



**SEISCO®
APPLICATIONS & DIAGRAMS**

A. Seisco Selection Criteria

B. Residential Floor Plan Diagrams

- 1. Standard One Story Home Options**
- 2. Standard Two Story Home Options**
- 3. One Story – Booster for Quicker Response**

C. Application Diagrams

- 1. General Residential - Whole House**
- 2. Booster Retro-fit for Existing Storage Tank**
- 3. High Flow or Large Demand Configuration**
- 4. Circulating System Arrangement**
- 5. Space Heating – Radiant Floor or Hydronic Heating System**
- 6. Space Heating – Indoor Hydro Heating or Heat Pump System**
- 7. Passive Heating – Combined with Indoor Storage Tank**
- 8. Solar Backup – Combined with Solar Heated Storage Tank**
- 9. Geothermal Backup – Combined with De-Super Heater**

A. SEISCO MODEL SELECTION CRITERIA

Below is a list of the basic information that is needed for selecting the proper Seisco model:

1. Peak flow rate in gallons per minute (GPM).
2. Inlet water temperature or cold water temperature.
3. Electrical capacity (amps) and the service voltage (VAC).
4. Desired output temperature or hot water temperature.

Additional information may be necessary for space heating applications, such as the following:

1. Heat loss rate (BTU/hr) of the home or building.
2. Flow rate of the circulating pump in gallons per minute (GPM).

Peak Flow Rate:

Below are typical flow rates for new residential construction. There may be exceptions, such as with new designer type fixtures and faucets. For instance, large custom body spa showers, whirl pool and Jacuzzi tubs may have faucets with flow rates ranging from 7 gpm to 14 gpm. However, a combination of multiple Seisco heaters (plumbed in a parallel configuration) can be installed to match these higher flow rates. The same peak design approach would be necessary for the anticipated life style of multiple flow rates occurring at the same time. Otherwise, use the table below and match the Seisco according to the peak flow and associated temperature rise of a single tub or shower. Also, refer to the *Product Specification Tables* in the “Description & Specifications” section of the Seisco Product Manual for the flow ratings of each Seisco Model.

Typical Flow Rates in Gallons per Minute (gpm)

Fixture Type	Lavatory	Bathtub	Shower	Kitchen Sink	Pantry Sink	Laundry Sink	Dish-Washer
Flow Rates	0.8 – 1.5	2.0 – 4.0	1.5 – 3.0	1.0 – 1.5	1.5 – 2.5	2.5 – 3.0	2.0 – 3.0

Measuring flow rates at a faucet can be done by simply using a common one-gallon bucket or a similar container of known liquid capacity. The approximate flow rate can be determined by simply turning on the faucet in question to full flow, and timing how long it takes to fill the one gallon bucket. If it takes 20 seconds to fill the one gallon bucket, then the flow rate is 3 gallons per minute or 3 gpm. If it takes 15 seconds to fill the bucket, then the flow rate is 4 gpm. Simply divide 60 seconds (which is one minute) by the recorded time to fill the bucket to arrive at the flow rate.

Inlet Temperatures:

Measuring the inlet temperature can be determined with a common cooking or baking thermometer. Simply turn on the cold water (not the hot) and place the thermometer into the flow. For best results, let the water run for approximately one to two minutes before taking the reading. This allows purging of any ambient temperature water sitting in the lines. It is important to know the inlet water temperature so that the temperature rise can be determined. The temperature rise and associated flow rating of the faucets are necessary for the proper model selection.

Inlet water temperatures can vary depending on geographical location, season of the year and the type of water system. For instance, Southern Georgia and Florida have inlet water temperatures typically between 60 and 70 degrees F. Mountainous areas, such as the Rockies may have water temperatures as low as 40 degrees F. In the middle and northern sections of the U.S., temperatures generally range from 45 to 55 degrees F. Most well water systems (except in mountainous areas) generally remain constant at 50 to 55 degrees year round.

Electrical Capacity:

Most **electric** homes today have 200 amp electric services. This has become the standard over the past 10 years or so in **new** home construction. However, homes that utilize gas for space heating, water heating and cooking may have 100 or 150 amp electric service. It is important to know whether the electrical capacity of the home or building is sufficient for the Seisco heater. In most cases, an all electric home of 3000 square feet or less with a 200 amp whole-house electric service will have the electrical capacity for one Seisco RA-28. The RA-28 is sufficient to provide all the hot water for a home of this size containing 2 _ or 3 baths with standard flow rate faucets. It will be necessary however, to have a qualified electrician calculate the electrical loads in the home or building with the load of the selected Seisco model(s). The load calculations should be done according to the National Electric Code (NEC), 220-30 and 220-31, Optional Calculation. Refer to the “Electrical Service Requirements & Sample Calculations” section of the Seisco Product Manual for how the NEC rules apply to the Seisco.

B. RESIDENTIAL FLOOR PLANS

Location of the Seisco heater in the home or building requires some planning so that the heater is in a position to respond quickly and to handle peak flow demands. Because of Seisco’s compact size, it is possible to locate the heater in closets and under stair cases so that it is central to nearly all the faucets. If necessary, a multiple heater system can even fit where most storage tank heaters cannot. These benefits are important to the user, as they help conserve water, reduce the wait for hot water and reduce energy costs.

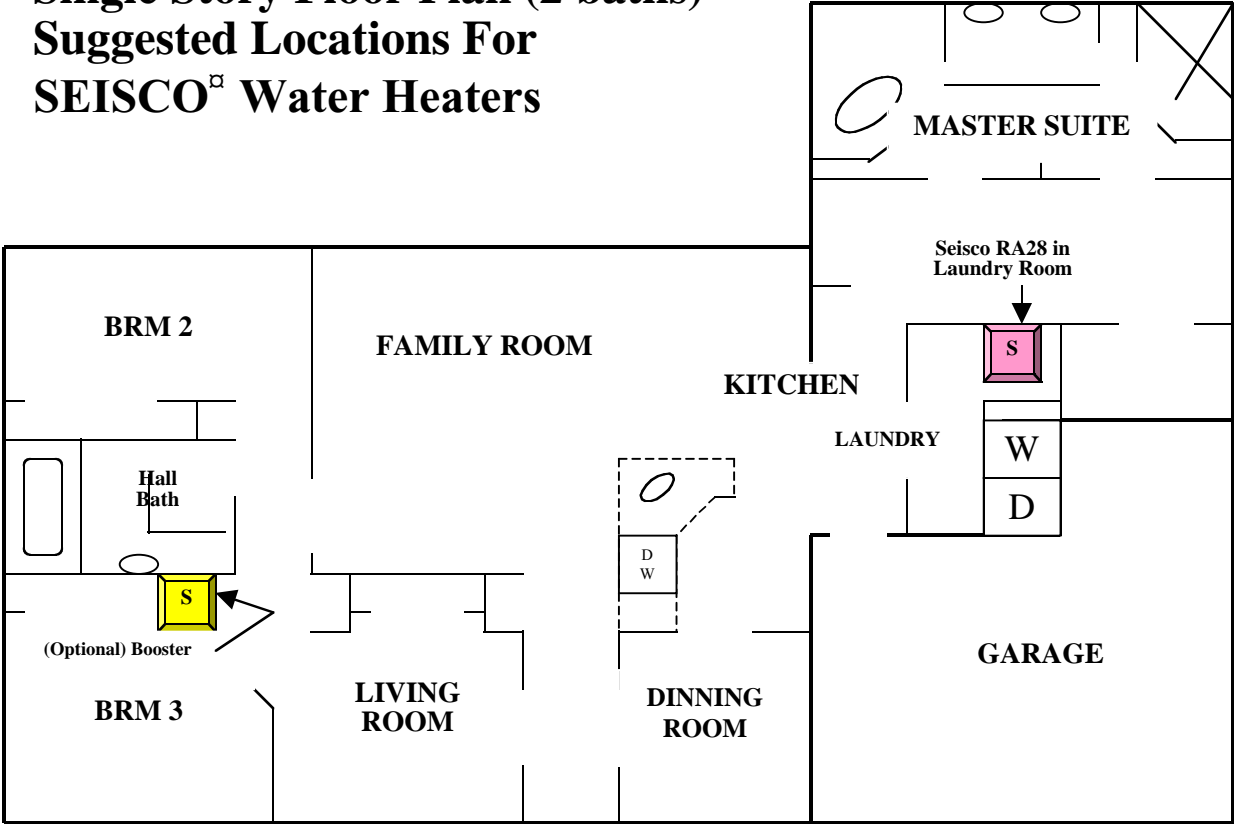
Typical one story and two story floor plans are provided to help illustrate the possibilities for locating Seisco heaters in the home to achieve maximum benefits. Also, the single heater and optional multiple heater configurations are shown. For instance, a single Seisco RA-28 can effectively provide hot water for the whole house. However, if peak flow demands of the master bath exceed the flow rate capacity of the RA-28, a booster, an RA-18 or RA-22, can be located downstream and closer to the master bath. This arrangement helps reduce the wait for hot water in the master bath as well.

In homes with a basement: There may be additional flexibility to locate the Seisco heater in the basement so that it is still central and directly below the faucets on the first and second floors. Instead of locating the booster in the master bath closet, it could be located in the basement, directly below the master bath floor. Also, there may be needs for hot water to faucets in the basement, such as the washing machine and future baths that may be installed when the basement is finished for living space.

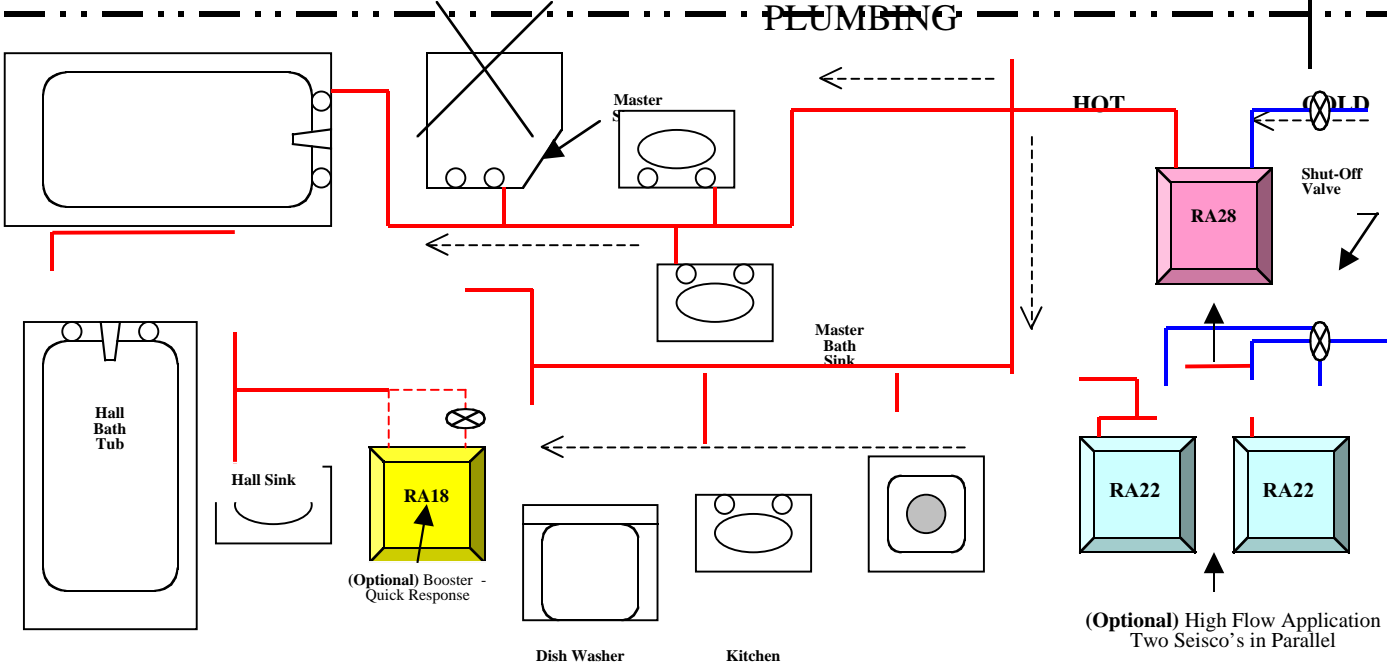
In homes with an attached garage: The garage may be one of the most convenient locations for the Seisco heater, but not necessarily the most central location to the faucets in the home. Typically, if the garage is on one end of the house, then the master bath is usually on the opposite end and probably a long distance from the water heater. This may result in relatively long delays (2 minutes or more) for the hot water to reach the master bath faucets. This arrangement is generally not acceptable by most unless a Seisco booster heater is installed in combination with the heater in the garage and within the vicinity of the master bath. It may be necessary to avoid installing the Seisco heater in the garage altogether due to possible exposure to high humidity and freezing conditions. If possible, locate the Seisco heater in the adjacent utility room or entrance room in conditioned air space.

Places to avoid installing the Seisco heater are in the crawl space under a house or building, in the garage (in regions prone to freezing or high humidity) and in the attic (unless the attic has been converted to living space). Like most appliances in the home, it is important to protect the Seisco heater from exposure to damp, humid and freezing conditions. Condensation from sweating pipes above and near the Seisco heater can drip down onto the plumbing connections and/or into the heater. This may cause corrosion at the plumbing connections or on components and electrical connections inside the heater. If it is necessary to install the Seisco heater on the second floor or in the attic, a drip pan with a drain should be installed below the heater to avoid damage to ceilings, walls and floors in the event of a leak. A drip pan is normally required for storage tank heaters located in the attic or on the second floor as well.

Single Story Floor Plan (2 baths) Suggested Locations For SEISCO[®] Water Heaters

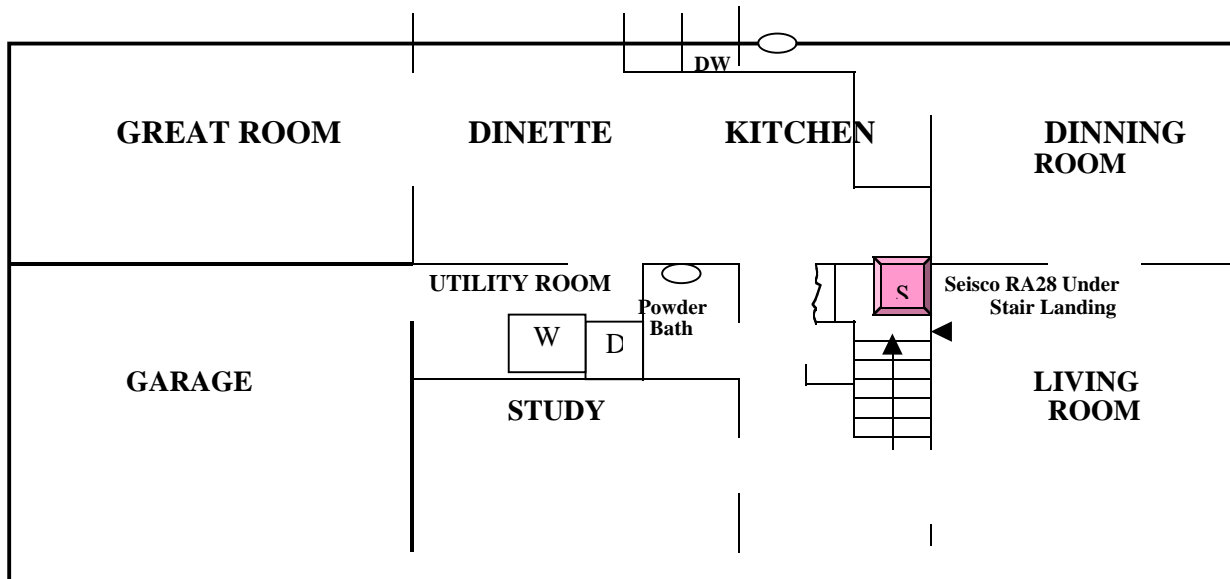
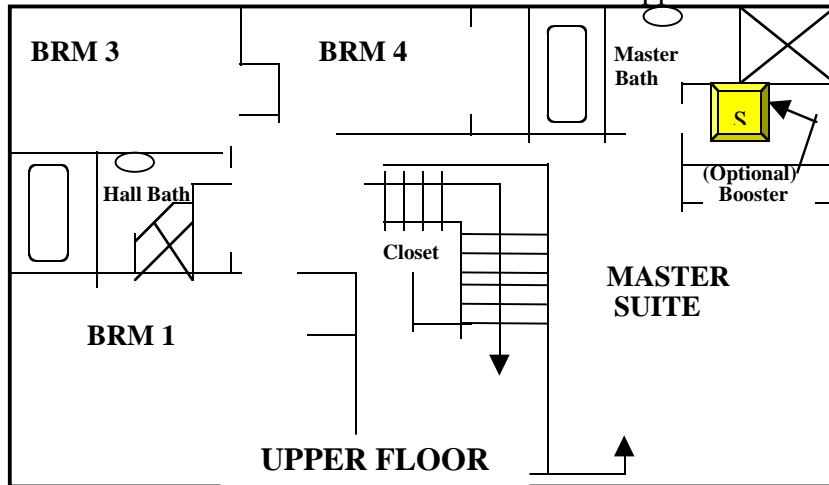


PLUMBING



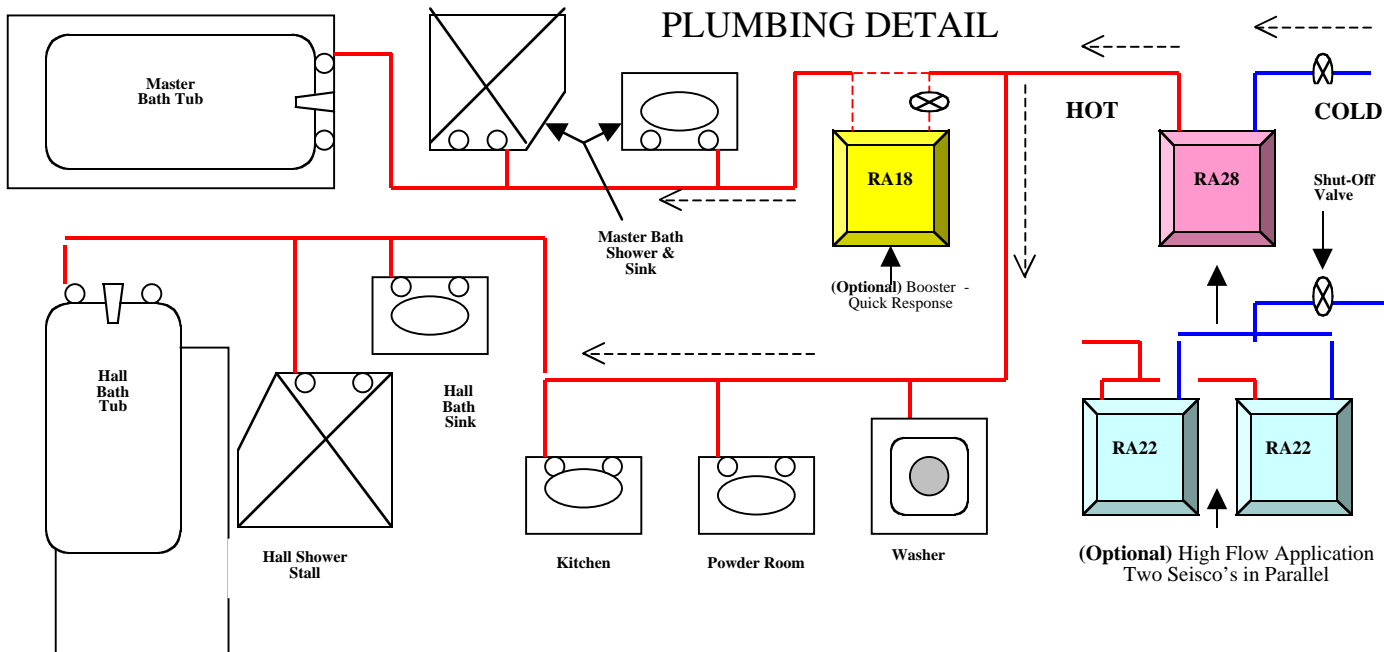
**Two Story
Floor Plan
(2 _ baths)**

**Suggested
Locations For
SEISCO®
Water Heaters**



MAIN FLOOR

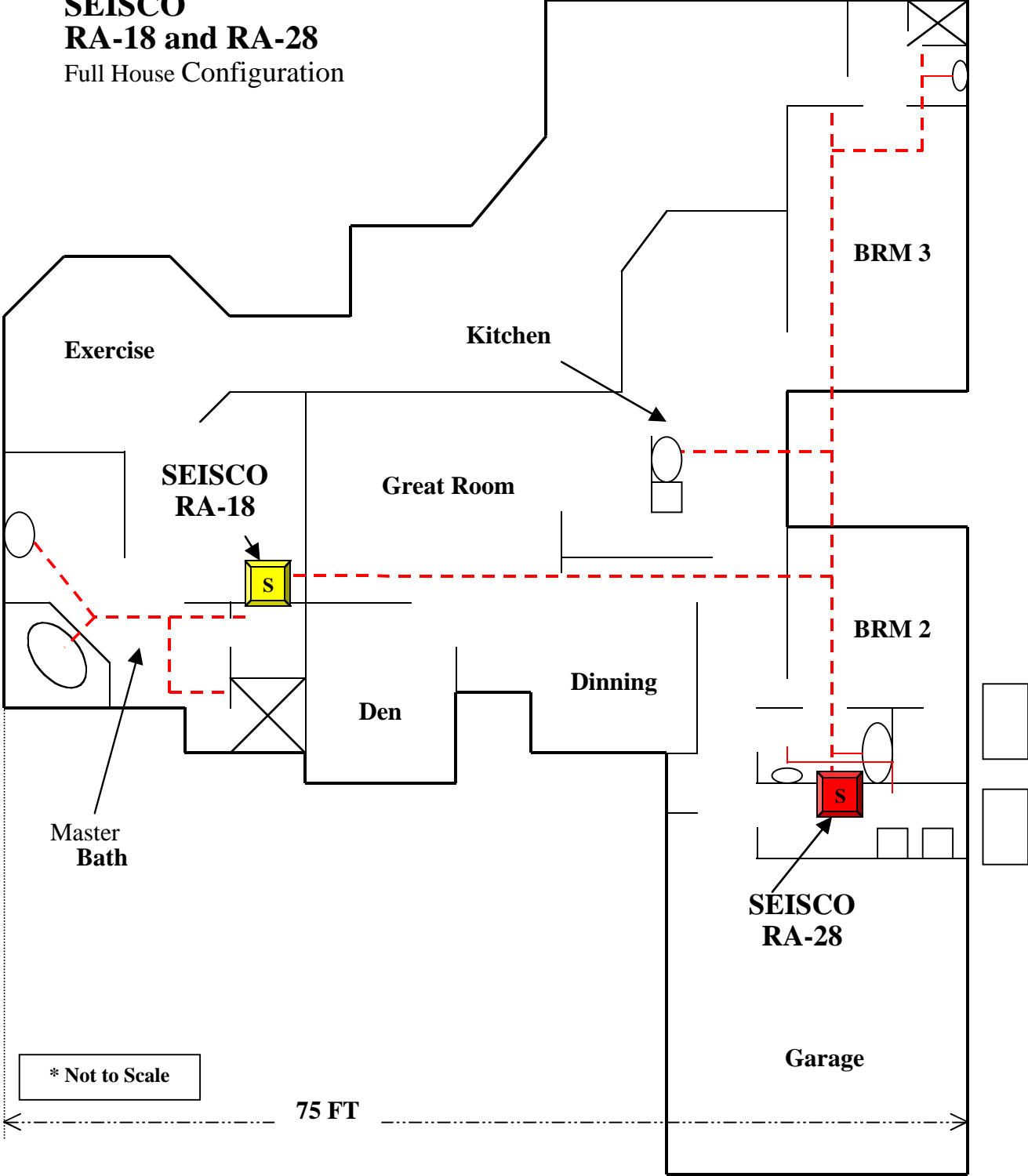
PLUMBING DETAIL



Florida Style Home – Single Story Floor Plan*

(SEISCO Full House Model With Booster in the Master Bath for Quicker Response)

**SEISCO
RA-18 and RA-28**
Full House Configuration



C. APPLICATION DIAGRAMS

Diagrams are provided in this section to show how the Seisco works in several different applications, ranging from a single whole-house heater to space heating system applications. The Seisco models chosen for these illustrations are examples for use in these types of applications. However, they are not necessarily the correct model for an actual application. It is important to size and match the Seisco for each individual application according to the selection criteria found at the beginning of this section and using the ratings in the *Product Specification Tables*.

Whole House Application:

The most common application for a home is using a single Seisco RA-28. The RA-28 was specifically designed with the power necessary to provide hot water for a moderately sized home with standard faucets. Most homes qualify for this application. Exceptions are when there is not enough electrical capacity in the home (below 200 amps), the cold water inlet temperatures are below 50 degrees F or there are higher than standard flow rate faucets in the home. If any of these conditions exist, it may be necessary to look at other feasible options, such as the booster or backup application or the multiple Seisco arrangement. Also, in warmer climates, where the inlet water temperatures are above 65 degrees F, it is very possible to use a Seisco RA-22 with a 150 amp whole-house electric service.

Booster Or Backup Application:

When a home or building does not have the electrical capacity (200 amps) for a Seisco whole-house model, the booster or backup application is a very effective option for providing endless hot water in combination with a storage tank heater. This is generally the case in homes that primarily use gas or oil for heating and the electrical service is only 100 or 150 amps. With the Seisco utilized as a booster or backup downstream from the storage tank heater, it is still possible for a large family or heavy users to enjoy endless hot water. In this arrangement, the Seisco will not turn on until the storage tank is depleted. While the storage tank is recovering, the Seisco will turn on and continue to provide hot water. Models to be considered for this application are the RA-18 and the RA-22. Refer to the *Product Specification Tables* for the ratings of these two models to determine the one that will work with the electrical capacity of the home.

High Flow Applications:

Combining two or more Seisco heaters in the parallel plumbing configuration (as shown in this section) is the most effective design for high flow applications. However, split systems, such as using a Seisco booster application in series with the main Seisco heater, are also effective when the parallel configuration cannot be located closer to the high flow faucet. Body spa showers (single shower stalls with multiple nozzles or sprayers), whirl pool and Jacuzzi tubs are among the fixtures with the highest flow rates found in the home (7 to 14 GPM's). Other high flow fixtures may be the standard tub faucet, shower, utility sink or the washing machine (3 to 6 GPM's). In addition, the life style of using hot water in the home needs to be evaluated. For instance, if two or more showers will be required to run at the same time, then the flow rate of the combined shower faucets must be added together to arrive at the peak flow rate demand.

It is important to start with the Seisco selection criteria to first determine the design parameters, such as the cold water inlet temperature, combined peak flow rate, and the electrical capacity in the home. It is recommended to install multiple Seisco heaters in parallel or in a split series configuration so that the peak flow is matched. Avoid zoning multiple Seisco heaters on individual branches of the plumbing system, as this will not work in keeping up with flow rates that exceed the capacity or flow rating of the Seisco.

Circulating System Application:

Some homes have a hot water circulating or re-circulating system designed to maintain hot water in the plumbing system throughout the house. This allows the user at any faucet on the system to receive hot water instantaneously. In most cases, these systems maintain the temperature between 90 and 125 degrees F with an auxiliary thermostat connected to the circulating pump. The Seisco control works independently in this type of system and does not require wiring to the pump or the auxiliary thermostat. The Seisco control is designed to detect flow and heat the water, which in this case occurs when the pump is activated by the auxiliary thermostat. The Seisco heater works very effectively with this arrangement as shown in the application diagram in this section. However, the same selection criteria applies to matching the proper model for this application and should be done using the cold water temperature entering the home and not the re-circulated water temperature in the system. Like any other high flow application, it is appropriate to install multiple Seisco heaters in parallel on this system if necessary. Refer to High Flow Applications in this section for details and the High Flow Application Diagram.

Space Heating – Radiant Floor Heating Systems:

Radiant floor heating systems are growing in popularity in the north, but also in new homes across the mid-section of the U.S. as well. Many feel that radiant floor heat is one provides the most comfort and warmth of any heating system. Using Seisco heaters in radiant floor heating systems can help make the installation and operating costs more affordable. As shown in the application diagram in this section, most radiant floor systems are plumbed in a closed-loop configuration and generally use antifreeze as the heating fluid. Note, that the Seisco works independently and does not require wiring to the circulating pump or the auxiliary thermostat.

As with most circulating or re-circulating systems, some of the heat or BTU's produced by the Seisco heater is recovered. For instance, the fluid that is initially heated to 125 degrees F by the Seisco heater may return to the heater at 80 or 90 degrees F, depending on the heat loss rate or BTU loss of the building. Generally, qualified HVAC Contractors are capable of calculating the heating requirements of a building, in BTU's per hour. For radiant floor heating applications, it is recommended to use two Seisco heaters plumbed in parallel, not in series. The BTU per hour rating of the combined Seisco heaters should equal no less than 125% of the BTU per hour requirements to heat the building. Refer to the chart in the application diagram for suggested heater sizes for a variety of home sizes in square feet.

Space Heating – Hydro-Heating Systems:

Hydro-Heating technology is generally used for indoor space heating systems in apartments and condominiums across the middle and southern sections of the U.S. The system was designed to extract heat from hot water circulating through an open loop heat exchanger. The small and compact size of the Seisco heater saves valuable space generally occupied by a boiler or large storage tank heater used with this application. Also, the Seisco provides the domestic hot water needed for household sinks, showers and tubs as well. See the Hydro-Heating Application Diagram in this section, illustrating the components generally used with this system.

Because of the high demand for hot water in this application, it is necessary to utilize a priority flow valve that helps insure all the hot water is available for the domestic needs. The priority flow valve detects flow to the domestic side and temporarily turns the hydro-heating pump off. The Seisco's output temperature setting should be between 125 and 130 degrees to enable the hydro-heating system to provide the required output rating (BTU per hour rating). Note, that today's building codes may require the use of a mixing valve on the domestic hot water supply to limit the temperature to 120 degrees F. The hydro-heating systems used for apartments and condominiums, are generally rated from about 27,000 to 40,000 BTU's per hour. However, the BTU requirements for the domestic hot water side may exceed 75,000 BTU's per hour during periods of peak flow, such as running the bath tub or the washing machine. The output of the Seisco Model RA-28 is about 96,000 BTU per hour and is ideal for this application.

Passive Heating – Ambient Storage Tank:

The combination of a Seisco heater downstream with a storage tank heater can provide for greater efficiency and greater flow rate capacity. In this application, the storage tank heater is not heating the water with electricity, gas or oil, but simply achieving room temperature, 64 to 68 degrees F. This can be very beneficial in areas where inlet cold water temperatures are low, 40 to 55 degrees F. The Seisco will use less energy to raise the inlet water to the desired output temperature, typically 120 degrees F.

This arrangement is particularly ideal in retrofit situations where the existing storage tank doesn't have to be removed, unless of course space is a premium. Even if the existing storage tank heater is old, it can still be used for this application because it won't deteriorate as fast. The insulating blanket should be removed from the storage tank to allow greater exposure and quicker heat gain from the conditioned air space in the room. However, because the ambient water temperature in the storage tank will eventually cool down during prolonged use, the Seisco should be sized using the selection criteria for inlet cold water inlet conditions.

Solar Backup Application:

Heating water with solar collectors in certain geographic regions is one of the most efficient systems. The sun is obviously free energy, but when the sun is not available for replenishing the heat used from the storage tank or batch collector, the Seisco heater provides the perfect back-up. As a back-up heater, the Seisco allows the passive system do what it was designed to do, to recover on it's own. Solar heating systems are particularly vulnerable of running out of hot water during the evening and early morning hours. Particularly, if the tank only holds 40 or 50 gallons. Two or three baths or showers taken during this period can deplete the tank when there is no sun available to recover or replenish the tank. The Seisco heater will only turn on and provide hot water when it senses the temperature from the storage tank or batch system is lower than it's set point, making it the perfect back-up. In addition, the Seisco will only use the energy necessary to raise the temperature it senses to the set point, typically 120 degrees F.

Refer to the Solar Backup Diagram in this section and note that a mixing valve must be used between the storage tank and the Seisco. Temperatures generated by the solar collectors can exceed 160 degrees F, too hot for domestic use. Also, the Seisco is equipped with a 180 degree F high temperature shut down switch. So temperatures of 180 or greater will disable the Seisco heater and require a manual reset. Because there will be periods when the solar collectors are not heating the water and the storage of hot water can be depleted, the Seisco heater should be sized to heat the water as if there were no solar heating system. Use the selection criteria at the beginning of this section the *Product Specification Tables* to size and match the Seisco for this application using the cold water inlet temperature.

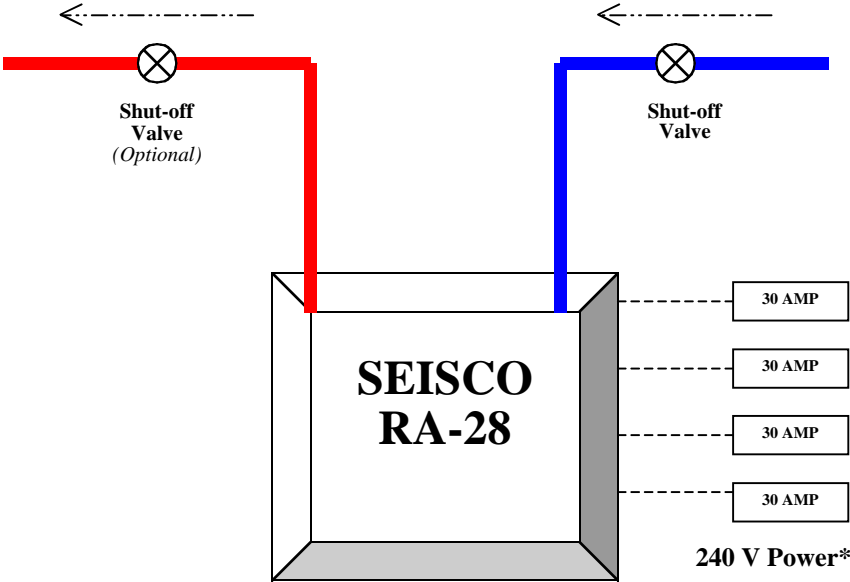
Geothermal Backup Application:

There are geothermal heat pump systems used for space heating that are also designed to heat water for domestic use. These systems utilize an auxiliary de-super heater (or heat exchanger) designed to heat water in a storage tank heater. This is a closed loop system that transfer heat from the de-super heater to heat exchanger coils inside the storage tank. The Seisco heater located down stream from the storage tank provides the perfect back-up for this application. Refer to the Geothermal Backup Application diagram for an illustration of how this system is configured.

As with the backup to the solar water heating system, the Seisco allows this passive geothermal heating system to recover the hot water in the storage tank when not in use. The Seisco will heat water only when the tank is depleted or drops below the set point of the Seisco heater during usage. The Seisco will not turn on during periods of standby while the geothermal system is recovering. Because there will be periods when the geothermal heat pump is not operating (spring and fall months), the storage of hot water can be depleted, the Seisco heater should be sized to heat the water as if there were no geo-exchange heating system. Use the selection criteria at the beginning of this section the *Product Specification Tables* to size and match the Seisco for this application using the cold water inlet temperature.

**Standard Whole House Application
for Domestic Hot Water with a SEISCO,
Model RA-28**

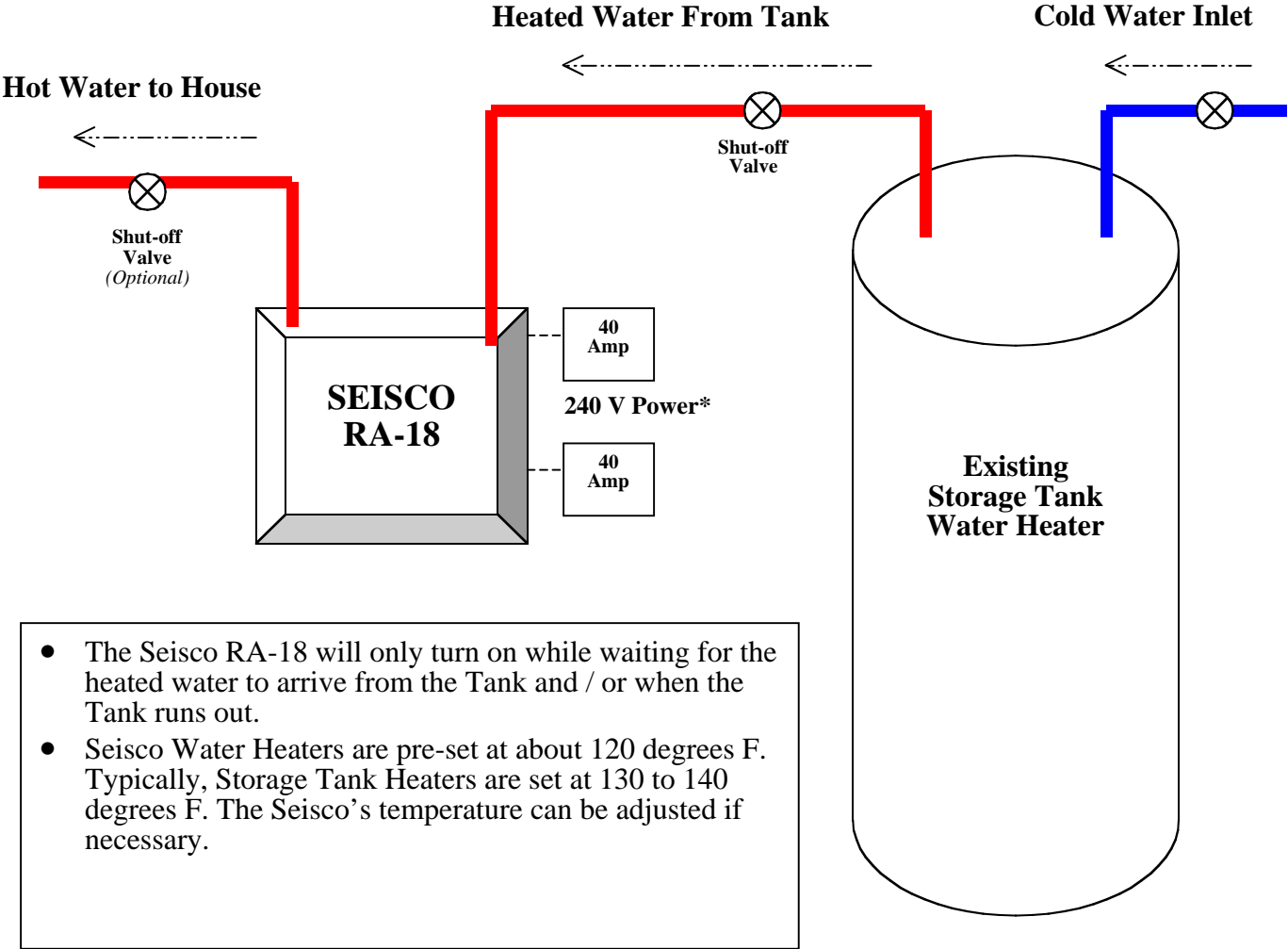
**SEISCO Model RA-28
Tank-Less!! ELECTRIC
Continuous Water Heater-
WHOLE HOUSE Application**



- The Seisco, Model RA-28, was designed to provide hot water at 120 degrees F for a home with standard faucets (2.5 GPM's) and minimum inlet cold water temperatures of 40 degrees. For ratings, refer to the *Product Specification Tables* in the "Description & Specifications" section of the Seisco Product Manual.
- However, special applications in a home, such as body spa showers, whirl pool and Jacuzzi tubs may require the use of multiple Seisco heaters. Refer to the "High Flow Applications" diagram in this section for the arrangement of multiple Seisco heaters.

**Storage Tank Booster Application
For Endless Domestic Hot Water with a SEISCO, Model RA-18**

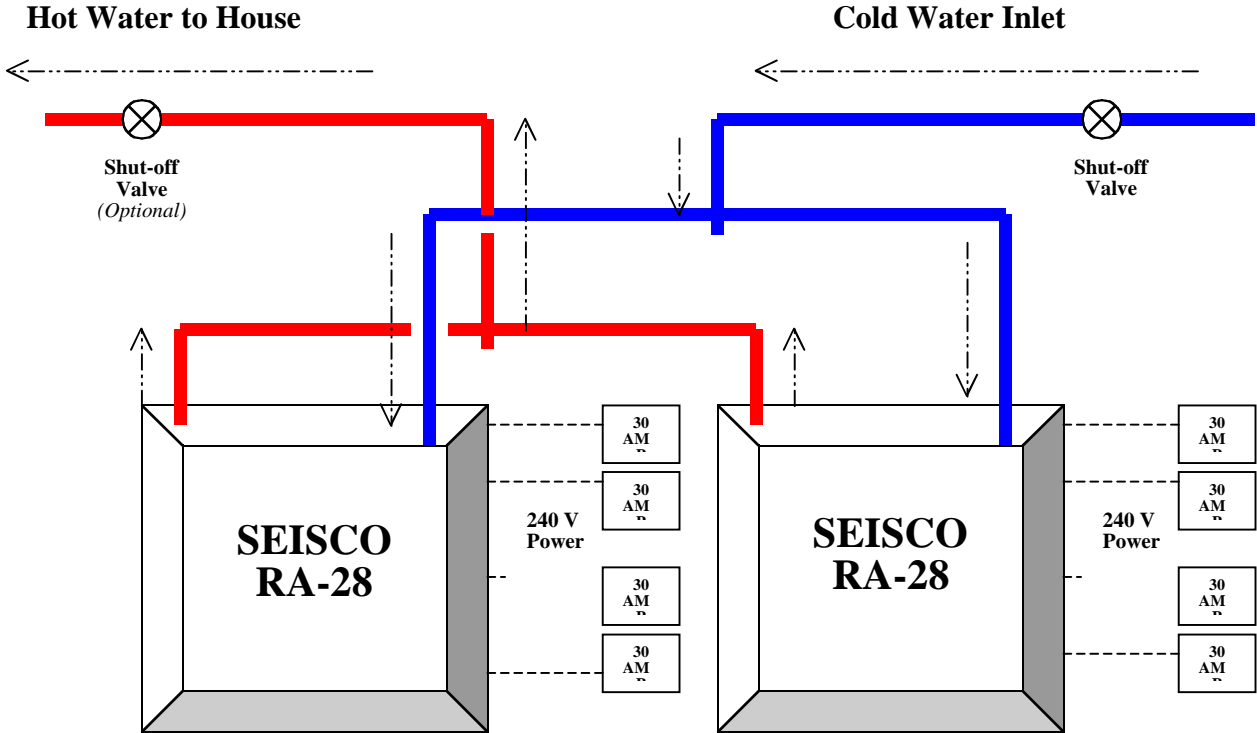
**SEISCO Model RA-18
Tank-Less!! ELECTRIC
Continuous Water Heater-
BOOSTER Application**



* The RA-18 Model requires **TWO** 40 Amp, 240 Volt circuits from the main electrical panel or from an installed 80 Amp sub-panel or disconnect box.

High Flow Application
Parallel Configuration for SEISCO,
Models RA-18, 22 or 28

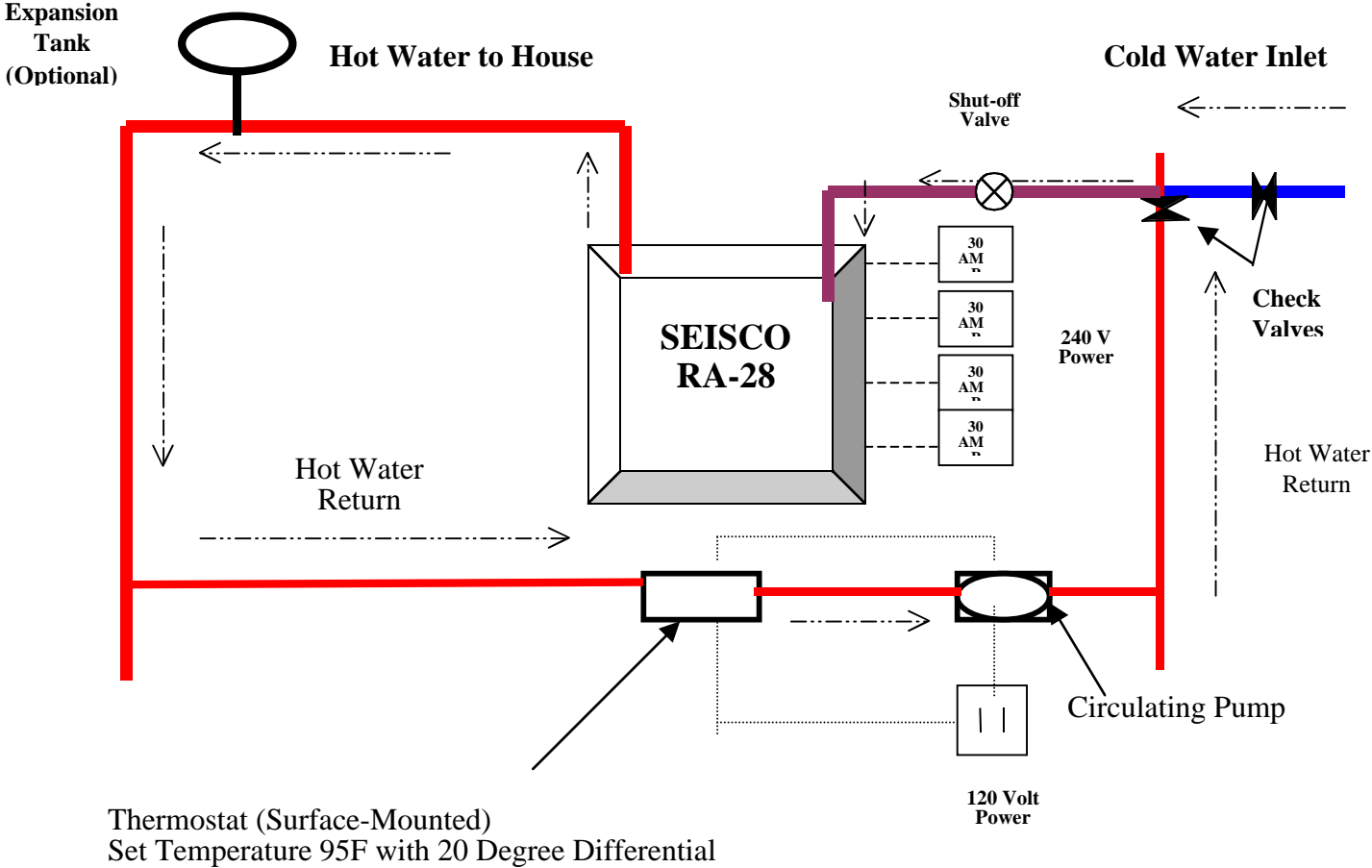
SEISCO Model RA-28
Tank-Less!! ELECTRIC
Continuous Water Heater-
HIGH FLOW Application



- For parallel installations, both Seisco heaters should be the same Model or size. At 240 Volts, two RA-18's = 36 KW, two RA-22's = 44 KW and two RA-28's = 56 KW maximum power output. Refer to the *Product Specification Tables* in the "Description & Specifications" section of the Seisco Product Manual.
- The thermostat setting of both heaters should be in the same position in order to balance the power of both heaters and maximize efficiency. The balance of power between the two heaters can be checked using a clamp-on amp meter by measuring the amp flow through the heating element wires.

Hot Water Circulation System Application
Using a Surface Mounted Thermostat in Combination with a
Circulating Pump and a SEISCO,
Model RA-28.

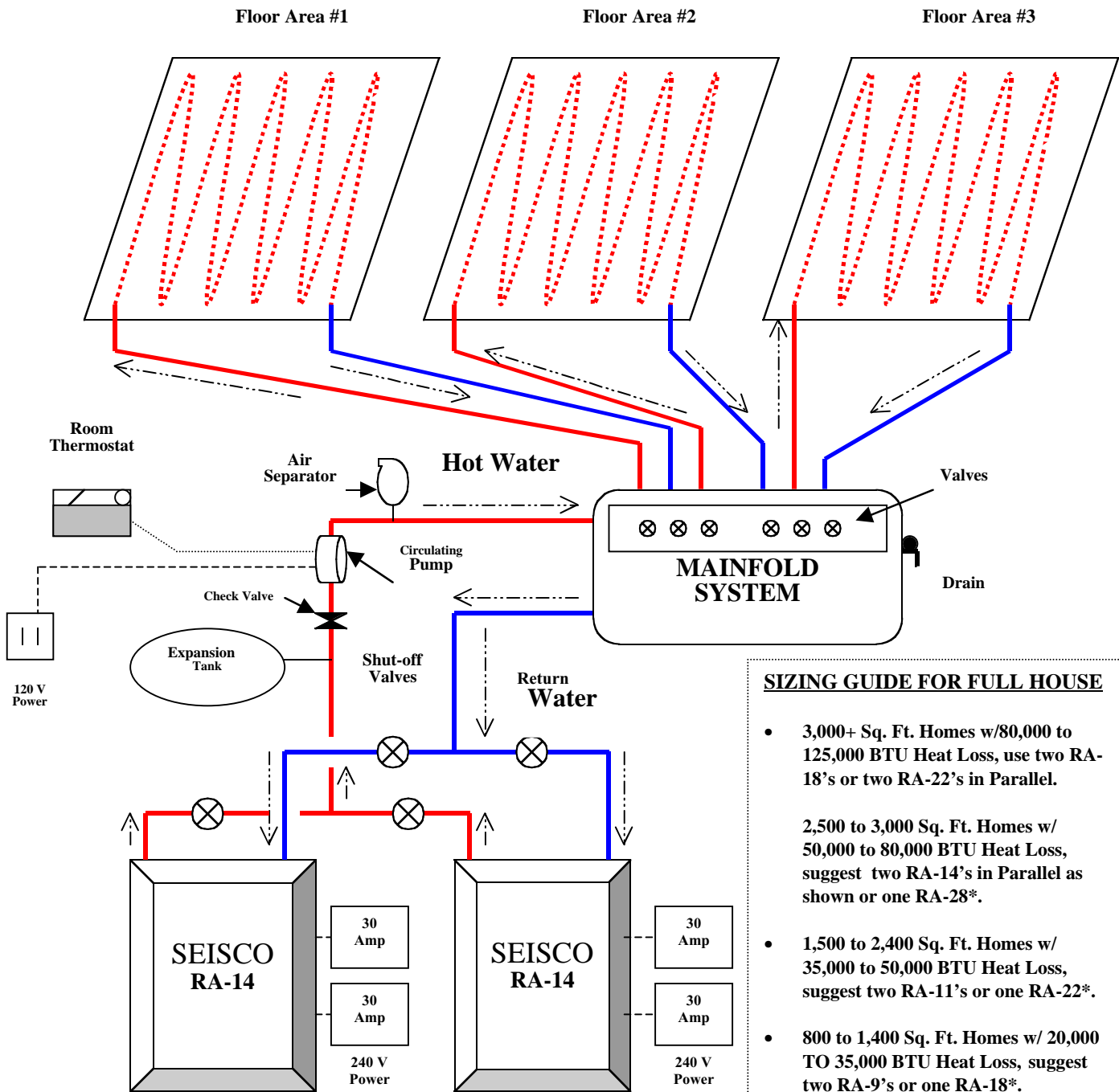
SEISCO Model RA-28
Tank-Less!! ELECTRIC
Continuous Water Heater-
HOT WATER CIRCULATING
Application



* Seisco Model RA-28 requires **FOUR** 30 Amp, double pole, 240 Volt circuits from the main panel or sub-panel / disconnect.

Radiant Floor or Hydronic Heating Application
For Full House Closed-Loop System
using Two Seisco Model RA-14's in Parallel.

SEISCO Model RA-14
Tank-Less!! ELECTRIC
Continuous Water Heater
RADIANT FLOOR HEATING
Application



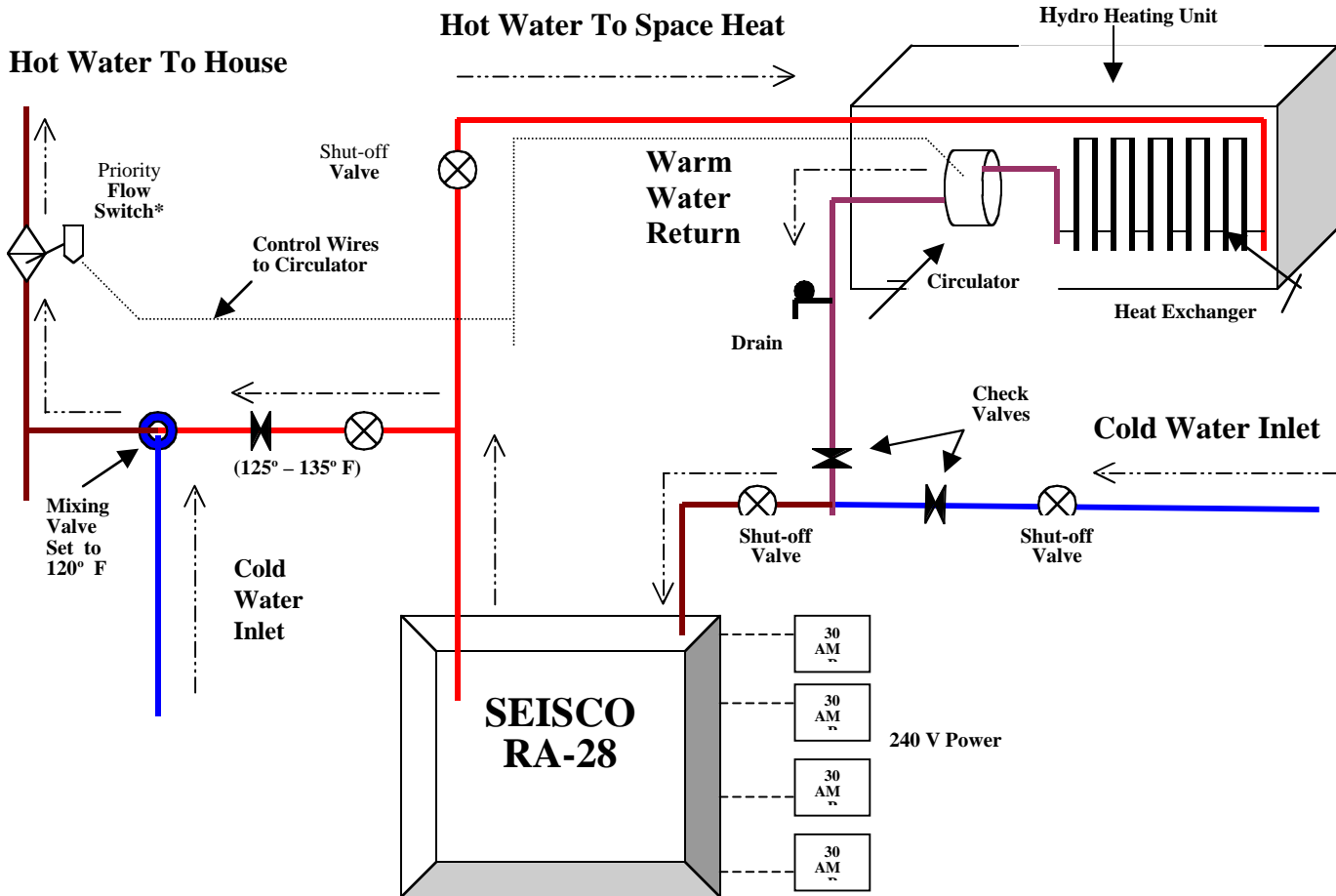
SIZING GUIDE FOR FULL HOUSE

- 3,000+ Sq. Ft. Homes w/80,000 to 125,000 BTU Heat Loss, use two RA-18's or two RA-22's in Parallel.
- 2,500 to 3,000 Sq. Ft. Homes w/ 50,000 to 80,000 BTU Heat Loss, suggest two RA-14's in Parallel as shown or one RA-28*.
- 1,500 to 2,400 Sq. Ft. Homes w/ 35,000 to 50,000 BTU Heat Loss, suggest two RA-11's or one RA-22*.
- 800 to 1,400 Sq. Ft. Homes w/ 20,000 TO 35,000 BTU Heat Loss, suggest two RA-9's or one RA-18*.

***Note:** It is recommended to use two Seisco units in Parallel for radiant floor heating application fails, the second unit would continue to provide heat. If necessary, by only heating a critical area heating zones, until the failed unit is repaired.

Hydro Heating (Indoor Heat Pump) Application with Seisco Model RA-28 for Space Heating and Domestic Hot Water System Combination

SEISCO Model RA-28 Tank-Less!! ELECTRIC Continuous Water Heater-GEOTHERMAL Application

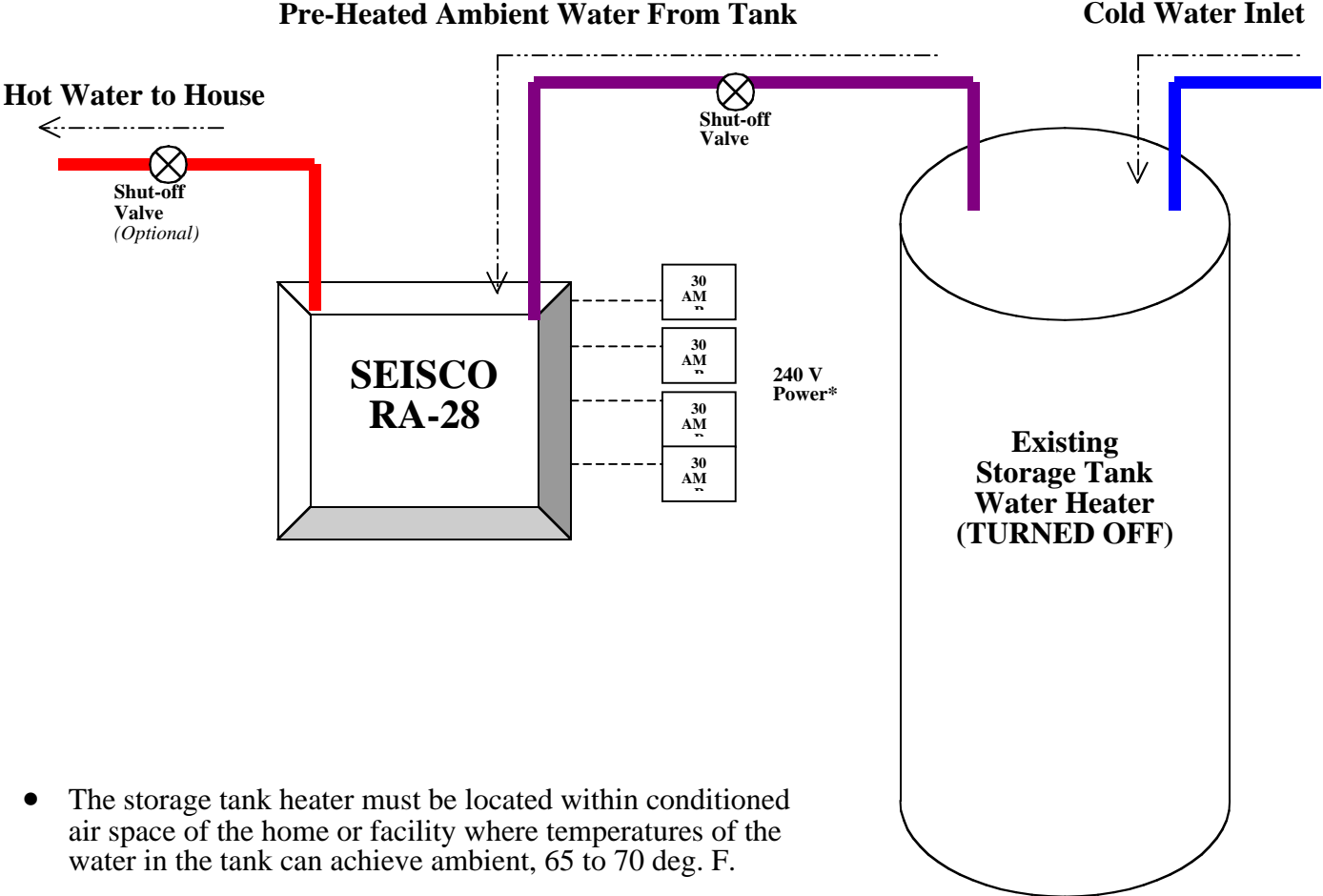


- **Hydro-Heating** systems are generally used for apartments and condominiums throughout the central and southern regions of the United States. Typically, the BTU ratings for these systems range from approximately 27,000 to 40,000 BTU. The Seisco Model RA-28 is rated for over 96,000 BTU output.
- For the Hydro-Heating system to obtain it's maximum BTU rating, the Seisco temperature setting may need to be between 125° – 135° F.

*A "Priority Flow Switch" or a surface mounted thermostat could be used. Both serve the same function by turning off the circulator pump to the Hydro-Heating system when domestic hot water flow is sensed.

Passive Storage Tank Application
with SEISCO Model RA-28 in Conditioned Air Space for
Added Efficiency & for Higher Flow Rate Capacity

SEISCO Model RA-28
Tank-Less!! ELECTRIC
Continuous Water Heater-
GEOTHERMAL Application

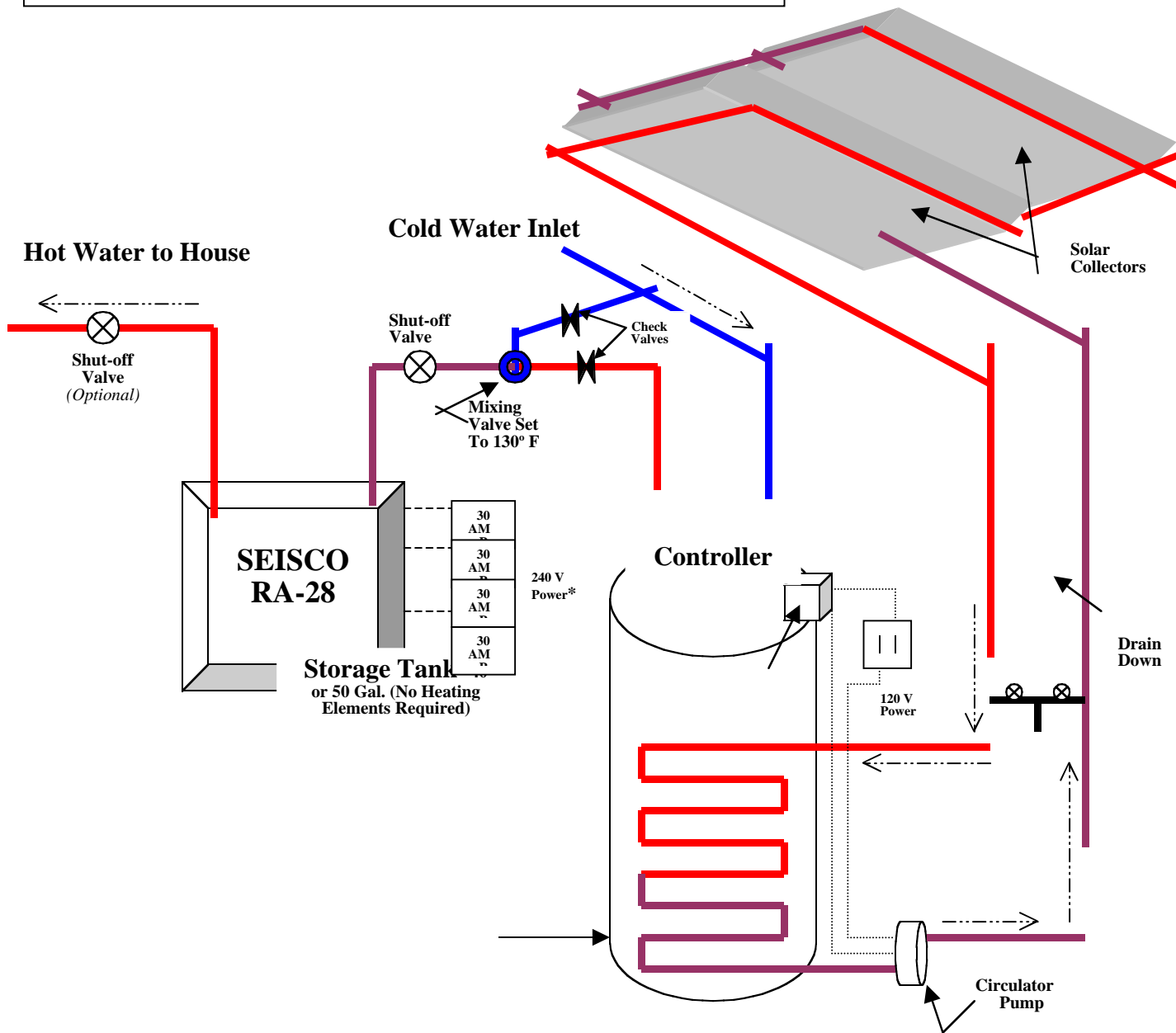


- The storage tank heater must be located within conditioned air space of the home or facility where temperatures of the water in the tank can achieve ambient, 65 to 70 deg. F.
- Existing tank heaters should be in good condition (not leaking) and turned off. The life expectancy of the tank will be extended. Scaling and sediment build-up will be significant reduced or eliminated. If necessary, the tank can be turned on at low temperatures, 90 to 100 deg. F to further increase flow rate capabilities of the Seisco.

* The RA-28 Model requires **FOUR** 30 Amp, 240 Volt circuits, with double-pole breakers at the main electrical panel or at an installed 120 Amp sub-panel or disconnect box.

Solar Backup Water Heating Application
With Storage Tank and Closed-Loop Heat Exchanger
using a SEISCO, Model RA-28

SEISCO Model RA-28
Tank-Less!! ELECTRIC
Continuous Water Heater-
SOLAR Application

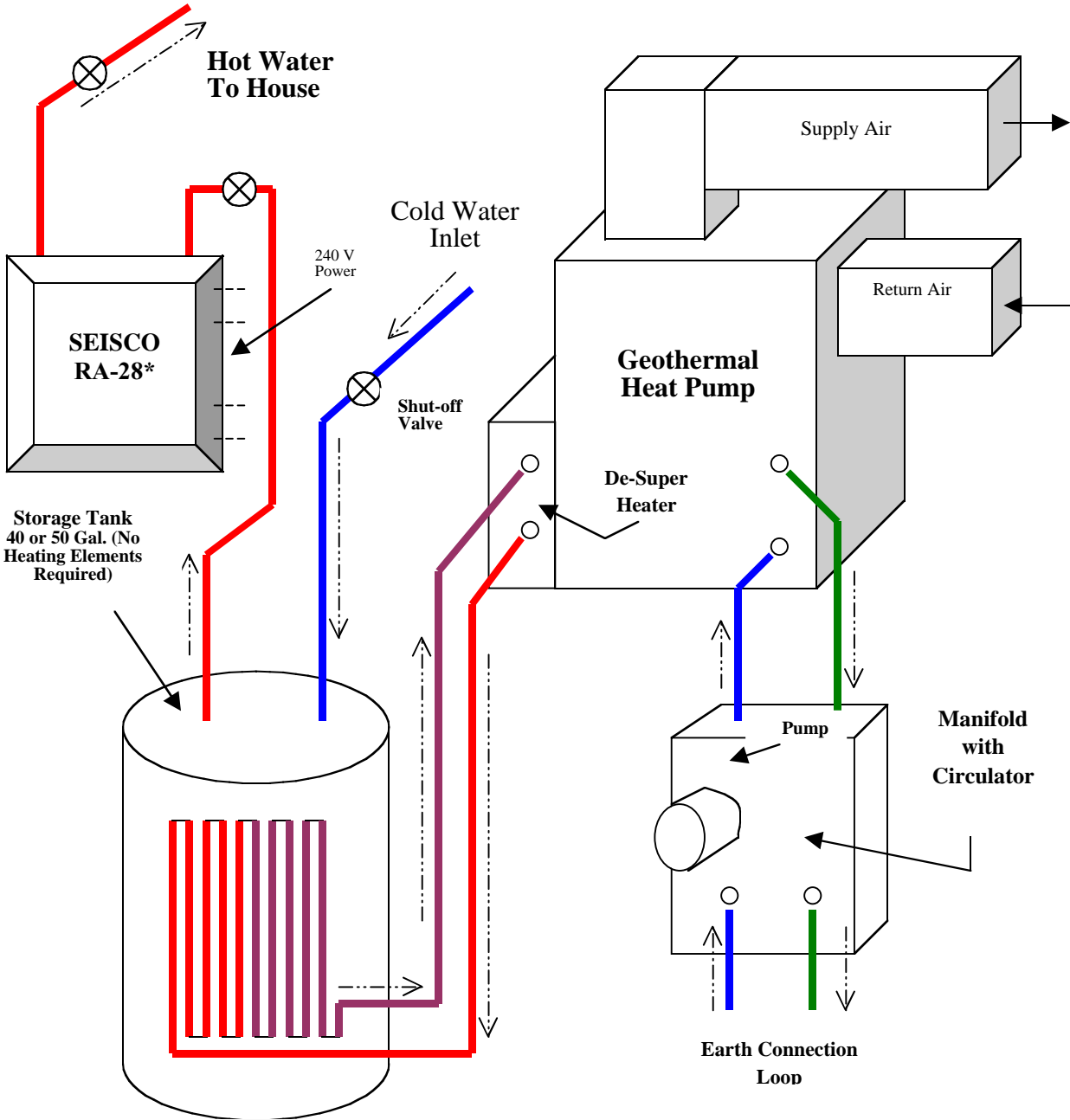


- ◆ Temperatures from the Solar Heated Storage Tank can reach 160° F, thus requiring a mixing valve ahead of the Seisco to prevent the high temperature switch from tripping and disabling the Seisco.
- ◆ If the Storage Tank contains heating elements, they should be disconnected or the power turned off to enable the Seisco to provide the back-up heating. The Seisco should be set to turn on when the water from the Storage Tank drops below 120° F.

* The RA-28 Model requires **FOUR** 30 Amp, 240 Volt circuits from the main electrical panel or from an installed 120 Amp sub-panel or disconnect box.

**Geothermal Backup Application
with a De-Super-Heater for Domestic Hot Water using a
Seisco, Model RA-28.**

**SEISCO Model RA-28
Tank-Less!! ELECTRIC
Continuous Water Heater-
GEOTHERMAL Application**



- ◆ If the Storage Tank contains heating elements, they should be disconnected or the power turned off to enable the GeoExchange System to provide as much of the heated water in the tank as possible. Seisco provides back-up hot water only when the GeoExchange System is not running or not providing enough heat to the Storage Tank. This typically occurs during the spring and fall.
- ◆ Seisco also provides the added feature of endless hot water after the storage tank has been depleted during heavy domestic hot water usage.

* Seisco Model RA-28 requires FOUR 30 Amp, 240 Volt circuits from the main panel or from an installed 120 Amp sub-panel or disconnect box.