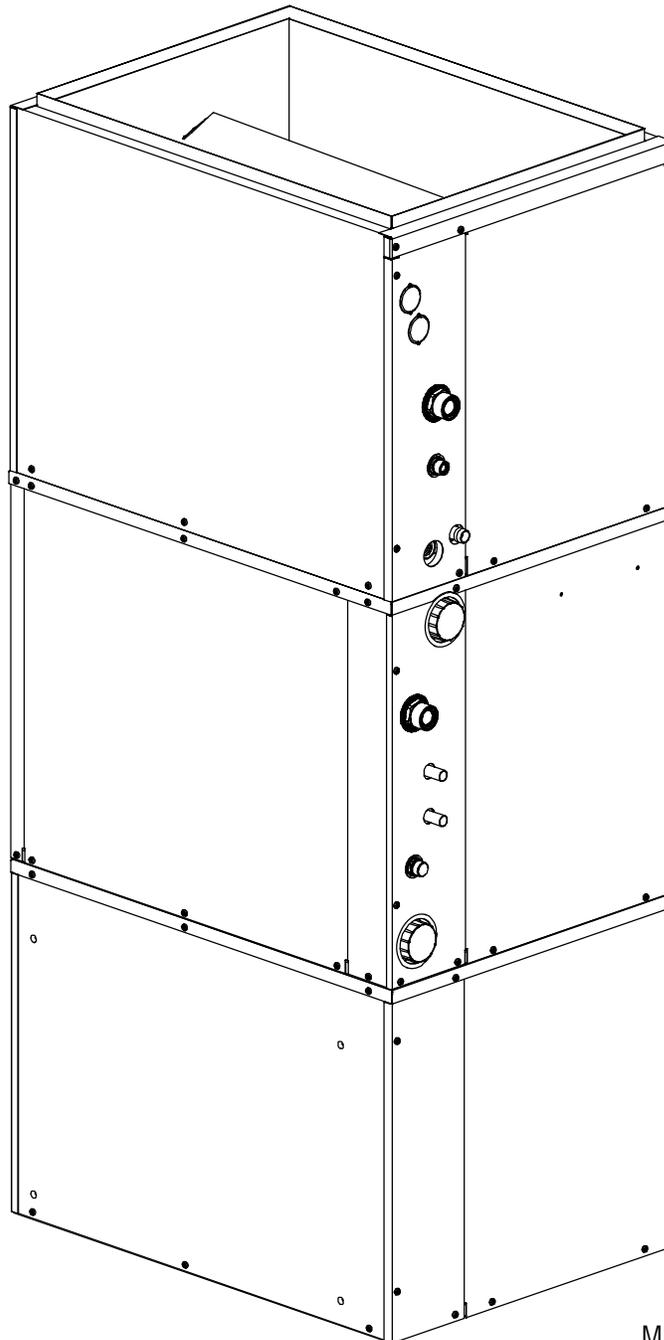


# USER'S GUIDE

## For GT-Series Geothermal Heat Pump Systems



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# GENERAL INFORMATION

This manual is intended to be a general guide for care and operation of typical systems and covers the most important features you should be aware of and are responsible for as the user of the equipment.

You should request a detailed operation sequence and explanation of any special features from your installer and/or Service Company, and also have them instruct you as to any routine maintenance procedures you are responsible for.

This manual will address the basic items that should apply to all systems, and will then be separated into specific types of products to cover things unique to those product types.

## AIR FILTERS

Keeping clean air filter(s) is the single most important responsibility of the user of the equipment. Each type of system must be equipped with an air filter(s) in the indoor circulating air system to clean the air, to keep the system itself clean for peak efficiency and capacity, and to prolong the useful life of the equipment. DO NOT operate the system without the proper air filters.

Filters should be inspected at least monthly, and replaced or cleaned (depending on type) as needed. The useful life of an air filter can vary widely depending upon application and use of the equipment, and it is critical to monitor filter condition and establish an acceptable maintenance schedule. Failure to do so will increase operating and repair costs, decrease capacity and efficiency, and shorten the service life of the equipment. A common symptom of a dirty filter in the cooling mode is a freeze-up of the indoor coil.

The air filters used may be a disposable (throwaway) type or may be a cleanable type that can be thoroughly cleaned, rinsed and reused many times. It is important to make sure that the correct filter size and type for your system is always used. If there is any question as to acceptable filter size or type, review the Installation Instructions for the specific equipment involved, if available. Otherwise, consult with your installing dealer or Service Company.

Most equipment can have the filters inspected and serviced by the user with no problems. In some instances, because of equipment design or specific installation conditions, it may be necessary to have this procedure done by a qualified service company. Have your installer or service company show you where the filter(s) are and demonstrate the service procedure or make arrangements for them to provide this service on an as needed basis.

## BASIC OPERATING PRINCIPLES

### HEAT PUMP (Water-to-Air)

These types of heat pumps are also commonly referred to as water source or geothermal systems. Just like the air source heat pump, they are refrigerant-based systems that both heats and cools using a compressor for both modes of operation. The primary difference is that the system uses water or antifreeze protected water solution instead of an air-cooled outdoor heat transfer coil, and there is no outdoor motor/fan system but instead a water pump to provide adequate water flow to the system.

### COOLING MODE

The cooling mode operates similar to a refrigerator, removing heat from inside the conditioned space and rejects it outside of the space being controlled. There are three main parts of the system:

1. The evaporator (indoor) coil where cold refrigerant absorbs heat from the air, which circulates from the conditioned space, through the machine, and is returned to the space at a lower temperature and with some of the humidity (moisture) removed. The moisture exits through a condensate drain system. A motor/blower assembly moves the indoor air through the system.

2. The compressor, which is a sealed pump that moves the refrigerant through the system.
3. The water coil where the heat that was absorbed from the indoor space is discharged to the circulating water supply. A pump is required somewhere in the system to move the water through the heat pump water coil.

### HEAT PUMP (HEATING MODE)

The system operates in reverse cycle, meaning that it acquires and moves heat from the water supply flowing through the water to refrigerant coil, and transfers it indoors to be rejected into the circulating air stream.

Most water-to-air heat pumps will also be equipped with some amount of electric heat to supplement the heating capacity of the compressor system on an as needed basis. This operation is entirely automatic and is controlled by the indoor thermostat.

Because of the design of water-to-air heat pumps and the water temperatures involved, no defrost system is required as in air-to-air heat pumps.

### WATER SUPPLY SYSTEMS

Depending upon type and application of the water-to-air heat pump, the water-side of the system could be one of the following:

1. Individual closed loop buried in a trench or vertical bore hole(s).
2. Individual loop submerged in a pond.
3. Water supplied from a well and discharged into pond, stream, ditch or another well.
4. Water supplied from a boiler/tower system, typically only in larger multi-unit installations.

A properly sized heat pump cannot cool a structure off rapidly, and instead will pull down the temperature slowly. It also will remove a certain amount of moisture (humidity) from the circulating air stream in the process. It may take several hours to pull down a hot, moist building or structure on initial start up, or anytime the system has been turned off for a long period of time. It is generally best to set the thermostat at a comfortable temperature and let it control the system as needed, rather than turning it on and off.

Moisture (humidity) removal with a conventional air conditioner (cooling) unit, or heat pump when operating in the cooling mode, is not directly controlled and is a by-product of the unit operating to control temperature in response to the temperature (thermostat) control device. Over-sized equipment can easily control temperature but will have short run-times, thus reducing its ability to remove moisture from the circulating air stream. There are also many additional influences that can affect humidity levels within the conditioned space such as laundry appliances, cooking, showers, exhaust fans, and any other items that can generate moisture or affect its removal from the space. Therefore, while operation of the air conditioning or heat pump system in the cooling mode will remove some amount of moisture as it reduces the air temperature, precise humidity regulation in the conditioned space cannot be assured and additional equipment such as a dedicated dehumidifier may be required.

# AUTOMATIC CONTROL SYSTEMS

## THERMOSTATS

There are many types of thermostats available to properly control your system, and these can vary in features and some functions depending upon the type of system (air conditioner, heat pump, etc.) installed and any special options (ventilation, supplemental heat, etc.) that may be installed.

Approved compatible thermostats are available for all applications, and since these can vary in numerous features and functions, it is not possible to adequately discuss them all in this User's Guide. Many installers also install thermostats other than those offered by the equipment manufacturer, and must determine proper compatibility prior to installation.

In addition, many schools and similar institutions may utilize central energy management systems (EMS) or direct digital control (DDC) systems.

In all circumstances have your installer, Service Company, building administrator or maintenance department personnel instruct you as to proper operation of your specific thermostat or temperature control system.

## INSUFFICIENT COOLING OR HEATING

In extremely hot or cold weather, your system will continue to deliver its normal supply of conditioned air. If the unit operates but fails to provide sufficient comfort, check the following before calling your Service Company:

1. Be sure the thermostat setting is correct.
2. Check the air filters, and replace or clean if dirty.
3. Make sure that air can circulate freely throughout the conditioned space, and that all supply registers and return air grilles are not blocked.
4. Make sure that the water supply is at the proper flow rate and is not restricted.

## FAILURE TO OPERATE

Check the following before calling your Service Company:

1. Be sure the thermostat setting is correct.
2. Check the air filters, and replace or clean if dirty.
3. Make sure that the power supply and water supply are "On".
4. Make sure that air can circulate freely throughout the conditioned space, and that all supply registers and return air grilles are not blocked.
5. Make sure that the water supply is at the proper flow rate and is not restricted.

## LUBRICATION REQUIREMENTS

The indoor air-moving motor is permanently lubricated and requires no re-oiling.

## PERIODIC MAINTENANCE

Periodic maintenance must be conducted on your system to ensure maximum performance, especially during peak operating periods and conditions.

1. Keeping the air filters clean is a key element. These are user responsibilities, either all or at least in part, and if they cannot be fulfilled by the user, arrangements should be made with your Service Company.
2. There is a condensate drain system for all heat pumps, and this must be kept open and free to convey the condensate generated by the operation of the equipment to a suitable location, (typically an internal drain). Depending upon the specific installation, the user would at least be aware of the drain mechanism and know what to expect. If any questions, it should be reviewed and discussed with your installer and/or Service Company.
3. All heating and cooling systems should have periodic inspections made by a trained professional, who has the experience, knowledge, training, licensing, certifications, and the necessary tools and equipment required to do these tasks properly and in accordance with approved or mandated procedures.
4. The maintenance procedures and frequency of routine service can vary depending upon actual type of equipment in use, type of building or facility, and other factors that can impact how often a machine must be serviced.
5. Proper and routine maintenance and service will protect your investment and help extend the service life of the product, and also help ward off more extensive and expensive repairs.
6. An open loop or well supplied water system may require special review by your system installer. Check with installer for any special water system requirements.

## HELPFUL HINTS AND GOOD OPERATING PRACTICES

The following information will help you enjoy the full comfort and benefits of your cooling and heating system, maximize the performance and efficiency, and help extend the life of your system:

1. Always keep the equipment in peak operating condition with routine scheduled maintenance, especially the air filters.
2. For most efficient operation, set the thermostat at the temperature you prefer, and then let it take control. If any changes to the settings are required, they should be made in small adjustments and the system be allowed time to respond. Rapid changes either up or down should not be done.
3. Setting the thermostat very high does not make the system heat faster, and setting it very low does not make it cool faster.
4. It is not recommended to turn the system "Off" and then back "On" when you need it. This can allow temperature and humidity to build up in warm weather conditions and force the system to run continuously to try and catch up. If the building is to be unoccupied for a lengthy period, it is best to adjust the thermostat to a reasonable higher (or lower depending upon the season) setting rather than turning it completely off. Upon return, the inside conditions will not be totally out of control, and recovery time to desired conditions would be much shorter.
5. Keep all supply registers open and all returns free and unrestricted. The heating and cooling system is designed to have a certain amount of airflow for proper operation. Therefore, closing off registers, in unused rooms as an example, could reduce airflow below acceptable levels and should not be done without review by your Service Company who can access the overall situation and advise you accordingly.

6. Heat pumps may have the system (compressor) run continuously at lower outdoor temperatures, and this is normal. The heat pump (compressor) mode is controlled by the 1<sup>st</sup> & 2<sup>nd</sup> stage of the thermostat, and delivers the most efficient heat. As the outdoor temperature drops off, the heat loss from the structure can exceed the heating capacity of the heat pump, and must be supplemented by the 3<sup>rd</sup> stage electric heat, which is not as efficient as the heat pump. The thermostat automatically controls everything, and the backup electric heat will only operate on demand as needed to maintain the desired temperature.
7. The thermostat is the user's primary connection to the system, so it is very important to have a thorough understanding of how it works and how to use it properly. Since there are many different types of controls available, and can vary depending upon what type of heating/cooling system you may have. Have your installer or Service Company explain and demonstrate proper operation of the controls.
8. Make sure you thoroughly understand how the heating and cooling system itself is intended to operate and what to expect from it. Have your installer or Service Company explain and demonstrate proper operation of the heating and cooling system.