BC NPHA

Operator Training Manual

Through Wall Heat Pumps

source: https://www.waysos.com/-air-source-through-wall-heat-pumps

How To Use This Guide

This guide is designed to make sure that when your through wall heat pump (TWHP) installation is complete, you have all the information you need to operate and maintain it effectively and confidently.

It includes references and checklists you can use directly, as well as items you should request from your contractor before the project is finished. The checklist below shows everything covered in this guide:

- ☑ Items already included here
- ☐ Items you'll need to ask your contractor for

Contents

	Item	Notes/Description	Status
1. Equipment Overview			
1.1	Description	A brief explanation of how the system works	☑
1.2	Labeled Diagram	A labeled diagram of the system and its primary components *A general diagram is provided here; ask your contractor for a model-specific version.*	☐
1.3	How It Works	A high-level overview of system operation *General overview has been provided, but model specific details should be provided by the contractor during your training session or handoff process.*	☐
1.4	Key Benefits and Limitations	Key benefits and limitations of the system	☑
1.5	System Operation	A summary of operating limits, recommended setpoints, backup heating considerations *These should be provided to occupants to improve efficiency and ensure comfort.*	☑
2. Commissioning and Project Handoff			
2.1	Equipment Spec Sheets	Equipment specification sheets (spec sheets) or manuals for each piece of equipment – Including make, model and serial number	☐
2.1	Equipment O&M Manuals	These provide details on how to operate and maintain the equipment	☐
2.2	Key Contacts List	A list of all key people to contact for questions, issues, warranty etc.	☐
2.3	Warranty Details	Warranty terms and expiry date	☐
2.4	Commissioning Report	The completed record showing the results of commissioning tests. It provides proof that the systems work.	☐
2.5	Training Session	This is not always done as part of a project handoff and likely needs to be requested. *A sample training agenda is provided for reference.*	☐
2.6	Simplified User Guide	Simplified version of the information found in the equipment manuals *This is not standard and will need to be specifically requested. It can be an output of the training session.*	☐
2.7	Maintenance Requirements	This consists of a maintenance schedule and a troubleshooting guide *General examples for both documents have been provided, but the contractor should provide model specific details in the handoff documentation.*	☐
-	Digital Copies	Digital copies (USB / shared folder) of all above	☐

1. Equipment Overview

1.1. Description

A through-wall heat pump (TWHP) — also called a packaged terminal heat pump (PTHP), compact heat pump, or all-in-one model — is a self-contained unit where all components are housed in a single box that installs directly into a wall. It looks much like a packaged terminal air conditioner (PTAC), often seen in hotels and apartments. The key difference is that a PTAC provides cooling and uses electric resistance for heating, which is less efficient and more costly to operate. A TWHP instead uses a heat pump cycle for both heating and cooling, making it more energy-efficient in moderate climates, though it may rely on backup electric heat in very cold weather.

The table below highlights the key differences between a PTAC, PTHP or TWHP and a split heat pump.

System Type	Heating Method	Cooling Method	Efficiency	Indoor Noise Level
PTAC (Packaged Terminal Air Conditioner)	Electric resistance	Air Conditioning Unit	Lowest efficiency	Moderate
PTHP / TWHP (Through-Wall Heat Pump)	Heat pump cycle and backup electric heat in cold weather	Heat Pump	Lower efficiency	Moderate
Split Heat Pump	Heat pump cycle	Heat Pump	Highest efficiency	Quieter inside (louder outside)

1.2. Labeled Diagram

The first picture shows a through-wall heat pump (TWHP) unit installed on a perimeter wall. The unit is mounted indoors, while openings are drilled through the exterior wall to allow for the air inlet, air outlet, and condensate. The second diagram provides a labeled view of the unit from both the front and back.

source https://www.literature.mestek.com/dms/DesignLine/Roommate%20Brochure%20RMM-4.pdf

Glossary of Terms

Coefficient of Performance (COP) - A measure of efficiency for heat pumps. A COP of 2.0 means the system produces two units of heat for every one unit of electricity used.

Cold Climate Heat Pump (ccASHP) – A specially designed heat pump that maintains high efficiency and heating capacity in very cold outdoor temperatures (down to about –20 °C or lower).

Defrost Cycle – A short process where the heat pump melts frost from the outdoor unit in cold, damp weather. Heating pauses briefly, and overall efficiency drops slightly during this time.

Refrigerant – The fluid that moves heat between the indoor and outdoor units. It absorbs heat from cold air outside and releases it inside (or the reverse in cooling mode).

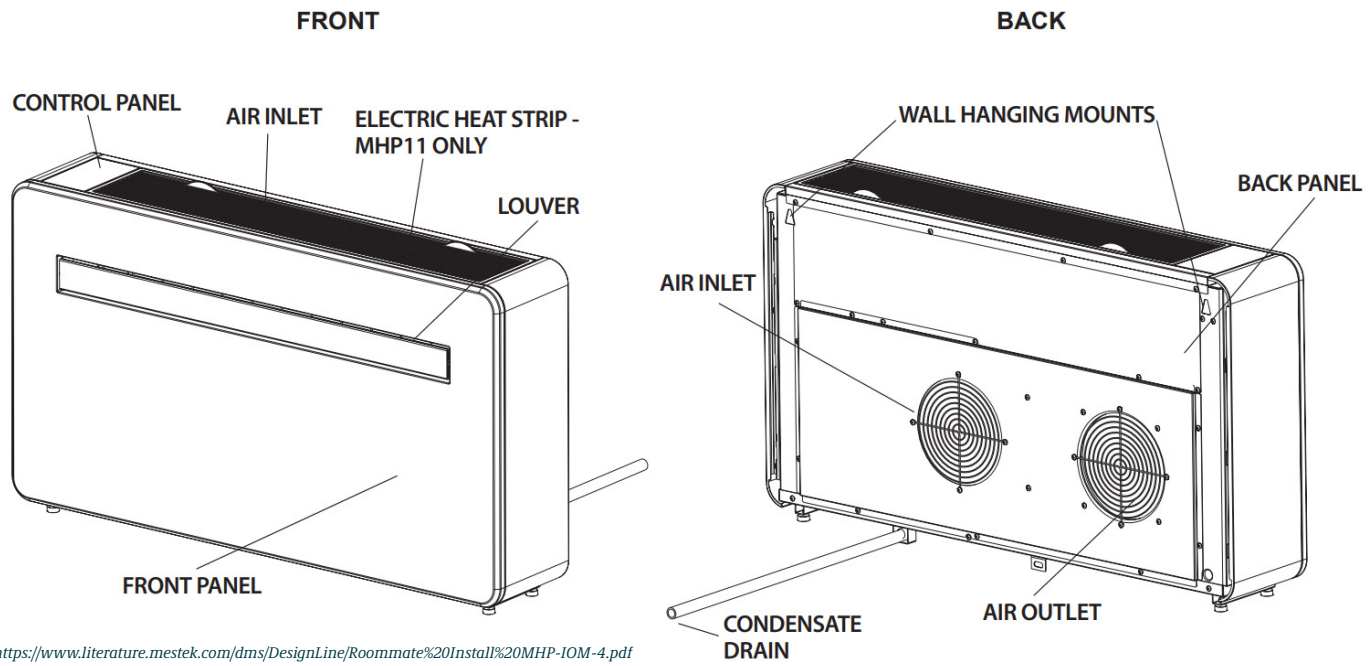
Setpoint – The temperature you choose on the thermostat or remote control for heating or cooling.

Switchover Temperature – The outdoor temperature at which it becomes more efficient to use a backup heating system instead of the heat pump.

Through Wall Heat Pump (TWHP) – A self-contained heating and cooling system that slides into a wall sleeve and includes all major components in one unit Also known as a Packaged Terminal Heat Pump (PTHP).

Packaged Terminal Air Conditioner (PTAC)- Similar in appearance to a TWHP/PTHP but provides cooling only and relies on electric resistance heating instead of a heat pump cycle.

Zone – An area or room in the building controlled by its own indoor unit, allowing different spaces to have different temperature settings.



source: https://www.literature.mestek.com/dms/DesignLine/Roommate%20Install%20MHP-IOM-4.pdf

1.3. How It Works

A through-wall heat pump is a self-contained unit that sits directly on a perimeter wall, with half the system facing indoors and half outdoors. It has the same basic heat pump cycle as a split system, but all the components—compressor, coils, and fans—are packaged together in one box.

- In heating mode, the unit pulls heat from the outside air and transfers it inside through the refrigerant cycle.
- In cooling mode, it removes heat from the indoor air and pushes it outdoors.
- Conditioned air is blown directly into the room, while moisture from the cooling process is carried outside through a condensate drain.

But wait, how does it MOVE heat?

The heat pump uses a refrigerant that stays colder than the outside air, even in winter. Because heat always flows from warmer to colder, the refrigerant absorbs that heat. The system then compresses the refrigerant, making it very hot (hotter than the inside temperature), so then the heat flows naturally into the space.

It's not creating heat — it's just moving and concentrating the heat that's already in the air. Think of it like a sponge soaking up even small amounts of water and squeezing them out somewhere else. That's why a heat pump can still work in sub-zero temperatures: there's always at least a little heat in the air to capture.

1.3.1. Performance Rating Metrics

Unit	Use	What It Means
Coefficient of Performance (COP)	Heating	Instant measure of heat output per unit of electricity. (COP 3 = 3 units of heat out for every 1 unit of electricity in) *Most used metric for TWHPs in heating.*
Efficiency (%)	Heating	COP shown as a percentage (COP 3 = 300%).
Heating Seasonal Performance Factor (HSPF)	Heating	Average heating efficiency over an entire heating season. *TWHPs can be rated with HSPF, though manufacturers sometimes emphasize COP more.*
Energy Efficiency Ratio (EER)	Cooling	Cooling efficiency at one fixed condition (like a snapshot test). It measures the full load under high temperature conditions. *Most used metric for TWHPs in cooling.*
Seasonal Energy Efficiency Ratio (SEER)	Cooling	Measures the average cooling efficiency over an entire season. SEER tends to be higher than EER because it includes part load operation (which is more efficient). *Not commonly used for TWHPs, since they only serve a single room; a fixed-condition rating like EER is typically provided.*

1.4. Key Benefits and Limitations

1.4.1. Benefits

- **Energy Efficient:** Like split systems, TWHPs move heat rather than generating it, making them more efficient than electric resistance heating (up to 300%).
- **Compact and Self-Contained:** All components are housed in one unit that mounts directly through an exterior wall. No refrigerant piping, separate outdoor unit, or large exterior footprint is required – making them easier to install and practical where outdoor space is unavailable or aesthetics are a concern.
- **Zoned Comfort:** Each unit operates independently, allowing room-by-room temperature control for greater flexibility in multi-unit buildings such as hotels or apartments.
- **Year-Round Use:** One system provides both heating and cooling. They rely on electric resistance back-up for extreme cold temperatures.

1.4.2. Limitations

- **Lower Efficiency vs. Splits:** While more efficient than electric resistance heating, TWHPs are generally less efficient than split systems because of their compact, all-in-one design and smaller coil surfaces.
- **Noise Levels:** With the compressor and fans located in the same cabinet as the indoor unit, TWHPs can produce more noticeable indoor noise compared to split systems.
- **Limited Capacity:** Because of their compact design, TWHPs have lower heating and cooling capacity and are not intended for whole-building applications. Typically, one TWHP is required for each room or space.

1.5. System Operation

1.5.1. Operating Range and Back-Up Heating

Older TWHPs were designed mainly for mild to moderate climates. Once outdoor temperatures dropped below about –5 °C (23 °F), their efficiency declined sharply, and they typically switched to electric resistance back-up heat.

Newer models, however, are engineered for colder climates, with the ability to operate down to –15 °C (5 °F) and in some cases as low as –20 °C (–4 °F). Even at these conditions, they can maintain a coefficient of performance (COP) of around 1.75–1.9, delivering significantly more heat than the electricity they consume.

In Vancouver's mild coastal climate, outdoor temperatures rarely drop below these limits, so TWHPs can typically heat efficiently year-round without needing backup heat.

However, as outdoor temperatures fall, the heating capacity of the system decreases. In more extreme climates, if the heat pump cannot maintain comfortable indoor temperatures, it may be necessary to enable supplemental heating (such as electric baseboards or a gas furnace) if it is available.

In most modern split and through wall heat pumps, if outdoor temperatures drop below the compressor's operating limit, the unit will automatically disable the compressor and switch to electric resistance heating only. This allows the system to continue providing heat, although it will operate at lower efficiency and use more electricity during these periods.

1.5.2. Defrost Cycle

In damp, cold conditions, frost can build up on the outdoor-facing coil of a heat pump. When that happens, the unit can't breathe properly, and efficiency drops. To solve this, the heat pump occasionally goes into a **defrost cycle**, where it briefly runs in reverse to warm the outdoor coil and melt the frost.

- While defrosting, the indoor unit may pause heating for a few minutes, and the backup electric resistance heater may switch on to maintain indoor comfort.
- Defrosting is normal, but because it uses power without heating your space, it slightly lowers the overall efficiency of the system in colder weather.
- Published efficiency metrics on specification sheets typically **do not account for defrost operation**, so actual seasonal performance may be lower than rated values.

1.5.3. Recommended Indoor Temperature Setpoints

To balance comfort and efficiency, we recommend the following indoor thermostat settings for buildings in the Vancouver area:

- **Heating:** 19–21 °C (66–70 °F)
- **Cooling:** 22–24 °C (72–75 °F)

2. Commissioning and Project Handoff

2.1. Spec Sheets and Manuals

Your contractor should provide a spec sheet and manual for each piece of equipment that's installed. Because manuals often cover several different models, make sure you know the exact make and model of your unit. You can usually find this in the commissioning reports.

While these manuals are helpful, they're often long and hard to follow. That's why it's a good idea to also ask your contractor for a training session and a simplified user guide. These guides are shorter and can be helpful to understand how to operate and take care of your system day-to-day, see section 2.6- Simplified User Guides for examples.

2.2. Key Contact List

Contact Type	Contact When?	Company / Name	Phone / Email
Heat Pump Manufacturer	For warranty questions or if you need information about the equipment **Warranty end date: mmddyyyy** **Unit warranty must be registered with the manufacturer*		
Controller or Thermostat Manufacturer	For warranty questions or if you need information about the equipment.		
General Contractor (Installer)	For any questions about the system or if something isn't working within the warranty period (Typically one year after install).		
Service Contractor (If different)	For repairs or issues that come up more after the warranty period.		

2.3. Warranty Details

Make sure you know when warranty expires as well as how to reach the manufacturer if you need to submit a warranty claim.

2.4. Commissioning Report

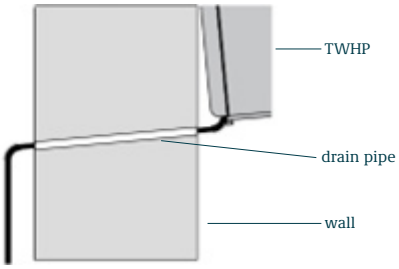
2.4.1. Overview

When a new TWHP is installed, the contractor follows a process to make sure everything is set up and working the way it should. This process involves two key parts:

- **Commissioning Checklist:** A step-by-step list the contractor uses to confirm the system is installed correctly and operating as intended.
- **Commissioning Report:** The completed record showing the results of those checks and tests. It confirms the system works properly, provides key details like model and serial numbers, and documents that the owner/operator has been shown how to use and maintain the system.

While only the **commissioning report** will be provided to you at the end of the project, we've included examples of both the checklist and the report so you can understand the process. If the contractor does not have a clear commissioning checklist, or if the report is unclear, this reference can help you know what types of checks they should be performing and documenting.

2.4.2. Commissioning Checklist Example

Section	What To Check	Why It Matters
Before Start Up		
Install Details	• Ensure the unit is mounted securely, level, and flush to the wall sleeve. • Check that the wall sleeve is properly sealed to prevent drafts and water intrusion. • Inlet and outlet holes drilled with proper angle, aligned with template, sealed airtight. • Confirm correct voltage supply and breaker size per nameplate. Ensure a dedicated circuit is used. • Ensure power cord or hardwire connection is properly secured and protected.	Ensures safe operation, prevents air and water leaks, and maintains correct airflow for efficiency and comfort.
Condensate	• Drain hole angled downward (see below), frost protection (heat trace or insulated pipe) as required, no kinks/restrictions.  *source: https://www.literature.mestek.com/dms/DesignLine/Roommate%20Install%20MHP-IOM-4.pdf*	Prevents water leaks, condensation damage, and ensures reliable drainage even in freezing conditions.
When The System Is Turned On		
Controller	• Ensure system powers up and responds to the remote or wall control, and that the remote, wall panel, or app works as expected. • Ensure temperature can be adjusted and that both heating and cooling modes work. • Review safety indicators and error messages.	Confirms unit is working, and that controller setup works and occupants will be able to manage their space temperature.
Noise Levels	• Check outdoor unit noise level – does it meet requirements (typically 55 dB daytime, 45 dB nighttime).	Confirms proper operation without excessive noise.

2.4.3. Commissioning Report Example

2.4.3.1. System Information

- **Manufacturer / Model:** DesignLine “Roommate” MHP Series (TWHP/PTHP)
- **Serial Numbers:** Indoor: 123456789
- **Capacity:** 12,000 BTU
- **Refrigerant:** R32

2.4.3.2. Key Checks

Item	Status
Unit level, secured in wall sleeve, clear of obstructions	☐
Sleeve and wall penetrations properly sealed to prevent air/water infiltration	☐
Electrical connections correct and tight	☐
Condensate drain clear, tested for flow, sloped downwards	☐
Condensate connected to internal drain or heat traced	☐
Remote control/thermostat working	☐

2.4.3.3. Functional Tests

Test	Status
Power ON – no errors	☐
Heating and cooling modes working	☐
Indoor airflow steady at all fan speeds	☐
Noise levels acceptable	☐
Condensate draining properly, no leaks	☐

2.5. Training Session

As part of handoff, ask your contractor(s) to conduct a formal training session for facilities, maintenance staff and tenants (if possible). This has proven to be the best way to make sure everyone understands the system.

A sample agenda for a training session is laid out below. Consider recording the training for future reference or for new staff.

- System overview and walkthrough
  - Labeled diagrams should be presented here
- Controls and operation
  - Explain how the unit works, how to control it – live demo
- Maintenance schedule and requirements
  - Provide details on maintenance requirements
- Documentation review, including manuals and warranty information
  - Make it clear where to find all the information
- Operational quirks and seasonal tips
- Training session deliverables
  - Simplified user guides (see section 2.6 Simplified User Guides)
  - Simplified maintenance guides

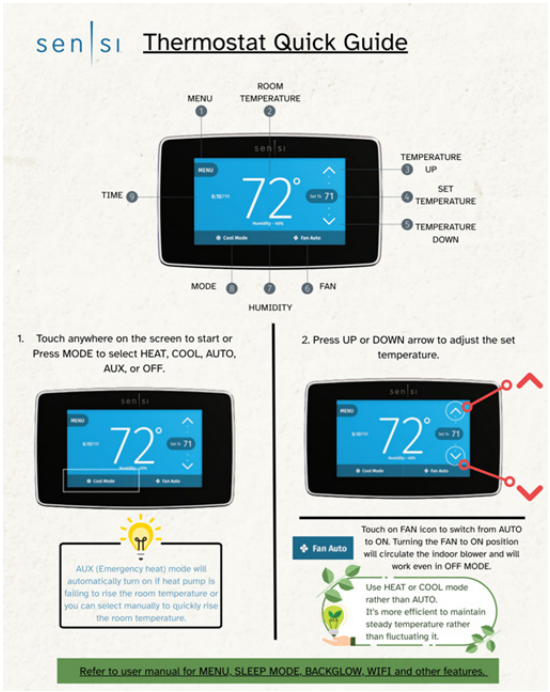
2.6. Simplified User Guides

Most equipment comes with an installation or user manual, but these can be difficult to follow. A good practice is to ask your contractor for a simplified operator or user guide during the training session or handoff.

Simplified guides are handy as quick references — they can be posted on the wall or shared with occupants once the project is complete.

Some example guides developed for previous Non-Profit Resilient Retrofit Grant (NRRG) program participants are presented below.

2.6.1. Remote and Thermostat User Guide (Examples)



2.7. Maintenance Requirements

The operation and maintenance information for your system is usually included in the equipment manual and should also be covered during your training session and project handoff. Be sure to review this information carefully and confirm that clear instructions are provided – either in the documents you receive, during training, or ideally in both places. This will help you feel confident in operating and maintaining your equipment. You'll want to make sure that both a maintenance schedule and a troubleshooting guide are provided.

2.7.1. Maintenance Schedule

The maintenance schedule should outline the types of checks and service tasks needed to keep your equipment running efficiently. This usually includes:

- **Filter cleaning/replacement** – how often this should be done (e.g., monthly or quarterly).
- **System inspections** – such as checking controls.
- **Part replacements** – when to replace key components like sensors, or batteries.
- **Seasonal checks** – ensuring the system is ready before peak heating or cooling seasons.

A general example as well as an example of what was provided for a specific project can be found below.

2.7.1.1. General Maintenance Schedule

Frequency	Task	Responsible
Monthly	• Ensure nothing is in front of the indoor unit that could block airflow (plants, furniture etc.). • Check for unusual noise or vibration. • Verify occupants can operate the system (remote batteries OK, thermostat working).	On Site Staff
Quarterly / Seasonally	• Clear inlets and outlets. • Check condensate lines. • Clean grill. • Make sure the unit is still sitting level.	On Site Staff
Annually	• Check thermostats or remotes. • Inspect and secure unit mounting. • Verify condensate drain is free from build-up.	Licensed HVAC Contractor
As Needed	• Replace damaged remote controls or batteries. • Reset system after power outages if required. • Record and respond to any error codes on indoor units. • Respond to occupant comfort complaints quickly to catch small issues before they grow.	On Site Staff (basic resets) / Licensed HVAC contractor (repairs)

2.7.1.2. General Maintenance Schedule

This maintenance guide example comes from the Roommate Through Wall Heat Pump Model MHP Installation, Operation and Maintenance Manual.

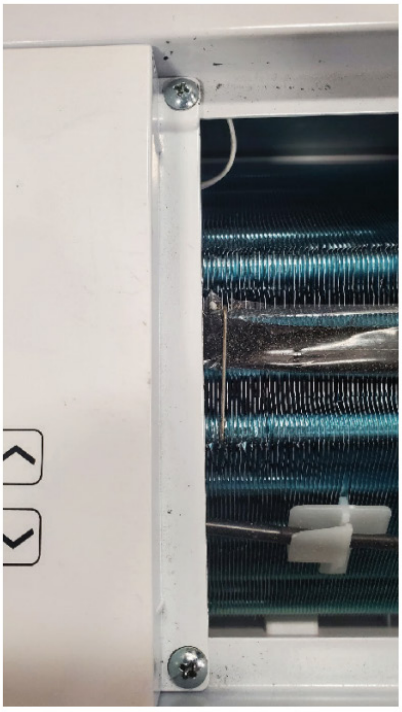
Servicing

To access the main control board (PCB) and wiring compartment please follow the steps below.

⚠CAUTION All troubleshooting and diagnosing should be done by a qualified professional service technician or installer. If any doubt, please contact Designline tech support. The below steps should be conducted with the power removed from the unit to ensure the safety of the technician from electrical hazards.

1. Remove top filter and set aside to keep safe.

2. Remove 2 screw located to the right of the main control panel. Set aside to keep safe.



3. Gently remove the main control touch panel exposing the underlayment. Gently slide the underlayment away, take care not to disconnect any wiring harnesses, exposing two (2) mounting screws. Remove these and set aside to keep safe.

4. Once removed, the side panel can now be pushed down and removed from the unit exposing the cover panel for the control board section.

5. Remove five (5) mounting screws located around the perimeter of this cover panel to expose the main control wiring and PCB. Set screws aside to keep safe.

6. To replace, reverse these instructions securing the panels to the unit as required.

General Maintenance:

- Clear inlets and outlets
- Check condensate lines
- Clean grill
- Make sure it's still level

2.7.2. Troubleshooting Guide

The troubleshooting guide should list common problems you may encounter and simple steps to resolve them. This example troubleshooting guide comes from the Roommate Through Wall Heat Pump Model MHP Installation, Operation and Maintenance Manual.

Problem	Reasons	Solutions
The unit does not work	There is no electricity.	Check the unit is plugged in, and the socket is working normally.
	The ambient temperature is too low or too high.	Only use to use the unit with a room temperature between 23 and 95°F.
	In cooling mode, the room temperature is lower than the desired temperature; in heating mode, the room temperature is higher than the desired temperature.	Adjust the desired room temperature.
	In dehumidification (dry) mode, the ambient temperature is low.	Ensure that the room temperature is above 62°F for dry mode.
	There is direct sunlight.	Use curtains to reduce heat from the sun.
Poor heating or cooling	Doors or windows are open; there are a lot of people; or in cooling mode, there are other sources of heat (e.g. fridges)	Close doors and windows; increase air conditioning power
	The filters screen is dirty.	Clean or replace the filter screen.
	The air inlet or outlet is blocked.	Clear obstructions; make sure the unit is installed as per the instructions
The unit is leaking	The unit is not straight.	Use a level to check the unit is horizontal, if not remove from the wall and straiten.
	The drainpipe is blocked.	Check the drainpipe to ensure it is not blocked or constricted.
Compressor does not work.	Overheat protection operational.	Wait for 3 minutes until the temperature is lowered, and then restart the unit.
The remote control does not work.	The remote control is not aligned with the direction of the remote-control receiver.	Move the remote control closer to the unit in question. The remote can be used for other units, ensure the remote is aimed at the unit needed to be operated and reacts accordingly.
	Batteries poor.	Replace batteries.