AoFrio

USER MANUAL

SCS Controller - Standard features

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Warnings

Please read the following warnings to maintain the safe function and continued performance of your AoFrio SCS Controller:

Installation; Installation of the SCS Controller other than in accordance with the "Description & Install" section of this manual will invalidate the warranty. The SCS Controller must only be installed and configured by trained and authorized staff.	
Washdown; The front of the unit may be exposed to water jets. Warning! The rear of the unit must not be exposed to high pressure water jets or temporary submersion, as this will invalidate the warranty, and may damage electronic circuits leading to premature failure or unsafe operation. Mounting of the unit must be in accordance with orientation as specified in the "Description & Install" section.	Do not use water jets on the rear of the unit. **Warning! Risk of electrocution.** If correctly installed, powerful water jets may be applied only to the front of the unit.
Chemicals; The SCS Controller's housing is made of polycarbonate and should not be exposed to chemicals which attack this material, as this will invalidate the warranty and may damage the housing, leading to unsafe operation.	**Warning! Risk of electrocution**
Temperature; The SCS Controller must only be subjected to temperatures as specified in the "Technical Specifications" section of this manual. Exceeding these ranges, either in operation, installation, transportation, or storage, will invalidate the warranty, and may damage electronic circuits and housing components, leading to premature failure.	
Vibration and impact; The unit MUST be installed in such a way as to be protected from impact in operation. Do not hit or drop the unit. Exposure to impacts, either in operation, installation, transportation, or storage, may damage electronic circuits and housing components, leading to premature failure, and may cause the SCS Controller to become unsafe. Any impact which causes visual damage to the controller casing will invalidate the warranty.	Do not drop the SCS Controller.
No serviceable parts; There are no serviceable parts inside the SCS Controller. Do not open the housing, except for the rear cover, as described in the "Description and Installation" section of this manual. Opening of the electronics housing, altering, or modifying the SCS Controller will invalidate the warranty and can cause risk of electrocution.	There are no serviceable parts inside the SCS. Do not open the housing. **Warning! Risk of electrocution.**

Continued over page >

Voltages; The SCS Controller must only be connected to power supplies which comply with the acceptable voltage ranges specified in the “Technical Specification” section of this manual. Connection to supply voltages outside of these ranges can damage electrical circuits, leading to premature failure, and may cause the SCS Connect controller to become unsafe. All SCS Controllers ship from the factory with voltage limits enabled. Disabling this protection invalidates any warranty due to incorrect voltages. Maximum voltages are logged by the SCS Controller.	Do not connect the SCS Controller to the incorrect voltage supply.
Voltage fluctuations and surges; SCS Controller has surge protection as specified in the “Technical Specification” section of this manual. Exposure to surge voltages outside these limits, or excessively repeated surges within these limits, may cause damage to electrical circuits, leading to premature failure. Failure due to excessive surge voltages is not covered by warranty.	
Currents; SCS Controller outputs should not be connected to short circuits or to loads which exceed the currents specified in the “Technical Specification” section of this manual. Doing so may cause the controller to fail prematurely or immediately, and possibly to damage the connected load. Connection to incorrect loads voids the warranty. Phase and relay terminals may carry currents high enough to overheat cable terminations if these are not correctly specified and crimped. This may cause risk of electrocution or fire. Care must be taken to ensure that cables and terminations are safely terminated.	Ensure phase and relay terminals are correctly crimped. **Warning! Risk of fire.**
Segregation of power and signal cabling; Correct segregation of power and signal cabling must be followed. Do not run power and signal cables together in the same conduit. Induction from power cables may corrupt data signals, leading to incorrect operation.	Do not run power and signal cables together in the same conduit. **Warning! Risk of electrocution.**
Consequential failures; SCS Controller includes features to protect both itself and connected components in the event of a failure. However, failure of connected components may cause damage to the SCS Controller, and failure of the SCS Controller may cause damage to connected components. Critical or vulnerable components should be protected independently against failure. SCS Controller is not warranted against damage caused by or to other components.	

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Fit for purpose; The SCS Controller must only be used for the purpose and functions described in this manual. While AoFrio may provide technical support on suitable applications and configuration of the SCS Controller (where such a relationship may exist), no liability, responsibility or risk is accepted in determining if the SCS Controller is fit for purpose for any particular application. As each different application requires a different configuration of controlling parameters, no liability, responsibility, or risk is accepted by AoFrio for the correct operational function of any particular installation or configuration.	The SCS Controller must only be used for the purposes described in this manual.
Continuous development; AoFrio undertakes to continuously develop and improve products and services. The design and specification for the SCS Controller is subject to change without warning. The contents of this manual are subject to change without warning. While every endeavour is made to ensure that all specifications and documents are current and complete, AoFrio accepts no liability, responsibility, or risk due to omissions or changes caused by continuous improvement and design changes. Users of this manual should verify that they have the current released version (published on the AoFrio website www.aofrio.com) before proceeding.	The design and specification of the SCS Controller is subject to change without warning.
Correct disposal; The SCS Controller is subject to EU Directive 2002/96/EC (WEEE) regarding e-waste. It may also be subject to other national legislation for the safe disposal of e-waste. The SCS Controller must not be disposed of in municipal collections; it must be disposed of through an approved WEEE collection point. Alternatively, the SCS Controller may be returned to an authorized AoFrio distributor at the end of its working life. Penalties may be applicable for incorrect disposal, as specified by national legislation. The circuit board may contain hazardous substances which could affect health and the environment if disposed of incorrectly. The SCS Controller complies with EU Directive 2002/95/ EC (RoHS).	The SCS Controller must not be disposed off in municipal collections; it must be disposed off through an approved e- waste collection point.

Introduction

AoFrio's SCS Controller is an electronic refrigeration control unit designed to provide a very high level of flexibility for manufacturers of refrigeration units.

The interface system permits different groups of users to have different levels of control, based upon their levels of expertise and their actual control needs.

A unique feature is a mobile app that gives authorized Service Technicians full wireless access to data logging and diagnostic control. The SCS Controller's housing meets industry benchmarks for compact size and exceeds benchmarks for sealing at the front face. The appearance of the SCS controller can be customized to suit the brand requirements of end customers.

Front display panel

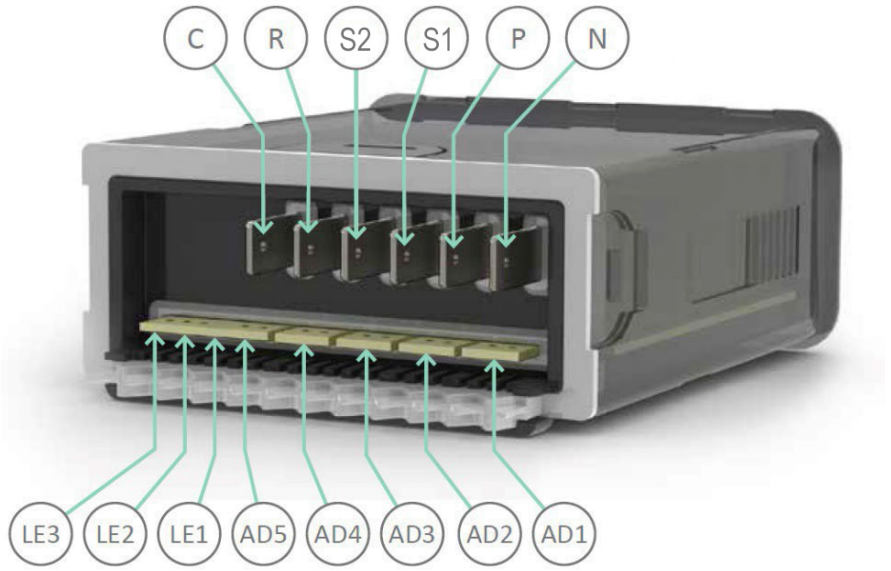
The SCS Controller consists of three main groups of features:

- The front display panel with the user interface controls.
- The rear connector panel where the input and output cables are connected.
- The main housing includes the mounting clips, gasket and faceplate trim used for installation.

If the indicator LEDs are lit this means that the function is currently active.

1= Night Mode Indicator	5 = Bluetooth® Wireless Indicator	9 = Compressor Indicator
2 = Three Digit LED Display	6 = Defrost Mode Button & Next / Enter Button	10 = Defrost Mode Indicator
3 = Back / Abort Button & Night Mode Button	7 = Down Button	11 = Fan Indicator
4 = Up Button	8 = Alarm Indicator	

Rear connector panel



C	Compressor*	Switched 8 (8)Arms, 90-240Vac o/p	AD1, AD2, AD3	Sensor i/p* Switched o/p*	Digital 0-5V i/p Analog NTC i/p
R	Relay*	Switched 3 (3) Arms, 90-240Vac o/p	AD4	Sensor i/p* Switched o/p*	Digital 0-5V i/p Analog NTC i/p 5V 100mA o/p
S1	Switch 1*	Switched 0.4Arms, 90-240Vac o/p	AD5	Sensor i/p* PWM o/p	Digital 0-5V i/p Analog NTC i/p 0-24V switched 1A DC o/p
S2	Switch 2*	Switched 0.4Arms, 90-240Vac o/p	LE1, LE2, LE3	PWM o/p	0-24V Switched 1A DC o/p per channel
P	Phase**	90-240Vac i/p			
N	Neutral				

*Refer to the Hardware Set Up Menu (HSu) section included in a separate manual (WT9753 SCS Controller User manual - Standard Parameters).
**Refer to the Upgrading Firmware section in this manual

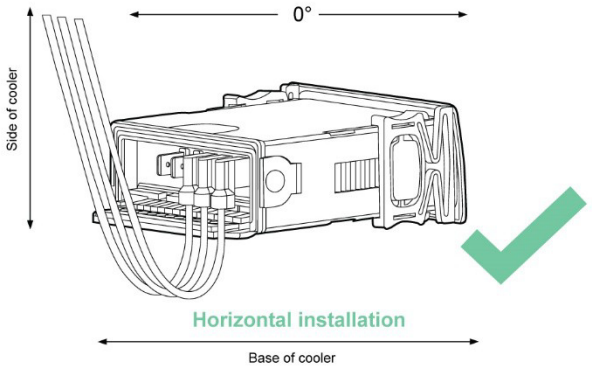
Installation

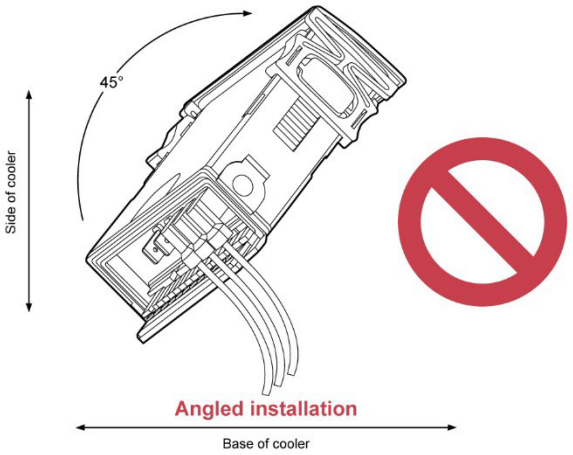
Safety

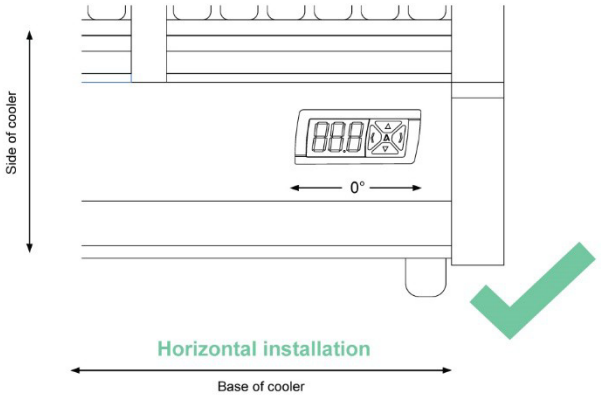
- Turn off and isolate the power supply before removing the controller cover. **Danger! Risk of electrocution!**
- Never use an uninsulated screwdriver to remove the controller cover. **Danger! Risk of electrocution!**
- Avoid placing the controller where it will be exposed to condensation or dripping from above.

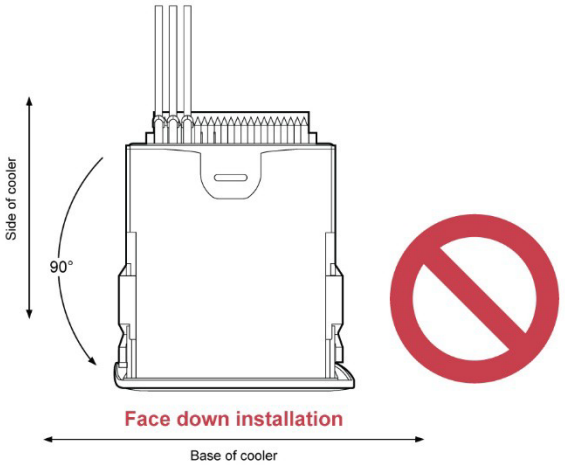
Position and orientation

- Ensure the controller is always mounted horizontally (as pictured below) and with both rubber seals and End Cap attached (not shown). This will minimise the risk of water and dust ingress and improves communication with other devices via Network Pro and Field app.
- The controller can be mounted inside the cold chamber for certain cooler types – but check with your AoFrio representative before installing to see if this is appropriate.

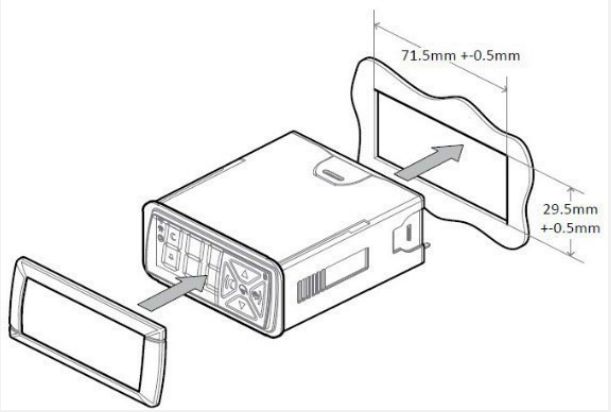
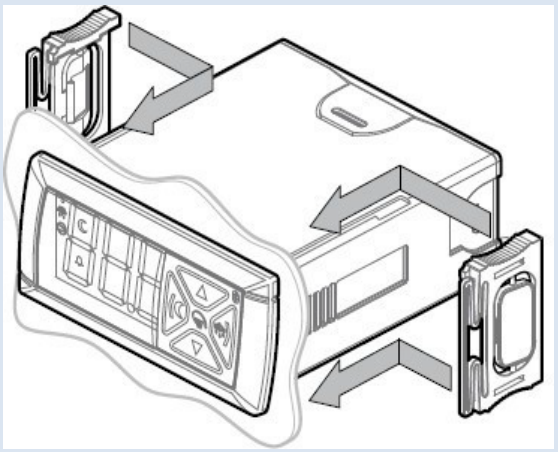
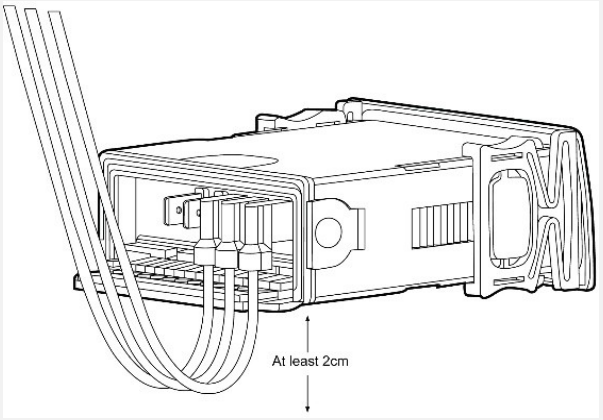
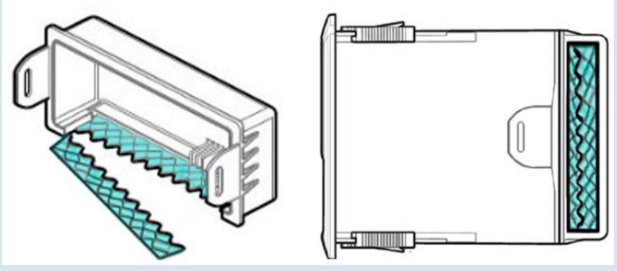








Installation steps

Step	Details
1 To clip on the Front Fascia Panel, cut a rectangular aperture in the Mounting Panel measuring 71.5mm wide by 29.5mm high. Insert the SCS Controller into the hole. NOTE: The maximum permitted mounting panel thickness is 9mm. Ensure there are no obstructions 7mm to the left and right of the hole, and 4mm above and below it to provide clearance with the Front Fascia. Check the hole is free of burrs and sharp edges.	
2 Insert the Side Clips into the slots on the side of the body and slide these forwards until the SCS is held securely against the mounting panel. To disengage the Side Clips, press the back half of the button pad inwards. Then slide the clips backwards.	
3 Attach all cables from sensors and hardware to the controller connectors with a loop at least 2cm below the controller to encourage any moisture that gathers outside the housing or on the wires to run away from the controller. Wiring size can impact the seal. Please refer to the list of terminals and ports for the Hardware Set Up (HSu) parameters and refer to the section about Wiring diagrams.	
4 After wiring, insert the two rubber cable seals or ‘grommets’ (highlighted blue in image) into the underside of the end cap and main housing.	

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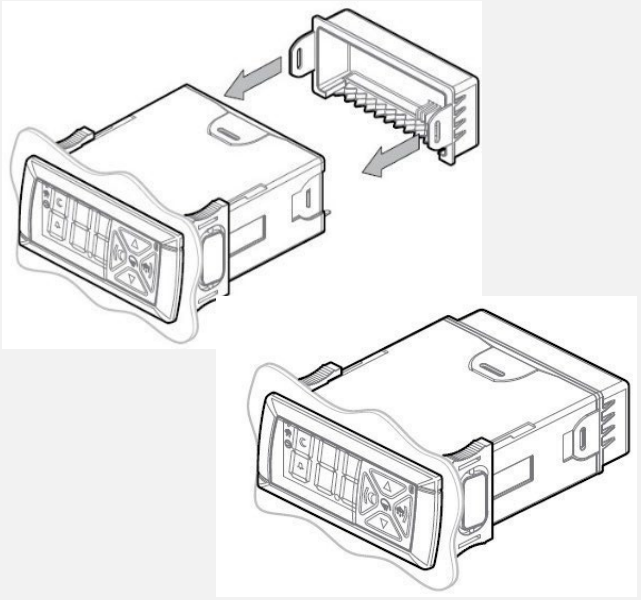
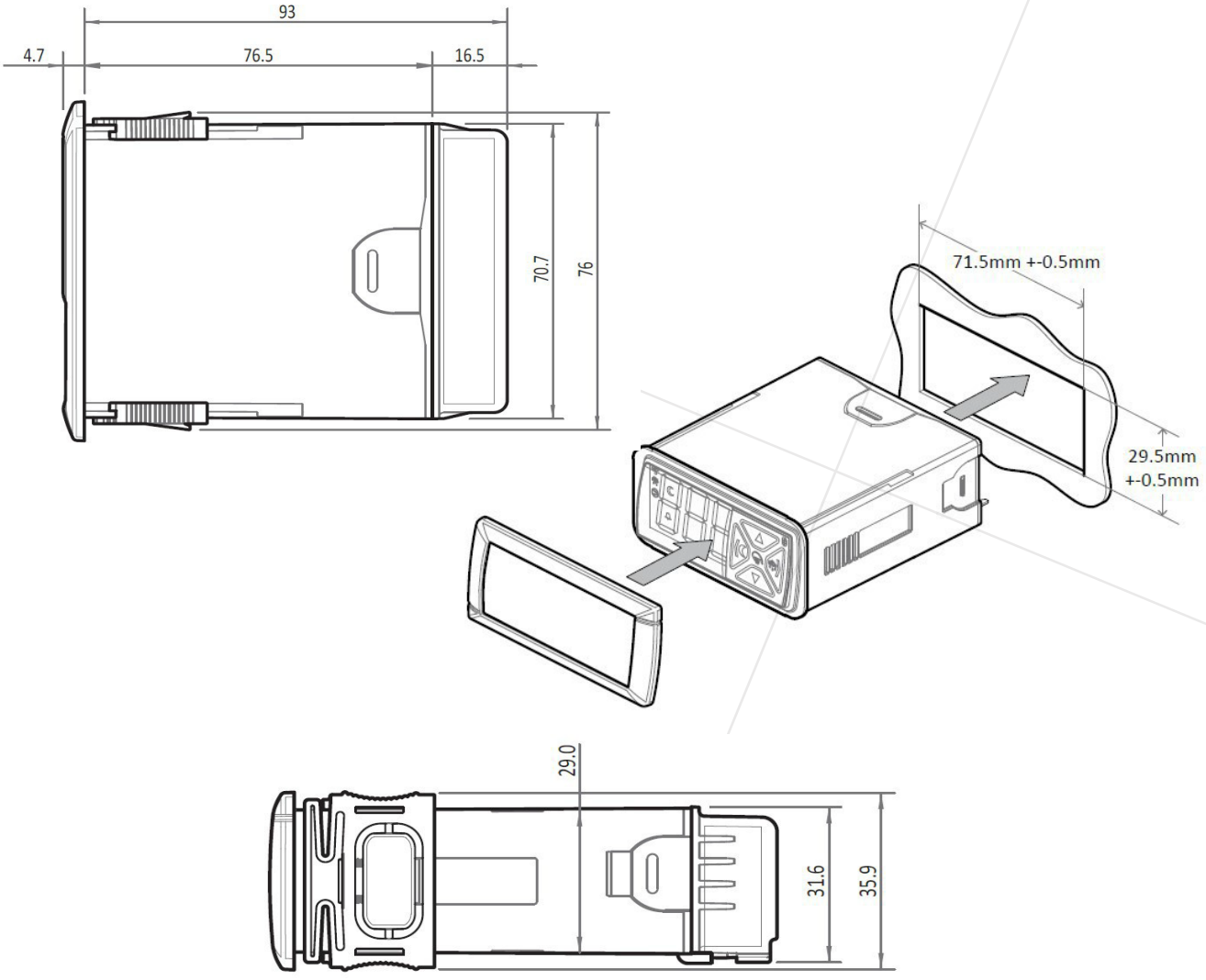
Step	Details
5 Slide the rear cover forwards and attach using the two outside clips. **Danger! Risk of electrocution!** Turn off and isolate the power supply before removing this cover. To remove the cover, gently disengage the two clips and slide the cover backwards.	

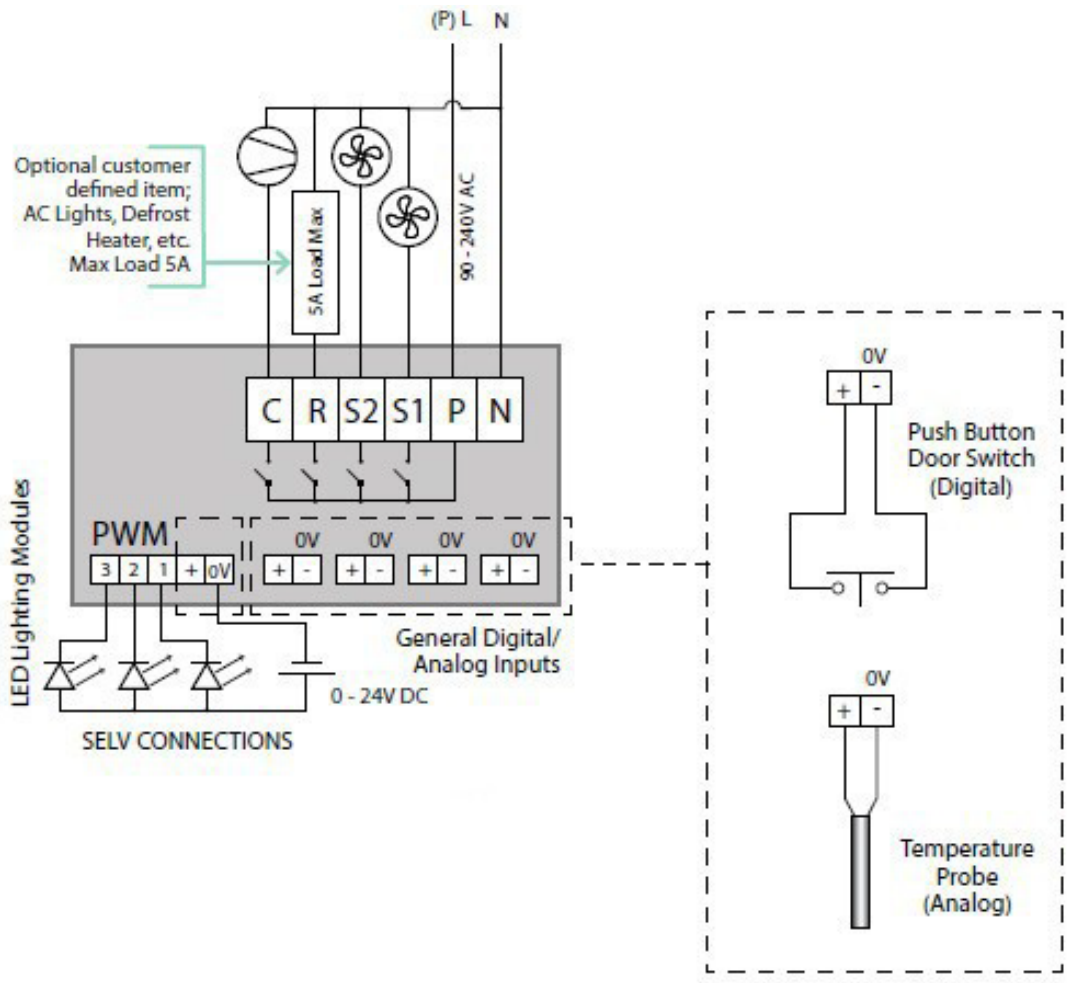
Dimensions



Wiring diagrams

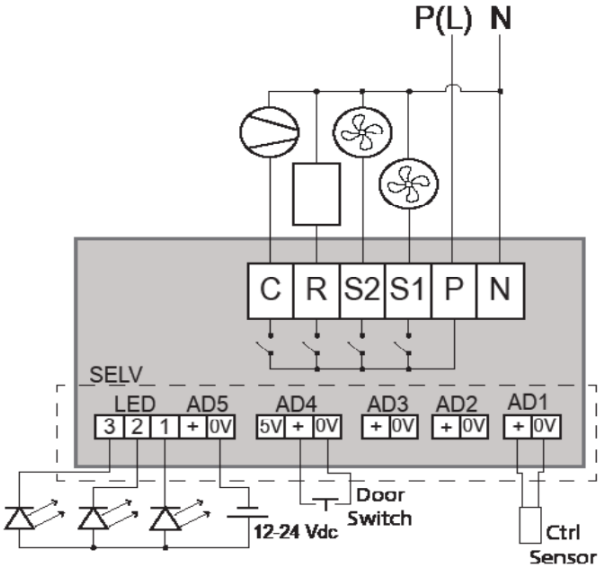
Mains Connections – Warning! Risk of Electrocution

Wiring for standard installation – older model



Wiring for standard installation – new model

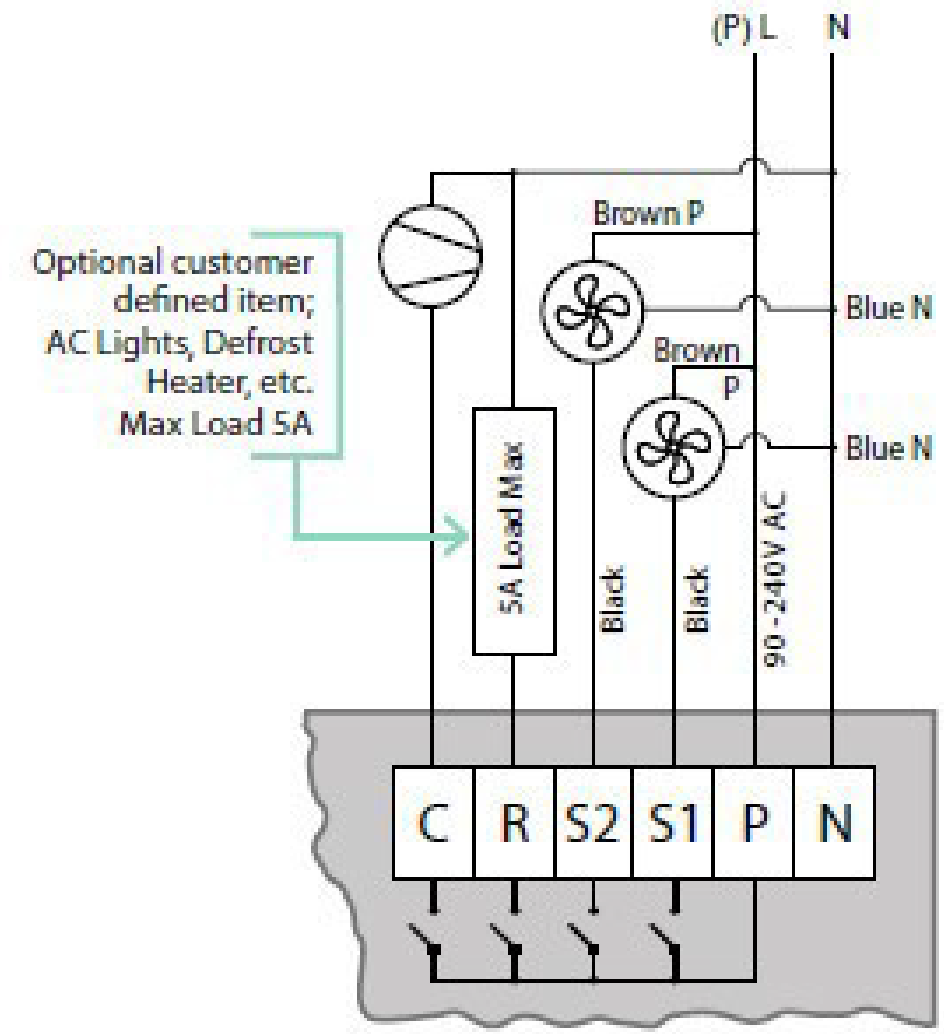
The AD4 port has 3 connections and can be configured as a sensor input or a 5V output, see LV inputs / outputs.



Wiring for Variable Speed motors

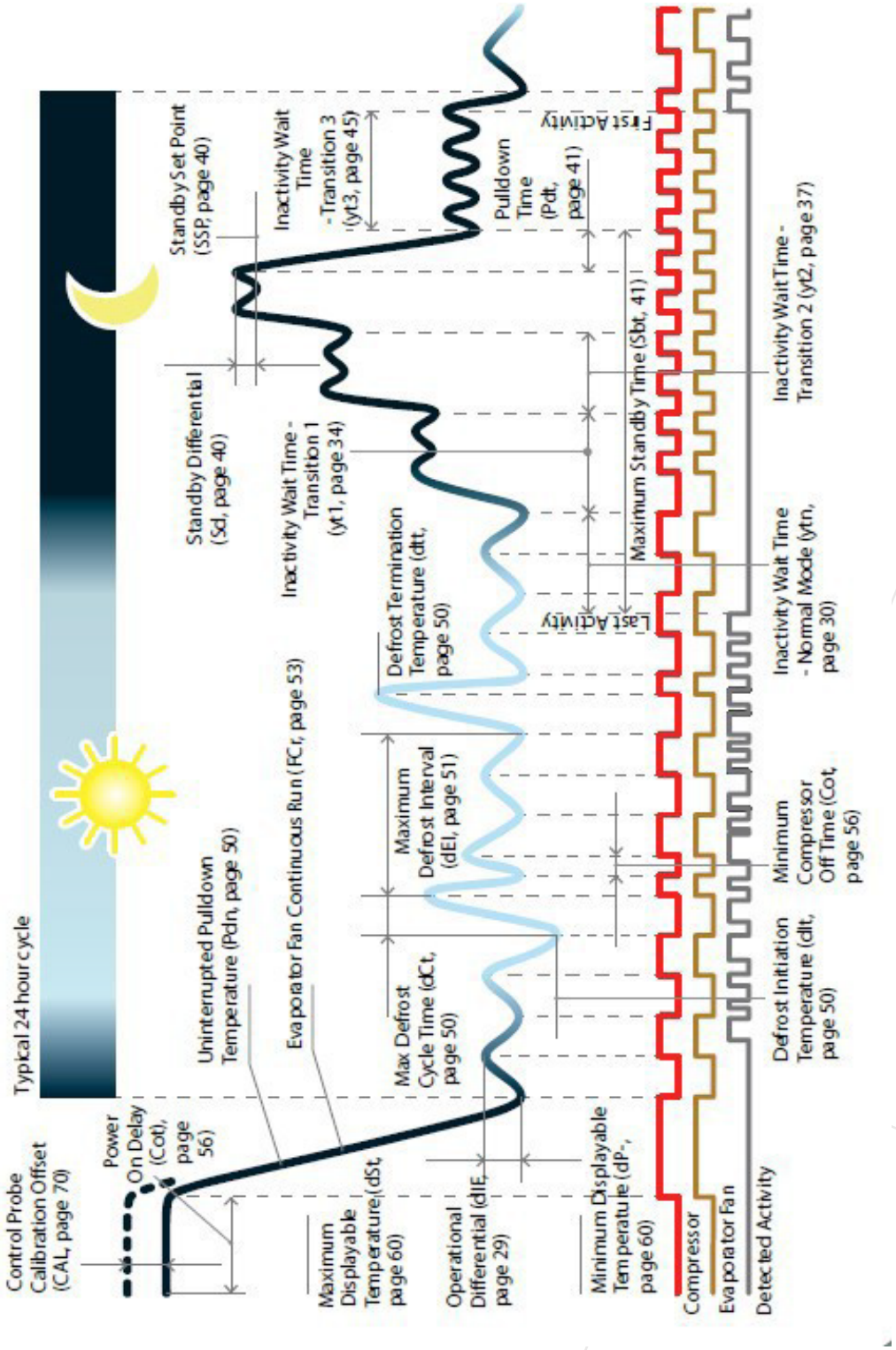
- Alternative connection method for Wellington Variable Speed motors

Mains Connections – Warning! Risk of Electrocution



Operating cycle

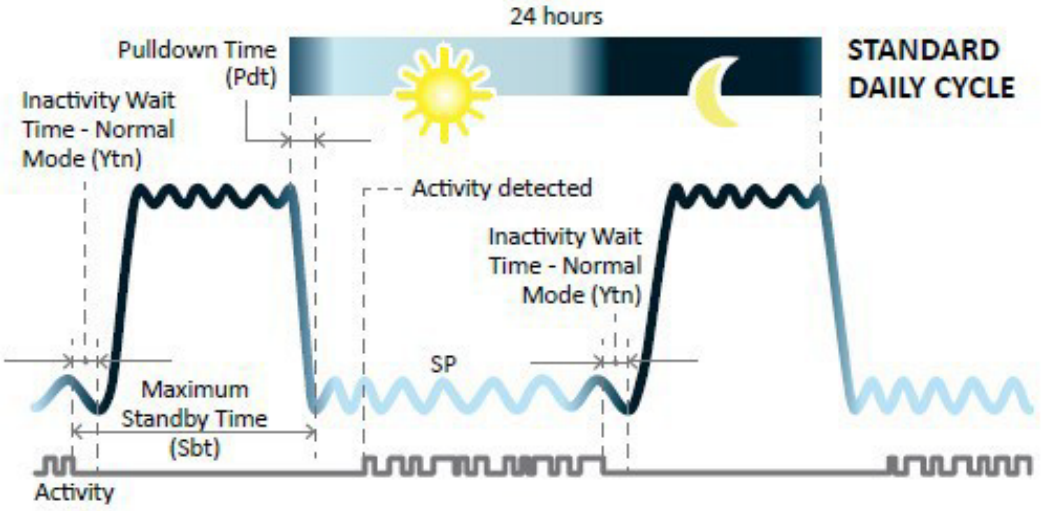
Typical 24-hour cycle



Standby refrigeration cycle

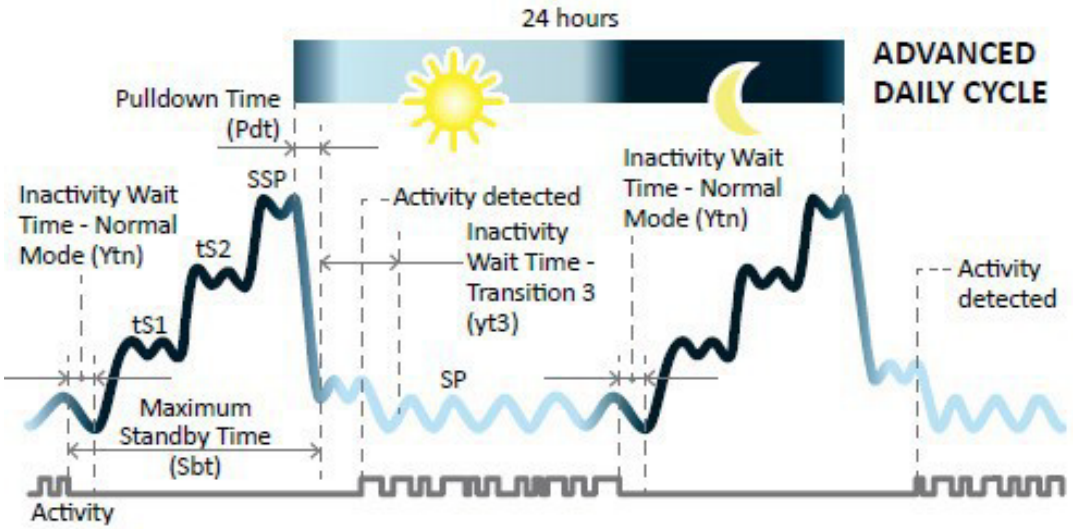
Standby daily cycle

When in Non-Perishable Mode, the SCS Controller enters Standby Mode at night to save energy. At the start of each day, it leaves Standby Mode and commences a Pulldown. The start of the Pulldown is timed to ensure that the Operational Set Point (SP) is reached before the first customer Activity is expected. When the Operational Set Point (SP) is reached the SCS™ controller enters Normal Mode.



Advanced daily cycle

When using the advanced daily cycle, the SCS Controller enters and leaves Standby Modes in progressive stages to save energy. At the start of each day, it leaves Standby Mode and commences a Pulldown. This continues until Transition 3 Set Point (tS3) is reached and the Inactivity Wait Time – Transition 3 (yt3) commences. During this time if any activity is detected, the Pulldown continues until the Operational Set Point (SP) is reached. When this is reached the SCS Controller enters the Normal Mode.

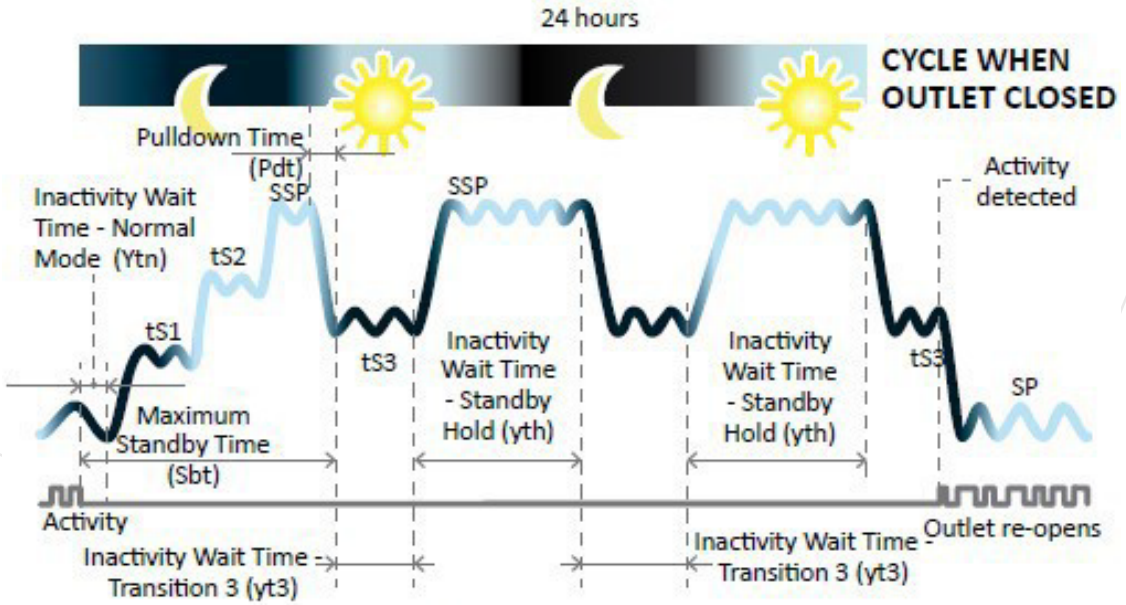


Cycle when outlet closed

If a retail outlet does not open on a particular day, to save energy the system returns to full Standby. This can occur in several stages.

If no activity is detected during the Inactivity Wait Time – Transition 3, the SCS Controller returns to Full Standby Mode, and is then ready to start the Pulldown again at the start of the next day as per normal.

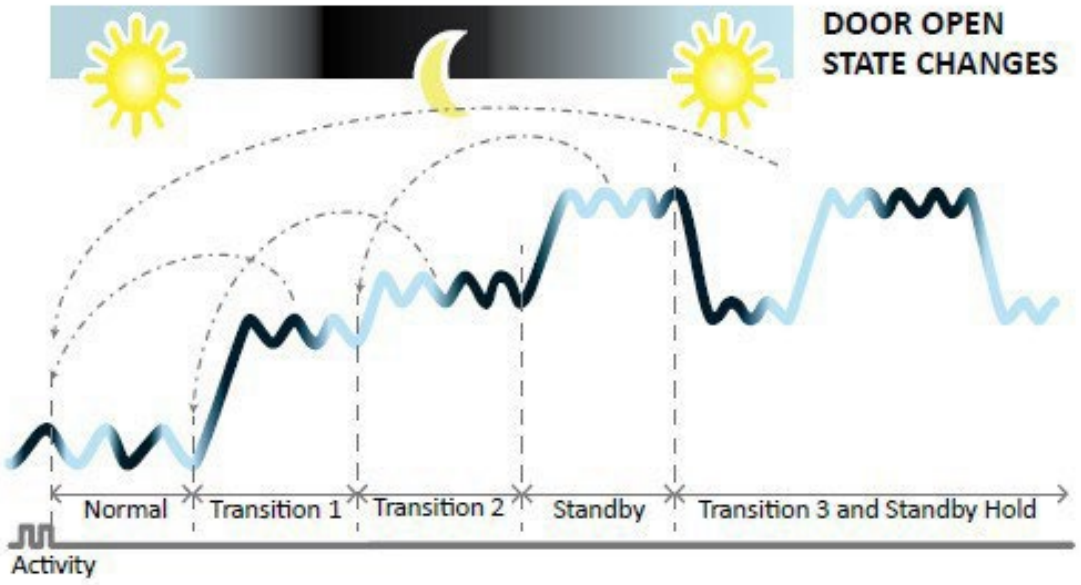
Should any activity be detected while in Full Standby mode, the SCS Controller will immediately commence a Pulldown.



No activity, outlet closed

Door open state changes

- If the cooler is in Normal mode and an activity is seen, the “Inactivity Wait Timer - Normal Mode” will be reset.
- If the cooler is in Transition 1 Mode and an activity is seen, the cooler will move back to Normal Mode, and the “Inactivity Wait Timer - Normal Mode” will be reset.
- If the cooler is in Transition 2 Mode and an activity is seen, the cooler will move back to Transition 1 Mode, and the “Inactivity Wait Timer - Transition 1” will be reset.
- If the cooler is in Standby Mode and an activity is seen, the cooler will move back to Transition 2 Mode, and the “Inactivity Wait Timer - Transition 2” will be reset.
- If the cooler is in Transition 3 Mode or Standby Hold Mode and an activity is seen, the cooler will move back to Normal Mode, and the “Inactivity Wait Timer - Normal Mode” will be reset.



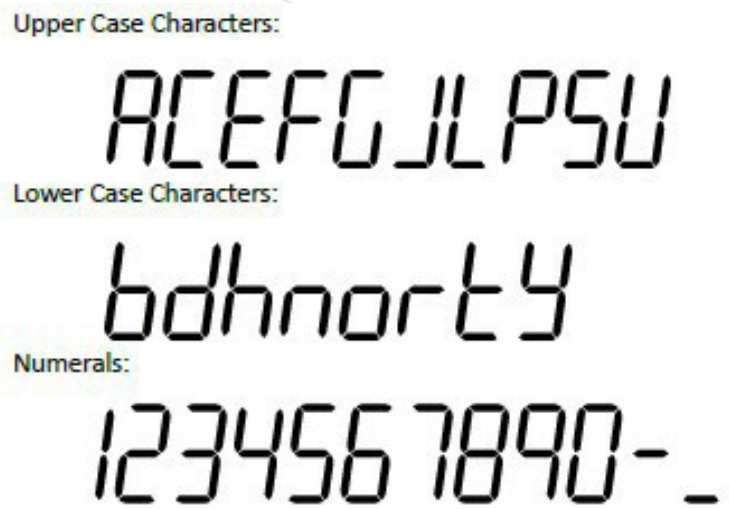
Start up sequence

Power cycling the SCS Controller initiates the start up sequence, which goes through the following steps:

Step	Details
1. Displays **SCS**.	
2. The current Firmware Version is briefly displayed. This is a 6-digit number. The first 3 digits are displayed for 2 seconds, then the remaining 3 digits for 2 seconds.	
3. (not yet implemented) The loaded Parameter Set Name is briefly displayed. This is a 6-character alpha-numeric name created by the customer. The first 3 characters are displayed for 2 seconds, then the remaining 3 characters for 2 seconds.	
4. The SCS Controller cycles through the outputs displaying “CoP”, “FAn”, “LIt” as it self-tests the outputs.	
5. The SCS Controller displays the current temperature and enters Normal Mode.	

Parameter Set Name

The Parameter Set Name is a 6-character alpha-numeric code created by the customer to uniquely identify the type of refrigeration system in use and the associated parameter configuration loaded into the SCS Controller. For clarity on the display, we recommend that the name should be created using the following characters:

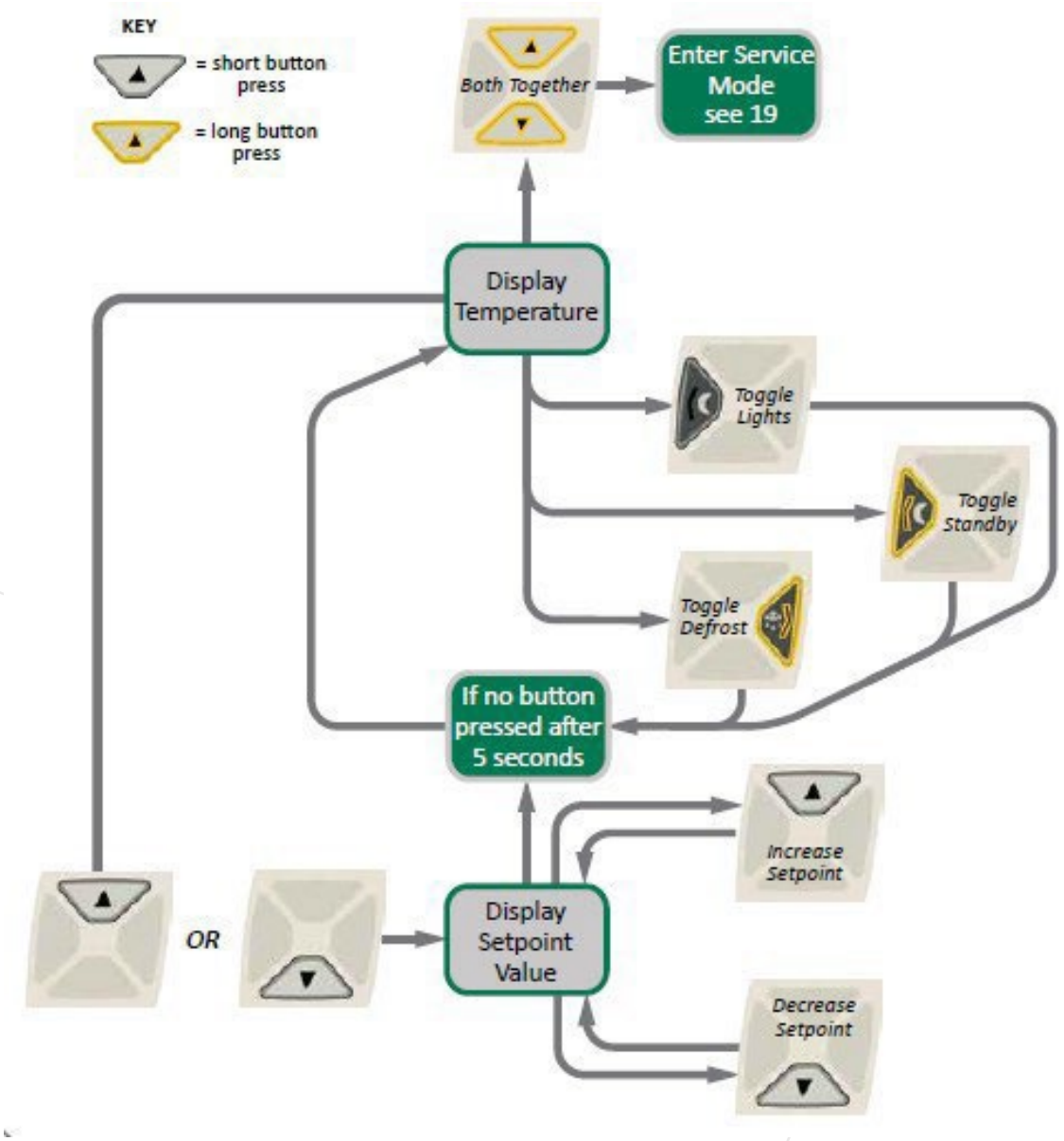


Front panel user interface

User mode

These are the essential functions that retail staff can control:

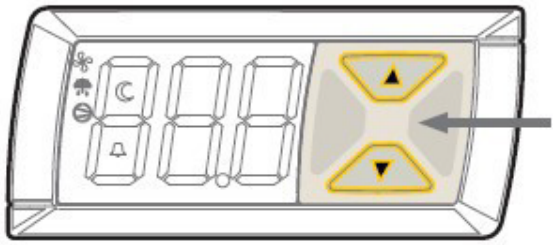
- Manually toggle the Lights on and off.
- Manually toggle Standby Mode on and off.
- Manually initiate a Defrost.
- Adjust the Set Point Temperature within a predetermined range.



Service mode

The Service mode is entered from the User mode by holding down the Up and Down buttons together.

To access the Service mode parameters, a 9-digit PIN code must be entered, consisting of L=left, R=right, U=up, D=down. The pin code is displayed in the AoFrio Field app against the companies you are activated to.



To enter Service mode, press Up and Down Button together to enter Service mode, followed by the 9-digit PIN code.

There are 5 categories main Service mode categories:

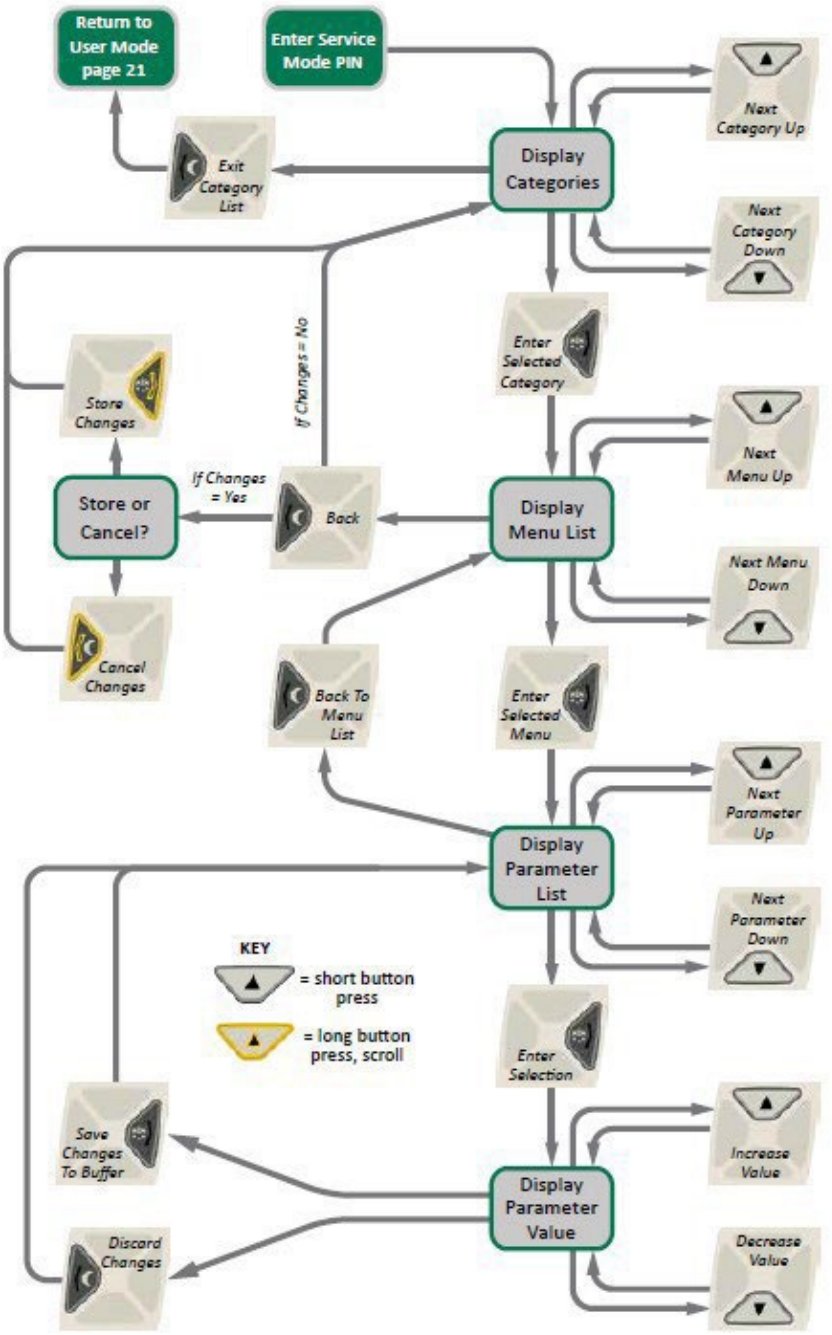
- Parameters
- Reset* - returns the SCS Controller back to Factory or Default settings.
- Manual Test* - allows service technicians to inspect input values from sensors and check the effects of output adjustments to peripherals, and to run pre-set test routines.
- Statistics* - displays logged values and event counts to help Service Staff fine tune and trouble shoot the system.
- About* - lists the properties of the refrigeration system and the controller, including cooler model codes, firmware, hardware, and software versions.

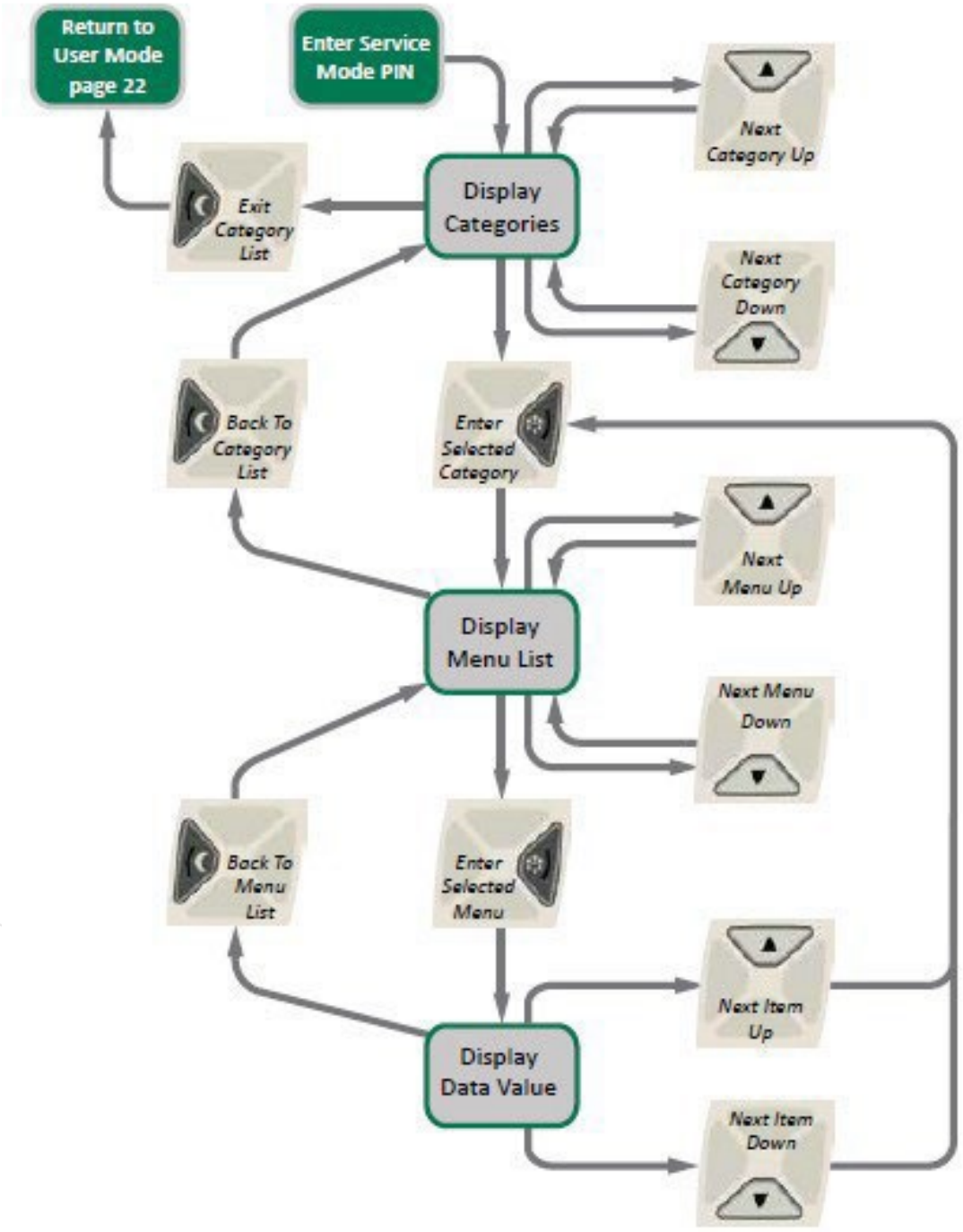
*Not yet implemented

User Interface (UI) flow charts

There are two different UI flow charts to follow depending on which of these categories are selected:

Parameter, Reset and Manual Test categories




Return to User Mode page 22
Enter Service Mode PIN
Next Category Up
Exit Category List
Display Categories
Next Category Down
Back To Category List
Enter Selected Category
Next Menu Up
Display Menu List
Next Menu Down
Back To Menu List
Enter Selected Menu
Next Item Up
Display Data Value
Next Item Down

Graphical user interface (GUI)

The AoFrio Field App provides a wireless connection to the SCS Controller from mobile devices fitted with Bluetooth® LE. This gives users and technicians an unprecedented level of visibility, control, and diagnostic tools to optimise the controller's performance and to troubleshoot any problems. The following guide provides an overview of the app and its capabilities.

Note: Screen shots shown are indicative only. Different devices have different screen ratios, sizes, and resolutions. The actual image seen on your device may vary from the screen shots shown in this guide. Holding your device in portrait or landscape mode may have an effect on appearance and may change how the various windows and graphics are displayed and arranged on your screen.

User interfaces

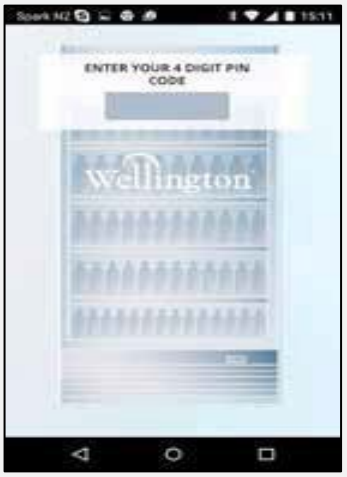
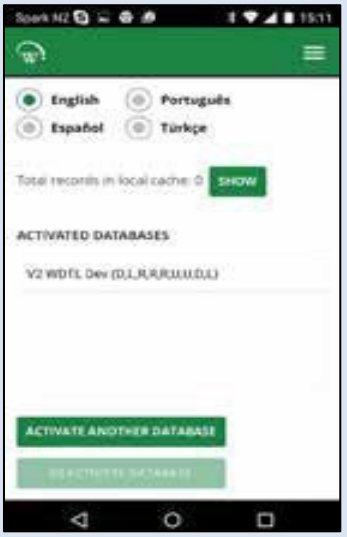
Customisation using company colours and logos are also available. Please talk to AoFrio for further details.

Authentication

Note: Your activation code is unique to you, and should **NEVER** be shared with anyone else, as it determines your personal access level for the app. The same code will give you access to all SCS apps you are authorised to use.

Step	Details
1. Download and install the AoFrio Field app from Google Play on your mobile device. (Go to the Google Play store and search for “scs wellington” to find the app).	
2. When you first run the Field app, you will be requested to enter an activation code. Contact your User Manager or AoFrio to receive your activation code NOTE: You must be connected to the Internet at the time of activation.	

Continued over page >

Step	Details
3 Once activation is complete, you must define a 4-digit PIN code to be used as your access code. This can be any code unique to you. Each time you start the app, you will be required to enter this same PIN code then tap **ACTIVATE**.	
4 You can see which databases you are activated against from the “Settings” screen. You can be activated to more than one database at the same time. Simply tap **ACTIVATE ANOTHER DATABASE**, and enter the new database’s unique activation code, as in Step 2.	

Connect to a mobile device

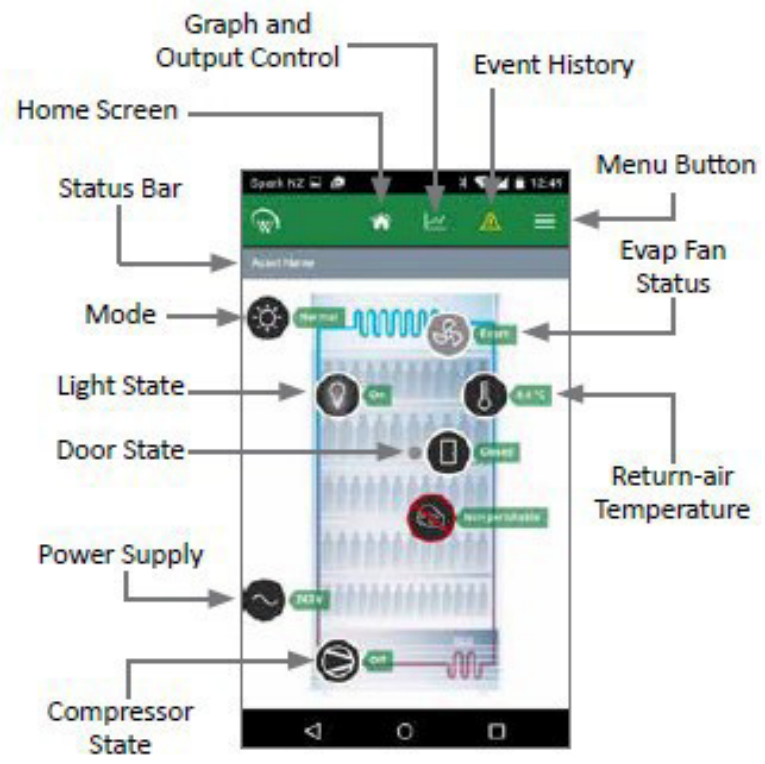
If the Bluetooth™ logo on the top right of the SCS Controller button panel is lit, then the Bluetooth™ signal is broadcasting and it should be visible to a nearby mobile device. This logo will start flashing when connected to a device.

Step	Details
1. Open Field app on your mobile device. Wait a few moments for it to find nearby AoFrio IoT devices. This list will be filtered by your activation permissions, so devices you are not authorised to connect to will not be displayed.	
2. Select the AoFrio IoT device that you want to connect to from the visible device list.	
3. Tap **CONNECT** to connect to the cooler.	

Home screen

The Home Screen shows a graphic representation of the current state of the refrigeration unit being controlled.

Fridge or cooler status



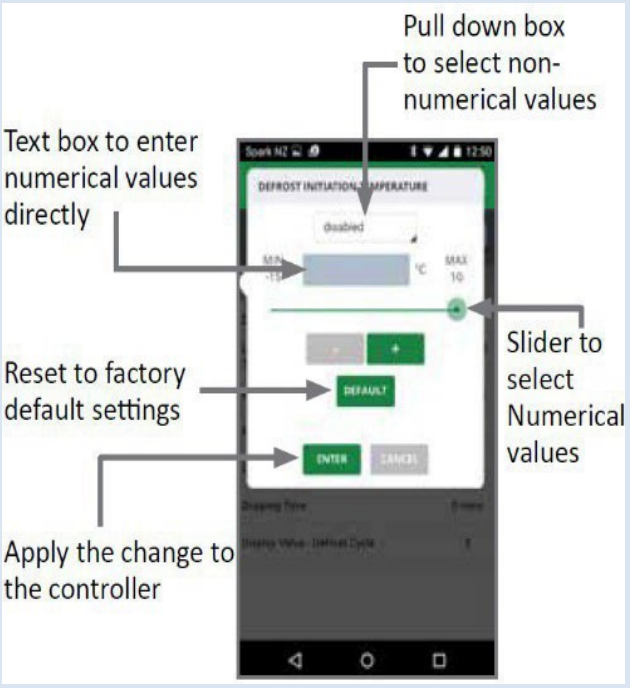
Main menu

Parameter editing

Mobile

Step	Details
1 Open the main menu and tap **EDIT PARAMETERS**.	
2 Tap the parameter category you want to view.	
3 Inside the parameter category, tap a parameter to open it for editing.	

Continued over page >

Step	Details
4 Make your changes, then tap **ENTER** to set it in the controller	

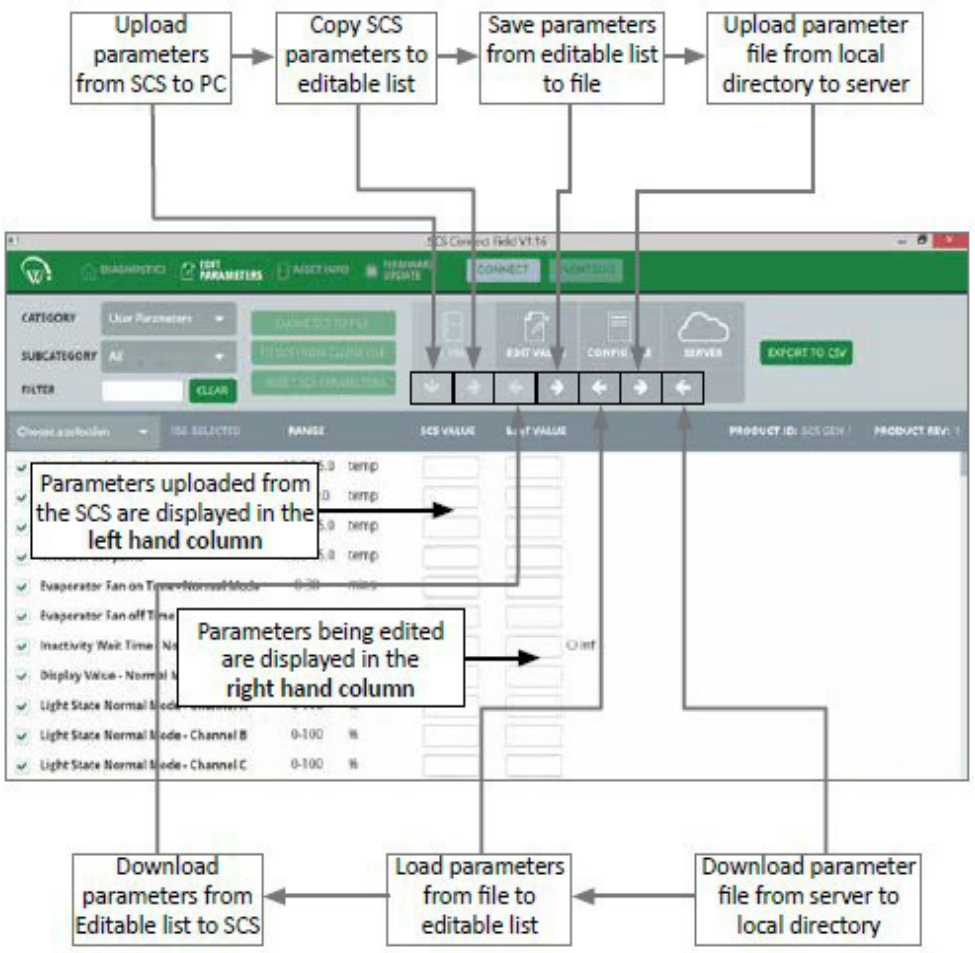
Desktop

The Desktop App is intended for OEM's and manufacturers. It supports easy creation, checking and saving of parameter files for Lab and Production use:

- Requires a Blue-Giga USB dongle to support BT-LE

Due to the poor handling of Bluetooth LE by Windows, use of the desktop app on Windows computers requires an external Bluetooth device ("dongle"). The supported dongle is Blue-Giga model BLED112, available from Blue-Giga stockists or from AoFrio.

- Uses the same activation code as for all other apps
- Connects to the controller in the same way as the mobile app
- Basic 4-screen interface (no hidden menus)
    - Diagnostics
    - Edit Parameters
    - Asset Info
    - Firmware Update

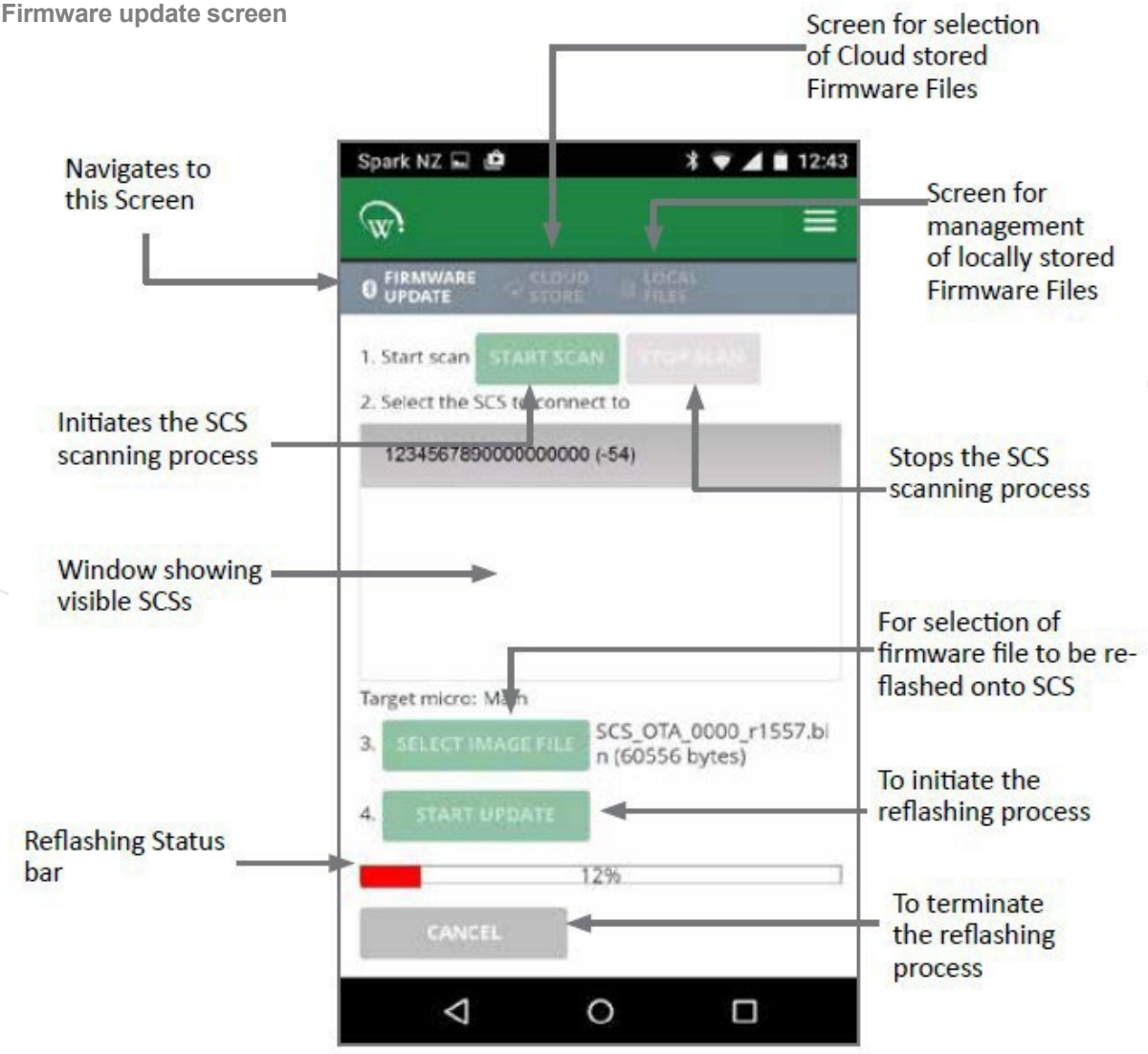


Upgrading firmware

Firmware can be updated from either the mobile or desktop app. The steps are the same for both. Screenshots used are from the mobile app but look the same on the desktop app. The SCS contains two microprocessors.

- Hi-side micro - Responsible for all voltage, power, and current monitoring and S1 and S2 switching
- Main micro - Responsible for all control algorithms

Firmware update screen



Update process

Step	Details
1. Open Field app and select **Cloud Stored Firmware Files** from the main menu.	
2. Select the file you want to use and tap **DOWNLOAD**. NOTE: SCS_OTA are Main micro files, while SCS_DUAL are Main micro + Hi-side files	
3. Tap **START SCAN** then select the SCS model you want to upgrade The Bluetooth indicator light on the SCS Controller will flash to show it has successfully connected with Field app.	
4. Tap **SELECT FIRMWARE FILE** and select a locally stored firmware file.	
5. Tap **START THE UPGRADE** then wait until you see the message “Firmware Update Complete” after programming. Otherwise, you will need to try again.	

Disable equipment

This function lets any role with the correct permissions disable equipment (eg. coolers) in the field, eg when store owners are stocking unpermitted items in a cooler, or when the equipment is not located as agreed.

How it works

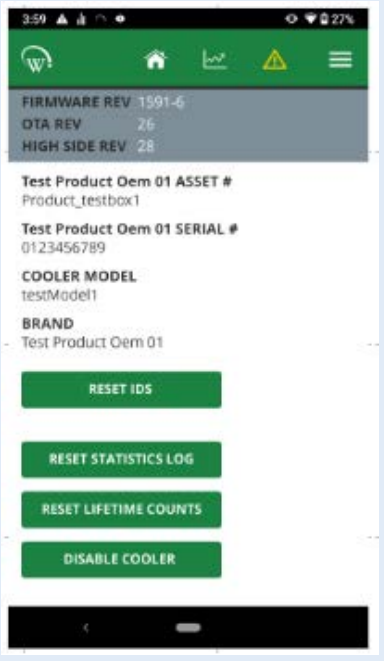
Once activated this feature:

- Immediately turns OFF the cooler compressor and both fans
- Shuts down the AL19 port

Power cycling while disabled: If the cooler is switched off then on again while disabled, this may clear the AL19 port, but the compressor will not run, and the cooler will shut down on AL19 again once the time has elapsed.

Disable a cooler

- **Before starting:** Ask your AoFrio administrator to update your permissions in User Manager to see this function.

Step	Details
1. Log on to Field app and connect to the cooler you want to disable.	
2. On the SCS info screen for the cooler you are connected to, tap **DISABLE COOLER.**	

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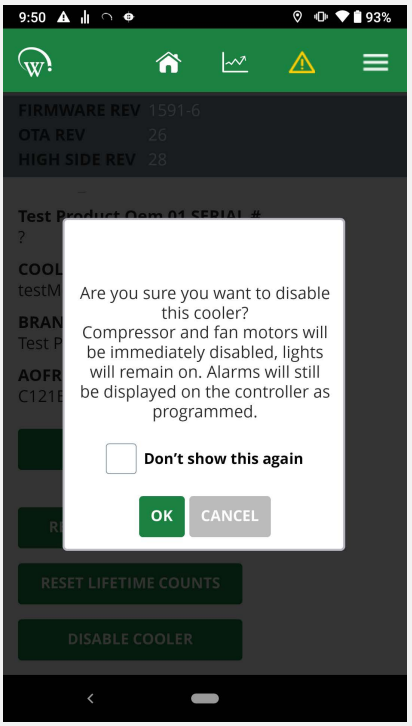
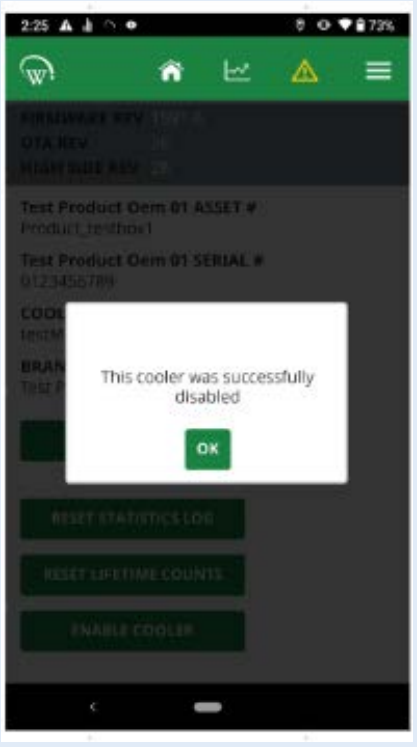
Step	Details
3. Click **OK** to confirm that you want to disable the cooler. There is also a checkbox saying ‘Don’t show this again': • If you leave this field unchecked, you will see this confirmation step next time you want to disable a cooler. • If you check this field, you won’t see this step again.	
4. Click **OK** to confirm.	

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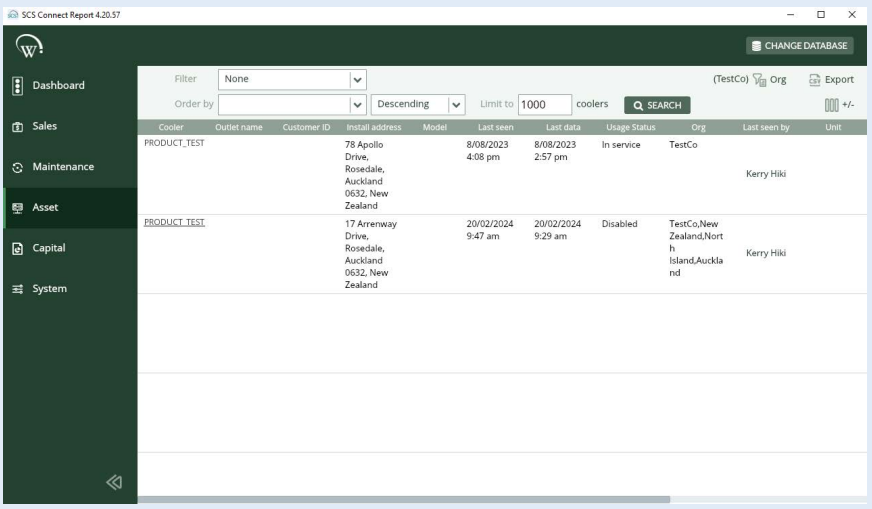
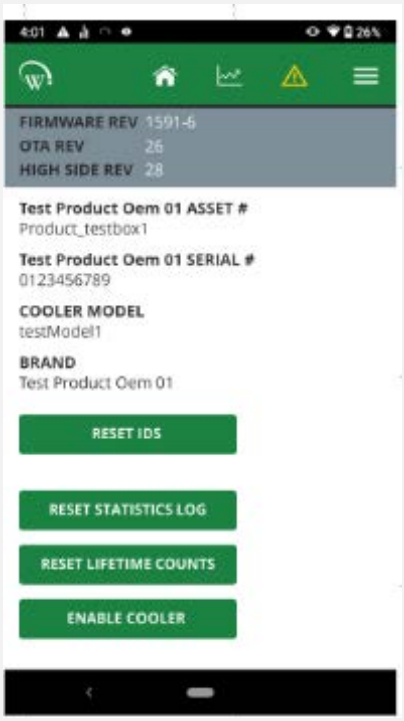
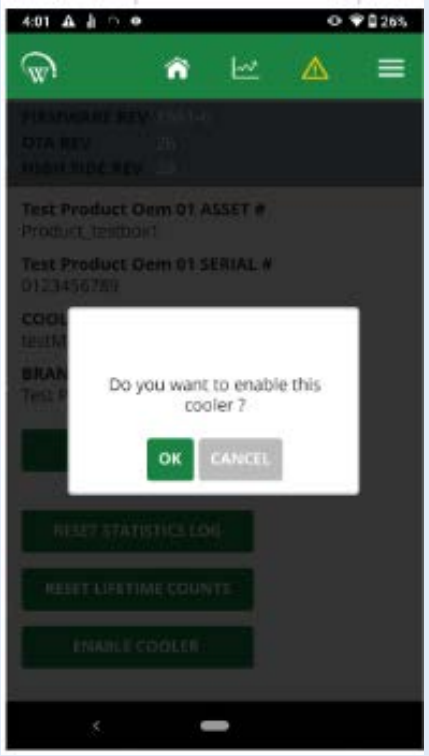
Step	Details
5. The cooler will now turn off the compressor and cooling fans. Anyone who now connects to it will see the notification “This cooler has been disabled.” and the cooler ID will also appear as disabled in the list of nearby coolers.	 
6. In Report app (from v4.20 onwards) the Audit List page can be used to see all coolers in a Disabled state.	

Reactivate a cooler

- **Before starting:** Ask your AoFrio administrator to update your permissions in User Manager to see this function.

Step	Details
1. Log on to Field app and connect to the disabled cooler you want to reactivate.	
2. On the SCS info screen for the cooler you are connected to, tap **ENABLE COOLER.**	
3. Click **OK** to confirm that you want to enable the cooler.	

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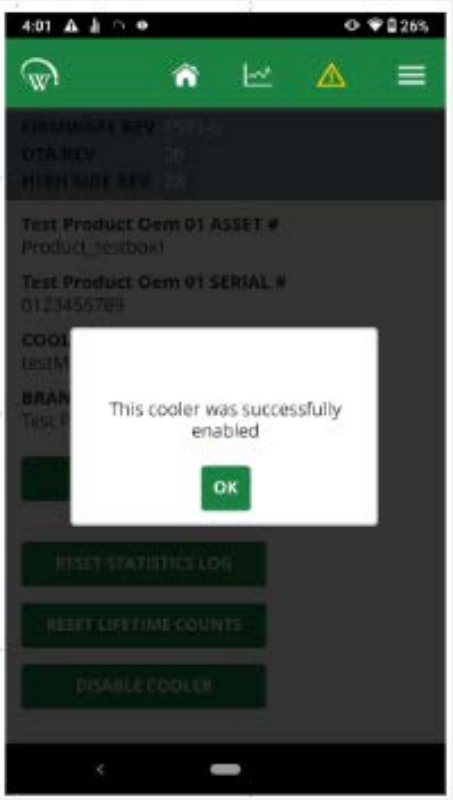
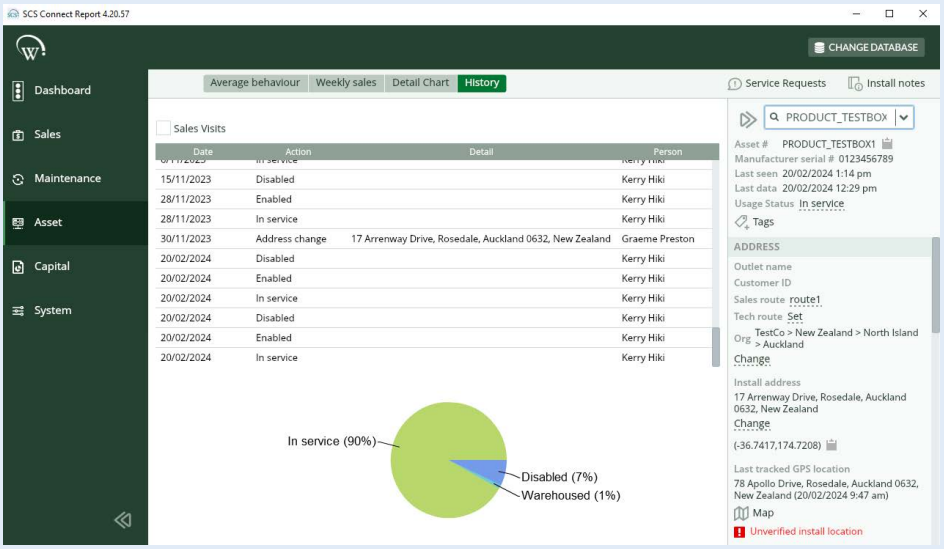
Step	Details
4. Click **OK** to confirm. The cooler will now turn on the compressor and cooling fans. Anyone who now connects to it will see the cooler listed as available.	
5. The Single Cooler page in Report app can be used to see the transition of cooler states.	

Faults and alarms

The SCS Controller contains the following fault protection mechanisms:

FAULTS (Displays Alarm Symbol)

- Door Fail
- Excessive Door Open Counts
- Over Voltage
- Under Voltage
- Condenser Overtemp
- Maximum Compressor Starts in 1hr

ALARMS (Displays Alarm Symbol and Alarm Code)

- Door Left Open Alarm (dor)
- Excessive Condenser Overtemp (AL15) **
- NTC Failure (AL17)
- Refrigeration Fail (AL19)
- Return Air Under Temp (AL20)
- Triac Overcurrent (AL22 , AL23)
- Other Sensor Failure (AL27)**
- No Downward Tendency Lockout (AL28)**
- Excessive Overpressure Trips (AL29)***
- Excessive Short Defrosts (AL30)***

FAULTS are logged, but do not affect product temperature, and require no action by the Shop Owner.

ALARMS are logged, but they can result in warm product. Some faults can be cleared by the store owner, but others can only be cleared by a service technician.

* Not yet implemented
** FW version 1580 onwards
*** FW version 1700 onwards

Alarm codes

Reporting an alarm early will minimise the down time of the cooler. An alarm code should always be supplied when reporting an alarm.

Fault code	Fault	Possible causes and actions
dor *	Door Open The door has been left open	Closing the door will clear this fault. The door may not be close properly due to sagging and may require adjustment.
15	Excessive Condenser Overtemp The condenser has seen multiple overtemperature conditions in a short space of time.	Check that nothing is blocking the condenser e.g., boxes, and then reset by power cycling. If this fault continues to happen, check that the condenser fan is functioning correctly.
17	NTC Failure Either the main temperature sensor probe or the condenser temperature probe (if fitted) has failed.	The temperature probe needs replacing. The system will not run while this fault is present.
19	Refrigeration Failure The compressor has run continuously for the configured time without reaching the setpoint temperature	Multiple possibilities, preventing the system from achieving temperature. In all FW Versions prior to 1574, the system will not reset by power cycling, only by writing to the “Clear Terminal Alarm” parameter (see page 72).In all FW versions from 1574 onward, the system can also be reset by power cycling
20	Return Air Under Temp The temperature has dropped below the normal mode setpoint by a specified amount	The product temperature keeps getting colder, even when the compressor is turned off. Check the compressor is correctly wired, and that the “Compressor State” parameter is set correctly. Can also be due to an external secondary compressor relay failure.
21	Compressor Excessive Starts ** The compressor has had repeated over temperature trips equalling the high temperature lockout count, within the specified period (This alarm is disabled by default. Parameter access is available upon request)	The condenser sensor keeps seeing a high temperature. Check the condenser is not blocked, and the condenser fan is running.
22	Triac S1 Overcurrent The loading on S1 draws too much current	A high current component, such as the compressor, has incorrectly been connected to the S1 output. Check the wiring.

Continued over page >

* FW version prior to 1574 used fault code 1
** FW version 1580 onwards
*** FW version 1700 onwards

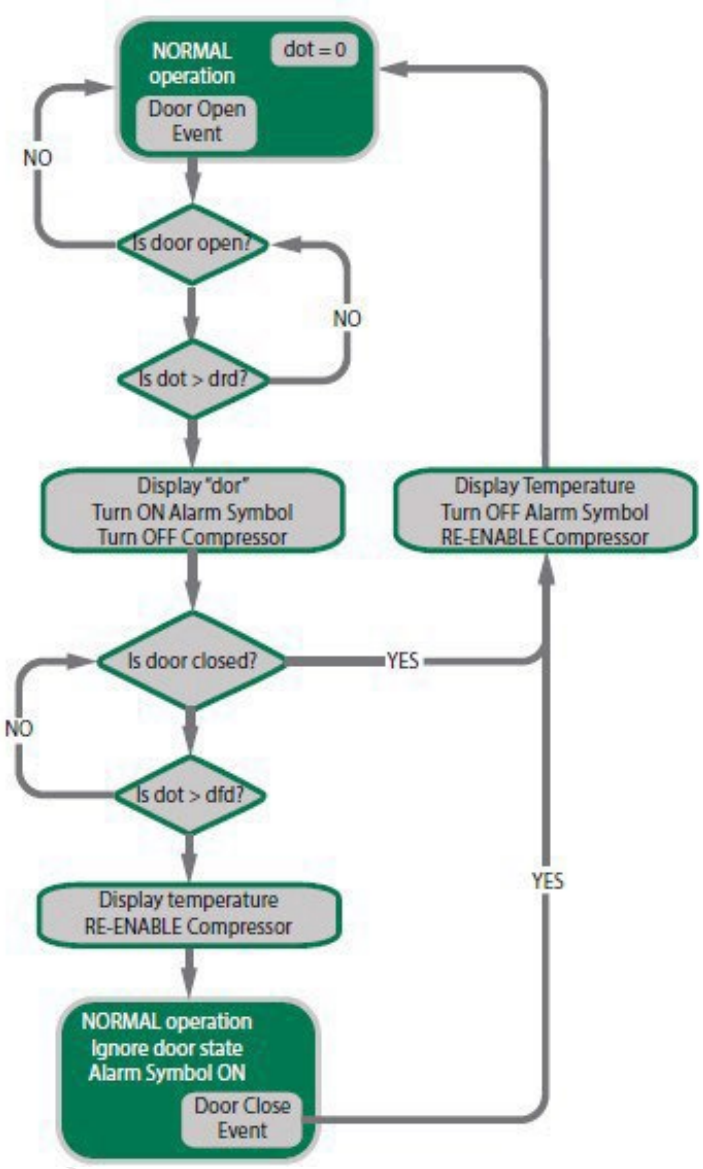
Fault code	Fault	Possible causes and actions
23	Triac S2 Overcurrent The loading on S1 draws too much current	A high current component, such as the compressor, has incorrectly been connected to the S1 output. Check the wiring.
27	Other Sensor Failure ** A sensor other than the return-air-sensor has failed	The sensor needs replacing. The system however will continue to run by ignoring this sensor.
28	No Downward tendency lockout ** The NDT defrost has been blocked the maximum number of times	There could be multiple possibilities that are preventing the system to reach its desired temperature. Most likely causes are frozen evaporator coils, low refrigerant charge or slow fan speed.
29	Excessive Overpressure Trips *** The compressor has had repeated over pressure trips equalling the Over pressure lockout count within the specified period. (This alarm is disabled by default. Parameter access is available upon request)	The compressor is faulty or requires servicing. The condenser coil may be blocked and may require cleaning.
30	Excessive Short Defrosts *** The defrost initiation probe has repeatedly triggered defrosts within the min allowable time between defrosts, equalling the Excessive Defrosts Lockout Count. (This alarm is disabled by default. Parameter access is available upon request)	The defrost initiation probe is reading a low value within a short time of the compressor turning on. Check that the probe is not touching the evap coils, and that the evap fan is running.

* FW version prior to 1574 used fault code 1

** FW version 1580 onwards

*** FW version 1700 onwards

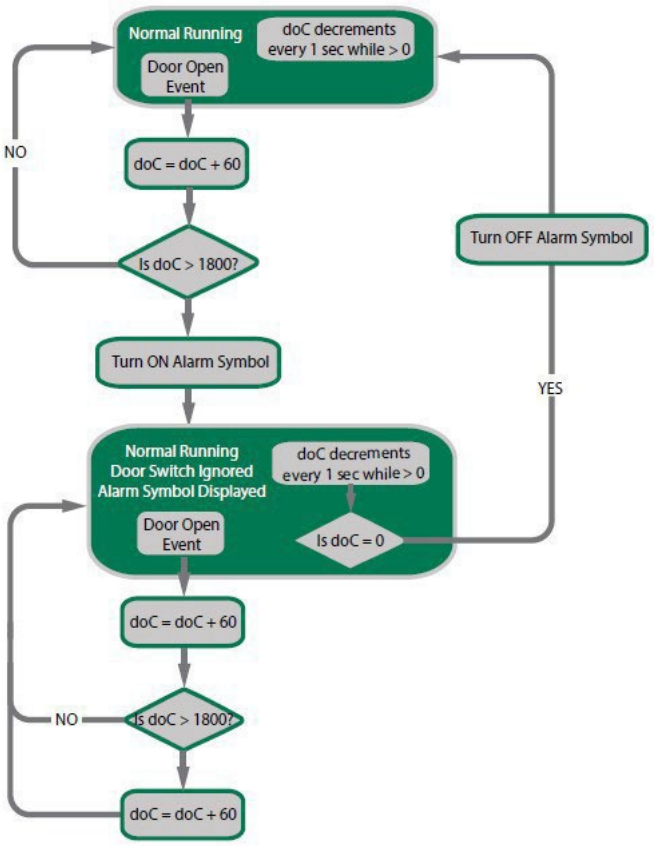
Fault logic - Door open and door fail



Variable	Type	Description
dot	Timer	Door open time
drd	Limit	Door open delay
dfd	Limit	Door fail delay

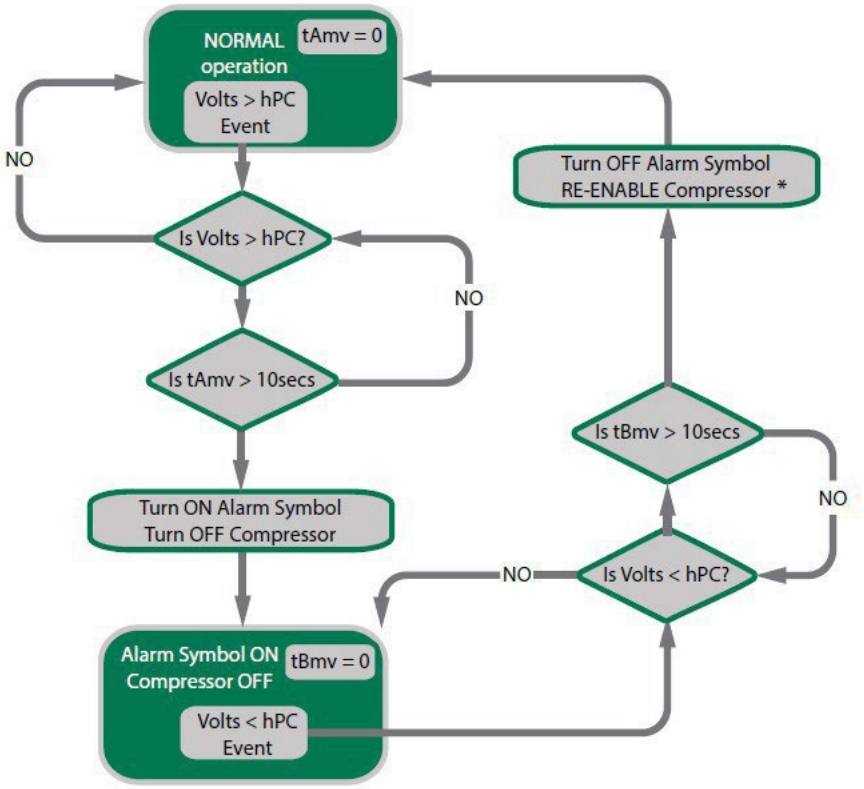
*Compressor will not re-start unless it has been off for the minimum off time

Fault logic - Excessive door openings



Variable	Type	Description
doc	Limit	Door open count

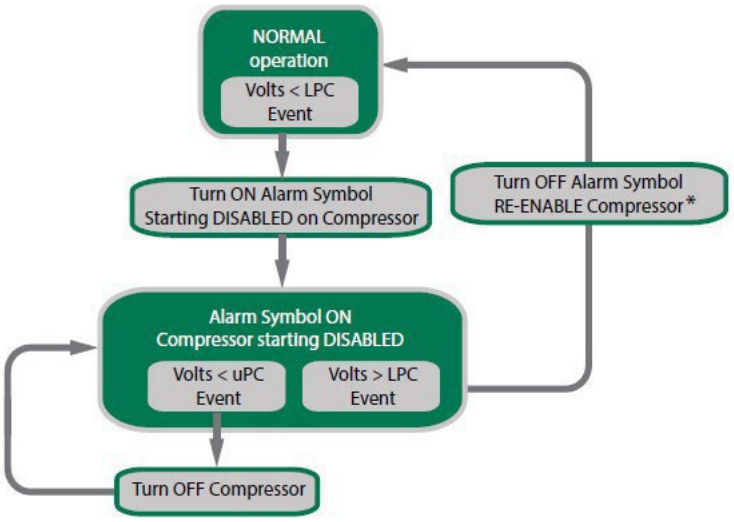
Fault logic - Over voltage



Variable	Type	Description
Volts	Input	Current voltage level
hPC	Limit	Maximum Run/Start Voltage
tAmv	Timer	Time ABOVE maximum voltage
tBmv	Timer	Time BELOW maximum voltage

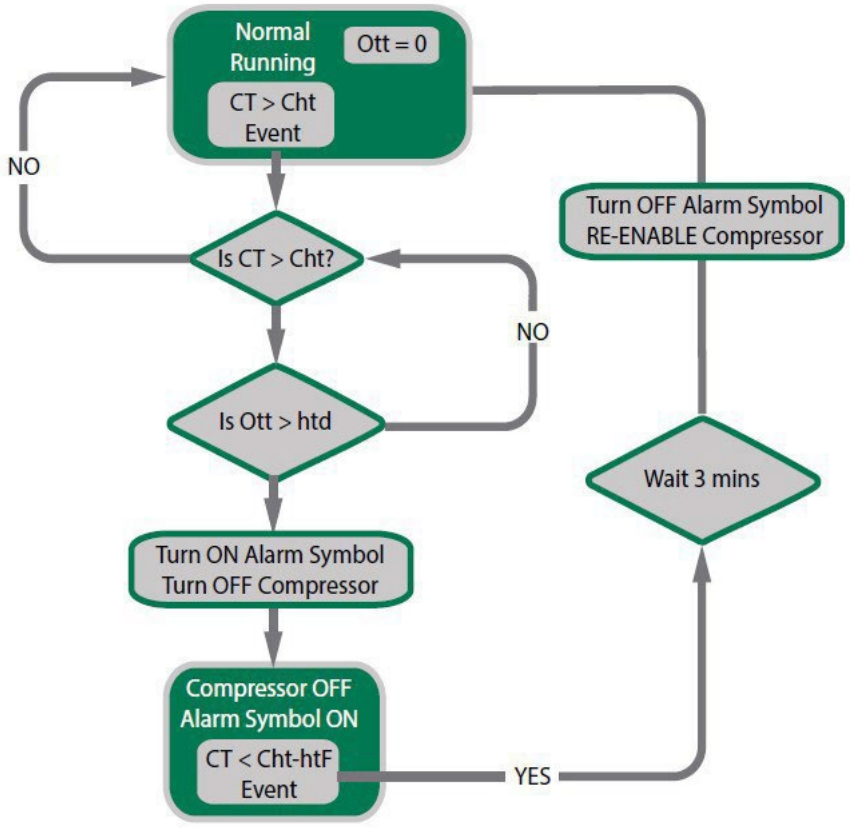
* Compressor will not re-start unless it has been off for the minimum off time.

Fault logic - Under voltage



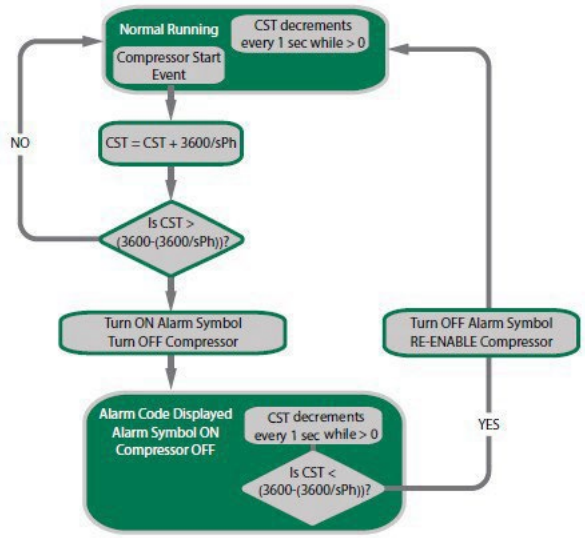
Variable	Type	Description
LPc	Limit	Minimum Start Compressor Voltage
uPC	Limit	Minimum Run Compressor Voltage

Fault logic - Condenser over temp



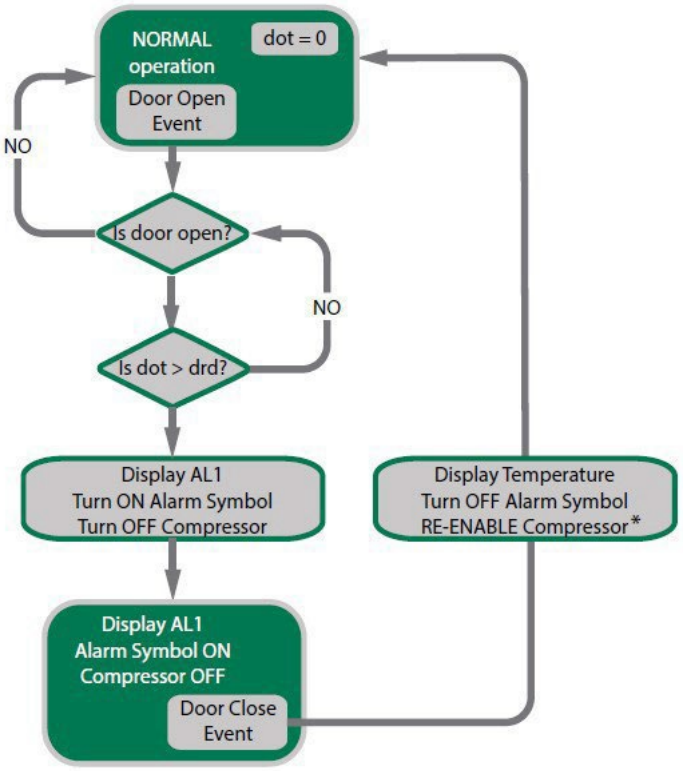
Variable	Type	Description
CT	Input	Condenser Temperature
ott	Timer	Over Temperature Timer
Cht	Limit	Condenser High Temperature Limit
htd	Limit	High Temperature Delay
htF	Limit	High Temperature Differential

Fault logic - Max compressor starts in 1hr



Variable	Type	Description
sPH	Limit	Compressor Starts per Hour
CST	Timer	Compressor Starts Timer

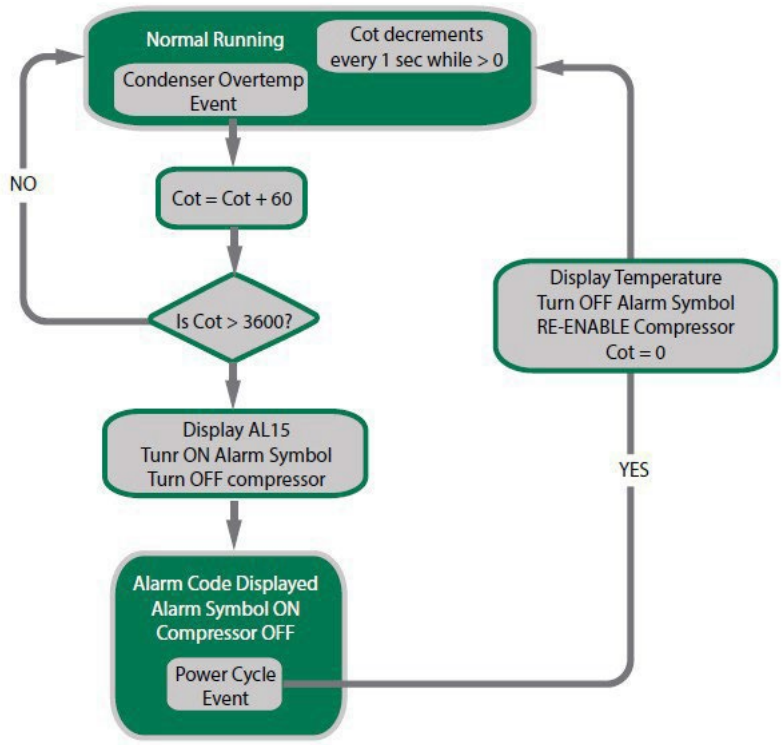
Fault logic - Door left open



Variable	Type	Description
dot	Timer	Door open time
drd	Limit	Door open delay

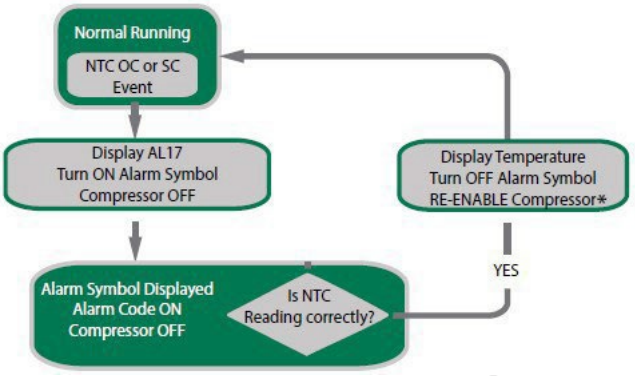
*Compressor will not re-start unless it has been off for the minimum off time.

Fault logic - Excessive condenser over temp



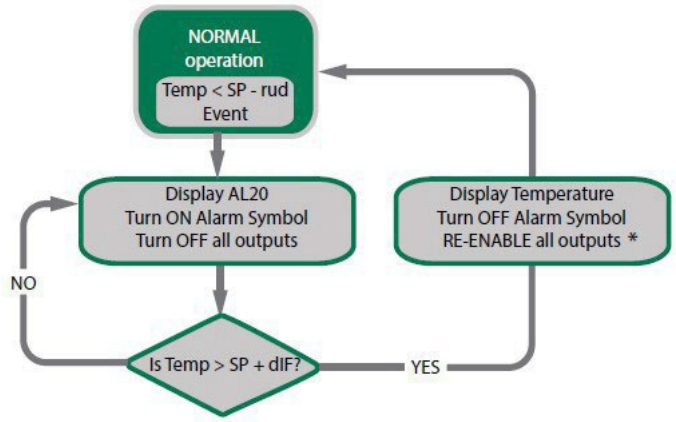
Variable	Type	Description
SP	Limit	Current Mode Set-point
Cot Timer	Timer	Compressor Overtemp Timer

NTC failure



* Compressor will not re-start unless it has been off for the minimum off time.

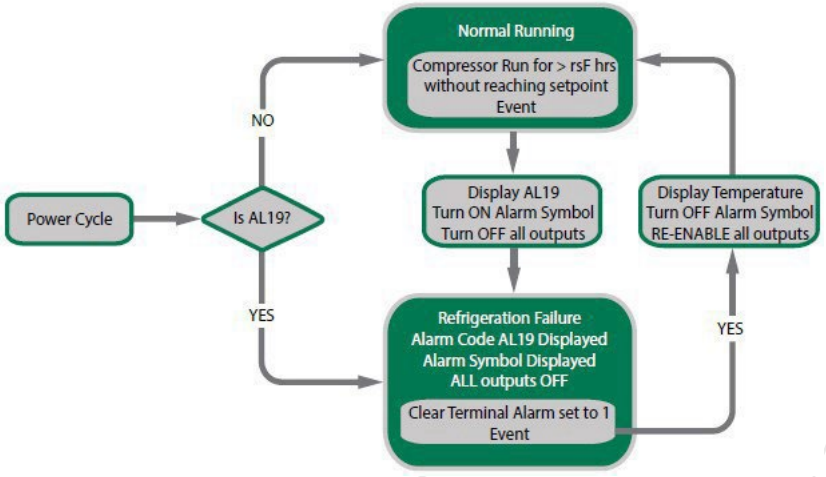
Fault logic - Return air under temp



Variable	Type	Description
SP	Limit	Current Mode Set-point
diff	Limit	Current mode differential
rud	Limit	Return-Air Undertemp Differential

*Compressor will not re-start unless it has been off for the minimum off time.

Fault logic - Refrigeration failure



Variable	Type	Description
rsF	Limit	Refrigeration System Failure Time

Technical specifications

Power

Power supply	90 - 240Vac +10/-15% 50/60Hz
Input connectors	6.35mm x 0.81mm QC tabs Maximum rated current per terminal 12A
Power consumption	3.5W maximum
Voltage protection	Compressor Over Voltage Protection Compressor Under Voltage Protection

HV Outputs

Output ratings	C: 1x12A (UL: 7.2FLA & 34.8LRA, IEC: 8A)* R: 1x5A (UL: 3A, IEC: 3A)* S1: Switched 0.4Arms* (Switched 0.6Arms)** S2: Switched 0.4Arms* (Switched 0.6Arms)** Maximum total rated current 11.8A
Relay operating cycles	EN60730-1: 100,000 operations UL: 100,000 operations
Output connectors	6.35mm x 0.81mm QC tabs Maximum cable length: 10m

LV inputs / outputs

Sensor temperature range	-50°C to 90°C @ 0.1°C (-50°C to 300°C measurement range, limited only by NTC capability)
Ratings	SELV Digital 0 - 5V i/p Analog NTC i/p 5V, 100mA o/p (AD4 only)
LV connectors	2-way Stocko 7234-202-000-960-000-00-G 5-way Stocko 7234-005-000-960-000-00-G Maximum cable length: 10m***
Supported temperature sensors	NTC - 1k to 15k @ 25°C, Beta Value 3400 to 4000
Supported digital inputs	High impedance voltage input
PWM outputs	0 - 24Vdc, PWM, 1A (x4)
UART	Half duplex and Full duplex

*At 55°C with 105°C wire or at 42°C with 90°C wire
**At 42°C with 105°C wire
***2m when not installed in a cabinet (EN55014-1)

Environmental

Operational temperature range	IEC -20°C to +55°C (-4°F to +131°F) UL - 20°C to +50°C (-4°F to +122°F) <90% RH non-condensing
Storage conditions	-40°C to +80°C (-40°F to +176°F) <90% RH non-condensing

Connectivity

Bluetooth™ capability	Bluetooth™ LE
Supported Windows O/S for GUI module	Windows XP SP 2 Windows Vista Windows 7 Windows 8 Windows 8.1
Supported mobile app devices	Android with BT 4.0 and OS 4.4.3 or above iPhone 4S or later iPAD 3rd Gen or later iPAD mini

Physical

Dimensions	SCS Overall Dimensions: 36.2mm (H) x 81.2mm (W) x 97.7mm (D) Aperture Dimensions: 29.5mm (H) x 71.5mm (W) (+-0.5mm) Maximum Mounting Panel Thickness: 9mm Clearance Required for Escutcheon: 4mm above and below and 7mm to the left and right of aperture hole.
Display	3 Digit LED Display, Digits 20mm high Minimum Resolution: 0.1°C Colours: Green, Blue, Red
Activity indicators	Fan Indicator Defrost Mode Indicator Compressor Indicator Night Mode Indicator Alarm Indicator Bluetooth™ Indicator
Interface	4 capacitive touch buttons
Housing materials	Escutcheon: ABS, Color: Please enquire Main Housing: PC, Color: Grey tinted clear Seals: Silicone, Color: Black Rear Cover: PC, Color: Gray tinted clear Retaining Clips: POM, Color: Black
Cleaning	Use only a damp cloth with neutral detergents

Compliance and approvals

Fire rating	UL94-V0
Electrical insulation rating	Class II (when correctly installed)
Immunity against voltage surges	4000V (per EN61000-6-2)
Software classification	Class A
Safety compliance	IEC-60335 IEC-60730 UL-60730 cUL
Ingress protection	Front Panel: IP 68 Rear (Connectors enclosure): IP x5
Explosive environments	HC Compatible EMC Immunity: EN6100-6-2, EN 301 489-1, EN301 489-17 Emissions: EN55014-1 , EN301 489-17 , EN300 328 V1.8.1 EN50371 FCC Part 15B and 15C EN 300 328 ICES-001, RSS-247, RSS-102 AS/NZS 4268, AS/NZS CISPR 22
European Directive: Restriction of Hazardous Substances (RoHS)	EU Directive 2002/95/EC (RoHS)
European Directive: Waste Electrical and Electronic Equipment (WEEE)	EU Directive 2002/96/EC (WEEE)
Bluetooth SIG	BQB QDL
IMDA Singapore	Dealer Licence No. DA103787
CNC/AFTIC Argentina	CNC ID: C-17898

FCC declaration

Information to the user (FCC Part 15.105)
CLASS B DEVICE

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

This device complies with Innovation, Science and Economic Development (ISED) Canada's licence-exempt RSS standards. Operation is subject to the following two conditions:

1. This device may not cause interference; and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

DÉCLARATION DE CONFORMITÉ À LA FCC/IC
Cet appareil est conforme avec Innovation, Sciences et Developpement economic Canada RSS standard exempts de licence(s). Son utilisation est soumise à Les deux conditions suivantes:

1. cet appareil ne peut pas provoquer d'interférences et
2. cet appareil doit accepter Toute interférence, y compris les interférences qui peuvent causer un mauvais fonctionnement du dispositive

CAN ICES-3 (B)/NMB-3(B)
Warning: Any changes or modifications not expressively approved by AoFrio could void the user's authority to operate this equipment

NOM Declaration

La operación de este equipo está sujeta a las siguientes dos condiciones: (1) es posible que este equipo o dispositivo no cause interferencia perjudicial y (2) este equipo o dispositivo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada" and the IFETEL number RCPWESC17 -0936

Related documents

Talk to your AoFrio representative about access to other SCS documents that may be relevant to your business.

Main topic	Document number
Standard parameters	WT9753
Advanced parameters	WT9750
Advanced defrost	WT9749
Variable Speed Control - Fans	WT9766
Variable Speed Control - Compressors	WT9091
Lab app user manual	WT9785
Cradle app user manual	WT9584
Reset IDs for SCS Controllers	WT9204
Alarms External Indications	WT9838

SCS Controller user manual

Standard features

WT 9748_i8 Issue date: August 2024

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