



SNOWLAND
COOLING SYSTEMS L.L.C.



OPERATIONS & MAINTENANCE MANUAL

Cold Rooms • Chillers • Freezers • Blast Freezers
General Operating, Safety, Troubleshooting and Spare-Parts Guide

Document	Details
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Prepared by	Snowland Cooling Systems LLC
Applicable system	Project-specific cold-room and direct-expansion refrigeration systems

IMPORTANT:

This manual is a general guide. The approved project drawings, technical submittal, controller manual, equipment nameplates and local statutory requirements take precedence.

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Document Control and Use

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0	28-Jul-2026	General master issue for Snowland cold-room systems	Snowland Cooling Systems LLC

Project Information

Field	To be completed at handover
Client / facility	
Project / quotation reference	
Room designation and use	
Room internal dimensions	
Design room temperature	
Design ambient temperature	
Refrigerant / total charge	
Condensing-unit make / model / serial no.	
Evaporator make / model / serial no.	
Controller make / model	
Electrical supply	
Commissioning date	
Snowland service contact	

Purpose and Limitations

This manual supports trained operators and maintenance personnel responsible for Snowland modular cold rooms and associated direct-expansion refrigeration equipment. It describes normal operation, routine care, fault recognition and safe escalation.

Manual Hierarchy

1. Approved project technical submittal, drawings and equipment schedule.
2. Equipment nameplates and manufacturer manuals.
3. Applicable law, authority requirements and site safety procedures.
4. This general Snowland Operations & Maintenance Manual.

Only competent, authorised refrigeration and electrical technicians may open electrical panels, connect gauges, handle refrigerant, change safety settings, braze pipework, replace pressure components or perform commissioning adjustments.

Contents and Quick Reference

Section	Subject	Primary user
1	Safety and responsibilities	All personnel
2	System overview and refrigeration cycle	Operators / technicians
3	Operating instructions	Operators
4	Product loading, hygiene and defrost	Operators
5	Planned maintenance	Operators / technicians
6	Troubleshooting and emergency response	Operators / technicians
7	Recommended spare parts and consumables	Maintenance / stores
8	Records, handover and service	Facility management

Immediate Actions

Condition	Immediate action
Person trapped inside	Use internal safety release/alarm; summon emergency assistance; never lock an occupied room.
Smoke, burning smell or electrical arcing	Do not touch equipment. Isolate at the safe upstream disconnect and follow the site fire plan.
Suspected refrigerant leak	Keep people away, ventilate only if safe, eliminate ignition sources where applicable and call a certified technician.
Abnormal knocking, severe vibration or oil discharge	Stop the unit safely and call Snowland/qualified service personnel.
Repeated HP/LP/overload trip	Do not repeatedly reset. Record the alarm and arrange diagnosis.
Temperature excursion	Protect or relocate product in accordance with the client's food-safety/ product procedure.

Emergency numbers, first-aid arrangements and refrigerant Safety Data Sheets must be available at the plant room or control panel.

1. Safety and Responsibilities

1.1 Principal Hazards

Hazard	Risk	Required control
Electricity	Shock, arc flash, fire	Isolate, lock out and verify dead before access; use qualified electricians.
Pressurised refrigerant	Frostbite, eye injury, rupture	Use rated tools/PPE; recover refrigerant; never heat a sealed circuit.
Refrigerant release	Asphyxiation; toxicity/decomposition products	Evacuate affected area, ventilate safely and follow refrigerant SDS.
Rotating fans	Cuts, entanglement	Isolate before guards or fan sections are opened.
Hot surfaces	Burns at compressor/discharge line/heaters	Allow cooling; wear suitable gloves.
Cold environment	Cold stress, slips, entrapment	Limit exposure, wear PPE, keep floor dry and test internal door release.
Working at height	Falls during coil/panel service	Use approved access equipment and site permit procedure.
Cleaning chemicals	Skin/eye/coil damage	Use food-safe, coil-compatible products and follow SDS.

1.2 Responsibilities

- ◆ The client/facility manager controls access, staff training, product safety, cleaning, operating records and timely service calls.
- ◆ Operators perform only visual checks, normal controller operation, cleaning and reporting within their training.
- ◆ Qualified technicians perform electrical, refrigeration, pressure, control-setting and major mechanical work.
- ◆ Snowland/project documentation must be kept available and updated after approved modifications.

1.3 Lock-Out / Tag-Out (LOTO)

1. Notify affected personnel and identify every energy source.
2. Stop the system normally, then isolate the approved upstream disconnect(s).
3. Apply personal lock and tag; release or control stored energy.
4. Verify isolation using an approved instrument and try-start check.
5. Complete work, refit guards, clear tools and personnel, then remove locks under the site procedure.

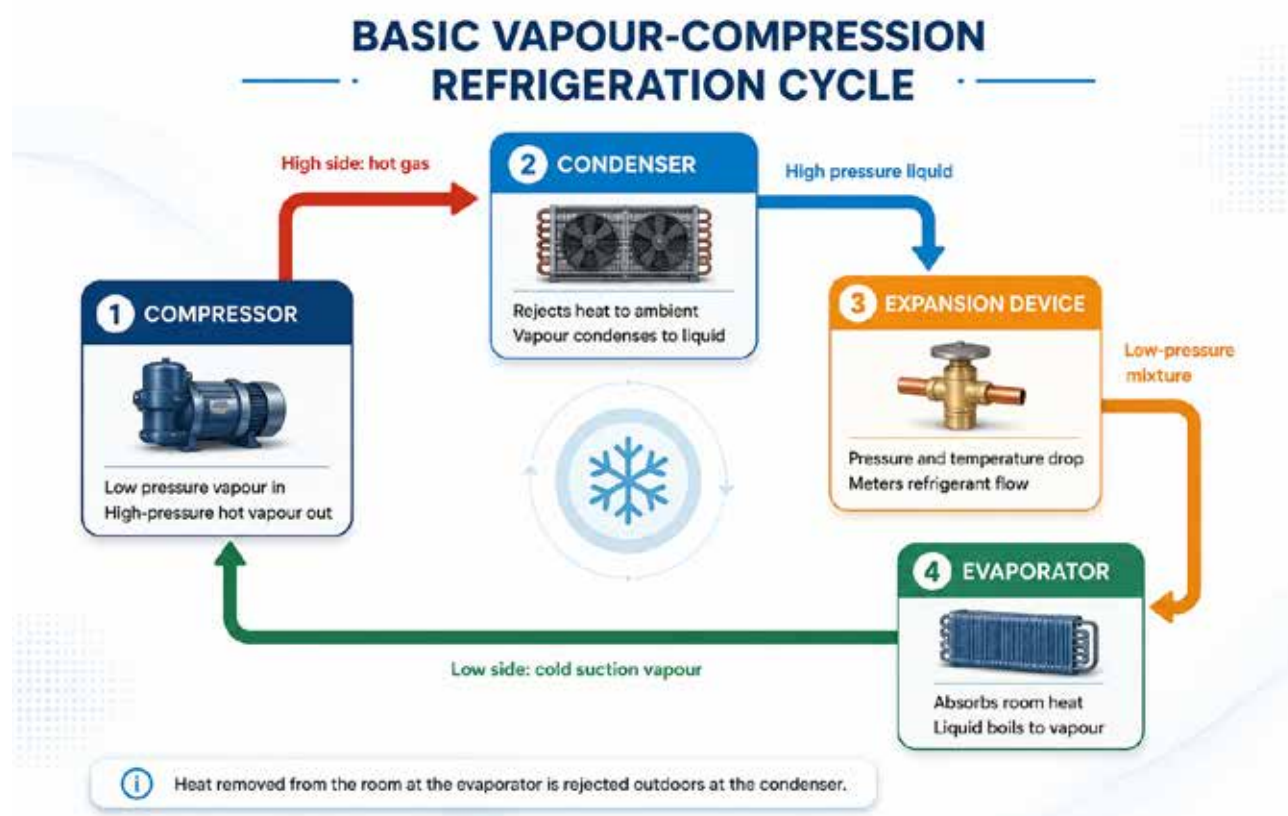
2. System Overview

2.1 Main Components

Component	Function / operator observation
Insulated envelope	Wall and ceiling panels limit heat and moisture ingress; joints must remain sealed.
Insulated door	Provides access and vapour seal; gasket, heater and internal safety release must be serviceable.
Compressor	Raises refrigerant vapour pressure and circulates refrigerant; abnormal noise or oil loss requires shutdown.
Air-cooled condenser	Rejects heat to ambient; coil and airflow must remain clean and unobstructed.
Receiver / liquid line	Stores and supplies liquid refrigerant where fitted.
Filter drier / sight glass	Removes moisture/particles and indicates liquid-line condition; interpretation is technician work.
Solenoid valve	Controls liquid flow and commonly supports pump-down operation.
Expansion device	Meters refrigerant into the evaporator and controls superheat.
Evaporator / unit cooler	Absorbs room heat; fans circulate air and defrost removes frost.
Drain system	Removes defrost water; freezer drains may include heaters.
Control panel	Houses controller, protection devices, contactors and alarms.
Sensors and safeties	Measure temperature/pressure and protect equipment; never bypass.

2.2 System Variations

A project may use a single or multiple compressor system, scroll or semi-hermetic compressor, air- or water-cooled condenser, thermostatic or electronic expansion valve, electric/off-cycle/hot-gas defrost, pump-down control, duty/standby operation, remote monitoring or BMS. Refer to the approved project schedule.



2.3 Basic Refrigeration Cycle

Stage	What happens	Typical condition
1. Compression	Cool low-pressure vapour is compressed.	Hot, high-pressure vapour.
2. Condensation	Ambient air removes heat; refrigerant changes to liquid.	Warm, high-pressure liquid.
3. Expansion	The expansion device reduces pressure and meters flow.	Cold, low-pressure liquid/ vapour mixture.
4. Evaporation	Refrigerant absorbs room heat and boils.	Low-pressure vapour returns to compressor.

Key Technical Terms

Term	Meaning
Setpoint	Target room/control temperature.
Differential	Temperature band between cut-in and cut-out.
Superheat	Suction-vapour temperature above saturation; confirms vapour quality and evaporator feed.
Subcooling	Liquid temperature below condensing saturation; helps confirm solid liquid supply.
Pump-down	Liquid solenoid closes; compressor runs until low-pressure control stops it.
Defrost	Scheduled frost removal from the evaporator coil.

Pressure, superheat, subcooling and refrigerant charge must be assessed with the correct refrigerant pressure-temperature data and manufacturer procedure by a qualified technician.

3. Operating Instructions

3.1 Pre-Start Inspection

Check	Acceptable condition
Room and product	Room empty/appropriately loaded; no obstruction, packaging or debris at evaporator.
Door	Closes freely; gasket seals; internal release and alarm tested.
Panels and floor	No open joints, damage, water pooling or ice hazard.
Condenser	Air path clear; coil visibly clean; no hot-air recirculation.
Evaporator	Fans/guards secure; drain clear; no excessive ice.
Pipework	Supported; no visible oil stain, damage or severe vibration.
Electrical	Panel closed; isolator accessible; supply/phase status healthy.
Controller	Correct room setpoint, clock and defrost schedule; no unresolved alarm.

3.2 Initial Start-Up / Commissioning

Initial start-up after installation, refrigerant work, prolonged shutdown or major repair must be completed and recorded by an authorised technician.

1. Confirm design data, refrigerant, electrical supply, protective settings and approved drawings.
2. Verify pressure testing, evacuation, refrigerant charge, oil level/type and leak testing records.
3. Check phase rotation, voltage balance, earth continuity, terminals, overloads, crankcase heater and control sequence.
4. Start the system and confirm fan rotation, pump-down/defrost sequence, pressure and temperature response.
5. Record suction/discharge pressures, superheat, subcooling, currents, room/product temperatures and ambient.
6. Demonstrate alarms, emergency stop/isolation and door safety release to the client.

3.3 Normal Start and Stop

- ◆ Start: close the door, ensure isolation switches are ON, enable the controller and observe one complete pull-down/cycle.
- ◆ Normal stop: use the controller or designated stop command; do not use the main isolator as a routine thermostat.
- ◆ Planned shutdown: remove/protect product, stop normally, isolate, clean and dry the room, and leave the door secured ajar if permitted.
- ◆ After power failure: allow the controller's anti-short-cycle delay to expire; inspect alarms and confirm temperatures recover.

3.4 Controls, Alarms and Setpoints

Function	Operator guidance
Room setpoint	Use the approved project value. Change only with facility authorisation and record the change.
Temperature differential	Technician/commissioning setting; excessive narrowing increases cycling.
Defrost schedule	Set for actual moisture load; do not add defrosts to hide a drainage, heater or airflow fault.
Fan operation	May run continuously or stop during refrigeration/defrost depending on design.
Alarm delay	Prevents nuisance alarms during door opening/defrost; must still protect product.
HP/LP protection	Protects the refrigeration circuit. Repeated trips require diagnosis, not repeated reset.
Motor overload / phase monitor	Protects motors against overcurrent, phase loss/reversal or voltage fault.
BMS/remote alarm	Supplementary indication only unless the approved control philosophy states otherwise.

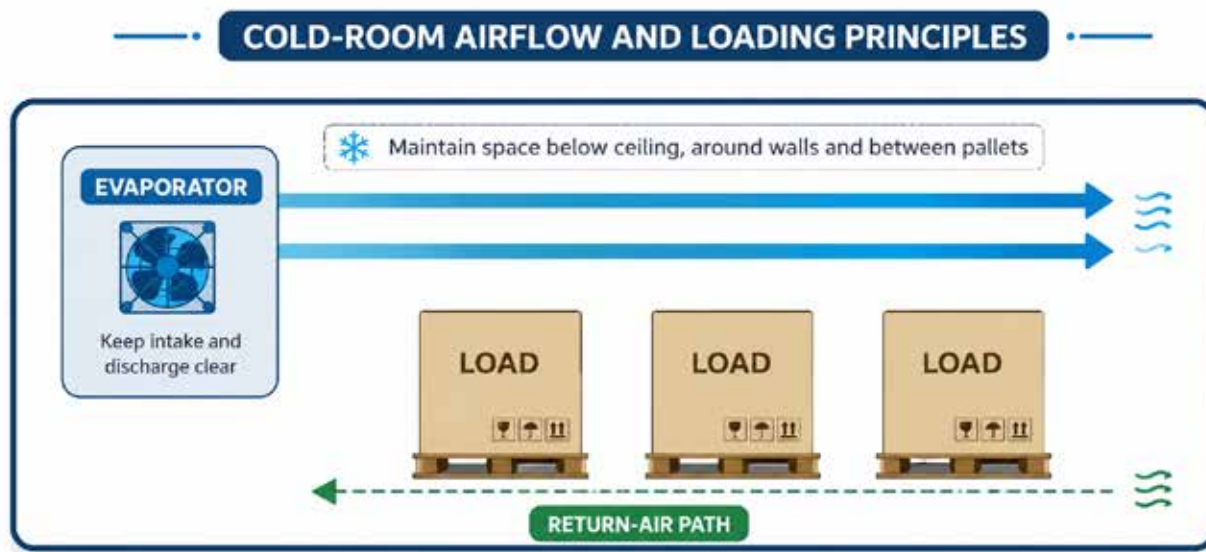
Never bypass, bridge, force or permanently reset a pressure switch, overload, phase monitor, door heater protection, temperature safety or emergency device.

3.5 Typical Temperature Guidance

Application	Common operating range*	Important note
Chilled room	Approx. 0 to +5 °C	Product and regulatory requirement governs.
Frozen storage	Approx. –18 to –25 °C	Do not use storage equipment for unapproved product freezing.
Blast freezing	Often –30 to –40 °C air	Cycle is based on product load/core-temperature target.
Ice storage	Project-specific, commonly below 0 °C	Depends on ice type, packaging and turnover.

*Indicative only. The approved project design and client food-safety/product specification govern.

4. Product Loading, Airflow and Hygiene



4.1 Loading Rules

- ◆ Pre-cool the room before loading unless the approved operating procedure states otherwise.
- ◆ Do not exceed the design product load, entry temperature, pull-down/freezing time or door-opening allowance.
- ◆ Keep evaporator intake and discharge paths clear; maintain project-specified wall, ceiling and pallet clearances.
- ◆ Use pallets/racking suitable for the room. Do not load directly against insulated panels or damage the floor.
- ◆ Minimise door-open time and use strip curtains/air curtains where provided.
- ◆ Record product core temperature when the process requires it; room air temperature alone does not prove product temperature.

4.2 Cleaning and Hygiene

Frequency	Task
Daily / as needed	Remove debris and spills; wipe door gasket; confirm floor/drain is not slippery or blocked.
Weekly	Clean accessible surfaces with approved food-safe chemicals; inspect mould, odour and damaged sealant.
Monthly	Inspect drain pan/outlet, door hardware, strip curtain and wall/floor junctions.
After contamination	Follow the client sanitation plan; protect electrical components and confirm room is dry before restart.

Do not pressure-wash electrical panels, controllers, fan motors, sensors, lights, door heaters or exposed cable entries. Avoid chlorine/caustic chemicals on aluminium/copper coils unless specifically approved.

4.3 Defrost and Condensate Management

Defrost type	General operation	Operator checks
Off-cycle	Refrigeration stops while fans/room heat melt frost; generally for above-freezing rooms.	Schedule, drain flow and coil cleanliness.
Electric	Compressor/fans stop; heaters warm coil and drain pan; drip time follows.	No persistent ice; heaters terminate; fans restart after delay.
Hot gas	Discharge gas is routed through evaporator under a dedicated sequence.	Only trained technicians adjust or service this system.

Signs of a Defrost Problem

- ◆ Ice blanket on the coil, fan guards or drain pan.
- ◆ Water refreezing on the floor or around the drain.
- ◆ Room temperature rises steadily while fans run.
- ◆ Defrost never ends, ends too early or occurs too frequently.
- ◆ Fans start while water remains on the coil, causing ice throw.

Safe Operator Response

1. Protect product and record room temperature, alarm, time and visible ice condition.
2. Check that the door is closed, drain outlet is not visibly blocked and airflow is unobstructed.
3. Use only the controller's authorised manual-defrost function if trained.
4. Do not chip ice with sharp tools or apply open flame, boiling water or unapproved heat.
5. If ice returns, arrange technician diagnosis of heaters, probes, fan delay, drain heat, infiltration and refrigerant performance.

5. Preventive Maintenance Programme

Intervals below are minimum general guidance. Increase frequency for dusty, greasy, corrosive, high-traffic or critical-temperature applications and follow component manufacturer requirements.

Interval	Operator tasks	Qualified technician tasks
Each shift / daily	Record temperatures/alarms; inspect door, ice, leaks, noise and airflow.	Respond to abnormal conditions.
Weekly	Clean gasket/handles; test internal release; inspect drains and floor.	—
Monthly	Inspect panels/sealant, lights, strip curtain and visible coil condition.	Review alarm history and operating trend.
Quarterly	Assist access and cleaning.	Clean coils; inspect fans, drains/heaters, terminals, contactors, pressures and leak indicators.
6-monthly	Review records and spare stock.	Check safety controls, sensors, superheat/subcooling, oil condition/level, crankcase heater and insulation.
Annually	Schedule shutdown and compliance review.	Full service, leak test, electrical test, calibration check, corrosion treatment and performance report.

5.1 Technician Service Checklist

- ◆ Compare operating data with commissioning baseline and equipment limits.
- ◆ Inspect for oil stains and leak-test with approved instruments; repair before recharging.
- ◆ Clean condenser/evaporator using an approved method; straighten fins carefully.
- ◆ Check fan motors, blades, guards, bearings, mountings and vibration.
- ◆ Inspect compressor oil, heaters, mounts, valves and discharge temperature.
- ◆ Check filter drier pressure/temperature indication, sight glass and refrigerant condition.
- ◆ Check drains, traps, fall, insulation, trace heaters and condensate disposal.
- ◆ Torque electrical terminals to manufacturer values; inspect contactors, overloads, fuses and cable entries.
- ◆ Verify sensors, controller clock, defrost termination, alarm outputs, HP/LP and phase protection.
- ◆ Issue a service report with readings, defects, corrective actions and recommended parts.

5.2 Inspection Limits and Good Practice

Item	Good practice / acceptance basis
Refrigerant	Use only nameplate-approved refrigerant and compatible oil; do not mix refrigerants.
Charge adjustment	Determine by approved procedure using charge mass, sight-glass context, superheat/subcooling and conditions.
Pressure testing	Use dry oxygen-free nitrogen with regulator; never use oxygen or compressed air.
Evacuation	Use calibrated micron gauge and standing vacuum test after repairs.
Brazing	Recover refrigerant, purge with low-flow nitrogen and protect valves/components from heat.
Leak repair	Locate and repair leak; do not repeatedly top up without repair.
Electrical readings	Compare voltage/current/phase balance with nameplate and commissioning values.
Coil cleaning	Isolate; protect electrics; use manufacturer-approved chemicals and rinse/dry as required.
Insulation	Maintain vapour-tight joints; replace wet/damaged pipe insulation.
Recordkeeping	Log before/after readings, refrigerant recovered/added and component changes.

Environmental and Regulatory Care

- ◆ Recover refrigerant into approved cylinders; intentional venting is prohibited where regulated and is not accepted Snowland practice.
- ◆ Use trained/licensed personnel and maintain refrigerant movement and leak records required by local authorities.
- ◆ Dispose of oil, filters, chemicals, electrical parts and insulation through approved waste channels.
- ◆ Select replacement refrigerant/components only through an engineering review; never retrofit by label change alone.

6. Troubleshooting — Operator-Level

First protect people and product. Record the exact alarm, time, room/product temperature, ambient conditions, door status and recent work. Operator checks below do not authorise opening panels or refrigerant work.

Symptom	Likely causes	Safe checks / action
Room too warm	Door open/leaking; excess/warm load; blocked airflow; iced coil; unit fault.	Close door; correct loading; inspect ice/airflow; record alarm; call service if temperature does not recover.
Compressor does not run	No demand; defrost/delay; power/phase fault; safety trip; control fault.	Check controller state and site supply indicators. Do not open panel or bypass safety.
Short cycling	Setpoint/differential; pressure trip; low charge; airflow; oversized unit.	Record cycle times and alarms; keep coils/air paths clear; request technician.
High-pressure alarm	Dirty/blocked condenser; failed fan; hot-air recirculation; overcharge/non-condensables.	Stop repeated reset; clear external obstruction only if safe; call technician.
Low-pressure alarm	Low load/airflow; iced coil; low refrigerant; restriction; solenoid/expansion fault.	Check doors, load, coil ice and defrost status; call technician.
Evaporator iced	Door infiltration; defrost/heater/probe/drain fault; low airflow; refrigerant fault.	Protect product; initiate authorised defrost once; call if ice returns.
Water/ice on floor	Blocked/frozen drain; failed drain heater; poor floor fall; door infiltration.	Cordon slip area; remove surface water safely; call technician.
Fan stopped/noisy	Defrost/fan delay; ice obstruction; motor/capacitor; loose blade/guard.	Keep clear; stop if contact/severe vibration; call technician.
Door condensation/ice	Gasket leak; heater fault; long openings; high humidity; misalignment.	Close/inspect/clean gasket; limit openings; call technician if heater/seal fault.
High energy use	Dirty coils; door leakage; excessive load; wrong settings; refrigerant/mechanical fault.	Review logs, door use and load; arrange performance service.

6.1 Troubleshooting — Technician-Level

Condition	Diagnostic checks	Corrective direction
High discharge pressure	Condenser airflow/fans; ambient/recirculation; coil fouling; charge; non-condensables; service valves.	Restore airflow; clean/repair fan; verify charge and evacuate correctly if contaminated.
Low suction / high superheat	Load/airflow; frost; liquid-line restriction; drier; solenoid; TXV/EEV; charge.	Correct airflow/defrost; clear restriction; repair leak; set/replace metering device per data.
Low superheat / floodback	Sensor mounting; airflow/load; expansion valve; defrost/fan sequence; refrigerant migration.	Correct sensor/airflow/valve; verify accumulator/crankcase heat; protect compressor.
High discharge temperature	High compression ratio; low charge; high superheat; poor cooling; oil/refrigerant mismatch.	Correct root cause; verify motor/valves/oil and operating envelope.
Compressor overload trip	Voltage/phase imbalance; high pressure; locked rotor; rapid cycling; overload setting.	Correct supply/pressure/cycling; test motor and protection; replace only after root-cause review.
Oil loss / foaming	Migration/floodback; piping velocity/traps; repeated short cycling; leak.	Protect compressor; correct piping/control/load; restore correct oil only after diagnosis.
Sight-glass bubbles	Low charge, flash gas from pressure drop, high load or receiver condition.	Do not charge by bubbles alone; assess subcooling, drier drop and system design.
Repeated drier restriction	Moisture, contamination or burnout residue.	Recover, clean circuit as required, replace drier, evacuate and confirm acid/moisture condition.
Sensor/controller error	Wiring/open-short; location; calibration; configuration; EMI.	Repair wiring, mount correctly, replace/commission with backed-up parameters.
BMS communication loss	Power, address, baud/protocol, polarity/shielding, gateway/network.	Restore local control first; verify approved communication schedule and mapping.

Do not condemn a compressor until supply, safeties, refrigerant circuit, oil return and system application have been checked. Replacing a compressor without correcting the cause can produce repeat failure.

6.2 Emergency Response

Event	Response
Refrigerant release	Do not enter a suspected oxygen-deficient area. Evacuate, isolate ignition sources if applicable, call emergency/site response and a certified refrigeration technician. Use the refrigerant SDS.
Fire / smoke / arcing	Raise alarm, call emergency response, isolate power only from a safe location and use only the correct extinguisher if trained.
Severe mechanical noise or vibration	Stop the system safely, keep clear of equipment and arrange inspection before restart.
Flooding / water ingress	Keep personnel away from electrical equipment, isolate upstream safely and have equipment tested before energisation.
Person trapped / cold stress	Use internal release/alarm, summon assistance, provide first aid and follow site emergency procedure.
Product-temperature excursion	Quarantine/identify affected product and follow the client's HACCP, quality or product disposition procedure.

Information to Give Service Personnel

- ◆ Site, room ID, application and design setpoint.
- ◆ Controller alarm text/code and time of occurrence.
- ◆ Current room/product and ambient temperatures.
- ◆ Which fans/compressor are running and any visible ice, oil or water.
- ◆ Recent power failure, loading, cleaning, setting change or maintenance.
- ◆ Equipment model/serial numbers and clear photographs where safe.

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Confirm current project emergency/service contacts at handover.

7. Do and Do Not

DO	DO NOT
Keep accurate temperature, alarm and maintenance records.	Do not bypass electrical, pressure, temperature or door-safety devices.
Keep doors closed and gaskets clean; test internal release.	Do not lock or obstruct a room that could contain a person.
Maintain clear airflow at condenser and evaporator.	Do not stack product against panels or block fans.
Use approved setpoints and authorised defrost functions.	Do not change hidden controller or protection parameters without approval.
Call a technician for repeat alarms, leaks, icing or abnormal noise.	Do not repeatedly reset trips or continue running damaged equipment.
Use correct PPE, LOTO and qualified personnel.	Do not open live panels or work on pressurised refrigerant without competence.
Use approved cleaners and protect electrical equipment.	Do not pressure-wash controls, motors, sensors or heaters.
Recover refrigerant and document all service work.	Do not vent refrigerant, mix refrigerants or use oxygen for pressure testing.
Use genuine/equivalent approved parts with matching ratings.	Do not fit an incorrect motor, heater, valve, oil, refrigerant or protection device.
Protect product during maintenance and verify recovery.	Do not assume room-air temperature alone proves product safety.

8. Recommended Spare Parts

Final quantities and part numbers must be prepared from the approved equipment schedule and BOM. The following is a general stocking guide for one system; increase quantities for remote sites, multiple identical rooms or critical product.

Priority	Recommended item	Typical stock	Selection / storage note
A	Temperature controller / PLC-HMI backup	1 per common type	Same hardware, firmware and backed-up parameters.
A	Room/coil temperature probes	2 each type	Correct range, cable and ingress rating.
A	Contactor, overload, phase monitor, control relay	1 each rating/type	Match coil voltage, poles and protection range.
A	Fuses / MCB auxiliaries / indicator lamps	1 set	Exact rating and breaking capacity.
A	Condenser and evaporator fan motor	1 each common type	Voltage, phase, speed, IP class, direction and blade match.
A	Solenoid coil and valve service kit	1 each size	Correct voltage, refrigerant, MOPD and connection.
A	Filter drier and sight glass	2 driers / 1 glass	Correct refrigerant, capacity, connection and pressure rating.
A	Expansion valve / orifice or EEV service unit	1 each type	Refrigerant, capacity, MOP and nozzle/orifice match.
A	HP/LP switch or pressure transducer	1 each type	Correct range, reset mode and approved setpoint.
A	Defrost heater / drain heater / termination probe	1 each type	Voltage, wattage, shape, sheath and sensor match.
A	Door gasket, heater cable and internal release parts	1 set per door type	Store flat/dry; match door dimensions and voltage.
B	Crankcase heater and compressor protection module	1 each type	Exact compressor-approved part.
B	Fan blade/guard, vibration mounts and eliminator	1 each common type	Match dimensions, rotation and pressure rating.
B	Compressor oil	One sealed service quantity	Only approved type/viscosity; keep sealed and dry.
B	Approved refrigerant	Per legal/site policy	Correct product, sealed cylinder, labelled and securely stored.
C	Compressor	Risk-based	Recommended for remote/critical sites only; exact model and accessories.
C	PLC, EEV driver or communication gateway	Risk-based	Keep configuration backup and version record.

8.1 Consumables, Tools and Storage

Category	General items
Service consumables	Approved refrigerant oil; dry nitrogen; brazing alloy; insulation; UV-resistant tape; approved sealant; drain cleaner; electrical terminals; labels.
Test equipment	Calibrated thermometer, clamp meter, insulation tester, manifold/digital gauges, refrigerant scale, vacuum pump, micron gauge, electronic leak detector.
Recovery equipment	Approved recovery unit, clean compatible cylinders, hoses and weighing scale.
Cleaning equipment	Soft brush, fin comb, low-pressure air/water method where approved, coil-compatible cleaner, wet vacuum.
Safety equipment	LOTO kit, eye/hand protection, cold-weather PPE, refrigerant-specific PPE, access equipment and gas detection where required.

Spare-Part Control

- ◆ Identify each part by system/room, manufacturer part number, rating and photograph where useful.
- ◆ Store electrical and electronic parts dry, clean and protected from electrostatic damage.
- ◆ Keep refrigerant cylinders upright, secured, labelled and segregated under site/legal requirements.
- ◆ Keep compressor oil sealed; moisture-contaminated oil must not be used.
- ◆ Use first-in/first-out stock rotation and review shelf life, corrosion and packaging every six months.
- ◆ Record every issue and reorder at the defined minimum stock level.

Information Required When Ordering

Equipment	Minimum information
Compressor	Make, full model, serial no., refrigerant, voltage/phase/frequency, oil, application.
Fan motor	Make/model, voltage/phase, watts/current, rpm, IP class, shaft/blade dimensions and rotation.
Expansion valve	Make/model, refrigerant, capacity, temperature range, equalisation, MOP and orifice.
Controller/probe	Make/model, supply, firmware/parameters, probe type/range and cable length.
Heater	Location, voltage, wattage, dimensions, sheath/material and termination.
Door part	Clear opening, panel thickness, hinge orientation, ambient/room temperature and photograph.

9. Operating Record — Daily / Shift Log

Project / site		Room ID	

Date / time	Room temp.	Product temp.*	Setpoint	Door / ice / noise / leak check	Alarm / action / initials

*Where required by the client's product/HACCP procedure. Investigate readings outside approved limits immediately.

Operator Weekly Check

Check	OK	Defect / action
Door closes, gasket seals, internal release/alarm works	☐	
Evaporator and guards free of excessive ice	☐	
Floor and drain clean; no water/ice hazard	☐	
Condenser air path clear	☐	
No abnormal noise, vibration, oil stain or damaged insulation	☐	
Panel joints, lights and strip curtains satisfactory	☐	

10. Technician Service Record

Field	Reading / result	Field	Reading / result
Date / technician		Ambient temp.	
Room / product temp.		Setpoint / differential	
Refrigerant		Charge added/recovered	
Suction pressure/temp.		Superheat	
Discharge pressure/temp.		Subcooling	
Compressor current(s)		Supply / phase balance	
Oil level/condition		Leak-test result	
Defrost / heater current		Drain / fan delay	
HP / LP / overload test		Controller / probe check	

Work Performed / Parts Used

Description	Part no. / quantity	Result

Outstanding Defects and Recommendation

Priority	Defect / risk	Recommended action / target date

Technician signature		Client representative	

11. Alarm and Fault Log

Date / time	Room	Alarm / symptom	Conditions and readings	Immediate action	Root cause / final repair

Recommended Escalation Priority

Priority	Definition	Example
Emergency	Immediate risk to life, fire, major release or unsafe electrical condition.	Evacuate / emergency response.
Critical	Product at risk or equipment damage likely if operation continues.	Severe noise, repeated trip, rapid temperature rise.
Urgent	Performance degraded but temporarily stable.	Recurring ice, one fan failed in multi-fan coil.
Planned	No immediate operational impact; schedule corrective work.	Damaged label, early corrosion, non-critical sealant defect.

12. Handover, Warranty and Service

12.1 Handover Documents

Document / item	Received / location
Approved technical submittal and equipment schedule	
As-built layout, piping and electrical/control drawings	
Equipment datasheets and manufacturer manuals	
Commissioning sheets and baseline readings	
Pressure test, vacuum, leak and refrigerant-charge records	
Controller parameter backup and alarm list	
Warranty certificate and exclusions	
Spare-parts list with exact part numbers	
Training attendance and emergency contact list	

12.2 Warranty and Modifications

The project quotation, contract and warranty certificate define the applicable warranty period, coverage and exclusions. Routine cleaning, consumables, misuse, unauthorised modification, unstable power, blocked airflow, improper loading and third-party damage are commonly outside standard equipment warranty unless the contract states otherwise.

No control logic, refrigerant, compressor, expansion device, safety setting, pipework or room-envelope modification may be made without engineering review and written approval. Record all approved modifications in the as-built documents.

12.3 Service Request Checklist

- ◆ Project/site and room identification.
- ◆ Equipment make, model and serial number.
- ◆ Exact alarm and current temperature.
- ◆ Time fault began and whether it is continuous/intermittent.
- ◆ Photographs/video only where safe.
- ◆ Site access, permit, induction and working-hour requirements.

13. Glossary and Final Notes

Abbreviation / term	Meaning
BMS	Building Management System.
CDU	Condensing unit.
DX	Direct expansion refrigeration.
EEV / TXV	Electronic / thermostatic expansion valve.
HP / LP	High-pressure / low-pressure control or alarm.
HACCP	Hazard Analysis and Critical Control Points.
LOTO	Lock-out / tag-out.
MOPD	Maximum operating pressure differential for a valve.
PPE	Personal protective equipment.
SDS	Safety Data Sheet.
Setpoint / differential	Target value / switching band around that value.
Superheat / subcooling	Temperature margins used to assess vapour and liquid refrigerant condition.

Final Operating Principles

1. Safety and product protection come before equipment operation.
2. Clean airflow, closed doors and correct loading are essential to performance.
3. A trip or alarm is information: record and diagnose it; do not bypass it.
4. Trend readings against the commissioning baseline instead of relying on one measurement.
5. Use approved parts, refrigerant, oil, settings and qualified personnel.
6. Maintain complete records so faults can be found early and warranty/service decisions are supported.

This manual does not replace equipment-specific instructions. Insert approved project annexures behind this section: controller guide, wiring diagram, component datasheets, approved setpoints, commissioning record and exact spare-parts BOM.



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