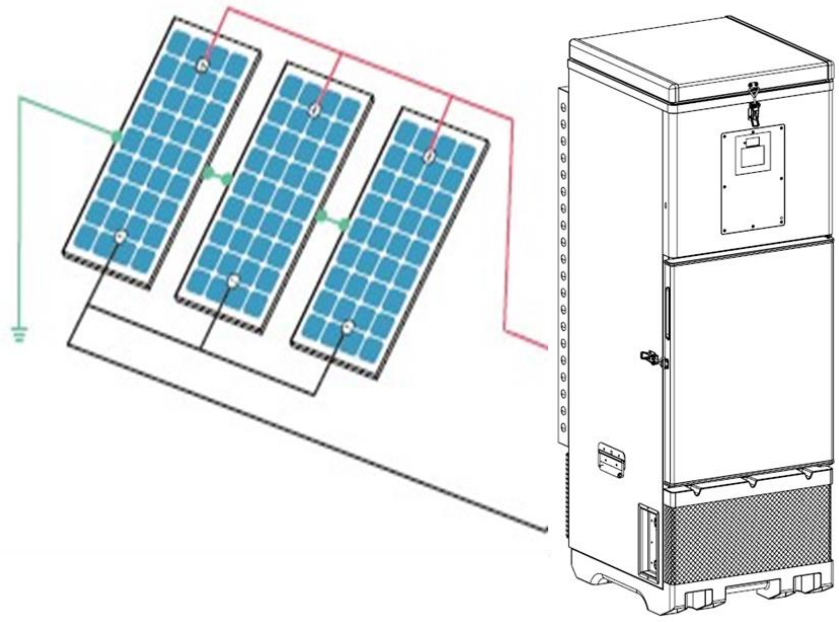
AUCMA

MetaFridge™ CFD-50 SDD
Technician Manual



⚠ Please read the manual carefully before use

Keep the manual in a safe place for future reference.

For safety purposes, please remove all package materials before use.

Qingdao AUCMA Global Medical Co., Ltd

ADD： No.315 Qianwangang Road, Huangdao District Qingdao, China

Zip： 266000

Tel： +86-532-86763602

Fax： +86-532-86762805

Email: info@aucma.com.cn

Website: www.aucmaglobal.com.cn

Rev. 202605

Contents

Contents 1
1 Product Description 3
2 CFD-50 SDD Components 4
3 Transport and Handling Instructions 6
4 Installation 6
4.1 Preparation 6
4.2 Positioning the CFD-50 SDD 7
4.3 Filling Instructions 8
4.4 Installation and wiring of BeyondCom Unit 10
4.5 Startup and Cooldown 11
5 Working Principles 12
5.1 ColdSafe Technology 12
5.2 Compressor Control Method & Test Mode 12
6 Use of the CFD-50 SDD 12
6.1 Vaccine Chamber 13
6.2 Use of the CFD-50 SDD built-in Monitoring System 13
6.2.1 Temperature Display and Status LED 13
6.2.2 30 DTR (Daily Temperature Record) Display 13
6.2.3 Alarms 16
6.2.4 USB Download and 30 DTR reports 18
6.2.5 Battery of the 30 DTR and display 19
6.2.6 Remote Temperature Monitoring System (optional) 19
6.3 Use of the Beyond EMS and M2M Power cable 19
6.3.1 Connections 19
6.3.2 Operating instructions 20
6.3.3 30 DTR 22
6.3.4 USB port 23
6.3.5 M2M interface 24
6.3.6 Examples of display modes 26
6.3.7 List of Error Codes 27
6.3.8 Ice3 web server (only available with Logic Board) 28
6.3.9 Beyond Coldcloud 31
6.3.10 Other 37
6.4 Energy Harvesting 37
6.5 Powering CFD-50 SDD from Mains Power 38
7 Maintenance 38
7.1 Daily maintenance tasks 38
7.2 Monthly maintenance tasks 39

7.3 Annual maintenance tasks 39
7.4 Cautions during maintenance 39
7.5 Maintenance 39
8 Safety Precautions 41
9 Electronics System 42
9.1 Electronics Diagrams 43
10 CFD-50 SDD Parts and equipment list 45
10.1 CFD-50 SDD MetaFridge vaccine refrigerator（1） 45
10.2 100w Solar modules（3） 47
10.3 Solar Array Cable Kit（1） 47
10.4 User Ordering Instructions for Spare Parts 49
11 Replacement Parts Installation Guide 50
11.1 Battery Replacement 50
11.2 Main Board Replacement 50
11.3 Power board replacement 51
11.4 Fan replacement 51
11.5 Compressor replacement 54
11.6 Beyond EMS and M2M power cord replacement 54
12 Troubleshooting Guide 56
13 Solar System Troubleshooting Guide 60
13.1 Solar Power System Troubleshooting 61
13.2 Spare Parts-Solar Power Kit 64
14 Advanced Troubleshooting 64
15 CFD-50 SDD Specification 64
16 CFD-50 SDD Disposal and Recycling Guidelines 64
17 Warranty 65

1 Product Description

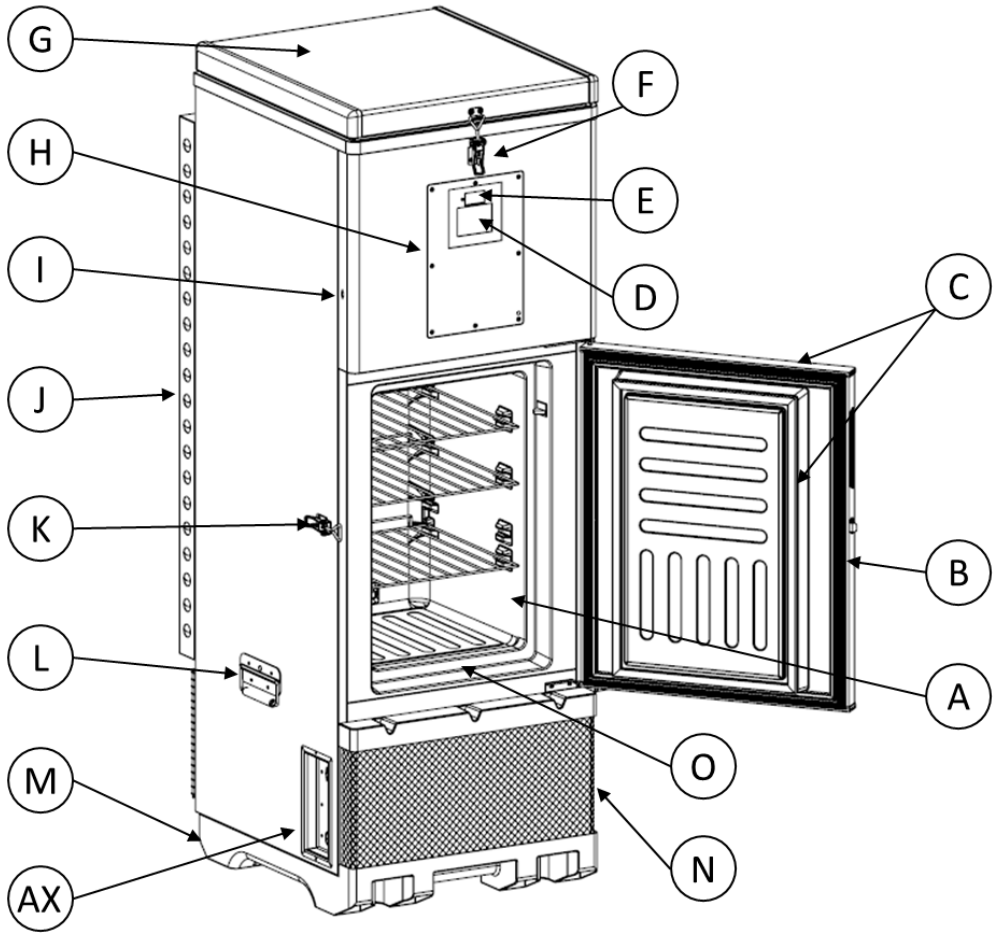
The MetaFridge CFD-50 SDD is a WHO PQS certified vaccine refrigerator that maintains a temperature between 2-8 °C with multi-day holdover/autonomy during extended power outages or low-light conditions. It includes integrated power protection, a display showing 30 days of temperature and alarm history, onboard logging of temperature and diagnostic data, and it supports remote monitoring of performance data.
This unit is factory-equipped with the Beyond EMS, an integrated high-precision temperature monitoring and data logging solution designed exclusively for vaccine cold chain equipment. The Beyond EMS consists of Beyond Com Unit（Ice^3）, Power sensor, power cord, sensors, etc. Before leaving the factory, all cables connected to Beyond device box will be pre-installed in place and placed inside a wiring box to avoid inadvertent repositioning, damage, or monitoring disruption.

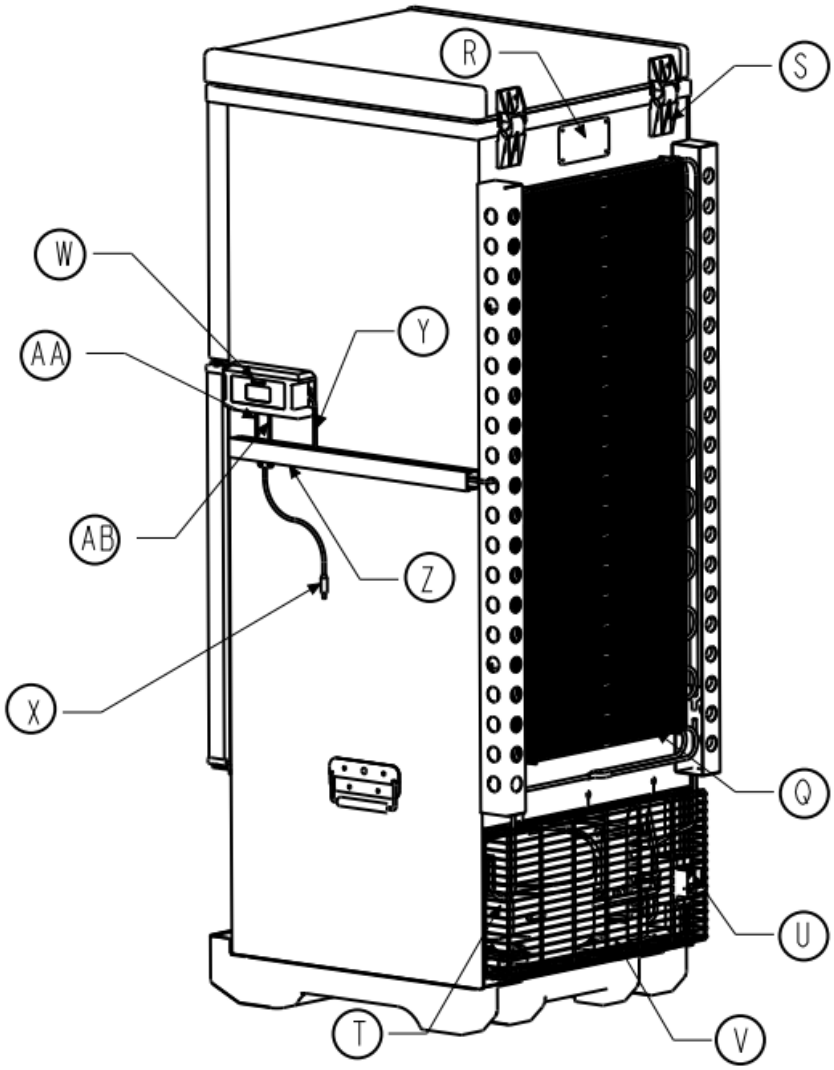
CFD-50 SDD standard features:

- 50-liter vaccine storage chamber volume
- Front-opening for easy user access to vaccines
- Integrated power protection system defending against voltage spikes
- 120 hours of holdover at constant ambient temperature of 43 °C (192 hours at constant ambient temperature of 25 °C)
- 120 hours of autonomy at constant ambient temperature of 43 °C in low-light conditions.
- Integrated 30-day temperature record (DTR) display and downloadable temperature history
- Integrated plastic base prevents corrosion from damp floor
- Excess solar energy can be harvested to charge mobile devices, lights, and other products.
- Remote temperature monitoring feature is available upon request
- Optional operation from mains grid power. Nominal input voltage is designed for worldwide range of 100-240VAC; actual range 90-290VAC. (maintains temperatures with as little as 3 hours of power a day on average)
- M2M interface：Type-C female receptacle be used for data download by external devices and power supply from external devices to the logger in the event the logger’s energy storage is depleted; The function of a barrel shaped cable is to supply power to external devices，Its rated voltage and current are 5V/1A.

2 CFD-50 SDD Components

Components of the CFD-50 SDD are labeled below. Refer to Chapter 10 for a more detailed view and spare part ordering information





Q: External condensers	R: Thermal safety shut-off (mechanical thermostat)	S: Water tank lid hinge
T: Compressor compartment (contains compressor, fan, power enclosure and power board, transformer, drain pan,DC power board, Power sensor)	U: Circuit breaker/switch	V: Back ventilation cover
W： Beyond Com Unit (BCU) /Ice3	X: M2M power cable	Y: Beyond Data line
Z: wiring box	AA: Beyond sensor Door contact_4P4C	AB: Beyond temperature contact_4P4C

3 Transport and Handling Instructions

⚠ Heavy object warning. To avoid injury, use lifting aids and proper lifting techniques when moving the CFD-50 SDD

a. **Leave the CFD-50 SDD in its protective packaging** as long as possible to protect from damage
   - Cutouts in the cardboard allow access to the manufacturer's label for inspection and to the handles for lifting without removing the packaging.

b. **Transport the CFD-50 SDD vertically when possible**:
   - If transport on the side is necessary, pay attention to "This side up" markings on the packaging and make sure package is in the correct orientation to prevent damage.

c. **Keep door and top lid closed and latched** when moving the CFD-50 SDD

d. If the CFD-50 SDD needs to be moved after initial installation, **remove the water from the water tank using a siphon hose before moving**.

e. **When using the handles for lifting**, keep one hand towards the top of the unit to prevent tipping.

f. **Avoid any excessive force** to prevent damage to the CFD-50 SDD.
   - Avoid any excessive force especially towards the door and lid to prevent damage.
   - Do not lift the CFD-50 SDD from the doors, grates, or condenser guards.
   - Do not apply pressure to the Beyond Module enclosure or cable ports during handling.

4 Installation

4.1 Preparation

a. Read the instruction manual carefully.

b. Remove all packaging materials, including foam base and tape.
   - Discard plastic wrappers and bags safely, to avoid suffocation of children.

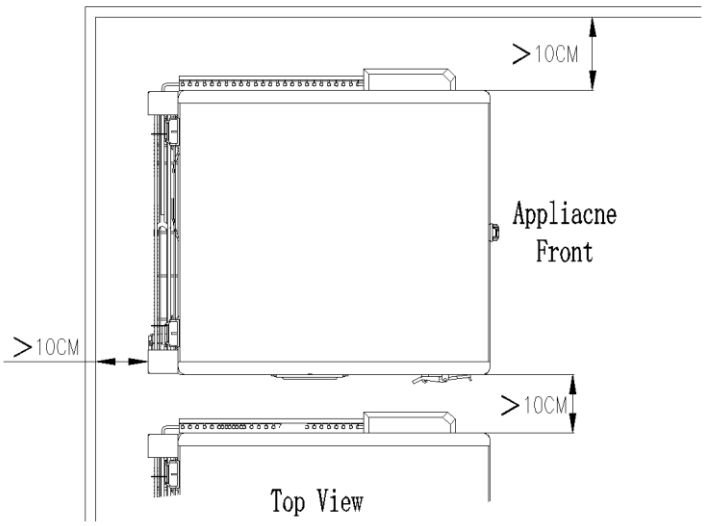
c. Inventory accessories and installation tools to make sure there are no missing parts. Each CFD-50 SDD should include the following parts shipped inside the vaccine chamber:
   - 3 shelves
   - 2 plastic vaccine trays (additional trays can be ordered)
   - 1 funnel for filling the water tank to commission the CFD-50 SDD
   - 1 BeyonCom Unit(Ice^3)
   - 1 Backup M2M power cord
   - 2 BCU fixing screws+1 screwdriver
   - User manual and Technician manual for CFD-50SDD
   - Technician Manual and Cold Cloud Administrator Manual for Beyond EMS
   - 2 sets of lock and key, for the water tank and vaccine chamber

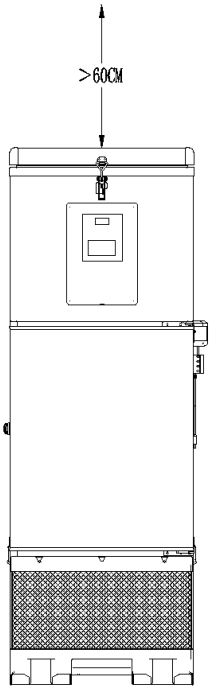
If any parts are missing, please contact the manufacturer or service provider.

If you need the electronic version, please download the CFD-50SDD <user manual >、CFD-50SDD< technician manual>,and Beyond <Technician Manual>,Beyond <ColdCloud Administrator Manual> from this website:http://www.aucmamedicalglobal.com.

4.2 Positioning the CFD-50 SDD

a. Place the CFD-50 SDD on a flat and solid ground and **ensure the unit is level.**
b. **No pallet is required:** CFD-50 SDD has an integrated plastic base.
c. Position the CFD-50 SDD near an accessible electrical outlet; the power cord length is 2 meters.
d. Position the CFD-50 SDD **away from direct sunlight and any source of heat** (e.g. gas stove, fireplace, etc.).
e. CFD-50 SDD must not be placed in or around flammable or corrosive gases that could cause an explosion or electric shock.
f. In order to prevent rust or electrical leakage, the CFD-50 SDD should not be placed in a high humidity environment or in a location where it could be splashed with water or rain.
g. Position the CFD-50 SDD in a **well ventilated area** and **make sure there is a minimum of 10 cm of empty space around the sides and back of the unit. The door latch must be accessible and the door must be able to open freely to at least 90°.**
h. Allow a minimum of 60 cm clearance above the CFD-50 SDD for accessing the water tank lid.

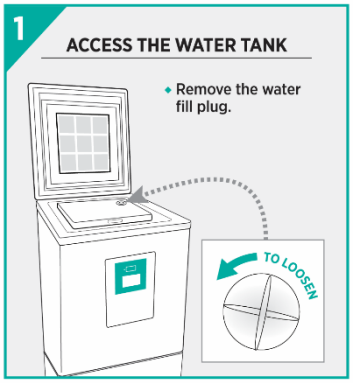
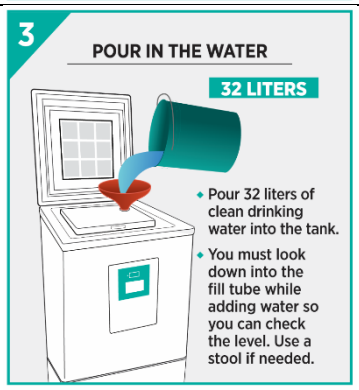


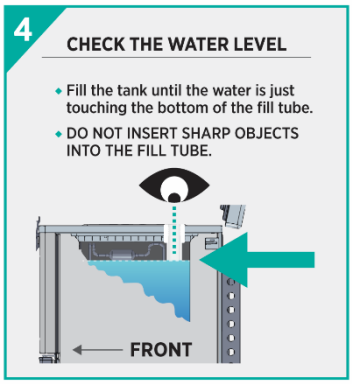
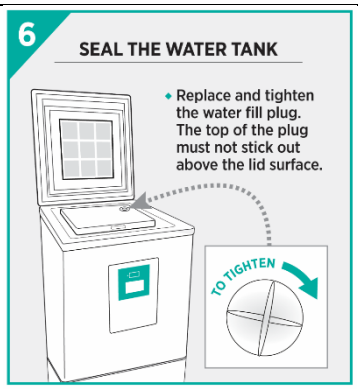


4.3 Filling Instructions

⚠ CFD-50 SDD must be properly filled with clean drinking water before operation and use. During the filling process, use care and common sense and follow all local safety precautions guideline must be taken into consideration.

Filling instructions can also be found on the inside of the water tank lid.

	Step 1: Unlatch the water tank latch and fully open the water tank lid. Turn the fill plug counterclockwise to loosen and remove the cap. Keep the plug on top of the water tank while filling so it does not get lost.
	Step 2: A funnel is shipped inside of each CFD-50 SDD. Install the funnel securely in the fill hole. Fill a bucket with clean drinking water. If there is no local source of clean drinking water, use bottled water.
	Step 3: Pour 32 L of water into the water tank through the funnel. If needed, use a stool to properly reach the funnel and be able to look down into the fill tube to check the water level.

		Step 4: While filling, stop periodically to check the water level by looking down into the tube with a light. The water should just reach the bottom of the fill tube. Do not insert sharp objects into the tube or you may damage the refrigerator evaporator.
		Step 5: If you accidentally overfill the water tank, remove excess water using a piece of tubing as a siphon. Adjust the water level by adding/removing water until the water level is at the bottom of the fill tube. Too little water will reduce holdover time; too much water may damage the unit.
		Step 6: When water is at the correct level, replace the fill plug and tighten until the plug is entirely within the lid and will not interfere when the top lid is closed.

⚠ Do not overfill the CFD-50 SDD (Figure G).
Remove excess water if overfilling occurs (Figure H).

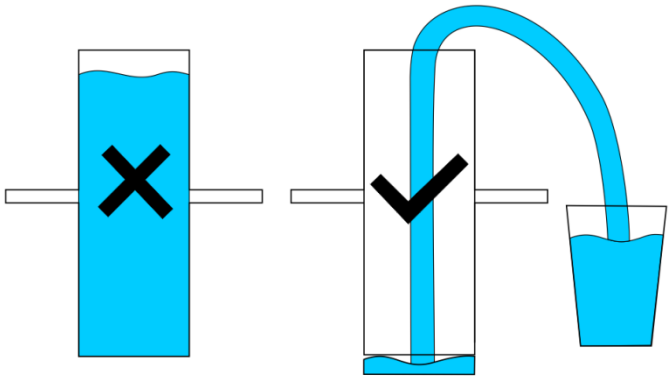


Figure G Figure H

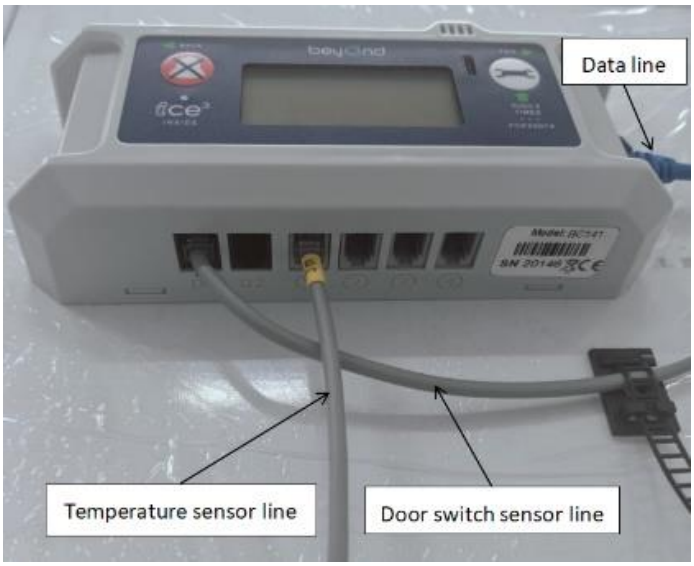
4.4 Installation and wiring of BeyondCom Unit

The hardware of Beyond EMS consists of the device box(Ice3 BCU), Power Sensor, and related cables. There are installation holes reserved on the machine for the Beyond Com Unit.

Before leaving the factory, all cables connected to the Beyond device box (BCU) will be installed in advance and wired out from the BCU attachment. All cables are placed inside the junction box to avoid accidental repositioning, damage, or monitoring interruption.

a. Take the Beyond Com Unit out of the machine,
b. Align the fixing holes on the Beyond Com Unit with the installation holes reserved on the machine, and tighten two screws to fix it.
c. After fixing the Beyond Com Unit, insert the sensor cable and power cable into the corresponding interfaces.





Beyond Com Unit wiring

a. As shown in the figure above, The blue wire is the power cord, the wire with a yellow label is the temperature sensor wire, and the other wire is the door switch sensor wire. Insert the temperature sensor cable into interface ①, insert the door switch sensor cable into interface D1, and insert the data line into the interface on the right side of Beyond Com Unit.
b. M2M power cable: The M2M power cable is fixed before leaving the factory, users can use it directly.

NOTE: The above is only a schematic diagram. The actual power cord, sensor cord, and M2M power cord are all fixed to the BeyondCom Unit accessory through cable trays.

The other end of the blue power cord is connected to the Power sensor, which is fixed inside the compressor chamber at the bottom of the machine to supply power to the BeyonCom Unit. The other end of the temperature sensor wire and the door switch sensor wire are pre embedded in the foam box.

4.5 Startup and Cooldown

> ⚠ Ensure that the water tank has been filled to the correct level before plugging in the CFD-50 SDD

Step 1: Plug the CFD-50 SDD's power cord into a dedicated outlet. There is integrated voltage protection and stabilization - do not connect to another voltage stabilizer.

Step 2: If mains power is available the unit will wake up from low-power shipping mode once power is connected. It may take a few seconds for temperature to show on the top display, and 30 DTR Information to show on the larger display.

a. If mains power is unavailable, use a #2 Phillips screwdriver to open the electronics enclosure. Unplug then reconnect the main system battery to wake up the system.
b. If the unit has been in storage for too long and the battery is drained, it will wake up when mains power is reconnected.
c. If mains power is available, the compressor will start after a delay of ~5 minutes. (indicated by green LED next to the temperature display) and verify that sides of the CFD-50 become warm to the touch after a few minutes of running, before replacing the electronics enclosure lid.
d. If mains power is not available, close the electronics enclosure and follow up the next day in person or by phone to verify the installation.

Step 3: Power-on the CFD-50 SDD by connecting the MC4 solar power connectors from the solar array, and turning on the switch/circuit breaker at the back of the refrigerator. If enough solar power is available, the compressor will start after a delay of 5 minutes.

Step 4: If telemetry module is installed, also connect battery on the telemetry module.

Step 5: Beyond EMS: Long press the  key and the  key for 8 seconds to start Beyond com Unit, It will automatically start recording data.

Step 6: Open the vaccine cabinet door to check if interior light is on and close the door. To enable or disable interior light, refer to the maintenance manual.

Step 7: If solar power is available, wait until compressor has started (indicated by green LED next to the temperature display) and verify that the rear condenser of the CFD-50 SDD become warm to the touch after a few minutes of running, before replacing the electronics enclosure lid.

a. If solar power is not available but mains power is available, plug into mains power and perform the test above. Follow up the next day in person or over the phone to verify that the CFD-50 SDD is operating normally on solar power.
b. If neither power source is available, close the electronics enclosure and follow up the next day in person or by phone to verify the installation.
c. If compressor run LED does not come on or sides of the unit do not become warm after compressor has run for several minutes, consult troubleshooting section of the maintenance manual.

Step 8: Do not use the CFD-50 SDD until the display indicates that the vaccine chamber temperature is below 8 °C and the 30 DTR indicates at least 2 days of remaining holdover, which might take more than two sunny days to achieve.

⚠ In the case of intermittent solar availability and high ambient temperature environment, the CFD-50 SDD may require more than 2 days after initial installation to reach full holdover capability.

⚠ During the initial cooldown, do not use the CFD-50 SDD until the display indicates that the vaccine chamber temperature is below 8 °C and the 30 DTR display indicates at least 2 days of remaining holdover.

5 Working Principles

5.1 ColdSafe Technology

MetaFridge CFD-50 SDD uses patented ColdSafe Technology to cool the vaccine chamber and provide extended cold holdover during power outages. ColdSafe Technology consists of a water tank above the vaccine chamber, and a thermosyphon that moves heat between the two, slowly melting ice built up in the water tank and passively cooling the vaccine chamber to between 2-8 °C.

5.2 Compressor Control Method & Test Mode

CFD-50 SDD's compressor is controlled by temperature sensors in the water tank that run the compressor to freeze water until an ice block builds up in the water tank to provide holdover. During regular operation the compressor will run every 6-36 hours (depending on ambient temperature) to keep the ice block fully frozen. In case of control system malfunction, a backup mechanical thermostat will open to turn off the compressor and protect the vaccines from freezing. Both the electronic control system and mechanical thermostat are preset at factory; no user adjustment is necessary to maintain the vaccine chamber temperature within 2 °C – 8 °C.

It is normal for the compressor not to run after a door opening, and for the vaccine chamber to cool slowly after power is first applied. For diagnostic purposes, CFD-50 SDD's compressor can be turned on by pressing the 'Run' button on the top right of the main board inside the electronics compartment. The compressor will only run if power is available, the vaccine chamber temperature is above 1.8 °C and the water tank sensors are above -0.7 °C. The compressor should turn on immediately and run until normal shutoff conditions are reached. To turn the compressor off, press the control reset button.

6 Use of the CFD-50 SDD

- Check the temperature display daily and make sure the chamber temperature is between 2-8 °C before using.
- Both the appliance and Beyond Com Unit can provide high-precision temperature data and 30 DTR reports. If the display data of different displays are different, this is normal, because different sensors have accuracy errors, and the accuracy is theoretically within ±0.5℃. In addition, when the displayed data is different, the value displayed by Beyond EMS should prevail.
- Do not overfill the vaccine chamber. Leave gaps between vials and boxes to enable cold air circulation within the chamber. Use trays to organize vaccines and keep boxes from touching the walls or sitting directly on the floor of the vaccine chamber.
- Keep vaccine chamber door tightly closed and latched when not in use to maintain the storage temperature inside.
- There is no user-adjustable thermostat or sensors in the CFD-50 SDD.
- Designate a person to inspect and record the daily operation to ensure the safe use of the CFD-50 SDD.
- Only approved vaccines or medical supplies should be stored in the refrigerator. Do not store any foods,

beverages, or flammable, explosive, volatile items (such as alcohol or gasoline) or other dangerous items in CFD-50 SDD.

6.1 Vaccine Chamber

All parts of the vaccine chamber are controlled between 2-8 °C and are suitable for vaccine storage.

Always check the chamber temperature on the main display (supplemented by the Beyond Module reading) before placing vaccines in the chamber.

Loose vials should be stored in the provided trays on shelves inside the vaccine chamber. Secondary packaging may be placed directly on shelves or in trays. Do not place secondary packaging directly on the bottom of the vaccine chamber to avoid contact with any excess condensation. Also avoid leaving secondary packaging in direct contact with the chamber walls.

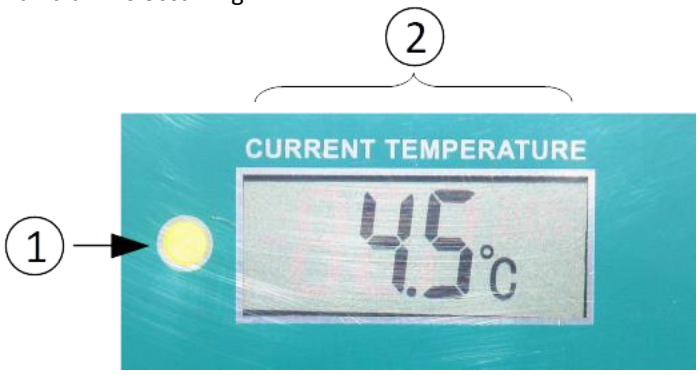
When solar or optional mains power is available, a LED light will illuminate the vaccine chamber when the door is open. If desired, the light can be disabled so it does not turn on when the door is opened by removing a black plastic jumper from the main board (#20 on the electronics diagram on the back of the electronics enclosure cover).

In humid environments condensation may collect on the sides and back of the vaccine chamber, and run down the walls into the drip channel surrounding the bottom of the chamber. Any accumulated condensation will flow to the back of the chamber and out through the drain hole.

6.2 Use of the CFD-50 SDD built-in Monitoring System

6.2.1 Temperature Display and Status LED

The top display shows the actual temperature in the CFD-50 SDD vaccine chamber. The temperature sensor and thermostat are factory calibrated and set. The user does not need to adjust any temperature settings. The red LED blinks when an alarm is occurring.



Current temperature and status

1. Status LED	The LED to the left of the display will be: • green while the compressor is running (as shown above), or • blinking red during alarms
2. Current vaccine chamber temperature	Temperature display showing the vaccine chamber temperature

The temperature display has an independent power source and will continue to display the temperature for 3 days without external power or a system battery. If power is not restored in that time, the display will go blank until power is restored or a new charged system battery is installed.

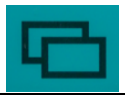
6.2.2 30 DTR (Daily Temperature Record) Display

The larger bottom display shows the temperature and alarm history over the past 30 days, as well as information about currently remaining holdover, current power availability, and ongoing alarms.



30 DTR display and navigation buttons

Navigation buttons

3. Menu button 	Tap the Menu button to move between CURRENT, HISTORY, and ALARM screens.
4. Back and Forward buttons 	Use the back and forward buttons to move backwards and forwards through the HISTORY screens to view temperature and alarm statistics from the past 30 days.

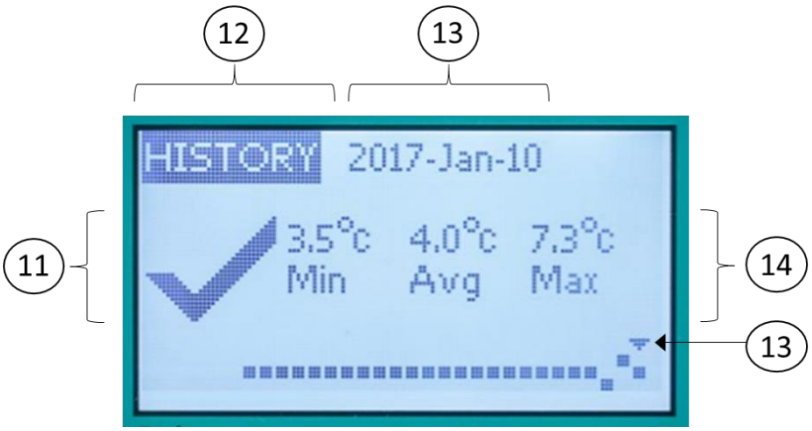


Current Screen: This is the default screen that shows status of the unit during regular operation.

5. Remaining holdover	Calculated remaining holdover time without power. This is an estimate only and not a guarantee of remaining holdover.
6. CURRENT screen	The CURRENT screen is the default screen that displays the CFD-50's status overview.
7. Date	The current date (default time zone is UTC).

8. Replace battery icon		The CFD-50's monitoring system is powered by a rechargeable battery. This icon will appear if the battery is not plugged in or if it has degraded over time and needs to be replaced.
9. Solar power icon		The solar power icon indicates whether solar power is currently available. A lightning bolt indicates that solar is available, while an "X" indicates that not enough solar power is available.
10. Alarm history indicators		Dots indicate vaccine chamber temperature range during each of the past 30 days. The current day is the rightmost dot, and the leftmost dot is 30 days ago. A raised dot represents a high temperature excursion on that day, a low dot represents a low temperature excursion, a neutral dot represents no temperature excursion. If no data is available for a day, no dot will be shown.

To view temperature and alarm history, from the CURRENT screen press the MENU button to go to the HISTORY screen



History Screen: Shows temperature and alarm statistics from each of the past 30 days.

11. Check/Alarm icon		The check/OK icon indicates that no temperature excursions occurred on the day being viewed.
		The alarm/X icon indicates that one or more temperature excursions occurred on the day being viewed. Press the back button to view alarm details.
12. HISTORY	HISTORY screens display summary information for each of the past 30 days	
13. Date	The date currently being viewed. An arrow towards the bottom of the screen indicates which of the past 30 days is being viewed.	
14. Temperature history	For each day, the minimum, average, and maximum recorded temperatures are shown.	

To view details for each temperature excursion, use the backwards and forwards buttons to navigate to the day when the excursion occurred. An extra screen will appear for each excursion that occurred on that day. An excursion that spans multiple days will trigger an alarm for each day.



Alarm History Screen: Shows information about each alarm that occurred over the past 30 days.

15. Check/Alarm icon	The alarm/X icon indicates that an alarm is being viewed.
16. ALARM screen / alarm number	ALARM screens show detail on each temperature alarm. Numbers indicate how many excursions occurred on the day being viewed, and which alarm is currently being viewed. "Alarm 1/2" indicates that two alarms occurred on this day and details for the first alarm are currently shown. Press the back and forward buttons to move between alarms.
17. Date	The date currently being viewed. An arrow towards the bottom of the screen indicates which of the past 30 days is being viewed.
18. Start time	The time (in 24-hour format, default time zone is UTC) indicates when the temperature excursion began. Note that the alarm time begins after the temperature excursion time threshold is exceeded – if the high temperature excursion threshold is 10 hours above 8 °C, the alarm will begin 10 hours after the temperature first exceeds 8 °C. Separate alarms occur when an alarm spans multiple days – an alarm that begins at 00:00 is likely a continuation of the same excursion as the previous day.
19. Temperature history	For each alarm, the type of excursion, duration of the excursion (excluding time elapsed while triggering the alarm), and average temperature during the excursion.

After 1 minute of inactivity the display will dim and prepare to go to sleep. Pressing any button during this time will wake up the display without changing the visible screen. After an additional minute of inactivity, the display will turn off, and any button press will bring up the CURRENT screen, or if there is an ongoing alarm, the ACTIVE ALARM screen.

Note: The backlight will only operate when mains power is available and battery is fully charged. During extended power outages the display will still function without backlight.

6.2.3 Alarms

CFD-50 SDD has five kinds of alarms:

1) High temperature excursion (defined by WHO PQS): 10 hours above 8 °C
2) Low temperature excursion (defined by WHO PQS): 1 hour below -0.5 °C
3) Close door: Door open for more than 20 minutes
4) Low holdover: 2 days of holdover remaining unless power is restored
5) No holdover remaining: All ice lining has melted and vaccine chamber is beginning to rise

Local alarm settings cannot be changed by the user.

After an alarm condition is triggered the Active Alarm screen will show, the red LED will blink (on for 1 s, off for 4 s) and the audible buzzer will sound (on for 1 s, off for 4 s). Pressing any button will silence the audible alarm and allow the ACTIVE ALARM screen to go to sleep, but the red LED will continue flashing until the alarm condition has ended.

The Active Alarm screen shows the alarm type and associated information.



Active Alarm Screen: Shows information about a currently ongoing alarm.

20. ACTIVE ALARM screen	ACTIVE ALARM indicates that an alarm is currently ongoing. This screen will continue showing until the alarm condition has ended. Touching any button during an active alarm will silence the audible alarm and allow the display to go to sleep.
21. Alarm type	Text indicates which type of alarm is occurring.
22. Alarm information	For temperature excursions, the duration of the excursion is shown. See troubleshooting guide in Chapter 8 for potential causes of temperature excursions and suggested remedies. For door excursions, the duration of the excursion is shown. If additional time is needed for loading or unloading vaccines, the door timer can be reset by briefly closing the door, or the alarm can be silenced by touching any button of the 30 DTR display. For holdover alarms, “RESTORE POWER” is displayed. A low holdover alarm indicates that the estimated remaining holdover is less than 2 days and the user may need to take action to restore power or find backup cold storage for the vaccine payload. A no holdover alarm indicates that all of the CFD-50 SDD’s ice lining has melted and the vaccine chamber is warming up. Power should be immediately restored or vaccines should be removed to backup cold storage.

Pressing the Menu button from the ACTIVE ALARM will show the CURRENT and HISTORY screens and allow normal navigation. After the display turns off due to inactivity, the first button touch will again bring up the active alarm screen.

Alarm Acknowledgement

The 30 DTR report shows the time that each temperature excursion begins, ends, and when the alarm was acknowledged. A button press that silences an alarm counts as an acknowledgement. If a high or low temperature excursion alarm occurs, and ends before a buttons is pressed to silence and acknowledge the

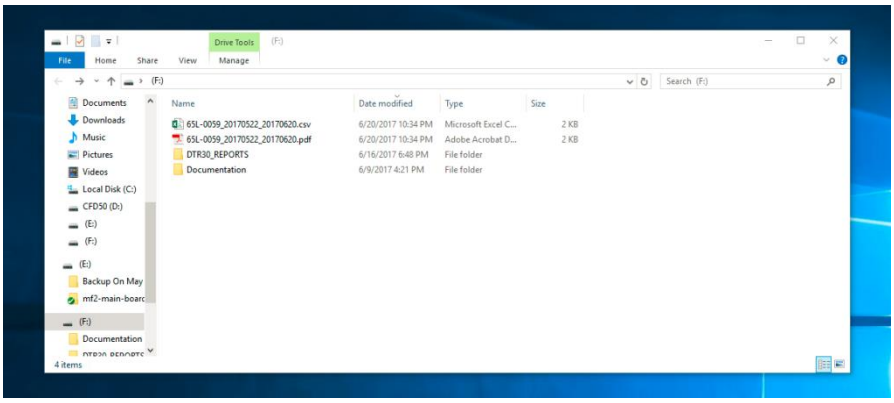
alarm, the ALARM ENDED screen will show the user which alarms occurred in their absence. The user will be asked to touch any button to acknowledge. Door excursions and holdover alarms do not require acknowledgement after the alarm condition returns to normal. Even if multiple alarms have occurred without being acknowledged, only one ALARM ENDED screen will be shown. Full alarm history can still be viewed through the ALARM HISTORY screens.



Alarm Ended Screen: Displays information about the most recent un-acknowledged temperature alarm.

6.2.4 USB Download and 30 DTR reports

30 DTR reports can be downloaded from the CFD-50 SDD by attaching a micro-USB cable to the outlet to the left of the electronics enclosure and connecting to a laptop computer. The CFD-50 SDD will show up as a mass storage device. In the top directory are .csv and .pdf files showing the temperature and alarm history over the past 30 days. Previous reports are also saved in a history folder. Other folders hold documentation (such as this manual) and 30 DTR reports covering the entire time since the refrigerator was installed.



CFD-50 SDD Mass storage device: contains .pdf and .csv versions of the most recent 30 DTR reports. User manuals and older 30 DTR reports are available in subfolders.

The 30 DTR reports are labeled with the last 7 digits of the unit's manufacturers serial number (also on a label on the back of the unit) and the date range covered in the report.

The root directory contains the following files/folders:

File/folder	Contents
65L_0059_20170522_20170620.pdf	Data in PDF format for the past month
65L_0059_20170522_20170620.csv	Data in csv format for the past month
DTR30_REPORTS	Reports every 30 days in the past
Documentation	Operation Guide

Where 65 is to be replaced by the product's volume, 0059 is to be replaced by product's serial number, and 20170522 with the actual time.

6.2.5 Battery of the 30 DTR and display

The 30 DTR and display are powered by a Li-ion battery installed in the electronics enclosure. A new battery will allow the system to continue to monitor and display temperatures for 1 week without mains power. During longer outages, the battery may drain completely and the 30 DTR display will no longer function until mains power is restored or the battery is replaced. Over time, the battery will degrade and lose capacity and will need to be replaced. Replacement batteries are available from Aucma or service providers; refer to Chapter 11.1 for battery replacement instructions.

6.2.6 Remote Temperature Monitoring System (optional)

CFD-50 SDD is compatible with approved third-party remote temperature monitoring systems that can be connected to the main electronics board at the factory or by a trained technician. If your CFD-50 SDD comes with the remote monitoring option, refer to the third-party documentation. For more information, contact the manufacturer or service provider.

6.3 Use of the Beyond EMS and M2M Power cable

The Beyond EMS consists of BeyondCom Unit（Ice^3）, Powersensor, power cord, sensors, etc. Before leaving the factory, all cables connected to Beyond device box will be pre-installed in place and placed inside a wiring box to avoid inadvertent repositioning, damage, or monitoring disruption.
The Power Board of the appliance supplies to the Power Sensor, and the Power Sensor supplies power to Ice3 BCU through a Data line and transmits data simultaneously.
The M2M DC power is controlled by an independent M2M power board, which is powered by the appliance's power board. The M2M power board be located in the power enclosure with the appliance's power board.

6.3.1 Connections



Ch.	Input type	Example
D1	Potential free digital input*	Door contact
D2	Potential free digital input**	Relay contact
①	Temperature probe / Potential free digital input***	NTC temperature probe / Door contact
②	Temperature probe / Potential free digital input***	NTC temperature probe / Door contact
③	Temperature probe / Potential free digital input****	NTC temperature probe / Door contact
④	Temperature probe / Potential free digital input***	NTC temperature probe / Door contact

* Either D1 or 1 can be used
** Either D2 or 2 can be used
*** Both inputs are available with the optional splitter unit (see ‘Spare parts andaccessories’).
**** D3 is internally used to monitor power supplied to the BCU. Should anexternal digital channel be required, then the BCU hardware will need to bemodified.

USB port:

The USB-C port allows the download of data directly from the Ice3 internal memory. Further details can be found in the next section.

Power module:

It is important that the supply voltage and current is within the specification detailed in this document. Make sure all required connections are made before connecting power.

Connect the power module plugging the one side of the ethernet cable into the Power module, and the other side into the RJ45 plug on the side of the of the BCU.

Plug the kettle plug from the other side of the power module into an AC supply plug (100 – 240 VAC).

How to connect / remove sensors:

All channel input sensors have RJ9 modular plugs (commonly used in old telephones). These can only be inserted in one way. With the clip facing the rear of the unit, push the connector in until you hear a click.

To remove, squeeze the clip towards the cable, and while squeezing pull the cable /connector out:

Connect:



Remove:



6.3.2 Operating instructions

The following operating instructions pertain solely to the BeyondCom unit hardware. Information regarding the online portal and smartphone application is not included in this document. Certain configurable features are factory-preset prior to delivery and can only be modified via the ColdCloud portal.

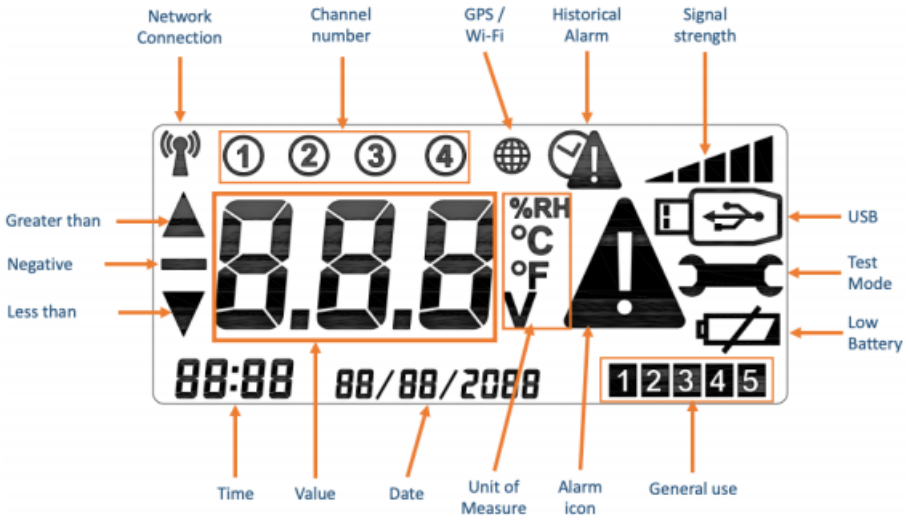
Membrane keypad, USB interface and alarm LED:

There are 2 buttons and a USB interface for downloading data. The Mute button will silence the buzzer for active alarms for the duration set on the ColdCloud portal. It will also log a record as a ‘Site Log’ proving that someone was at the unit and effectively acknowledged being there. The spanner button has various purposes including ‘Test Mode’ which is explained below.



LCD Display:

The LCD screen scrolls through different screens, depending on the relevant setup. The following table shows different scenarios with detailed explanations:



Buttons:

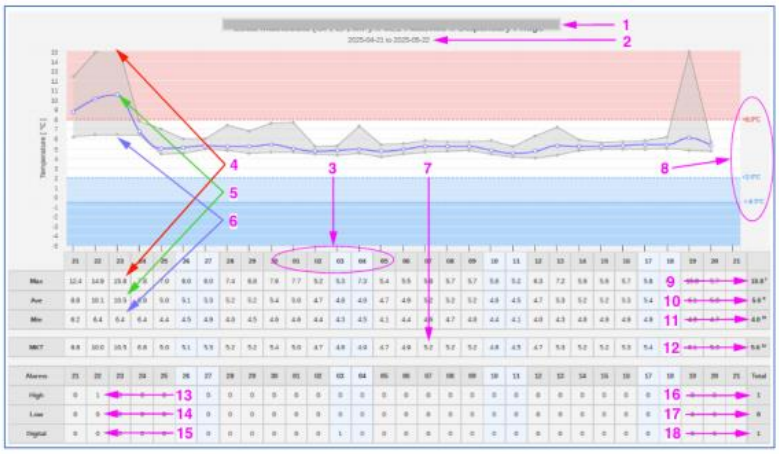
FUNCTION	Mute:	Spanner:	NOTES:
Buzzer Mute	Push for about 1 second.		• When there is an active alarm and the buzzer is sounding, the Mute function silences the buzzer for the buzzer mute duration. • A site log is created when Mute button is pushed.
Site log	Push for about 1 second.		• If no alarm is active, the unit will record a site log.
Test mode / force upload		Hold for at least 5 seconds (until you hear a beep).	• The spanner icon will display on the LCD to confirm unit is in test mode. • Since this mode forces an upload, the network connection icon will also illuminate.
30 DTR	Requires both buttons. See details below for full operational details.		
Switch unit ON / OFF	Hold both buttons simultaneously for at least 8 seconds.		• When switching on, the greater than and less than arrows will illuminate to indicate the unit is on and booting up. • When switching off, the unit will emit a single beep to confirm the action.
Switch Wi-Fi module on	Push both buttons momentarily and release.		• This function will only be available on units with Wi-Fi capabilities. • A short beep will confirm Wi-Fi has been enabled. • The Wi-Fi will be active for 5 minutes. • The icon flashes to indicate Wi-Fi is active.

Alarms and Mute:
When there is a warning or alarm condition (based on the thresholds setup on the ColdCloud portal), the red LED will flash and the buzzer will sound. The buzzer pattern will be as per the setup on the ColdCloud portal, for which “Disable buzzer” is one of the options.To Mute the buzzer, push the Mute button once. The duration of the Mute will be as per the setup on the ColdCloud portal.When the Mute button is pushed, this will be logged and sent to the ColdCloud portal as an alarm acknowledgement. Should the alarm still be active after the mute duration, the buzzer will resume sounding, unless the mute button is pushed again.
Test Mode:
To test the functionality of the system, it is recommended that alarms are periodically simulated. This is achieved by forcing any of the channels to go into an alarm state by exposing the input to values outside of the alarm threshold values set on the ColdCloud portal e.g. placing a temperature probe into hot water if the alarm is set to activate if temperature goes above say 8°C.When these tests are performed, the system processing the alarm as per the setup
BUT data is flagged as being in test mode to highlight that a test was being performed, and that the asset being monitored was not actually in alarm. To activate the Test Mode, push the spanner button for approximately 3 seconds.
The spanner icon will display on the LCD and will remain there for the duration of the Test Mode (which is set on the portal setup for the site. After this duration, the icon will automatically switch off on the display.

6.3.3 30 DTR

The 30DTR feature is a 30-Day Temperature Recorder which allows a user to view historical Min / Max / Ave temperatures and alarms. There are 2 ways to access this information:
Scan QR code:
This provides a chart referred to as a Temperature Monitoring Chart (TMC). The QR code is supplied with the unit, and is also downloadable from the ColdCloud portal.
Most smartphones will automatically open the web link when the QR code is scanned using the camera. If not, a QR scanning app may be required.
Note:Ensure the serial number on the QR code is the same as that on the BCU.
When this option is selected, a report with the previous 30 days will be downloaded. This includes:
- A graph showing Min/Max/Ave temperatures.
- A table with the same data, along with any alarms that occurred each day.
- Min/Max/Ave and MKT values for the 30-day period.

Note:
- **Only temperature data is available for this report.**
- **If the BCU is configured to monitor multiple assets, a separate chart will be generated for each asset.**



Item	Description
1	Region / Site / Asset name
2	Date range of report
3	Day of month (weekends shaded in light blue)
4	Day Max temperature (highest temperature recorded on that day)
5	Day Average temperature (average temperature for that day)
6	Day Min temperature (lowest temperature recorded on that day)
7	MKT (Mean Kinetic Temperature)
8	Alarm thresholds (as per sensor configuration for the asset)
9	Maximum recorded temperature over 30-day period
10	Average of recorded temperatures over 30-day period
11	Minumum recorded temperature over 30-day period
12	MKT for the month
13	Quantity of High temperature alarms on that day
14	Quantity of Low temperature alarms on that day
15	Quantity of Digital temperature alarms on that day e.g. Door or Power
16	Quantity of High temperature alarms in the 30-day period
17	Quantity of Low temperature alarms in the 30-day period
18	Quantity of Digital temperature alarms in the 30-day period e.g. Door or Power

Read data from LCD screen:
To read this historical temperature data directly from the BCU, an internet connection is not required. Proceed according to the following:
To go into 30DTR mode:
Push spanner button 3 times in succession, a beep will be heard to confirm the unit has successfully acknowledged each button press. The 3-button pushes must be done within 20-seconds. Display shows spanner icon flashing every
second to indicate unit is in 30DTR / historical mode.
To exit 30DTR mode:
If no buttons are pressed within 30 seconds, the unit will automatically return to normal mode.

Note:

- **Only once this mode had been exited will the spanner button be available for the normal 'Test mode'.**

Viewing historical data:
To select channel:
Once in 30DTR mode, select channel by pushing the spanner button. The selected channel will be illuminated (not flashing). Press the Mute button to accept your selection.

Note:

- **A number 5 on the bottom right of the screen indicates the built-in ambient temperature sensor (channel A5).**
- **The %RH icon indicates the built-in ambient relative humidity (channel A6).**

To show Previous day(s):
To scroll back through historical data, press the 'Mute/Back' button. Each press moves the display back by one day, up to a maximum of 30 days. Data older than 30 days is not accessible via this method.
To show Next day(s):
To scroll forward through historical data, press the 'Spanner/FWD' button. Each press advances the display by one day. Once the current day is reached, the display will return to the channel selection menu.

Note:

- **The bottom of the display will show Hd:xx where xx is how many days ago you are viewing.**
- **The date will be the specific day that you have navigated to.**

6.3.4 USB port

The USB port facilitates communication with external devices, such as computers, via a USB-C cable. The functionality differs depending on whether the BCU is fitted with an optional Logic board.

For models equipped with the Logic Board:

The Ice3 is recognized as a standard USB Mass Storage device when connected to a computer. To access the USB port, gently remove the protective sticker—applied only to units requiring a higher IP rating—by pulling on the tab that covers the USB port. The sticker must be reapplied after use to maintain the unit's protective rating.The following functionality is available through the USB interface:

- Downloadable 60-day PDF summary report:

Plug one end of the USB-C cable (not supplied) into the USB port, and the other end into a computer. The Ice3 will present itself as a flash drive. Navigate to the root directory from your computer and you will see a PDF file with a 60DTR summary report.

- Historical raw data files:

Up to a year's worth of history is available for active channels in the "DATA HISTORY" folder.

- USB Synchronisation file:

A synchronisation data file can be found in the root folder which will contain the last available data record of certain parameters.

For models without the Logic Board:

Historically logged data from Ice3 (active channels only), can be downloaded onto a computer via a standard USB cable. This requires software available for download on the ColdCloud portal.

The root directory contains the following files/folders:

File/folder	Contents
0123456789_60DTR_SUMMARY_PnDTnHnMnS.pdf	60 day summary report (including temperature, door switch, compressor operation data, etc.)
0123456789_CURRENT_DATA_PnDTnHnMnS.json	The raw data from the past 60 days (in JSON format, compliant with WHO/PQS/E006/DS01 standards).
0123456789_SYNC_PnDTnHnMnS.json	Containing the relative timestamp at time of mount, RTC Wakeup value (RTCW), present door opening data objects
0123456789_DATA_PnDTnHnMnS.json	All historical data

Where 0123456789 is to be replaced by the alphanumeric logger unique identifier, andPnDTnHnMnS is to be replaced by the relative timestamp as of the time of USB mount in ISO 8601 duration format.

6.3.5 M2M interface

The data logger of CFD-50 SDD adopts Beyond EMS, and the BCU has a USB Type-C interface. In addition, there is an M2M power cord arranged near the USB Type-C interface for recording data and interacting with external devices.

The M2M power cord has a quick plug connector, which is plugged into the power board inside the press room at the bottom of the machine. When replacing, unplug the M2M power cord plug from the power board and plug the spare power cord plug into the power board.

The Ice3 has a built in rechargeable Li-Ion battery that will be charged when there is appliance power but will work without appliance power for greater than 2 weeks. In the event the Ice3 internal battery is depleted, the Ice3 can be powered up through the USB-C connection and extarct data.

6.3.5.1 Health and Safety Guidelines

Electrical Safety: Ensure the device is connected to a power supply that complies with local electrical standards. Avoid operating the device in humid environments.

Device Operation: When operating the device, avoid inserting hands or other objects into the device's vents or mechanical components.

Data Access: When connecting external devices (such as laptops or mobile phones) to access logger data, ensure the device is stable and avoid moving it during operation.

6.3.5.2 Basic Operations

Device Startup: Connect the device to the power supply, ensuring the voltage meets the device's requirements. Once powered on, the logger will automatically start recording data.

Data Access:

Use a USB Type-C cable to connect an external device (such as a laptop or mobile phone) to the USB Type-C interface on BCU.
The external device will recognize the logger as a USB Mass Storage device, allowing users to access the data files stored in the logger.

Barrel Power:The M2M barrel power connection plug is for powering monitoring devices and not for the charging of mobile phones or other devices.

NOTE：The barrel-type male plug of power cable is protected by a waterproof cap, which needs to be removed when in use and plugged back in when not in use。

6.3.5.3 Routine Maintenance

The interface has a dust-proof and waterproof design to reduce daily maintenance work, but the following should also be noted.

Cleaning: Regularly clean the interface surface to prevent dust and dirt buildup. Use a soft, dry brush to wipe the interface, avoiding corrosive cleaning agents.

Note：There is a stuttering sensation when inserting the interface correctly.

Inspection: Periodically check the device's power and connection cables to ensure there is no damage or looseness.

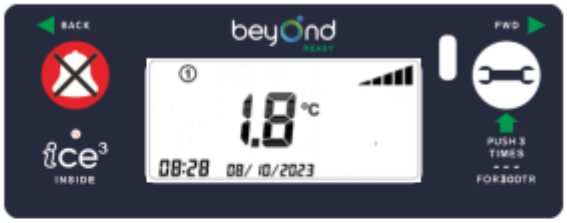
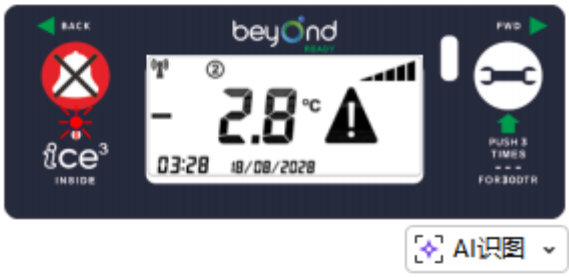
6.3.5.4 Troubleshooting

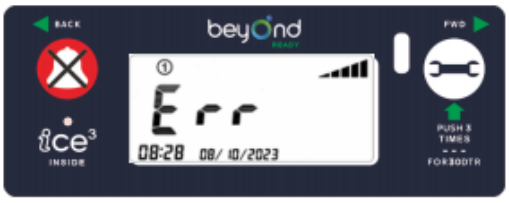
Unable to Access Data: Ensure the external device is properly connected to the M2M interface and check if the USB cable is damaged. If the issue persists, contact technical support.

Abnormal Data Recording: If abnormal data (e.g., inaccurate temperature readings) is found, check if the sensors are functioning properly and contact a technician for replacement if necessary.

6.3.6 Examples of display modes

Note:Not all scenarios are shown and it is possible to have a combination of the below examples.

No.	Display	Meaning
1		Normal operating mode showing current temperature on channel 1. Time: This is the local time based on the timezone set on the ColdCloud portal. Date: This is the local date based on the timezone set on the ColdCloud portal. Signal strength: Full signal (5 bars).
2	 AI识图	Current Alarm on temperature channel 2. The unit is currently uploading to the portal. Red LED is flashing as there is an active alarm.
3		Current Alarm on digital channel D3 (usually power to Ice³) e.g. supply power is OFF.
4		Historical alarm: Unit is no longer in an active alarm state; but a previous alarm on this channel was not acknowledged. Press the **Mute** button to clear the historical alarm indicator and log the event on the portal.

5		Test mode: hold spanner button (for at least 5 seconds) until you hear a beep. **Note**: If a unit is in Test Mode, then ALL channels on the units will be in test mode.
6		Low battery
7		Probe error on channel A1.

6.3.7 List of Error Codes

a. The following is an explanation of the ALRM code:

ALRM Code	Symbol description
HEAT/ HEATACK	Heat alarm/ Confirm
FRZE/ FRZEACK	Freeze alarm/ Confirm
DOOR /DOORACK	Door open alarm/ Confirm
POWR/ POWRACK	Power outage alarm/ Confirm
DCNT /DCNTACK	EMD disconnect alarm/ Confirm

b. See below error codes reported on the 60 day performance report.

Error Code Number	Description
16	Connect to server timeout
17	Failed to connect to IP address
18	Tried to connect to server 3 times without success
19	SIM card not detected
20	SIM card not registered
21	Both SIMs not registered
22	Problem disconnecting from the server
23	Watchdog reset
33	Start/ restart
35	Format EEPROM
36	Brown out restart
38	Power on reset

c. When the temperature sensor experiences an open circuit or a probe error, the code "Err" will be displayed on the screen, as well as in the PDF and JSON files.

6.3.8 Ice3 web server (only available with Logic Board)

The Logic Board includes a built-in Wi-Fi module, enabling the Ice3 to connect to Wi-Fi-enabled devices such as smartphones, computers, and tablets via a web browser. Through its integrated web server, users can access key information including summary KPI (Key Performance Indicator) reports, connectivity status, and battery level. The interface also provides basic configuration options—such as setting the system time and enabling or disabling alarms—and supports firmware updates for the Logic Board.

To access the web server:

- Enable Wi-Fi on the Ice3 by following the button sequence described above.
- On your smartphone, tablet, or computer, open the **Wi-Fi settings** and select the network **ICE3_xxxxx** (where *xxxxx* is the serial number of the Ice³).
- When prompted, enter the password: **Beyond123**.

Note:

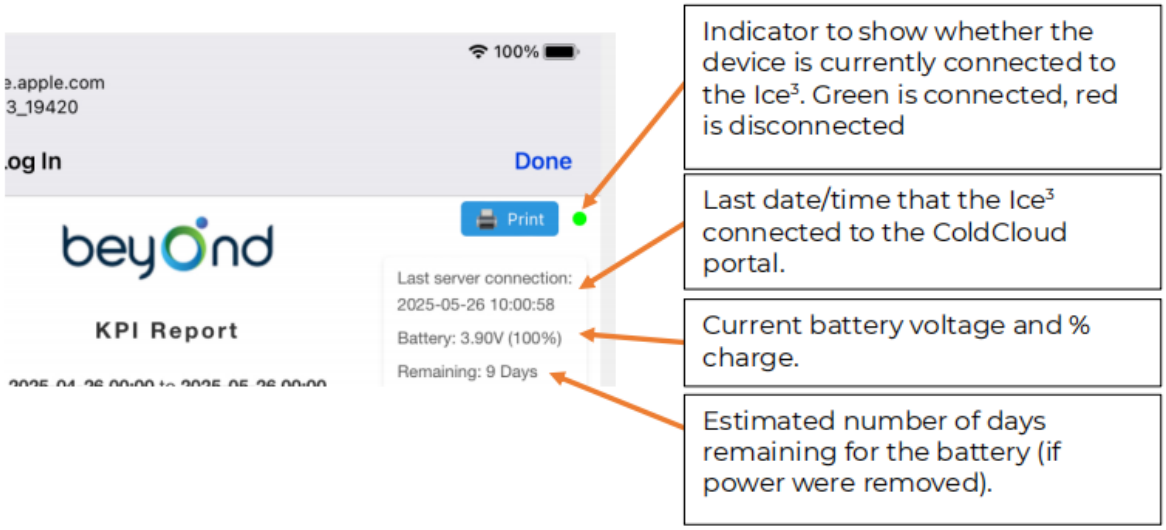
- **You will not be prompted for the password if the device has previously connected to this Ice3 unit.**

- Launch an internet browser. The Ice3 web server interface should automatically open.

Note:

- **Display screens may vary slightly depending on your device.**

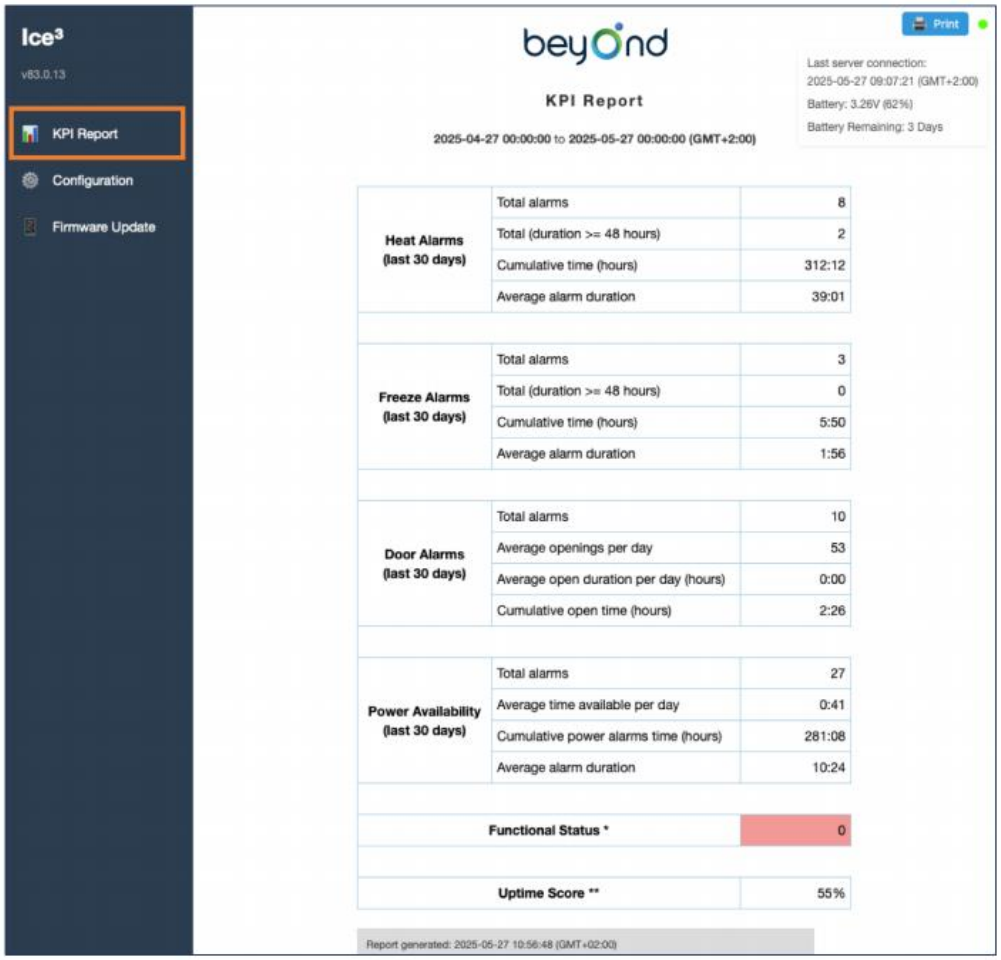
- At the top of the web interface, the following information is displayed:



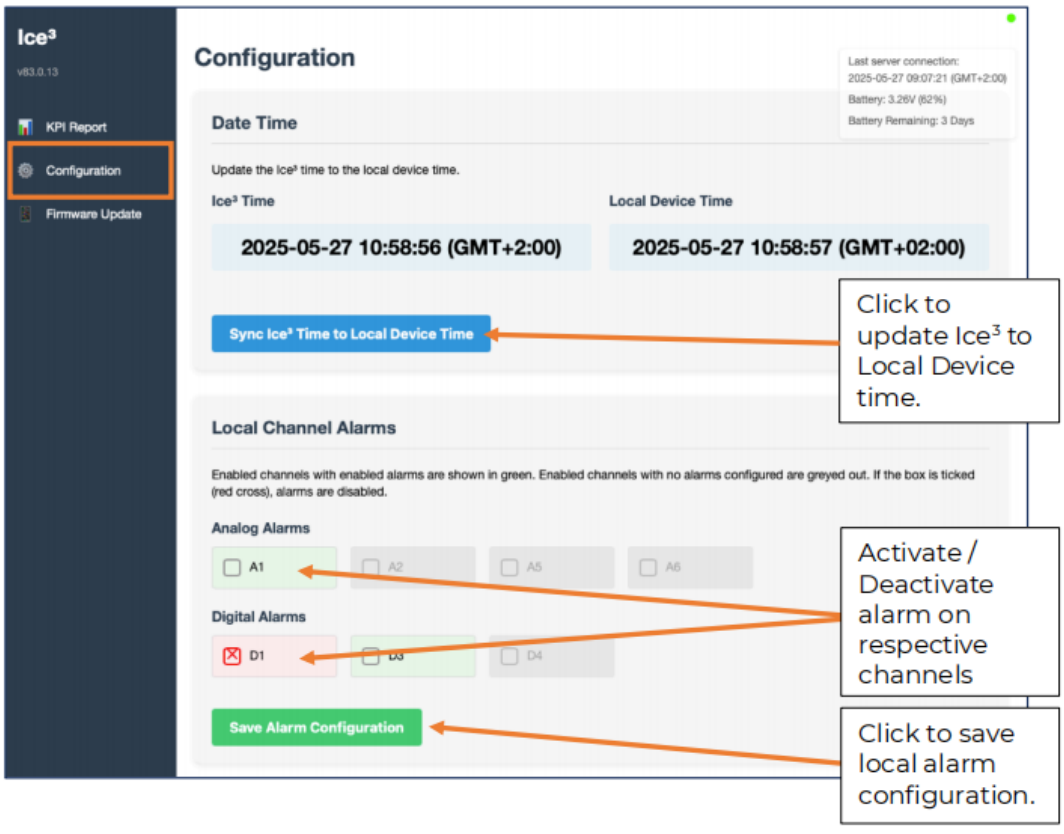
Menu options:

On the left side of the browser page, there are 3 menu items available. Select the menu item by clicking on the respective option:

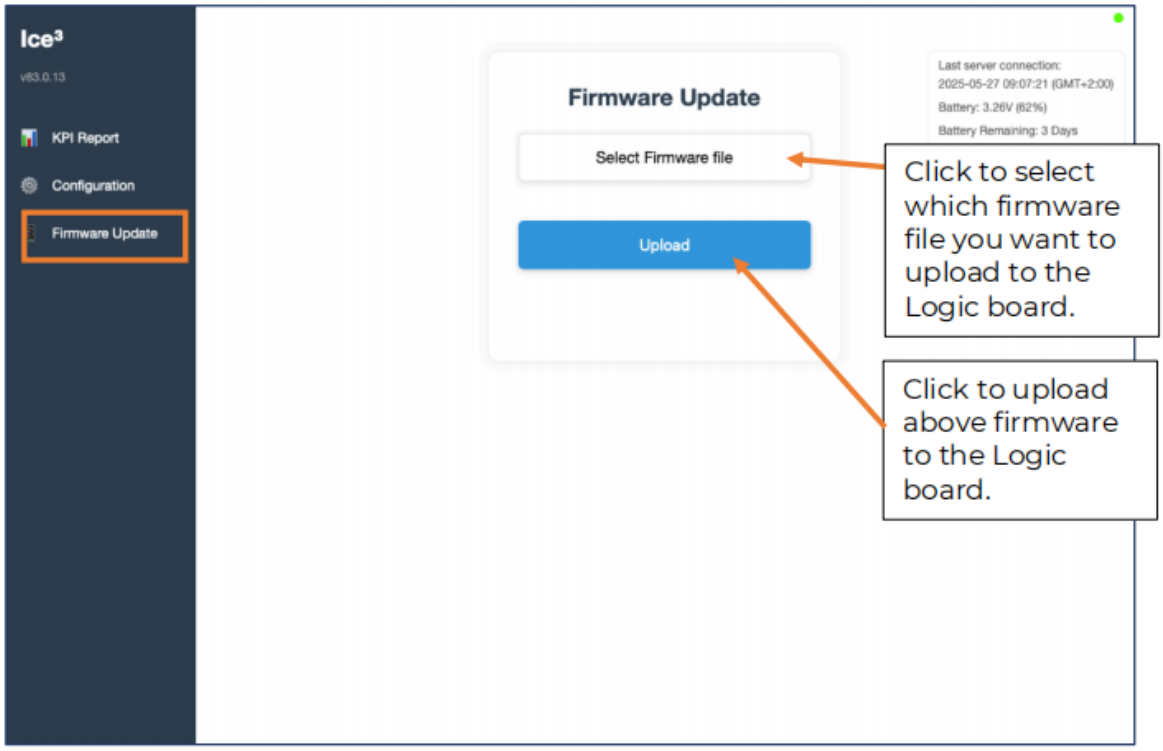
a. KPI (Key Performance Indicator) Report:



b. Configuration:



c. Firmware update:



Note: Users can configure administrative data on-site through the firmware update function, Any firmware file must be provided by the manufacturer. Please do not upgrade it privately unless notified by the manufacturer to upgrade the firmware

Note:If a unit is rebooted, then locally disabled alarms will return to their default setup state i.e. as per ColdCloud initial setup.

Note:For detailed operation, please refer to Technician Manual - Ice3 BC141，or refer to the Beyond Coldcloud Administrator Manual.

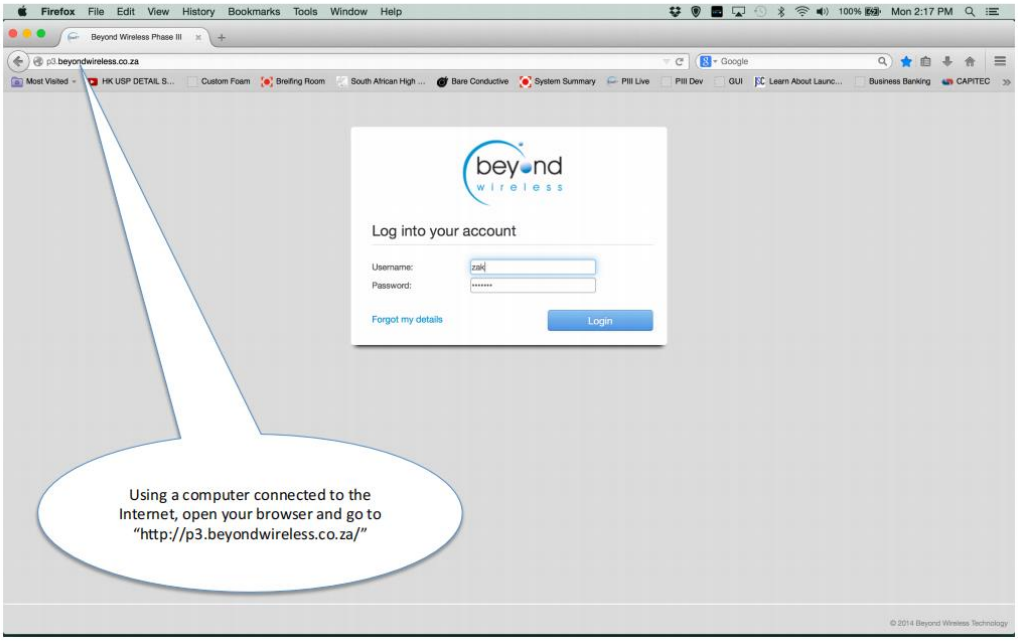
6.3.9 Beyond Coldcloud

Here is only a detailed introduction on how to access your temperature data and alarm data. For other information about Beyond Coldcloud, please refer to the Beyond Coldcloud Administrator Manual.

6.3.8.1 How To Access Your Temperature Data

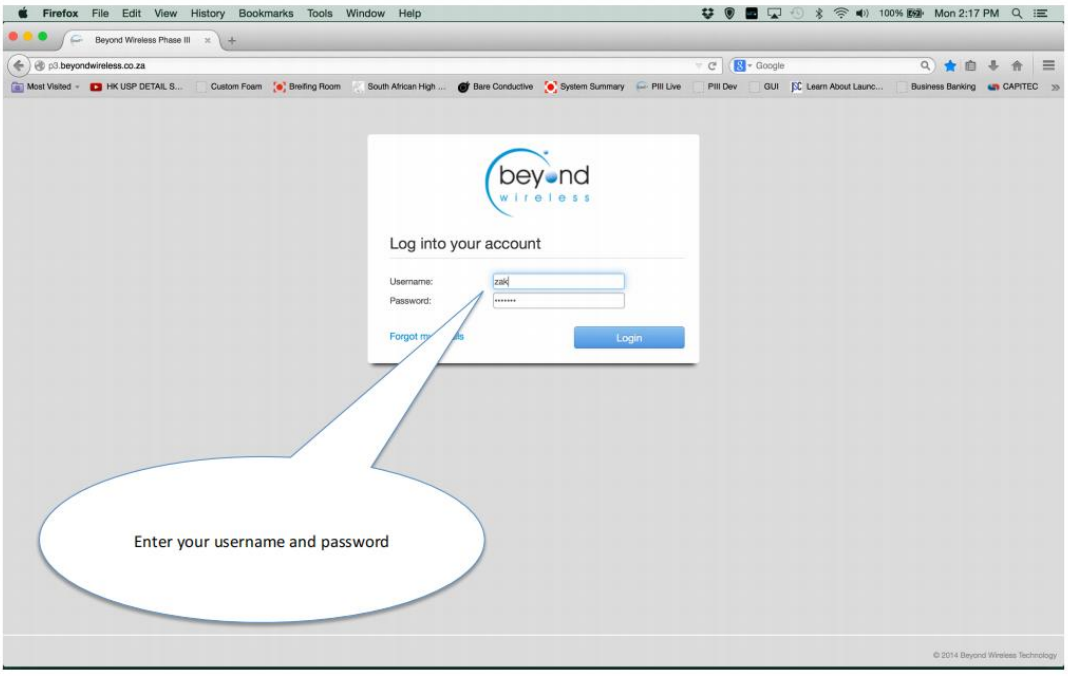
STEP 1:

NB: Portal works best with Google Chrome or Mozilla Firefox!



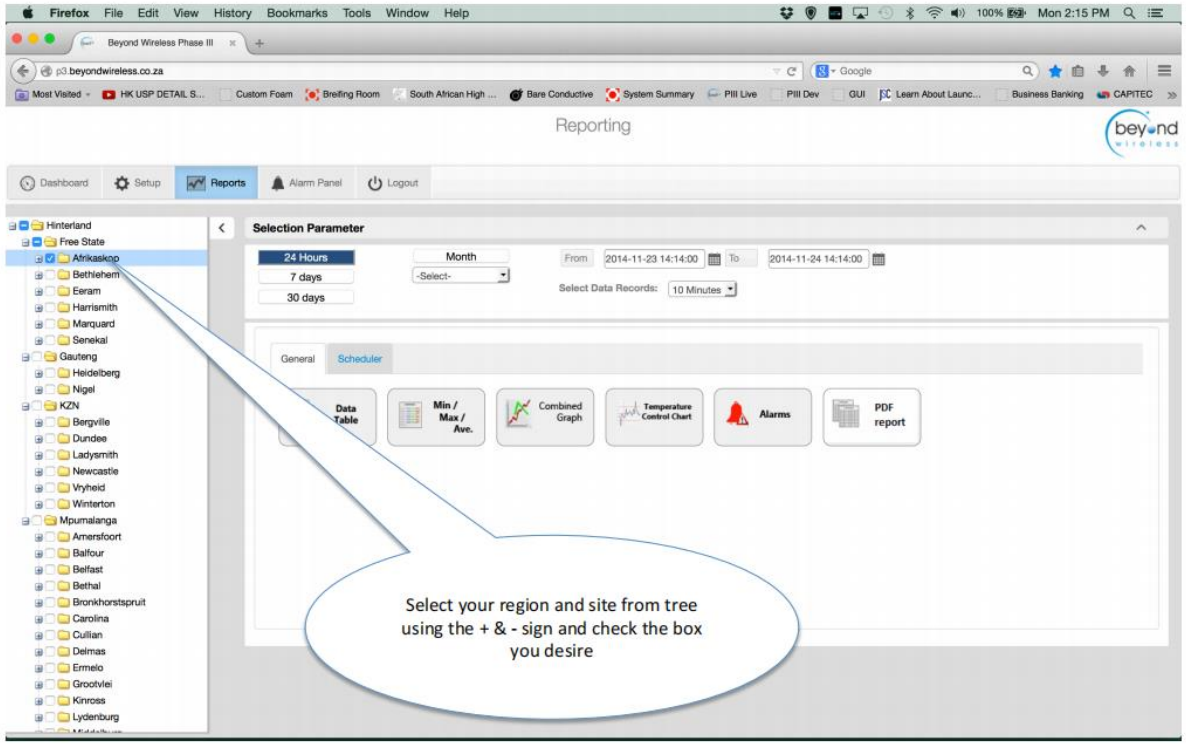
STEP 2:

NB: Portal works best with Google Chrome or Mozilla Firefox!



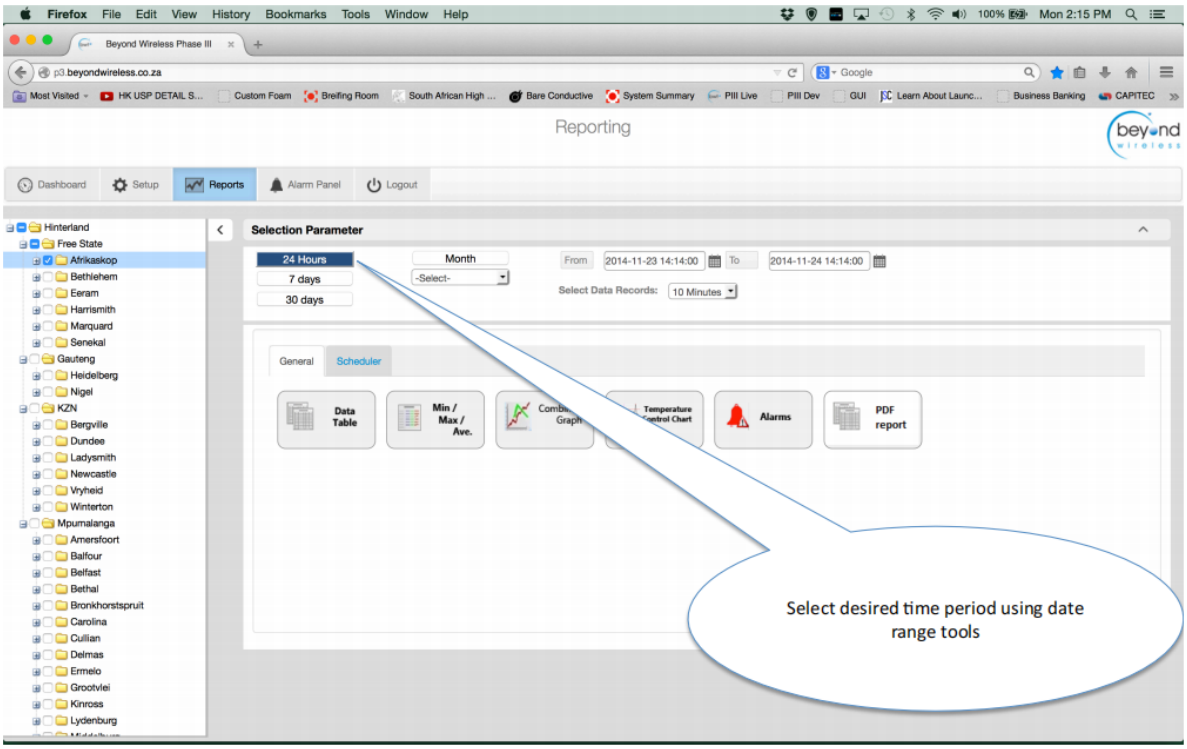
STEP 3:

NB: Portal works best with Google Chrome or Mozilla Firefox!



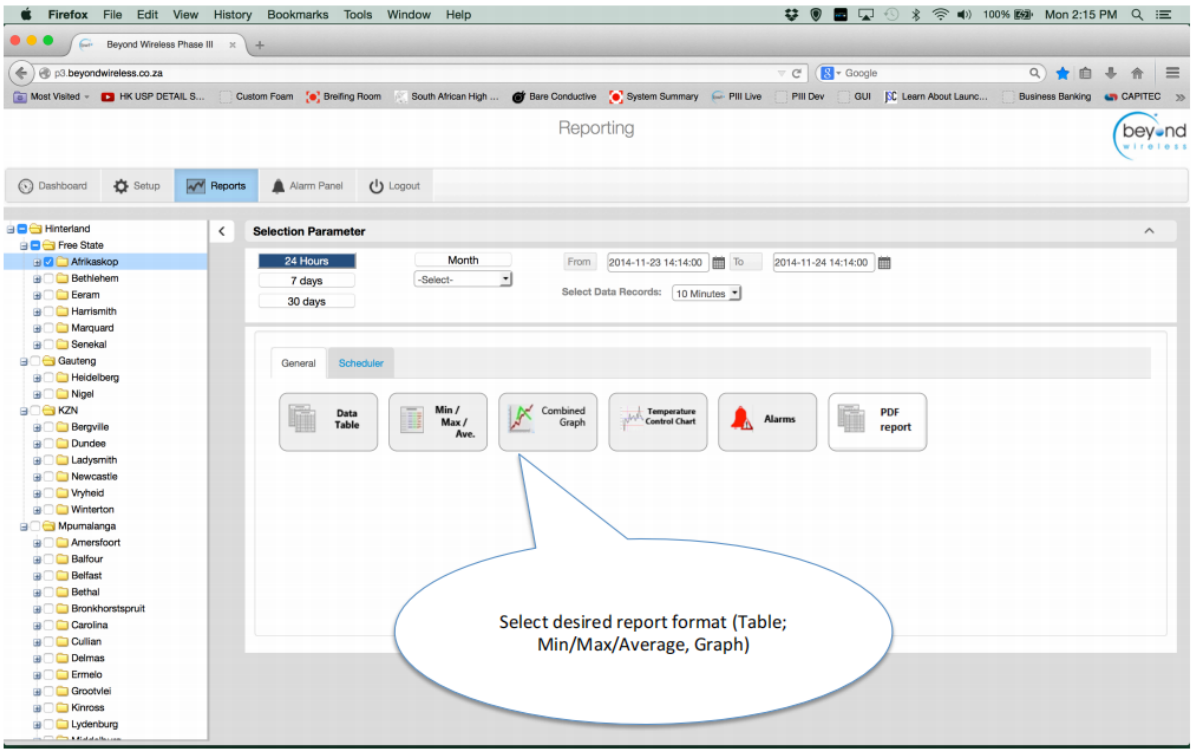
STEP 4:

NB: Portal works best with Google Chrome or Mozilla Firefox!



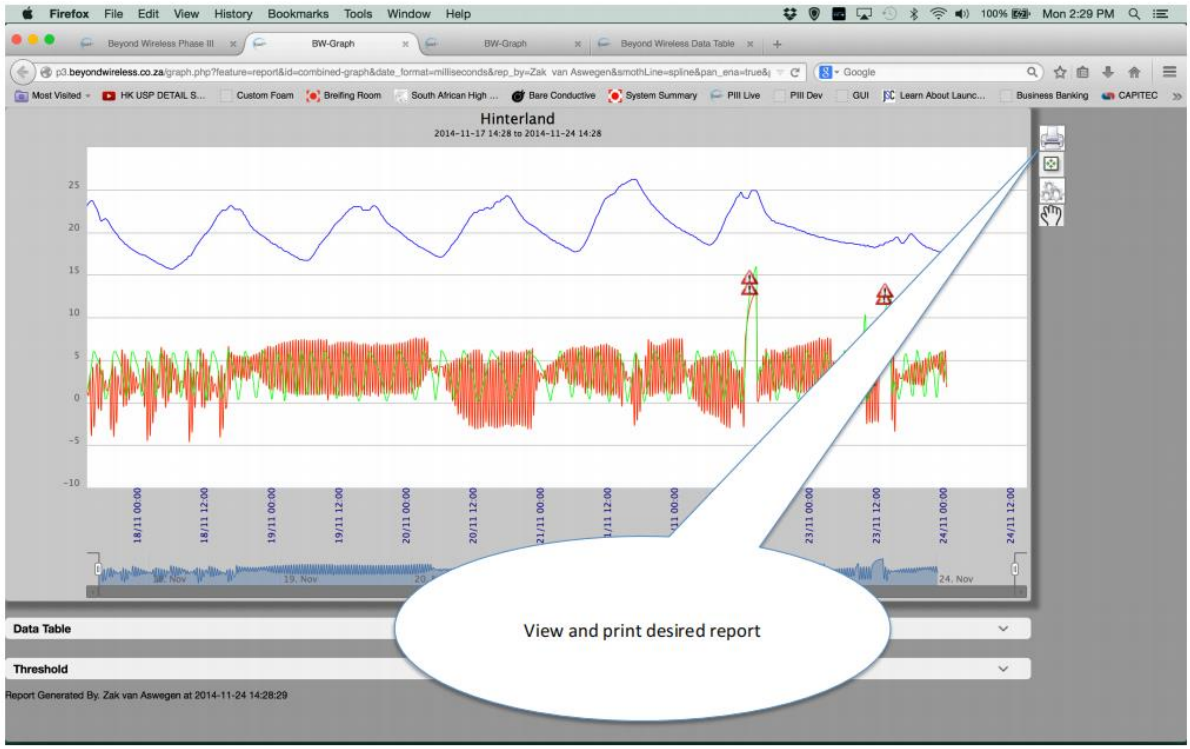
STEP 5:

NB: Portal works best with Google Chrome or Mozilla Firefox!



STEP 6:

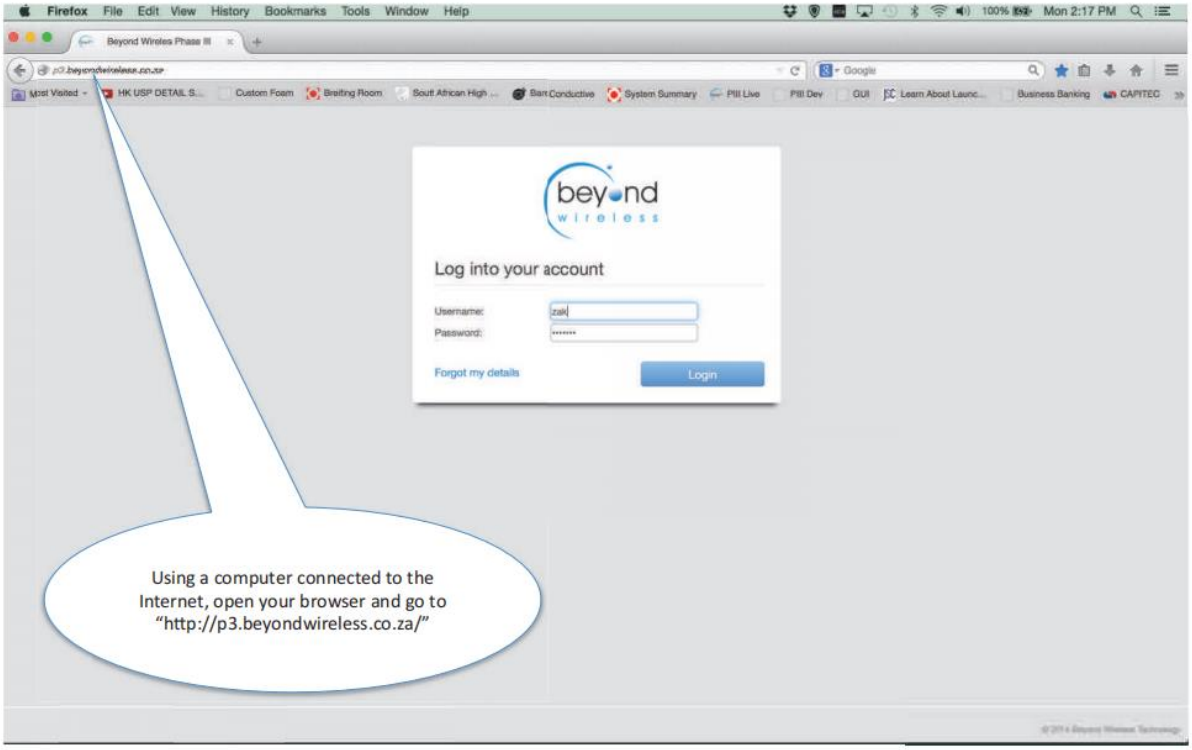
NB: Portal works best with Google Chrome or Mozilla Firefox!



6.3.8.2 How To Access Your Alarm Data

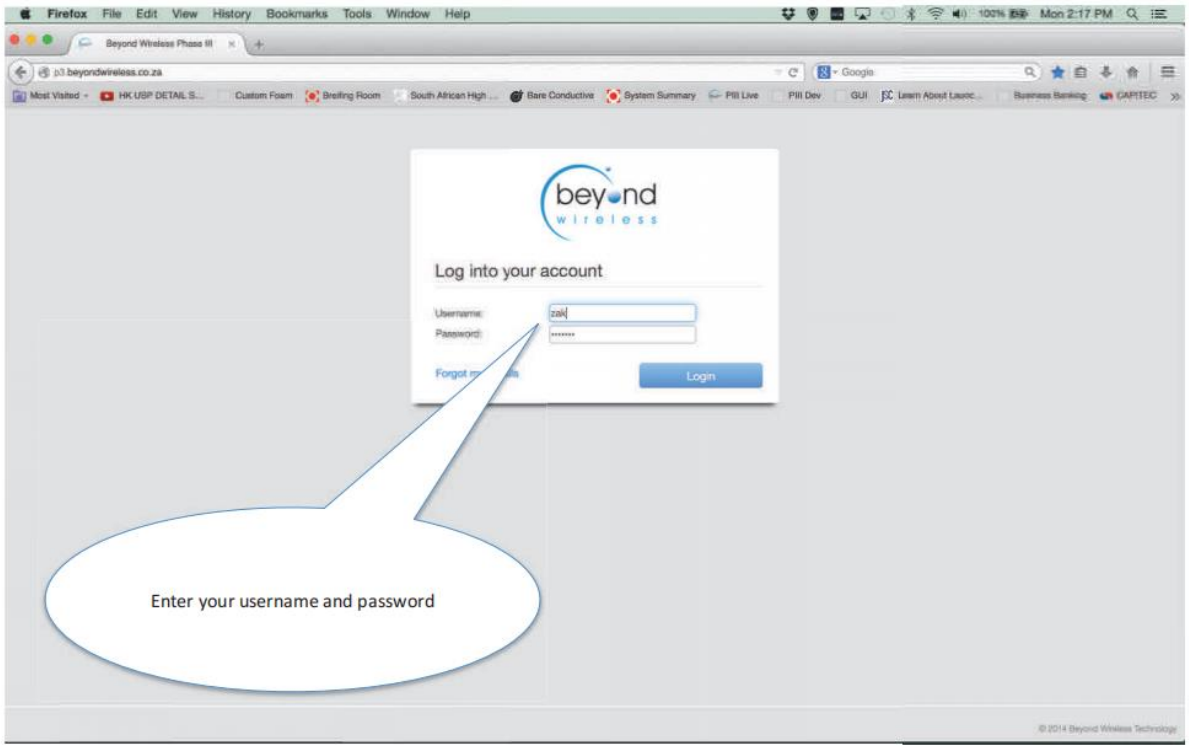
STEP 1:

NB: Portal works best with Google Chrome or Mozilla Firefox!



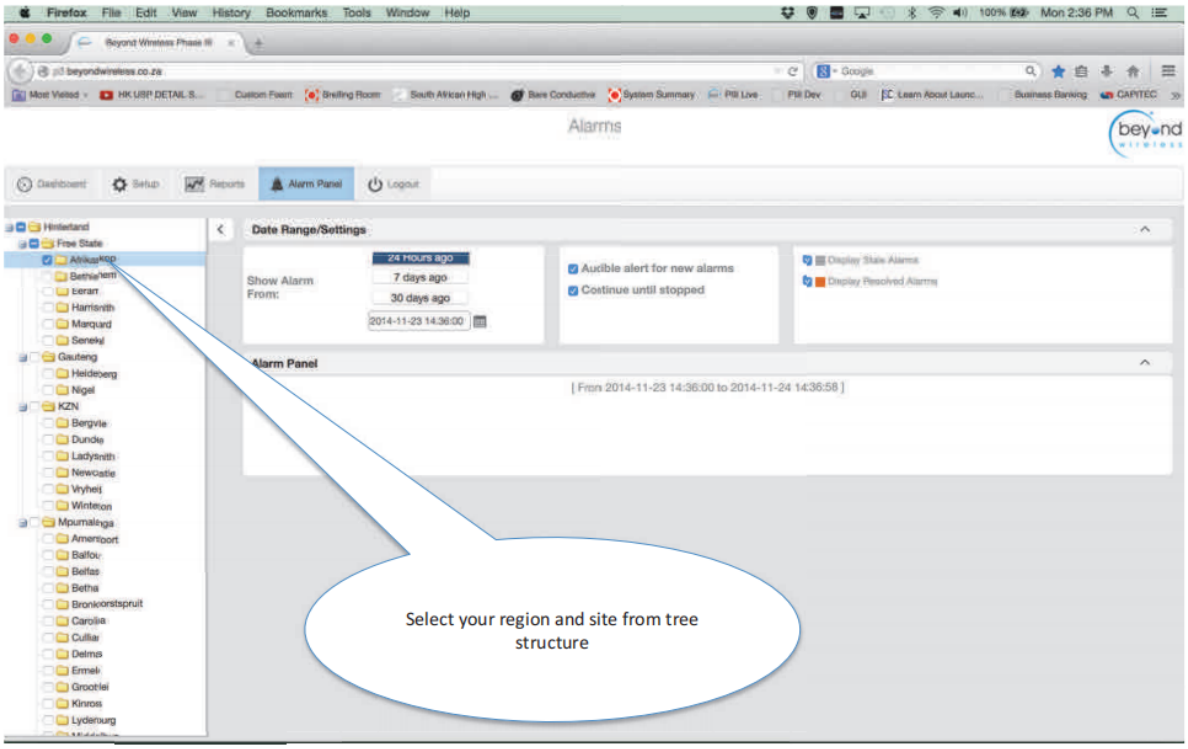
STEP 2:

NB: Portal works best with Google Chrome or Mozilla Firefox!



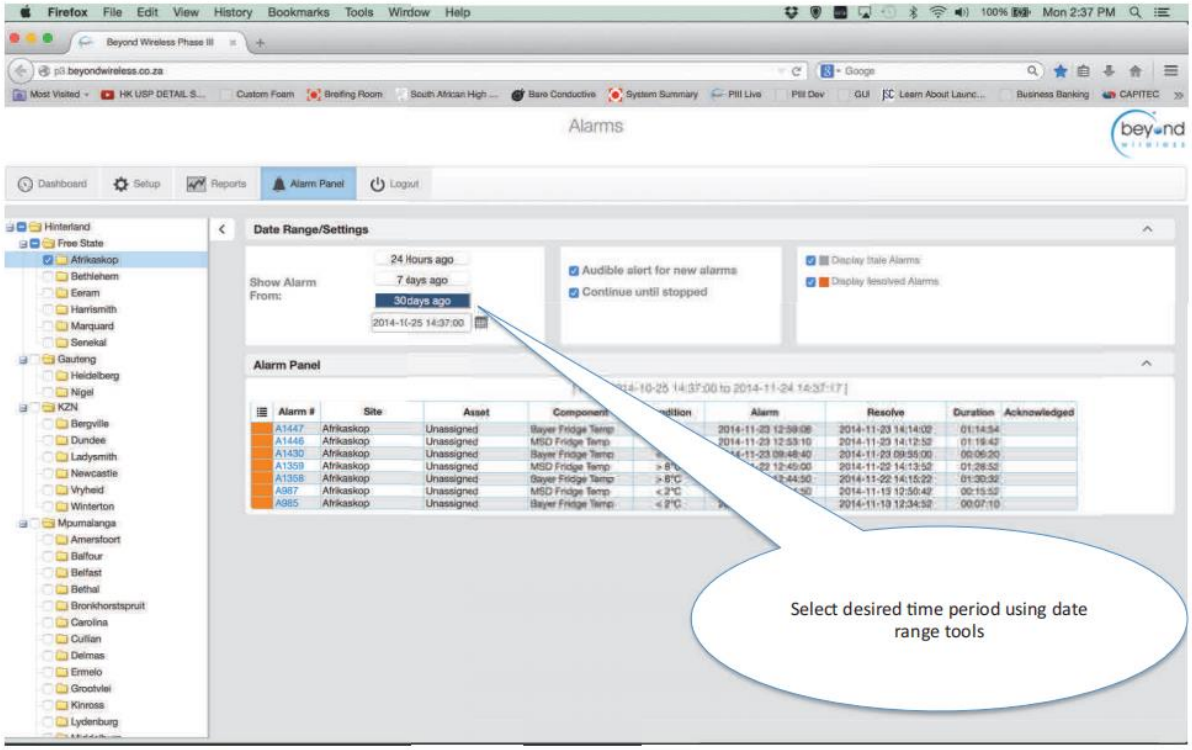
STEP 3:

NB: Portal works best with Google Chrome or Mozilla Firefox!



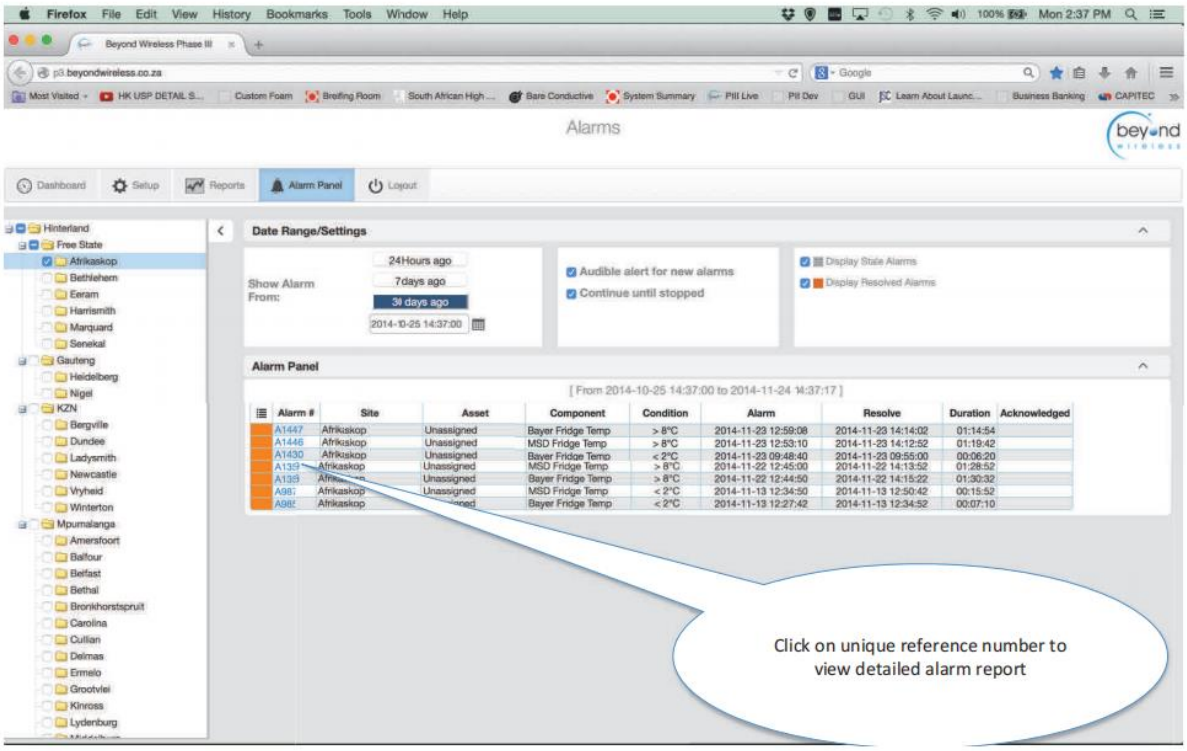
STEP 4:

NB: Portal works best with Google Chrome or Mozilla Firefox!



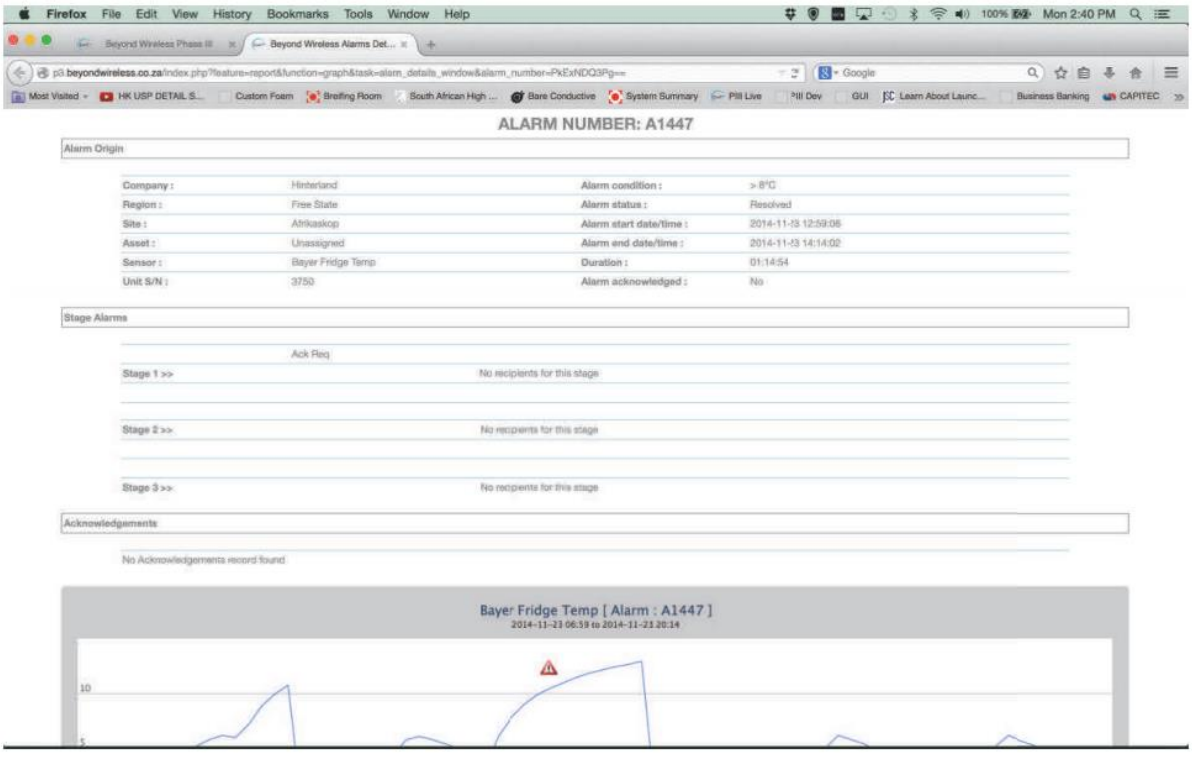
STEP 5:

NB: Portal works best with Google Chrome or Mozilla Firefox!



STEP 6:

NB: Portal works best with Google Chrome or Mozilla Firefox!



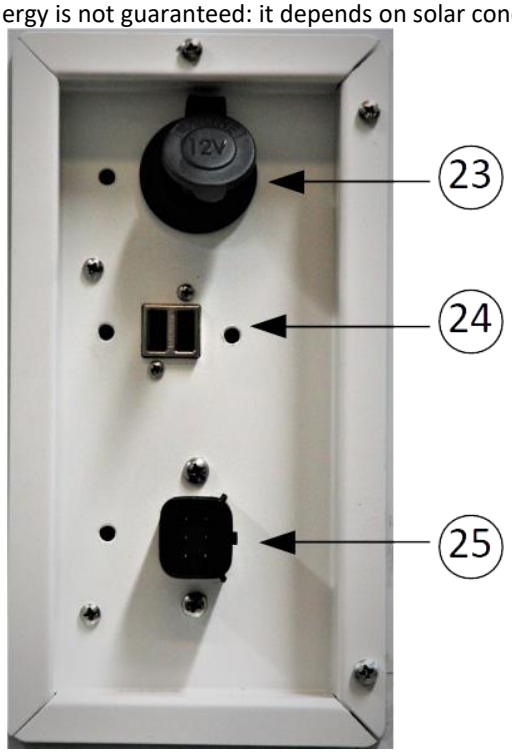
6.3.10 Other

•All spare parts are provided by Aucma. Before the logger recorder leaves the factory, we will reconfigure all administrative information according to the appliance without the need for on-site configuration.
NOTE:If the user needs to configure it themselves, they can refer to Section 5.3.8. We do not recommend self-configuration to avoid affecting the normal use of the product. Additionally, the relevant software required for configuration will be provided by Aucma or the local distributor.
•Beyond has passed the WHO prequalification（E006-036e）, As legal manufacturer，AUCMA and Beyond will not share collected datas with any third parties.
•For other instructions or operations related to BCU, please refer to the Technician Manual - Ice3 BC141.

6.4 Energy Harvesting

When the sun is shining brightly for long periods each day, there will be more energy available from the solar array than is needed to keep the ice block frozen. CFD-50 SDD can “harvest” some of that extra energy to be used for other purposes and send it to devices plugged into the energy harvesting outputs on the left side of the refrigerator. Whenever there is more power available than needed by the cooling system, some or all of the harvesting outputs will be powered. The number that are powered depends upon the amount of the excess. The cooling system is prioritized. For instance, if the compressor needs to start, harvesting outputs will be turned off. Or if a cloud passes between the sun and the solar array, harvesting outputs may be turned off to allow the compressor to keep running.

Keep in mind that harvested energy is not guaranteed: it depends on solar conditions and cooling needs.



Energy Harvesting Outputs

23. 12V Automotive	The 12V automotive-style socket can power or charge lights or other 12V devices. It has a current capacity of 2A, and is protected from short circuits. This is the second energy harvesting output to be turned on if extra power is available.
24. USB	The two USB sockets can be used to charge mobile devices like phones or tablet computers. These outlets are the first energy harvesting outputs to be turned on if extra power is available. Each can output 1A, and are protected from short circuits.
25. Accessory	Designed to supply power to future defined accessories such as ice-pack freezer, or existing undefined loads such as battery-based power stations or lighting systems. It will output between 0V and 18V, and can output a current

	up to 8A, depending on the accessory type and solar conditions.

The CFD-50 SDD continually measures the solar conditions by monitoring the solar array's characteristics. If the compressor does not need to run to cool the ice block, the energy harvesting outputs will be turned on in sequence. If the compressor is running, but there is extra power available, some or all of the outputs may also be turned on to make this power available to connected devices. First both USB outlets will be turned on to charge mobile devices or small battery-powered lights. If there is still excess power, the 12V outlet will be turned on. Finally, if there is yet more extra power or nothing is plugged into the USB and 12V outlets, the Accessory outlet will be turned on.

Green lights near each outlet indicate when they are being powered. It is normal for these lights to turn on and off over the course of the day as solar conditions and refrigerator cooling requirements change. It is recommended to not try to time plugging in a load with the state of the lights. If a load needs to be charged, just plug it in and the refrigerator will charge it with as much excess energy as possible.
The Accessory output has special behavior that is designed to accommodate a number of different kinds of higher power defined or undefined loads. Its proprietary connector contains both power and communication connections. Some accessories have the ability to communicate with the CFD-50 SDD to coordinate the power wires' voltage and current characteristics. For example, a solar ice pack freezer may have a minimum power level required to start its compressor, or a battery charger may need a minimum voltage in order to begin charging. Each of these could communicate its needs to the CFD-50 SDD.
Accessory output operation with non-communicating accessories is as follows: When there is extra energy available, the accessory output is turned on, but at a low voltage of about 3V. This setting allows the system to check for short circuits on the output and shut it off if necessary. In the case of a short, the system will retry a little while later. Assuming there is no short circuit, the CFD-50 SDD increases the output voltage slowly in steps. It continually measures the output power and compares it with the extra power available from the solar array. It also monitors for over-current conditions. If necessary, it will reduce the output voltage to regulate the power drawn from the accessory output, or turn it off entirely to ensure proper operation of the refrigerator.
For a current list of accessories that are compatible with the Accessory output, contact Aucma.

6.5 Powering CFD-50 SDD from Mains Power

The CFD-50 SDD also can be powered from mains electricity, if available at the location. The input can accept voltages anywhere in the worldwide range of 110V-240V 50/60 Hz, and can be connected at the same time as a solar panel. The CFD-50 SDD will automatically select which power source to use. It will prioritize solar power when both are available to keep the facility's electricity costs down. But if there is not enough sun during the day, the CFD-50 SDD will run the compressor at night from mains power to make sure that vaccines remain safe.

7 Maintenance

7.1 Daily maintenance tasks

- Confirm that the vaccine chamber is within acceptable temperature range (2°C to 8°C) and remaining holdover is at least 2 days. If temperatures are out of range or holdover is low, follow troubleshooting steps in Chapter 8.
- Ensure that door is fully closed and latched. Avoid unnecessary door openings.
- The health worker is responsible for day-to-day maintenance. Their main task is to monitor the CFD-50 SDD MetaFridge temperature for acceptable vaccine storage temperature of +2°C to +8°C. The health worker also will be responsible for keeping the CFD-50 SDD ventilation areas open and clean.
- If the refrigerator is moved they will need to assure the CFD-50 SDD is in a secure, dry, level location out of sunlight and away from rain hazards.
- Quarterly (or more frequently if Ministry of Health policies mandate) they will be responsible for assuring the solar array is clean, unshaded and undamaged. Solar array cable damage can occur from people, vehicles, large animals, small rodents and birds.
- If equipment problems occur the health worker must know who to contact first (usually a supporting technician with cold chain experience).

7.2 Monthly maintenance tasks

- Wipe down any condensation inside the vaccine chamber
- Remove any surrounding objects around the CFD-50 SDD that might obstruct airflow.
- Clean external condensers at the back of the CFD-50 SDD.
- Clean both front and back compressor ventilation covers.
- Clean vaccine chamber door inner and outer gaskets with a soft wet cloth to maintain flexibility and elasticity. Rub the door gasket with talcum powder to prolong its use. Check gaskets for any cracks or gaps that allow airflow through the door. Order spare parts and replace if necessary.
- Quarterly (or more frequently if Ministry of Health policies mandate) they will be responsible for assuring the solar array is clean, unshaded and undamaged. Solar array cable damage can occur from people, vehicles, large animals, small rodents and birds.

7.3 Annual maintenance tasks

- Inspect water level to ensure that water reaches the bottom of the fill tube; top off with clean drinking water if needed. It is normal for ice to be present in the bottom of the fill tube.
- The solar power system has no moving parts or controls.
- Each year it is recommended to have a technician inspect the solar array, cable and grounding.
- Look for shading, soiling and damage to the cable. Look for signs of corrosion and clean.
- Check each electrical connection and tighten all grounding parts and tighten mechanical connections.
- Train any new health workers in operations and maintenance and if necessary, retrain veteran health workers.
- See the CFD-50 SDD MetaFridge User's Manual for appliance specifics.

7.4 Cautions during maintenance

- Wipe both inner and outer surfaces using a soft cloth. Do not use any brushes, acidic or alkali detergents.
- In order to avoid water leakage to electric component and damage to the exterior, do not pressure-wash or use any hard scrub to clean the CFD-50 SDD.
- Before decommissioning or storing the CFD-50 SDD, unplug the unit, drain all water, clean the inside thoroughly, use a dry cloth to wipe the interior and leave the door and top lid open for 2 to 3 days until the inside is completely dry.

7.5 Maintenance

7.5.1 Cleaning

To clean the BCU, gently wipe the surface with a soft, damp lint free cloth. If required, a small amount of non-abrasive, mild soap solution can be used.

Warning:



- **Do not allow water or any other liquids to get into the equipment.**
- **Ensure mains power is removed before cleaning.**
- **Do not use any chemical detergents, abrasives or other chemical agents to clean the BCU or any peripherals or accessories.**

7.5.2 Preventative maintenance

Weekly checks:

- Check that the BCU is showing readings on its display
- Inspect the BCU for physical damage, and any error indicators
- Inspect the power and sensor cables for physical damage.

Monthly checks:

- Verify data integrity by viewing the LCD screen to see if the values look reasonable, and checking on the portal to see that data is uploading.
- Observe whether the battery indicator is showing 'low battery' and replace the battery if required.
- Check that the unit is clean and dust free. If not, clean with a damp cloth and a mild soap solution if necessary.

7.5.3 Corrective maintenance

The only user serviceable parts are the battery in the Ice3, the fuse in the Power Module, and damaged cables / probes. Any other repairs or damage to the BeyondCom Unit must be done by an authorised supplier.

Battery replacement:

The battery should be replaced if it:

- Discharges rapidly, for example, goes flat within a day of being fully charged.
- Fails to reach full charge within 1–2 days, with sufficient supply power.
- Charges intermittently or not at all, despite a functioning cable and power supply (Power Module or external DC supply).
- Becomes abnormally hot during normal use or while charging.

If battery replacement is required, follow the procedure outlined below:

- Switch the mains power off and unplug the mains kettle plug from the power module.
- Remove the ethernet cable from the BCU by gently squeezing the clip and pulling it straight out.
- Open the back cover by prying open with a flat screwdriver.



- Gently hinge the back cover open, ensuring you don't pull on the looms connecting the PCB on the back cover to the motherboard.
- Cut the cable tie holding the battery with a pair of scissors or wire cutters



- Unplug the battery connector from the PCB on the back cover by firmly pulling on the plug with two fingers. DO NOT pull on the wires.
- Gently pull the battery off the foam and totally remove from the unit.
- Replace the battery with a new one by following the above procedure in reverse.
- Insert a new cable tie under the PCB, and gently hand tighten.
- Replace the back cover and screw the self-tapping screws in.

Warning:

- **Take care to ensure that you don't pierce or damage the battery.**
- **Only use a battery supllied by Beyond or one of their designated agents.**
- **Do not over tighten the cable tie as this could be a safety risk if the battery does not have sufficient space for expansion.**
- **Do not over tighten the screws. Dispose of the battery in accordance with the 'Disposal' details in this manual.**

Fuse replacement (Power Module):

Should the fuse blow and need replacement, follow the steps below:

- Switch the mains power off and unplug the mains kettle plug from the power module.
- Remove the ethernet cable from the BCU by gently squeezing the clip and pulling it straight out.
- Unscrew the screws on either side of the Power Module.
- Open the back cover by prying open with your fingernail and pull the pieces apart.
- Gently pull the fuse cover and remove the fuse by twisting sideways (see below), and replace the fuse with the type and rating of fuse specified in the Technical Specification of this manual. It is recommended that you check the new fuse is not blown before use, by checking for continuity using a multi-meter.





- Replace the back cover and screw the screws back in.
- Reconnect the ethernet cable and power cord, switch the mains on, and verify that the power modules power LED is ON.

Damaged probe / cables:

- If the sensors are damaged, these will need to be replaced and cannot be repaired. Cables may be able to be repaired by a technician who has been specifically trained.
- To remove a sensor, unplug the RJ plug at the bottom of the unit by squeezing the tab and gently pulling downwards (see Connections section).
- The plugs on cable extensions can be disconnected in the same way.
- To re-install, push the cable back into the unit until you hear a click.
  (Similarly for extensions).

Note:

- **The removal and reinstallation of sensors and cables may not be covered in this manual, as the routing and method used depend on the specific equipment being monitored.**

Resetting the unit:

- To reset the unit, it needs to be switched off and then back on. To switch off, press and hold the Mute and Spanner buttons at the same time for 10 seconds. Once the unit is switched off, the LCD display will be blank. To switch the unit on, press and hold the Mute and Spanner buttons at the same time for 10 seconds. The LCD display will go on, and once successfully connected to the portal, the date / time on the bottom left of the display will be correct (as per the time zone setup on the portal).

Note:

- **The setup of the time zone that the unit operates in is done on the ColdCloud portal. The correct date and time will only display on the unit following successful communication with the portal.**

Firmware updates:

- Firmware updates are done remotely and can only be done by Beyond or one of their designated suppliers.
- If you suspect that your unit is not working properly, please contact Beyond support, or your account manager or sales representative to assess.

8 Safety Precautions

a. Connect the CFD-50 SDD to an approved solar array.
b. Use reliable grounding that is tied to the earth; not connected to any grid, heating pipe, gas pipe, etc..
c. Turn off the circuit breaker at the back of the CFD-50 SDD before unplugging or plugging in the connectors to the solar array.
d. If connecting to mains power, plug the CFD-50 into a standard electrical socket; appliance is rated for use with either 110-120V or 220-240V, 50 or 60 Hz.
e. To disconnect mains power, hold the plug firmly and pull. Do NOT pull on the cord to disconnect power.
f. For safety reasons, conduct any repair work by unplugging the unit before starting the work.
g. Do not use wet cloth to wipe any electrical parts.
h. Do not place or operate the CFD-50 SDD near any inflammable, explosive, corrosive materials, any

volatile gases, liquids, and any inflammable gases.

i. Do not touch any electrical components (such as plugs, switches, etc.) with wet hands in order to avoid electric shock.
j. Do not damage or break the power wires and connectors, in order to prevent fire and electric shock. Replace any damaged wires or connectors immediately by qualified maintenance personnel.
k. Do not place any water containers or heavy objects on the top of the CFD-50 SDD to avoid any damage to the top, any injury due to falling objects, or any electric leakage or electric shock due to splashing water on any electric components.
l. Do not climb onto or lean on the CFD-50 SDD, which may cause injury due to tilting or falling of unit.
m. Do not touch the compressor when the CFD-50 SDD is plugged in to avoid being burned or injured.
n. Do not allow children to play in inside of the CFD-50 SDD, which may cause damage or injury.
o. Remove the door when the CFD-50 SDD is no longer in use so children cannot be trapped inside.

9 Electronics System

A block diagram of the CFD-50 SDD electronics is shown in the figure below. There are two primary circuit boards:

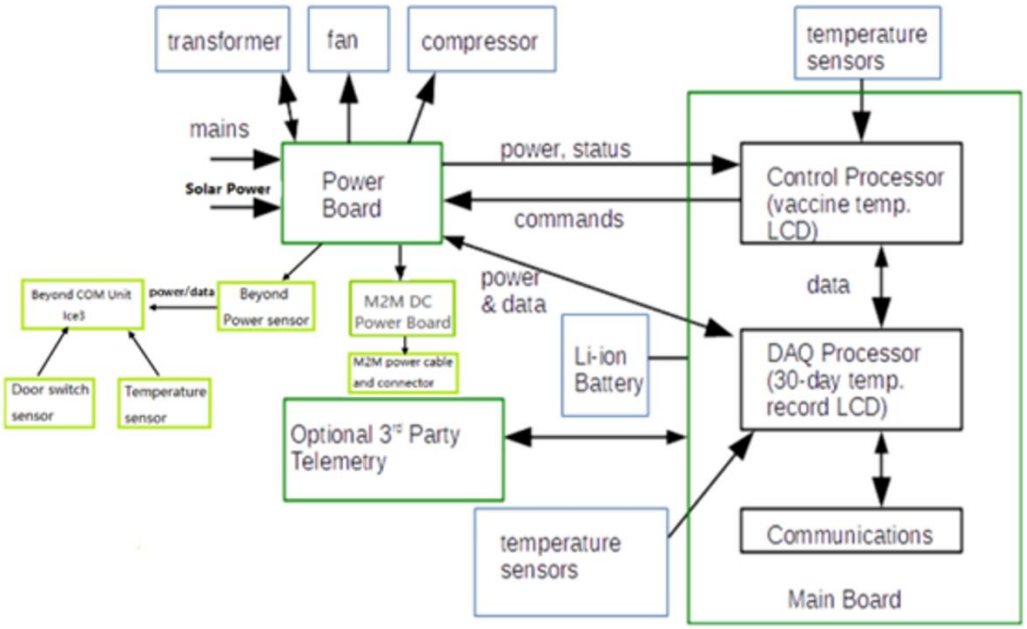
1) the Main Board, located in the electronics compartment, that measures, records, and displays temperatures and other refrigerator information, controls the compressor, and can connect to the optional telemetry module.
2) the Power Board, located in the power enclosure under the vaccine chamber, that protects the CFD-50 SDD from over and undervoltage events, stabilizes the compressor voltage using the attached transformer, produces DC power to power the rest of the system, and switches power to the fan and compressor under command from the control board. The Power Board also monitors incoming mains power and sends that data to the DAQ processor.

The optional telemetry module can connect to the main board and transmit data and alarms to a third-party remote monitoring service.

3) The M2M DC power is controlled by an independent M2M power board, which is powered by the appliance's power board. The M2M power board be located in the power enclosure with the appliance's power board.
4) The hardware of Beyond EMS consists of the device box(Ice3 BCU), Power Sensor, and related cables. The Power Board of the appliance supplies to the Power Sensor, and the Power Sensor supplies power to Ice3 BCU through a Data line and transmits data simultaneously.

The system is designed to operate normally without the data collection portion, therefore only the control processor and power boards are essential. The Li-ion battery is also not essential for refrigerator operation.

The M2M DC power is controlled by an independent M2M power board, which is powered by the appliance's power board.



System diagram of CFD-50 SDD electronics.

9.1 Electronics Diagrams

Diagrams showing key electronics components that may require technician interaction or that are useful for troubleshooting are located on the backs of the electronics enclosure and power enclosure



Diagrams are located on the backs of the electronics enclosure and power enclosure.

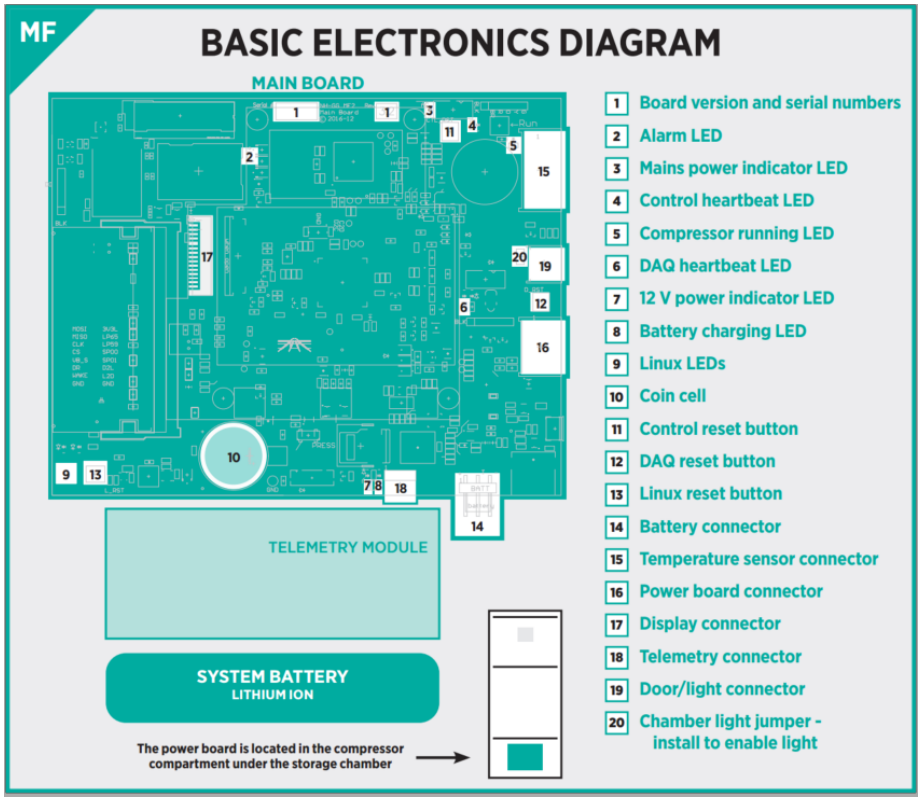


Diagram showing main board and other components in the main electronics enclosure located on the front of the CFD-50 SDD cabinet.

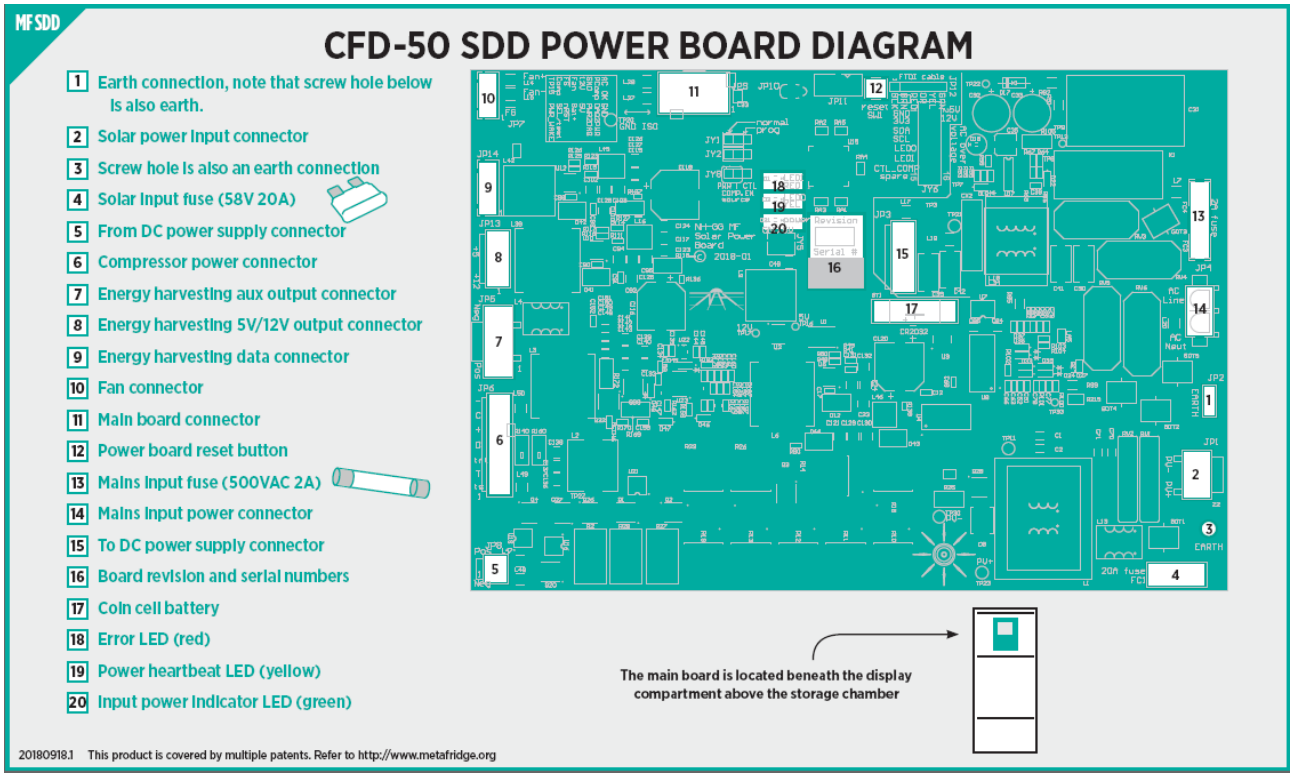
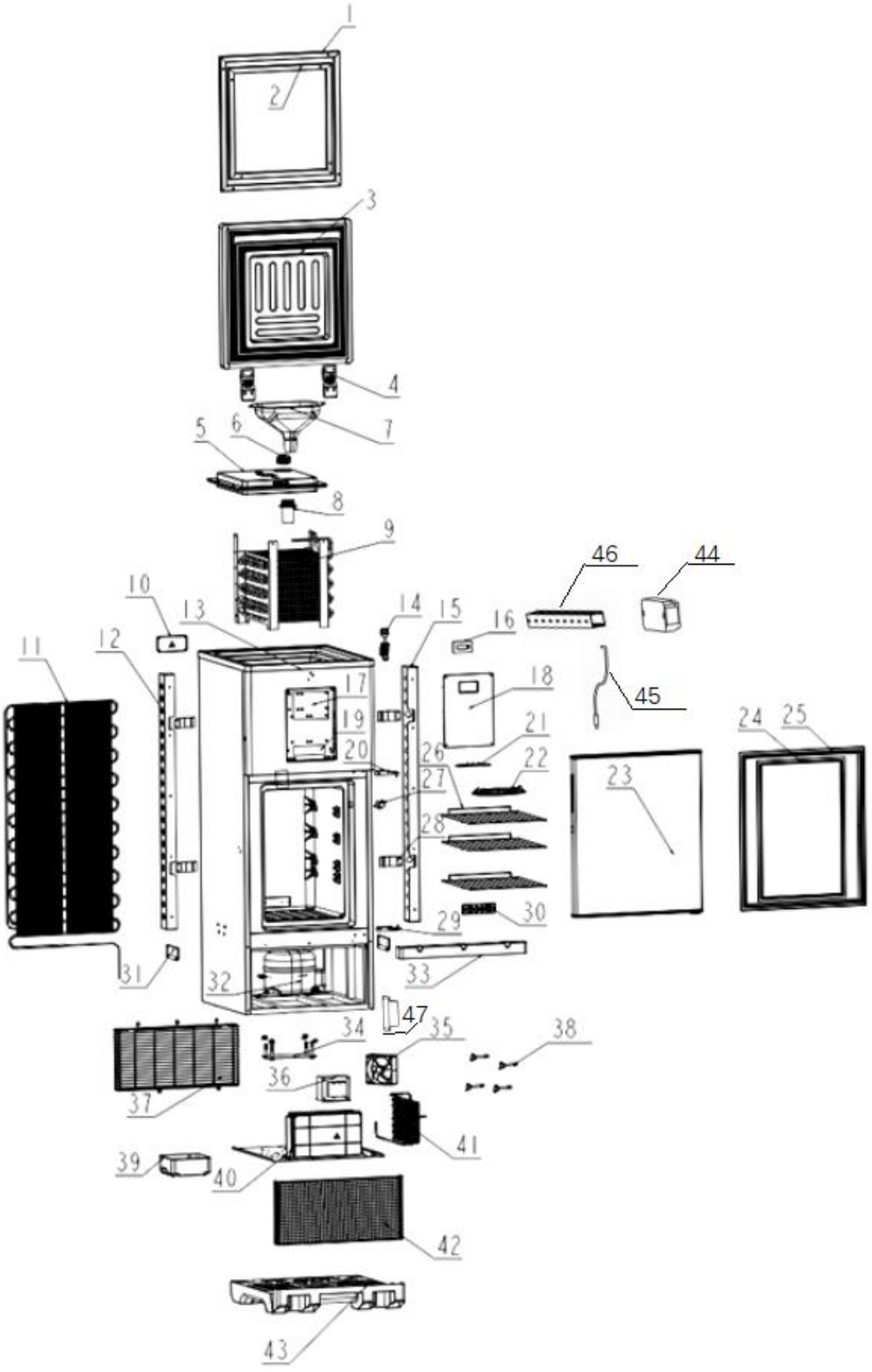


Diagram showing key power board components.

10 CFD-50 SDD Parts and equipment list

10.1 CFD-50 SDD MetaFridge vaccine refrigerator（1）



Item	Component	Item	Component	Item	Component
1	Water tank lid outer gasket	23	Vaccine chamber door	45	M2M power cable(part no. 3000000419)
2	Water tank lid inner gasket	24	Vaccine chamber door inner gasket	46	wiring box(part no. 3000001247)
3	Water tank lid	25	Vaccine chamber door outer gasket	47	DC power board(part no. 3000001247)
4	Water tank lid hinge (x2)	26	Vaccine chamber shelving (x3)	48	Beyond sensor Door contact_4P4C(part no. 3000007454)
5	Water tank inner lid	27	Door sensor/light switch	49	Beyond temperature contact_4P4C(part no. 3000000574)
6	Water tank plug	28	External condenser bracket (x4)	50	Beyond Data line(part no. 8000002541)
7	Funnel (accessory)	29	Vaccine chamber door hinge - bottom		
8	Water tank inner lid fill tube	30	Vaccine chamber sensor cover - bottom		
9	Evaporator	31	Cabinet handle (x2)		
10	Safety shut-off mechanical thermostat cover	32	Compressor (part no. 3000000353)		
11	External condenser set	33	Compressor ventilation cover trim – front		
12	External condenser guard – left	34	Compressor screws assembly		
13	Main refrigerator cabinet	35	DC fan (part no. 3000001115)		
14	Water tank latch	36	Transformer (part no. 3006000339)		
15	External condenser guard - right	37	Compressor ventilation cover – back		
16	Temperature display cover	38	DC fan hand screws		
17	Control board	39	Condensation catch tray		
18	Electronics enclosure cover	40	Power enclosure		
19	System battery	41	Bottom external condenser		
20	Vaccine chamber door hinge - top	42	Compressor ventilation cover – front		
21	Vaccine chamber temperature sensor cover - top	43	Integrated plastic base		
22	Vaccine chamber light cover	44	Beyond Com Unit (BCU) /Ice3(part no. 3000004417)		

10.2 100w Solar modules（3）

10.3 Solar Array Cable Kit（1）

1. Solar array cable kit (1)

Quantity	Unit	Part Number	Description
1	SET	3009900403	Photovoltaic wire,SDD,CFD-50,6*20M (include 2)
1	SET	3009900404	Four-way connector,SDD,CFD-50 (include 2)
50	EA	3109900015	Lock strap,300*7.6,nylon UV,black
10	EA	3404001037	Unilateral tube card,SDD,CFD-50,ϕ23, galvanized
10	EA	3406000759	Cement steel nails,3.8*60
10	EA	3406000699	Washers,Outer DiameterΦ20Inner DiametersΦ4.5 thick 1.5,Galvanised

2. **Ground wire kit (1)**

Quantity	Unit	Part Number	Description
1	EA	3009900412	Photovoltaic Ground Wire,SDD,CFD-50
1	EA	3009900411	Ground rod,SDD,CFD-50
1	EA	8106011891	Operator clip,SDD,CFD-50,U-type
3	EA	3405000255	Ground clip,SDD,CFD-50,AL6005-T5

3. Universal Mount Structure (1)

Quantity	Unit	Part Number	Description
2	EA	3405000247	Ground base tube, ground, SDD,CFD-50,Q235hot galvanizing1422.4MM
2	EA	3405000250	Rail,SDD,CFD-50,Q235 hot galvanizing, 1981.2MM
18	EA	3405000251	Carriage Bolt,SDD,CFD-50,SUS304,M8*75
26	EA	3405000252	Theft-deterrent nut,SDD,CFD-50,SUS303,M8
2	EA	3405000249	Support,SDD,CFD-50,Q235hot galvanizing,1422.4MM
12	EA	3405000244	Side pressure,SDD,CFD-50,SUS304,38MM
2	EA	3405000248	Ground base tube, column,SDD,CFD-50,Q235hot galvanizing,819.15MM
4	EA	3405000245	U-bolt,SDD,CFD-50,SUS304,M10*160,Φ110MM
8	EA	3405000246	Square gasket,SDD,CFD-50,Q235hot galvanized,2.67MM
8	EA	3405000253	Theft-deterrent nut,SDD,CFD-50,SUS303,M10
8	EA	3406000929	Expansion bolt,SDD,CFD-50,SUS304,M8*120
1	EA	3305000035	Modified Silicone sealing adhesive/sealant, MS1937, gray
4	EA	3405000256	Wood screws,SDD,CFD-50,Q235hot galvanizing,M10*140

4. **Tool kit (1)**

Quantity	Unit	Part Number	Description
1	EA	3500003215	Mop, SDD, CFD-50,520mm x 1300mm
1	EA	3500003216	Water bucket ,SDD,CFD-50,16L
1	EA	3405000254	Theft-deterrent fasteners SDD,CFD-50,SUS303
1	EA	3406000715	Hacksaw, SDD, CFD-50, alloy
1	EA	3406000714	Wrench, SDD, CFD-50, M8/M10
1	EA	3406000930	Hex wrench,SDD,CFD-50,Q235 hot galvanizing,M8

10.4 User Ordering Instructions for Spare Parts

To ensure the long-term maintainability of the CFD-50SDD throughout its lifecycle, AUCMA allows users with basic operational skills or on-site technicians to order and replace designated spare parts as needed. Strictly adhere to the following instructions.

10.4.1 Pre-Order Confirmation

1. **Fault Confirmation**: Users are advised to first perform preliminary diagnostics by referring to Chapter 12, Troubleshooting, to confirm that the symptom corresponds to the function of the intended spare part.
2. **Part Number Verification**: Please use the complete part number listed in the "Part numbers" field in the Chapter 10.1 spare parts number table when ordering. This prevents mismatches caused by incorrect model selection.
3. **Version Compatibility**: When replacing electronic components (e.g., thermostat, logger, external display screen), verify the hardware and software version compatibility between the current device and the spare part. If in doubt, contact technical support for confirmation.

10.4.2 Ordering Process

1. **Ordering Channels**:
    - Authorized Aucma distributors.
    - Aucma Biomedical Global Service Hotline: +86-532-86763602.
    - Official website spare parts ordering platform: http://www.aucmamedicalglobal.com.
2. **Order Information Submission**:
    - Provide the device model (CFD-50SDD) and its serial number (SN).
    - Provide the complete part number (Part No.) and quantity of the required spare part(s).
    - Provide the shipping address, contact person, and contact information.

10.4.3 Spare Parts Receiving and Storage Recommendations

- **Inspection upon Receipt**: Upon receiving the spare part(s), inspect the packaging for integrity, verify the model number is correct, and check for any visible transport damage. If any anomalies are found, contact the supplier within 48 hours of receipt.
- **Storage Conditions**: Spare parts not installed immediately should be stored in a dry, cool environment, free from corrosive gases, and protected from high temperatures, humidity, or direct sunlight.
- **Electrostatic Sensitive Devices**: For circuit board components (e.g., power control board, logger), store them in anti-static packaging. Wear an anti-static wrist strap when handling.

11 Replacement Parts Installation Guide

If the CFD-50 SDD is not working properly, you may contact your local service provider (information written on the front of the unit) for assistance, or follow steps in the troubleshooting guide. If needed, replacement parts can be obtained from the local service provider or Aucma. Follow replacement instructions below:

11.1 Battery Replacement

The system battery will degrade over time, especially if there are frequent extended power outages. When the battery capacity has dropped to 50% the 'replace battery' icon will appear at the top right of the 30 DTR display.

It is preferable to replace the battery while the CFD-50 SDD is on mains power, if possible.
To replace the battery, unplug the battery connector from the main board. The battery is attached in the electronics enclosure with a strong double-sided tape that can be slowly peeled off by pulling down on the battery.

⚠ Do not attempt to pry off the battery or use any sharp tools. The battery may be flammable if punctured.

⚠ The battery should be unplugged for at least 30 seconds before plugging in the new battery.

11.2 Main Board Replacement

Step 1: Unplug CFD-50 SDD
Step 2: Remove 8 screws on the electronics enclosure to remove the enclosure lid and set aside
Step 3: Unplug the system battery
Step 4: Unscrew the old main board and telemetry module, if present
Step 5: Remove all of the connectors from the main board
Step 6: Plug connectors into the new main board, except for the telemetry module and battery
Step 7: Screw the new main board back into the enclosure. Make sure a coin cell battery is installed in the main board.
Step 8: Connect the telemetry module and battery, and screw in the telemetry module
Step 9: Plug the CFD-50 SDD back into mains power

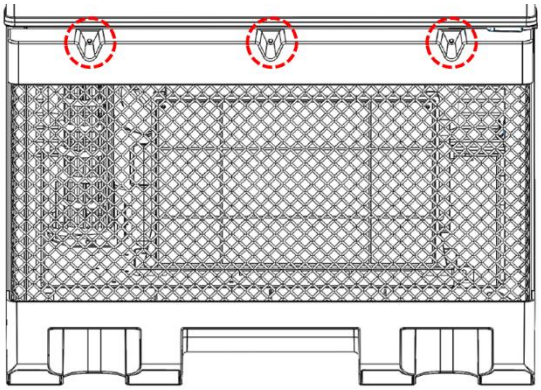
Step 10:

11.3 Power board replacement

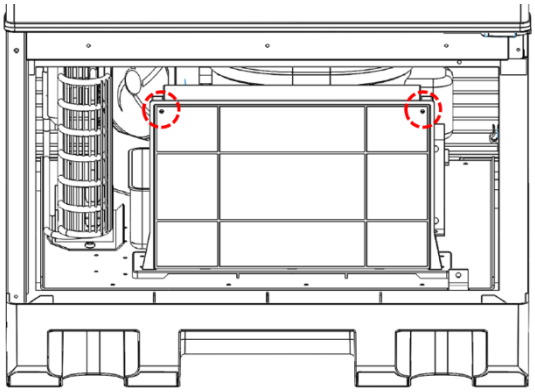
> ⚠ Always unplug the CFD-50 SDD before opening the power enclosure to avoid electrical shock

Step 1: Unplug CFD-50 SDD

Step 2: Remove 3 screws on the compressor front ventilation cover trim and remove front ventilation cover



Step 3: Remove 2 screws on power board enclosure cover and remove the cover



Step 4: Disconnect all connectors on power board and remove the power board

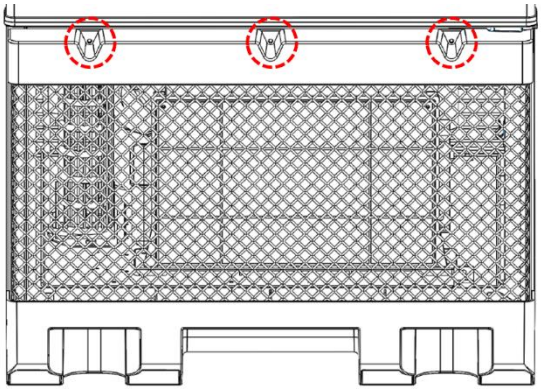
Step 5: Install new power board and reconnect all connectors

Step 6: Replace power board enclosure cover and front ventilation cover and trim

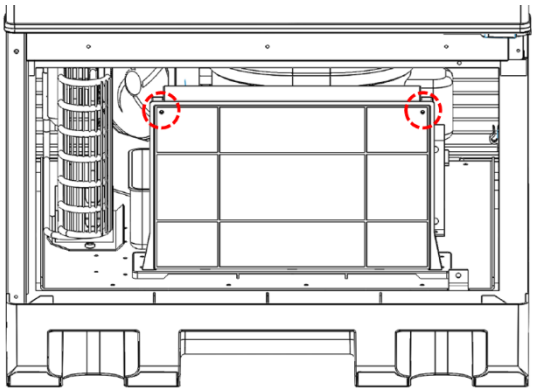
11.4 Fan replacement

Step 1: Unplug CFD-50 SDD

Step 2: Remove 3 screws on the compressor front ventilation cover trim and remove front ventilation cover

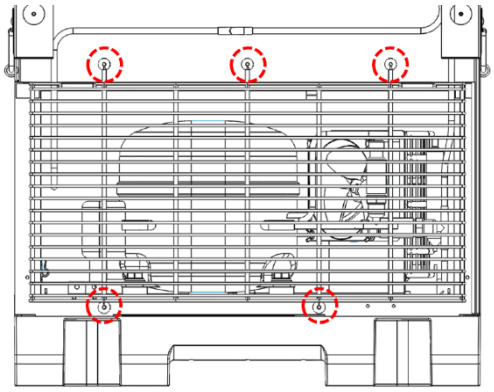


Step 3: Remove 2 screws on power board enclosure cover and remove the cover

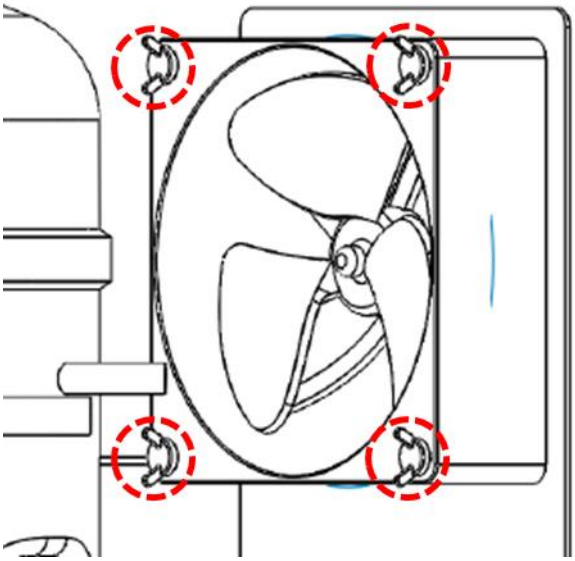


Step 4: Disconnect “Fan” connector (#7 on the power board diagram) on the power board

Step 5: Remove 5 screw on the back compressor ventilation cover to remove the cover



Step 6: Remove and replace the fan by removing 4 wingnuts around the fan



Step 7: Reconnect the “Fan” connector on the power board (with the newly installed fan) and replace the power board enclosure cover

Step 8: Replace front and back ventilation covers and trim

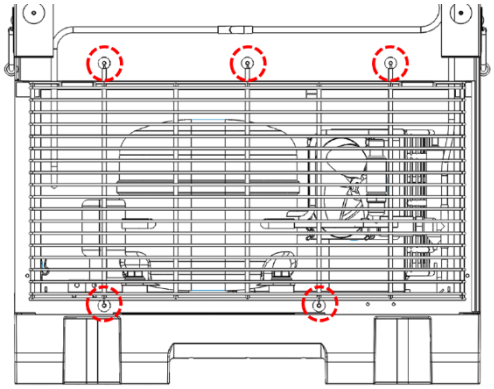
11.5 Compressor replacement

⚠ Refrigeration system work can only be performed by properly trained technicians with proper tools.

⚠ Follow all applicable laws regarding refrigerant recovery and disposal.

Step 1: Unplug CFD-50 SDD

Step 2: Remove 5 screw on the back compressor ventilation cover to remove the cover



Step 3: Remove fasteners holding the temperature sensor to the discharge line and move the sensor away from the tubing to avoid damage while working and brazing

Step 4: Remove start components and wiring from the left side of the compressor.

Step 5: Remove nuts holding compressor down onto the compressor mounting bolts.

Step 6: Remove refrigerant from system, disconnect compressor from tubing, and lift compressor off of bolts to remove from the compressor compartment. Follow all applicable laws regarding refrigerant recovery and disposal.

Step 7: Lower new compressor onto mounting bolts and tighten.

Step 8: Evacuate the system and recharge system using the type and amount of refrigerant indicated on the manufacturer's label on the back of the CFD-50 SDD.

Step 9: Replace the start components on the compressor.

Step 10: Replace the temperature sensor on the discharge line adjacent to the compressor and fasten in place securely

Step 11: Plug in the unit and make sure compressor starts

Step 12: Replace back ventilation cover

11.6 Beyond EMS and M2M power cord replacement

11.6.1 M2M power cord replacement

Step 1: The M2M power cord comes out of the cable tray, first open the cover of the cable tray.

Step 2: Remove the M2M power cord from the cable tray.

Step 3: Remove the zip ties that secure the M2M power cord to the external condenser guards.

Step 4: Slowly find the other end of the line along the M2M power cord,the other end of the M2M power cord has a quick connect plug.

Step 5: Remove the quick connect plug from the power board in the compressor compartment at the bottom of the refrigerator.

Step 6: Remove the new M2M power cord and insert the quick connect plug into the previous power board socket.

Step 7: The M2M power cord barrel plug extends from the back of the press chamber and rises along the External condenser guards.

Step 8: Secure the wire to the external condenser guards with zip ties.

Step 9: Thread the M2M power cord into the cable tray， If necessary, use zip ties to secure the wire.

Step 10: Cover the lid of this cable tray.

11.6.2 M2M power cord replacement

Beyond Com Unit (BCU) replacement

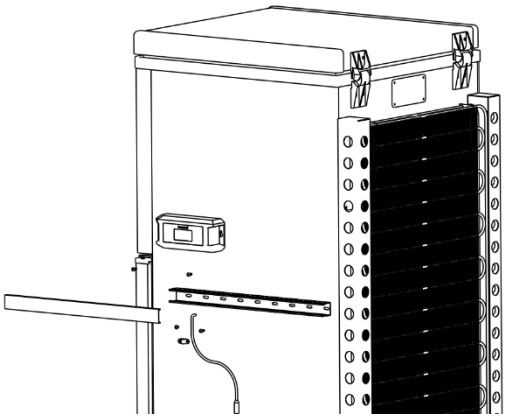
Step 1: Unplug all connection cables on the BCU, including power cables, sensor cables, etc.

Step 2: Insert the two fixing screws of BCU and remove the old BCU.

Step 3: Remove the new BCU, place it in its original position, and secure it with screws.

Step 4: Plug in the power cord, sensor cable, etc.

Step 5: Power on and reconfigure BCU.



12 Troubleshooting Guide

If CFD-50 SDD does not work properly, please proceed as described in the troubleshooting guide below.

If the problem cannot be resolved, please contact the manufacturer or the service provider.

Symptom	Possible Cause	Remedy
Vaccine chamber temperature above 8 °C	Prolonged door opening or door ajar	Avoid prolonged door openings and make sure door is fully closed and latched after use. Vaccine chamber may take some time to cool down again after extended door openings.
	Warm objects placed in the vaccine chamber	Do not place food, beverages, or other non-medical items inside the refrigerator.
	Door gasket not sealing properly	Check gasket condition; adjust door or replace gasket if necessary.
	Improper air flow around condensing unit	Re-arrange to allow proper air circulation; relocate the refrigerator away from heat-generating equipment, direct sunlight, or direct path of air conditioning or heating ducts.
	Power cord unplugged	Plug in power cord.
	Insufficient mains or solar power	Check solar array and facility wiring or contact electricity supplier.
	Improper voltage supplied to refrigerator	Connect to an approved solar array. For mains connections, correct supply voltage and ensure the power outlet voltage matches the CFD-50's voltage input requirements.
Vaccine chamber temperature is below 2°C	Ambient temperature is below 10 °C	Move the CFD-50 SDD to a warmer location. Note that the CFD-50 SDD is rated from 10 °C to 43 °C.
	Malfunctioning control board or	If vaccine chamber temperature

	mechanical thermostat	is below 2 °C while ambient temperature is above 10 °C, call for service.
Symptom	**Possible Cause**	**Remedy**
Low holdover or no holdover alarm	Power cord unplugged	Plug in power cord.
	Insufficient mains or solar power unavailable	Check solar array and facility wiring or contact electricity supplier.
	Improper voltage supplied to refrigerator	Connect to an approved solar array. For mains connections, correct supply voltage and ensure the power outlet voltage matches the CFD-50's voltage input requirements.
	Not enough water in the water tank	Check water level and if needed, add water until level reaches bottom of the fill tube.
Compressor does not start (green light will turn on when compressor is running) when the display shows sun icon indicating power is available	Refrigerator is in its normal operating cycle	Compressor only runs occasionally to keep the ice lining fully frozen; every 1 hours to every 24 hours, depending on ambient temperature. If good solar energy or mains power is available for multiple days and holdover continues to decrease, refer to maintenance manual or call for service.
Compressor does not start when green compressor run light is on	Refrigeration system or control malfunction	Refer to maintenance manual or call for service.
Door won't close tightly	Latch is blocking the door	Make sure latch is not caught in the door, adjust tension of latch to hold door tightly closed.
	Refrigerator is not level	Level refrigerator by shimming underneath CFD-50 SDD.
	Gaskets are not installed properly	Make sure gaskets are pressed firmly into door and lie flat
	Damaged or leaking door gasket(s)	Replace damaged gasket(s).

Symptom	Possible Cause	Remedy
Vaccine chamber light does/does not illuminate when door is opened	Solar or mains power unavailable	Chamber LED light will only illuminate when power is available
	Door has been open for more than 20 minutes	After a door excursion has occurred the door light will turn off. If more time is needed to load or unload vaccines, close and reopen the door to reset the alarm and light.
	Light is enabled/disabled	Light can be enabled or disabled by adjusting a jumper on the main electronics board. Refer to maintenance manual.
Condensation on the body of the refrigerator	High ambient humidity	Wipe down the condensation with a clean dry cloth.
Excess condensation water in the vaccine chamber	Clogged drain hole	Clean drain hole at the back of the vaccine chamber and tubing down to the drain pan, and empty drain pan.
	Prolonged door opening or door ajar	Avoid long door openings and ensure door is closed after use.
	Refrigerator is not positioned on a leveled and stable floor	Position the refrigerator on a stable floor and level it so that condensate flows to the drain in the back of the chamber
Buzzing or dripping sound of liquid	Refrigerant flows within the CFD-50 SDD or condensate flowing to drain pan.	Normal phenomenon, no action required.
Popping sound	Thermal contraction and expansion of the refrigeration system may cause occasional popping sound.	Normal phenomenon, no action required.
Clicking sounds	Occasional clicking sounds may be generated by relay or other electrical parts during compressor's starts and stops.	Normal phenomenon, no action required.
Whining or hissing sounds	The energy harvesting system can make hissing sounds in certain conditions.	Normal phenomenon, no action required.
External EMD unable to supply	The polarity of the barrel interface is	1. Check the polarity of the

power	reversed or the voltage is insufficient	interface (positive inside and negative outside) 2. Replace hardware or DC power cord

Beyond EMS Troubleshooting

The following possible problems may be encountered, with suggested remedies. Please contact your supplier should you require any assistance.

Diagnostic procedure:

PROBLEM	POSSIBLE CAUSE and SOLUTION
Display / unit not on:	**Mains circuit has tripped (MAINS units only):** • Check circuit breaker / fuse on mains supply and that power is available from power point. **Battery not connecting properly:** • Open back cover and connect battery. **Battery flat / faulty:** • Verify power supply connected via ethernet cable • Check mains power is available (MAINS units only) • Check fuse in Power Module (MAINS units only) • Check fuse in DC Power cable (SOLAR/TRUCK units only)
Unit not uploading:	**SIM card not communicating:** • Check with your account manager or service provider that the SIM card is activated. **Unit not set up correctly on portal:** • Verify setup on ColdCloud portal as per ColdCloud manual.
Incorrect readings on the display or portal:	**Unit not set up correctly on portal:** • Verify setup on ColdCloud portal as per ColdCloud manual. **Calibration is out:** • Calibrate probes and enter calibration factors on ColdCloud portal.
Electrical interference:	**Screen on cables not used:** • Connect screen on sensor cables. **Electrical interference from mains supply:** • Buy external filter or plug power module into 'clean' power source. **Interference from other equipment:** • Relocate BCU and cables away from equipment.

Display shows "Probe error"	**Probe not connected:** • Plug probe into active channel. **Probe faulty:** • Replace faulty probe.
Display shows "Low battery" indicator	**Battery is less than 80% of the capacity of a fully charged battery:** • Recharge battery by ensuring power is available from power module i.e., Power LED is illuminated, and ethernet cable is connected to both Power Module and BCU. **Power supply is not connected or working:** • Ensure ethernet or DC power cable is connected to both the power module or DC supply, as well as the BCU. • Ensure the mains cable is plugged in to a wall socket and that the wall socket is supplying power as per the specification in this manual. • Ensure there is the specified DC supply voltage and current available for DC and Solar applications.
Unit is beeping	**Unit is in alarm:** • Resolve alarm by rectifying asset alarm condition.
Red alarm LED flashing, but unit is not beeping	**Unit is in alarm but the portal is setup with buzzer disabled:** • Change setting on portal to required conditions for the buzzer. **Buzzer faulty:** • Contact your account manager or sales representative for technical assistance.
Unit does not go into alarm when thresholds are exceeded	**Unit has not received alarm parameters:** • Parameters not received yet – do a forced upload.

13 Solar System Troubleshooting Guide

Most solar arrays operate trouble-free for years with only routine, preventive maintenance. Solar direct drive (SDD) power systems are the simplest type of solar power system. There are no fuses, switches or controls between the CFD-50 SDD on/off switch and the solar array. There are two troubleshooting conditions that are possible – no power or not enough power. See CFD-50 SDD refrigerator troubleshooting for other possible troubleshooting conditions within the CFD-50 SDD.

13.1 Solar Power System Troubleshooting

Service providers are advised to carry a spare solar module, spare MC 4 branch connectors (+ and -), extra solar array cable (for extensions and for replacing damaged cable), spare theft deterrent fasteners and spare theft deterrent fastener tools.
No solar power kit spare parts are needed at the health facility.

NO POWER: If power is not available at the CFD-50 SDD its temperature will eventually rise and the green LED will not be lit when there is enough sunlight to start the compressor. If this occurs the most likely causes are:

1.) CFD-50 SDD "on/off" switch is in the "off" position; or
2.) Solar array is shaded or too dirty; or
3.) Solar array cable has an open circuit; or
4.) Solar modules are damaged; or
5.) Solar modules are missing; or
6.) Solar modules have failed.

To troubleshoot when there is no power to the CFD-50 SDD:

-Record CFD-50 SDD temperature, status of green LED and alarms and power icons on 30DTR display

-Check that CFD-50 SDD "on/off" switch is in the "on" position.

-Check solar array cable is securely connected to CFD-50 SDD cable (near the refrigerator).

-Check solar array cable is securely connected to solar array MC4 branch connectors (near the solar array).

-Carefully inspect the solar array, structure and cable to:

-Check that solar array is clean.
-Check that solar array is not shaded.
-Check that solar modules are not damaged, broken or missing.
-Check that mounting is secure, at correct tilt and orientation.
-Check that wiring is not damaged and is secure.

If no apparent fault is found next test the solar array for acceptable Voc and Isc.

⚠Safety first! For review see **Annex F: Using Multi-meters.**

-Switch the "on/off" switch on the CFD-50 SDD to "off".

-Disconnect both solar array cable MC 4 connectors from the CFD-50 SDD MC4 connectors near the refrigerator.

-Check that the polarity of the solar array cable and the CFD-50 SDD cable are correctly matched. If reversed, correct and test for CFD-50 SDD operation.

-Measure the solar array Voc.

-If zero (0) Vdc there is an open circuit. Find and repair.

-If the Voc is acceptable (e.g. at least 15 Vdc on hot day) then test for solar array Isc (short circuit current). Two technicians are recommended.

-Cover the solar array

-Set the multi-meter to read 20 Amp DC and position test leads in the solar array cable positive (+) and negative (-).
-Uncover the solar array and record amperage reading (and optionally record the solar radiation level with a hand-held solar meter).

-Cover the solar array.

-Remove the test leads now (this prevents dangerous direct current arcing that will damage both the MC4 connectors and the test leads).

-If the Isc is not acceptable repeat the Isc test with each solar module to determine which solar module(s) are faulty. Replace faulty solar modules.

NOT ENOUGH POWER: CFD-50 SDD is too warm but the compressor motor does operate for some on a sunny day. If this occurs the most likely causes are:

1.) Solar array is shaded or too dirty; or
2.) Power is being diverted for unauthorized use; or
3.) Solar module(s) cable has an open circuit; or
4.) Solar module(s) are damaged; or
5.) Solar module(s) are missing; or
6.) At times CFD-50 SDD "on/off" switch is accidentally in "off" position; or
7.) Solar module(s) have failed.

To troubleshoot when there is not enough power to the CFD-50 SDD:

-Record CFD-50 SDD temperature and status of green LED and alarms and power icons on 30DTR display

-Check that CFD-50 SDD "on/off" switch is in the "on" position.

-Check solar array cable is not connected to other devices.

-Check solar array cable is securely connected to CFD-50 SDD cable (near the refrigerator).

-Check solar array cable is securely connected to solar array MC4 branch connectors (near the solar array).

-Check that all solar modules are securely connected to the MC4 branch connectors.

-Carefully inspect the solar array, structure and cable to:

-Check that solar array is clean.

-Check that solar array is not shaded.

-Check that solar modules are not damaged, broken or missing.

-Check that mounting is secure, at correct tilt and orientation.

-Check that wiring is not damaged and is secure.

If no apparent trouble is found, you will need to test the solar array for acceptable Voc and Isc.

⚠Safety first! For review see **Annex F: Using Multi-Meters with Solar Refrigerator Systems.**

-Switch the "on/off" switch on the CFD-50 SDD to "off".

-Disconnect both solar array cable MC 4 connectors from the CFD-50 SDD MC4 connectors near the refrigerator.

-Measure the solar array Voc.

-If the Voc is acceptable (e.g. at least 15 Vdc on hot day) then test for solar array Isc (short circuit current). Two technicians are recommended.

-Cover the solar array

-Set the multi-meter to read 20 Amp DC and position test leads in the solar array cable positive (+) and negative (-).

-Uncover the solar array and record amperage reading (and optionally record the solar radiation level with a hand held solar meter).

-Cover the solar array.

-Remove the test leads now (this prevents dangerous direct current arcing that will damage both the MC4 connectors and the test leads).

-If the Isc is not acceptable repeat this test with each solar module to determine which solar module(s) are faulty. Replace faulty solar module(s).

13.2 Spare Parts-Solar Power Kit

Service providers are advised to carry a spare solar module, spare MC 4 branch connectors (+ and -), extra solar array cable (for extensions and for replacing damaged cable), spare theft deterrent fasteners and spare theft deterrent fastener tools.

No solar power kit spare parts are needed at the health facility.

14 Advanced Troubleshooting

A software tool called MFToolbox is available for advanced diagnostics and troubleshooting. A laptop computer and 3.3 V FTDI cable are required. To download the software tool and documentation go to http://www.metafridge.com/MFToolbox/ .

15 CFD-50 SDD Specification

Model	CFD-50 SDD
Ambient Operating Temperature and Humidity Range	10 ℃ - 43 ℃; Relative Humidity ≤ 95%
Vaccine Chamber Temperature Range	2 ℃ - 8 ℃
Holdover Time @ +43 °C	120-hrs
Autonomy Time @ +43 °C	120-hrs
Vaccine Storage Capacity	50 L
Solar Array Voltage Range / Peak Power Rating	15-24VDC / 300W
Maximum Refrigerator Power (DC)*	250W
Mains Input Voltage Range, nominal/full operating	100 –240VAC / 90-290VAC, 50-60 Hz
Maximum Mains Input Power (AC)*	150W
Energy Harvesting Outputs	USB Charging (2): 5V / 1A each 12V automotive: 12V / 2A EHC Accessory: 0V-18V / up to 8A
EMS	Beyond EMS-BC141
M2M DC Power	5V/1A
Refrigerant	R600a/150g
External Dimensions	545 W * 655 D * 1588 H mm
Net Weight	89kg

* The system will only operate either solely on DC or AC power, depending on power availability.

16 CFD-50 SDD Disposal and Recycling Guidelines

- Remove the door and top lid when the CFD-50 SDD is no longer in use.
- Disposal of the CFD-50 SDD must be made according to local appliance disposal and recycling regulation.

17 Warranty

To facilitate inquiries, please copy the model number and serial number in the following table.

Model		SN.	

To avoid losing the invoice, you can affix it to this page.

(Paste or staple your invoice here.)

Warranty Information

Thank you for using the MetaFridge CFD-50 SDD. Per the warranty card and invoiced date of sale (refer to the invoice), we will provide the following coverage to you.

1. **Two-year warranty on the device, beginning on the date of shipment from Aucma, included at no extra cost.**
2. Under warranty coverage, the manufacturer will repair or replace device components that have failed in the use of the device for its designed intent.

   Free warranty coverage does not include the following cases:

   (1) Damage caused by improper use or improper maintenance.

   (2) Damage caused by attempted repairs done by a non-designated repair department.

   (3) Damage caused by force majeure.

   (4) *Damage occurring after the warranty period has expired.*

Contact your local CFD-50 SDD distributor and service provider for any questions not covered in this manual.