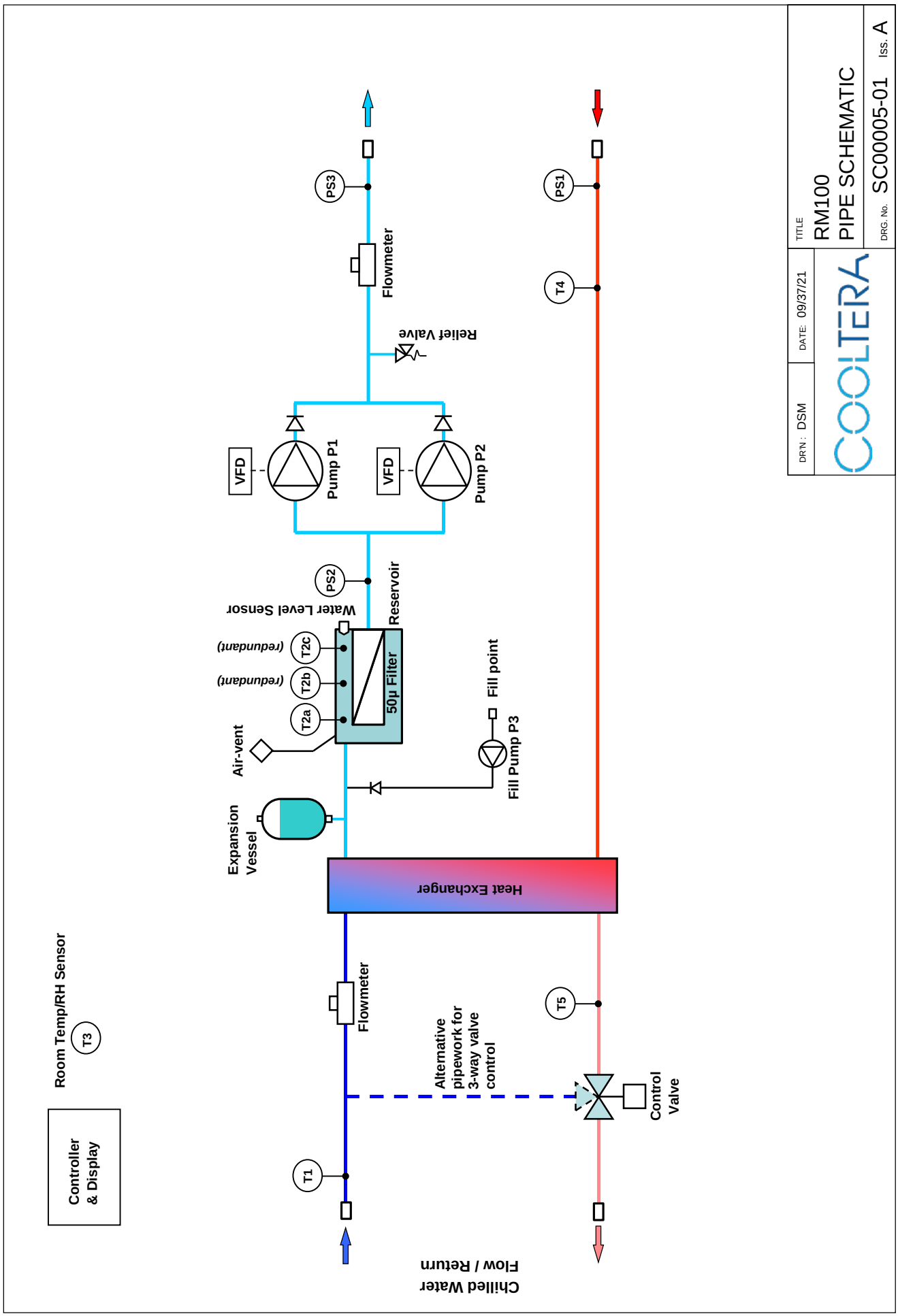

CONTROLLER I/O BOARD (TOP)
CONTROLLER I/O BOARD (BOTTOM)
POWER SUPPLY PSU 3
POWER SUPPLY PSU 2
POWER SUPPLY PSU 1
FS1 1.6A
24VDC TO CONTROL VALVE
SHEET 3 REF 5-A
24V SUPPLY TO DISPLAY
SHEET 6 REF 2-B
24VDC SUPPLY
SEE SHEET 1 REF 5-H
WATER LEVEL DETECTION SENSOR DFS1
ELS-950 LEVEL SENSOR
WATER LEVEL DETECTION DFS1
3-CORE SCREEN TYPE BELDDN 8771 (DO NOT CONNECT SCREEN)
MALE-FEMALE INLINE CRIMPS
From U09-5V SEE SHEET 2 REF 3-F
SECONDARY TEMP T2A
SECONDARY TEMP T2B
SECONDARY TEMP T2C
SECONDARY TEMP - T2A (RESISTIVE)
SECONDARY TEMP - T2B (RESISTIVE)
SECONDARY TEMP - T2C (RESISTIVE)
CONTROL VALVE DEMAND
CONTROL VALVE FEEDBACK (CONTROLLER U13)
SEE SHEET 4 REF 4-D
INLINE CRIMPS
USE 6 CORE UNSCREENED CABLE
SIEMENS GQD161.9A
CONTROL VALVE
TO CONTROLLER PSU 3 SEE SHEET 3 REF 2-H
SEE SHEET 1 FOR REVISION HISTORY
REV: MODIFICATION: DATE: DRN CHK/D
CONFIDENTIAL
COOLTERA
COOLTERA LIMITED
FIRCROFT HOUSE, FIRCROFT WAY
EBENBRIDGE, KENT TN8 6EJ
MATERIAL: N/A
FINISH: N/A
SCALE: N/A
©COOLTERA LIMITED
STANDARD TOLERANCES APPLICABLE TO ALL DIMENSIONS ON THIS DRAWING UNLESS OTHERWISE STATED
N/A
TITLE: WIRING DIAGRAM RM100 CDU
DRWG No: WD00010-02
REV B
SHEET SIZE A3
SHEET 3 of 6


CONTROLLER I/O BOARD (BOTTOM)
RD5
31(BLACK)
0.5R84
FAN
PUMP COOLING FAN (0.31A)
RD2
FILL PUMP
81(RED)
P3
FILL PUMP
FS2
2A
UI14
PRIMARY RETURN TEMP - T5 (RESISTIVE)
80(BLU)
79(RED)
0.5P78
TO PUMP P2-5V
SEE SHT 1 REF 4-D
PRIMARY RETURN TEMP T5
UI13
CONTROL VALVE FEEDBACK (0-10V)
0.5P77
0.5P76
TO PUMP P1-5V
SEE SHT 1 REF 4-C
CONTROL VALVE FEEDBACK
SEE SHEET 3 3REF 5-B
RI2
LEAK DETECTION
0.5P73
0.5P72
SK1
CABLE PART OF WATER DETECTION TAPE
REMOTE WATER DETECTION TAPE (PRIMARY)
0.5DB24
24VDC
31(BLACK)
0VDC
FROM 24Vdc PSU SEE SHEET 1 REF 5-H
TITLE: WIRING DIAGRAM RM100 CDU
DRWG No: WD00010-02
B
SHEET SIZE A3
SHEET 4 of 6
REV
MATERIAL: N/A
FINISH: N/A
SCALE: N/A
©COOLTERA LIMITED
STANDARD TOLERANCES APPLICABLE TO ALL DIMENSIONS ON THIS DRAWING UNLESS OTHERWISE STATED
N/A
CONFIDENTIAL
COOLTERA
COOLTERA LIMITED
FIRCROFT HOUSE, FIRCROFT WAY
EBENBRIDGE, KENT TN8 6EJ
SEE SHEET 1 FOR REVISION HISTORY
REV: MODIFICATION: DATE: DRN CHK'D


TOUCH SCREEN DISPLAY
VIN
232 RX
232 TX
485 +
485 -
COM
WHITE
ORANGE
BLUE
CABLE RS485 (1PR + 1)
BELDEN S5502415
SCREEN NOT TERMINATED
DISPLAY
CABLE RS485
(1PR + 1)
BELDEN S5502415
SCREEN NOT
TERMINATED
RS485-1
CABLE RS485
(1PR + 1)
BELDEN S5502415
SCREEN NOT
TERMINATED
RS485-2
TO PUMPS
SEE SHEET 1
REF 5-C
CONTROLLER PSU2
SEE SHEET 3 REF 2-G
24V DC
0V DC
FS3
500mA
0.50B24
0.50B30
SK1
CONTROLLER PROCESSOR/COMMS BOARD
PANEL MOUNTED
ETHERNET CONNECTOR
SK8
STUD
(E13)
ETHERNET
PATCH
CABLE
ETHERNET A
ETHERNET B
RJ45 CONNECTOR
CANBUS
L 0V H
RED
BLACK
* ON Semiconductor P6KE27CA,
Bi-Directional TVS Diode
TO CONTROLLER PSU3-0V
(SEE SHEET 3 REF 2-G)
CABLE RS485 (1PR)
BELDON 3105A or equivalent
SCREEN NOT TERMINATED
SK1
CONFIDENTIAL
COOLTERA
COOLTERA LIMITED
FIRCROFT HOUSE, FIRCROFT WAY
EBENBRIDGE, KENT TN8 6EJ
MATERIAL: N/A
FINISH: N/A
SCALE: N/A
©COOLTERA LIMITED
STANDARD TOLERANCES
APPLICABLE TO ALL
DIMENSIONS ON THIS DRAWING
UNLESS OTHERWISE STATED
N/A
TITLE: WIRING DIAGRAM
RM100 CDU
DRWG No: WD00010-02
B
SHEET SIZE A3
SHEET 5 of 6
REV
SEE SHEET 1 FOR REVISION HISTORY
REV: MODIFICATION
DATE:
DRN
CHK/D


WIRING DIAGRAM
RM100 CDU
DRWG No: WD00010-02
B
SHEET 6 of 6
SHEET SIZE A3
REV
TITLE:
CONFIDENTIAL
COOLTERA
COOLTERA LIMITED
FIRCROFT HOUSE, FIRCROFT WAY
EBENBRIDGE, KENT TN8 6EJ
MATERIAL: N/A
FINISH: N/A
SCALE: N/A
©COOLTERA LIMITED
STANDARD TOLERANCES
APPLICABLE TO THIS DRAWING
UNLESS OTHERWISE STATED
N/A
SEE SHEET 1 FOR REVISION HISTORY
REV:
MODIFICATION:
DATE:
DRN:
CHK/D
1050005 Extended CONTROLLER
PCB NOT TO SCALE
FS1
1.6A
SK1
CANBus
RS485 MODBUS
Leak Detect
ROOM RH&T
WATER LEVEL DET (OFS1)
SECONDARY SUPPLY TEMP (T2A)
SECONDARY SUPPLY TEMP (T2B)
SECONDARY SUPPLY TEMP (T2C)
SECONDARY RETURN TEMP (T4)
SECONDARY RETURN PRESSURE (PS1)
PUMP INLET PRESSURE (PS2)
SECONDARY SUPPLY PRESSURE (PS3)
ROOM SENSOR - RH
ROOM SENSOR - TEMP (T3)
PRIMARY TEMP (T1)
PRIMARY FLOW METER
SECONDARY FLOW METER
CONTROL VALVE
PUMP COOLING FAN
FILL PUMP
LEAK DETECTION
PRIMARY RETURN TEMP (T5)
CONTROL VALVE FEEDBACK
PSU 1
PSU 2
PSU 3
ETHERNET A
ETHERNET B
DISPLAY
RS485-1
RS485-2
MICRO SD
CANBUS

4.2 Pipe Schematic (SC00002-01)


TITLE
RM100
PIPE SCHEMATIC
DRG. No. SC00005-01
ISS. A
DATE: 09/37/21
DR'N : DSM
COOLTERA
PS3
Flowmeter
Relief Valve
PS1
T4
VFD
Pump P1
VFD
Pump P2
PS2
Water Level Sensor
Reservoir
(redundant)
T2c
(redundant)
T2b
T2a
50µ Filter
Fill point
Air-vent
Fill Pump P3
Expansion Vessel
Heat Exchanger
Flowmeter
T5
Alternative pipework for 3-way valve control
Control Valve
Room Temp/RH Sensor
T3
Controller & Display
T1
Chilled Water Flow / Return

4.3 Warranty & Contact Details

Technical and Service Support:
To obtain the above, please contact the manufacturer directly:

Tel:	**+44 (0) 1732 867105**
	+86 139-1779-7039
Email:	info@cooltera.com

Limited Product and Service Warranty

Cooltera Coolant Distribution Units (CDU's.)	2 Years parts only.
Cooltera Spares Parts.	2 Years parts only.

Extended warranties, service and maintenance programs are available in most locations, details available upon request.

To obtain further details of our manufacturer's limited warranty, also after sales service offerings:

Tel:	**+44 (0) 1732 867105**
	+86 139-1779-7039
Email:	info@cooltera.com
Visit:	www.cooltera.com

Notes:

Disposal Information

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

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

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

1. Disconnect unit from electrical supply.

2. Drain and dispose of any heat transfer fluid through an approved recycling facility.

3. Remove unit to approved recycling facilities only.