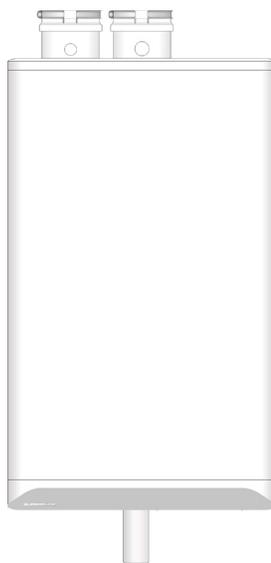


SFT 199 Tankless Water Heater

(Natural Gas or Propane)



WARNING: If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury, or loss of life.

Do not store or use gasoline or other flammable vapours and liquids or other combustible materials in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS:

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a nearby phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

Installation and service must be performed by a qualified installer, service agency or the gas supplier.

Ce manuel est également disponible en français sur notre site Web, au www.ibcboiler.com/TIPortal.



⚠ WARNING

If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury, or loss of life.

SAFETY CONSIDERATIONS

Installation, start-up and servicing of IBC units must be done with due care and attention, and should only be performed by competent, qualified, licensed and trained heating technicians. Failure to read and comply with all instructions and applicable National and local codes may result in hazardous conditions that could result in property damage and injury to occupants which in extreme cases might result in death.

HAZARDS & PRECAUTIONS**⚠ DANGER**

Points out an immediately hazardous situation which must be avoided in order to prevent serious injury or death.

⚠ WARNING

Points out a potentially hazardous situation which must be avoided to prevent serious injury or death.

⚠ CAUTION

Points out a potentially hazardous situation which must be avoided to prevent possible moderate injury and/or property damage

⚠ NOTE

Points out installation, maintenance and operation details that will result in enhanced efficiency, longevity and proper operation of your unit.

⚠ BEST PRACTICES

Points out recommendations for better installation.

Supplied with the unit - The SFT unit is shipped with an accessory parts kit consisting of the following items:

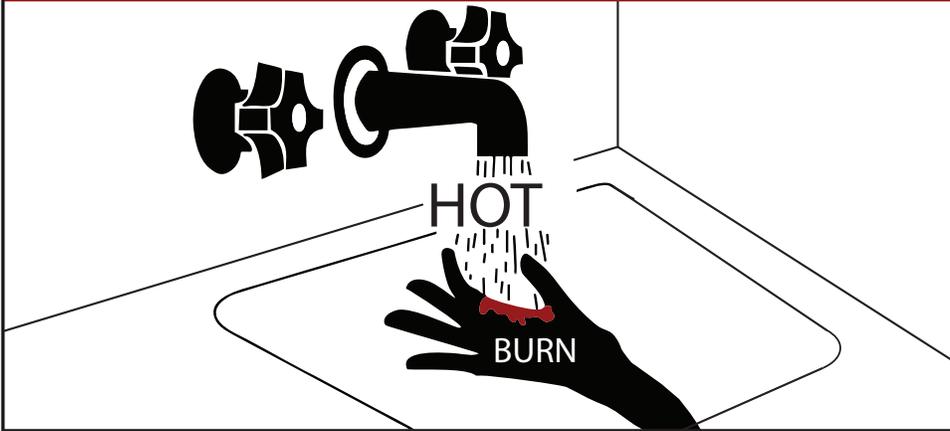
- 1 x Wall Mounting Bracket, 4 x 1¼" bolts - IBC part P-837
- 1 x Condensate trap assembly
- 1 x SFT Installation & Operating Instructions
- 1 x Propane Conversion Kit: P-802

SPECIFICATIONS

SPECIFICATION		SFT 199
Heat Capacity (Input)	Natural Gas	28,500-199,000 BTU/H
	Propane	28,500-199,000 BTU/H
Efficiency Ratings (NG & LP)	U.E.F	0.89
Flow Rate (DHW)	35°F (19°C) Temp Rise	10.1 GPM (38 L/m)
	45°F (25°C) Temp Rise	7.9 GPM 30 L/m)
	67°F (36°C) Temp Rise	5.3 GPM (20 L/m)
Dimensions - w, h, d	17.7 in. x 29.8 in. x 10.9 in (450 mm x 757 mm x 277 mm)	
Weight (empty) – lbs/Kg	68 lbs/ 31 kg	
Installation Type	Indoor only wall-hung	
Venting Type	Forced Draft Direct Vent	
	Electronic Ignition	
Water Pressure	40 - 150 PSI	
Natural Gas Supply Pressure (from source)	4 in WC-14 in WC	
Propane Gas Supply Pressure (from source)	4 in WC-14 in WC	
Minimum Flow Rate to activate DHW heating - USgpm	0.5	
Connection Sizes	Cold Water Inlet	3/4" Male NPT
	Hot Water Outlet	3/4" Male NPT
	Gas Inlet	3/4" Male NPT
Pressure Vessel water content – USG/Liters	0.19 / 0.72	
Ambient Temperature – Low (°F/°C)	32 / 0	
Ambient Temperature – High (°F/°C)	122 / 50	
Max relative humidity (non-condensing)	90%	
Min water Temperature – Domestic Hot Water (°F/°C)	34 / 1	
Max water Temperature – Domestic Hot Water (°F/°C)	149 / 65	
Power Supply	Main Supply	120Vac, 60Hz
	Watts @ full fire	100 watts
Materials	Casing	Painted steel and plastic
	Heat Exchangers	Copper tubes in AL block
Venting	Intake & Exhaust	2" or 3" PVC, CPVC, Polypropylene 2" or 3" Special Gas Vent Type BH (Class II, A/B/C)
Vent Clearances	0" to combustibles	
Safety Devices	Flame Proving module, Flue Gas Temperature Sensor, Protective fuse	
Certified design	ANSI Z21.10.3 • CSA 4.3	
Freeze Protection	Yes	

* Units ship configured for Natural Gas (NG) with a Propane (LP) conversion kit included. Converting an LP unit back to NG requires the certified NG conversion kit that can be ordered separately.


DANGER



- Water temperature over 125°F (52°C) can cause severe burns instantly or death from scalds.
- Children, disabled, and elderly are at highest risk of being scalded.
- See instruction manual before setting temperature at water heater.
- Feel water before bathing or showering.
- Temperature limiting valves are available, see manual.

WATER HEATER INSTALLATION GUIDELINES

WARNING

- This unit must be installed in accordance with local codes, if any; if not follow the National Fuel Gas Code, ANSI Z223.1/NFPA 54, or the Natural Gas and Propane Installation Code, CAN/CSA B149.1, as applicable.
- Failure to correctly install and operate this appliance can result in severe personal injury or death.
- The unit shall have a pressure relief valve installed within 6" [152mm] of the DHW HOT outlet connection.
Refer to the unit's User Manual before operating the relief valve.
- The unit requires a pressure relief valve identified with the ASME V or HV symbol and set to relieve at or below 150psi of domestic water pressure and a minimum relieving capacity of 199,000 Btu/hr with 3/4" NPT threads. For safe operation of the unit, the relief valve must not be removed from its designated point of installation or plugged.
- Read and follow warnings and instructions.

CAUTION

- Hotter water increases the risk of scald injury. Before changing the temperature setting, see instruction manual.

ADJUSTABLE TEMPERATURE SETTING

- Touch the panel above the white dot twice, then touch the Tap  Adjust the water temperature with the Plus + and Minus - then touch the Return button  to save the changes.

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⚠ DANGER

Should overheating occur or the gas supply fails to shut off, do not turn off or disconnect the electrical supply to the pump. Instead shut off the gas supply at a location external to the appliance.

⚠ WARNING

Do not use this unit if any part has been under water. Immediately call a qualified service technician to inspect the unit and to replace any part of the control system and any gas control that has been under water.

⚠ CAUTION

Care must be taken to properly size the unit for its intended use. Prolonged full fire run time, over-sizing or under-sizing, and incorrect flow rates through the unit can lead to increased maintenance costs, equipment stress and premature failure.

PRE-INSTALLATION CHECK

Carefully consider clearances and access, vent travel and termination, gas supply, condensate removal and combustion air supply.

Consider the following:

- Install the water heater in areas where the combustion air source is not subject to chemical fouling or agricultural vapours. Exposure to corrosive chemical fumes such as chlorinated and/or fluorinated hydrocarbons can reduce the life of a unit. Cleaners, bleaches, air fresheners, refrigerants, aerosol propellants, dry-cleaning fluids, de-greasers and paint-removers all contain vapours that can form corrosive acid compounds when burned in a gas flame. Avoid airborne chlorides such as those released with the use of laundry detergents.
- Locate the unit where water leakage will not result in damage to the area (for example, do not install above carpeting). If you cannot find a suitable location, install a drain pan under the appliance.
- At a new construction site, or during renovations, protect the unit from drywall dust or other construction related contaminants.
 - Ensure combustion air is drawn from a CLEAN source (e.g. outdoors).
 - Isolate the unit from interior dust sources.
- When the unit is in operation, assess the impact of the steam plume normally experienced at the exhaust terminal of a condensing water heater. Generally, intake and exhaust pipes should terminate at a rooftop or sterile wall location. Water heater condensate is corrosive. Protective measures must be taken to prevent corrosion damage to metal roofs or other metal building components in contact with the condensate. Keep exhaust plumes well away from all building air intakes including those of neighbouring properties.
- Place the exhaust outlet so it reaches 12" minimum above the down-turned intake. Avoid exhaust re-ingestion.
- For sidewall venting options: Both the inlet and exhaust terminations should normally be located on the same side of the building. You can elevate both pipes in "periscope style" after passing them through the wall to gain required clearance above grade and snow level.
- Examine the condensate outlet to ensure proper disposal of condensate will occur during operation. If discharging condensates into building drain piping materials that are subject to corrosion, you must use a neutralization package.
- Ensure that the pressure relief valve is installed with no valves or other means of isolation between its inlet and the unit. Pipe the relief valve with unobstructed piping (minimum 3/4" diameter) to a safe discharge location.
- In locations where power supply quality varies or is unstable, consider installing surge protection and power conditioners (up to and including battery back-up uninterrupted power supply devices).
- Ensure the domestic hot water demands are considered before purchasing the SFT series unit. You may need to add a storage tank.

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NOTE

Commercial use is allowed only if the unit is regularly maintained, and the heat exchanger is cleaned at least once a year, or more often if the unit is experiencing heavy use. **Note: If the appliance is serving only one residential appliance in a multi-family building, then the appliance shall be considered used for residential use.**

1.0 INSTALLATION

1.1 GENERAL

SFT series gas fired modulating water heaters are designed to be used for domestic (residential) purposes. Domestic use is considered to be an average annual gas usage of ± 4000 m³ (± 140,000 ft³) for natural gas or ± 5680 L (1500 US gallons) for propane. The products are fully condensing units with variable input ranges (see *specification chart - page 3*). The units are approved as “Category IV” vented appliances using Direct Vent (sealed combustion).

Figures 1a and 1b show outer case dimensions and piping. Use this diagram to find a suitable location for the unit. See also *Section 1.3 Location*.

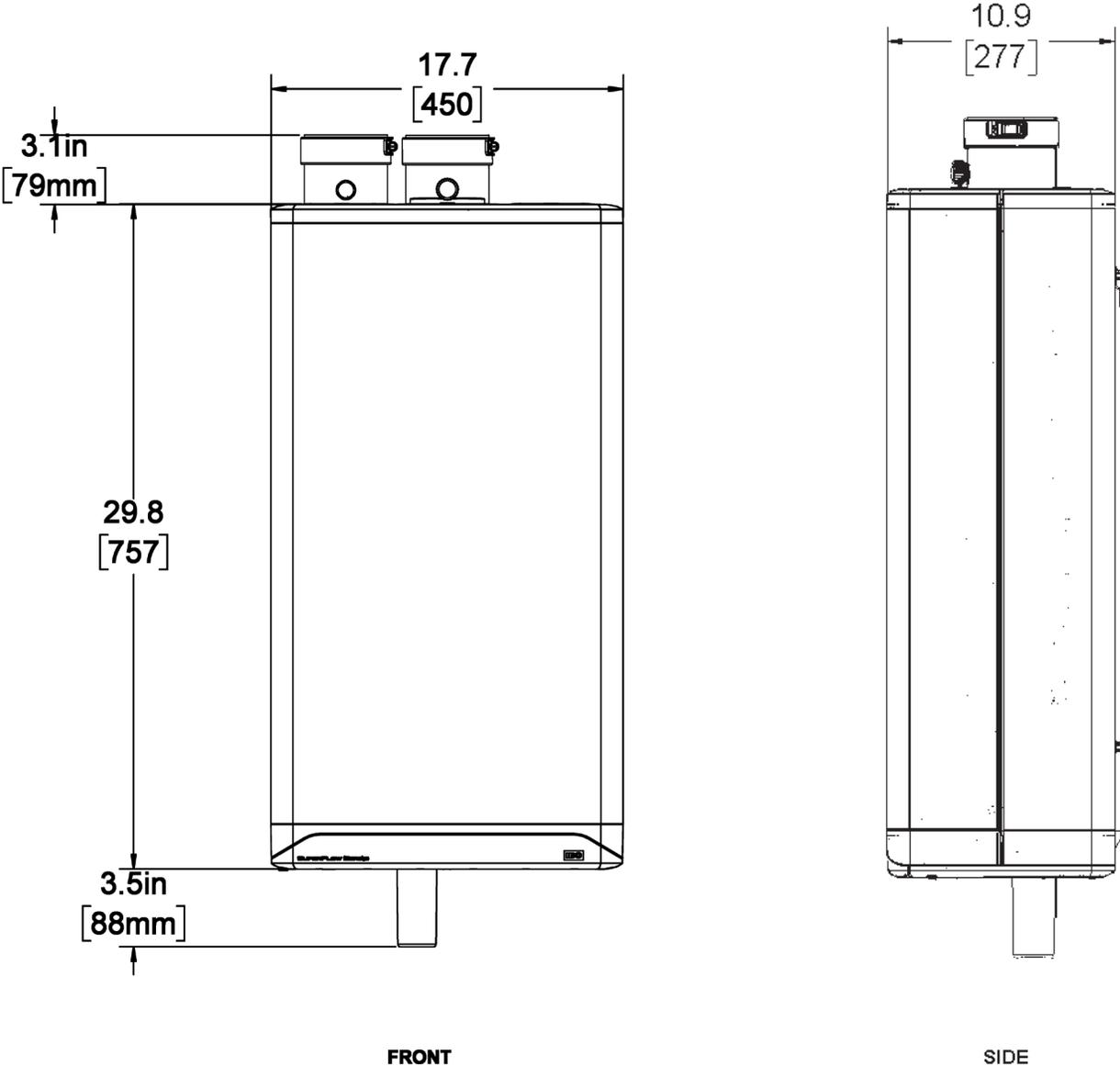


Figure 1a: Dimensions / Connections for SFT Series

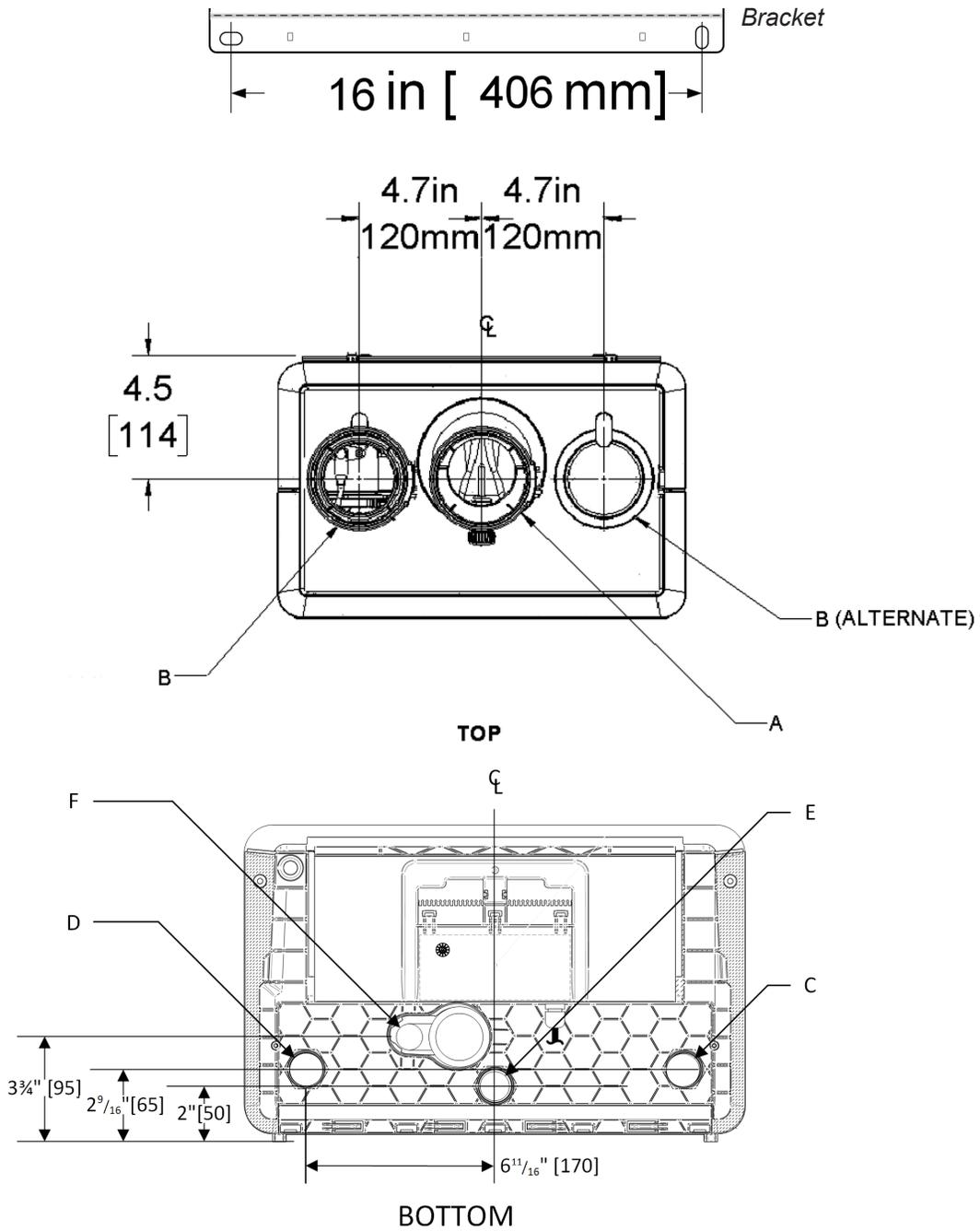


Figure 1b: Dimensions / Connections for SFT Series

DESCRIPTION	SFT UNIT
A Exhaust Outlet	3" Schedule 40
B Combustion Air	3" Schedule 40
C Cold Domestic Water Connection	3/4" Male NPT
D Hot Domestic Water Connection	3/4" Male NPT
E Gas Inlet	3/4" Male NPT
F Condensate Outlet	3/4" Hose

Table 1: Connections

⚠ WARNINGS

- Keep the unit area free and clear of combustible materials, gasoline, and other flammable vapours and liquids.

- Combustion air must not be drawn from areas containing corrosive air from swimming pools or spas, including air directly next to outdoor pools and spas.

- The unit must not be exposed to water leaks from piping or components located overhead. This includes condensation dropping from un-insulated cold water lines overhead.

- Ensure the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation and when servicing (pump replacement, condensate trap servicing, control replacement, etc.)

1.2 CODE REQUIREMENTS

The SFT water heaters are certified under CSA 4.3 / ANSI Z21.10.3.

The installation must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to the *National Fuel Gas Code, ANSI Z223.1/NFPA 54, and/or Natural Gas and Propane Installation Code, CAN/CSA B149.1*. The installation must also conform to the Canadian Electrical Code Part 1 CSA C22.2 No.1 and/or the National Electrical Code ANSI/NFPA 70.

1.3 LOCATION

The SFT series unit is designed and approved for indoor installation. Its venting options provide flexibility of location; for example, placement in an alcove, basement, utility room or closet. The unit is approved for installation in a closet (see Table 2 for clearances to combustibles).

Conditions for safe installations

Ensure that the surrounding conditions are 0°C to 50°C and less than 90% relative humidity.

Install the unit in areas where the combustion air source is not subject to chemical fouling or agricultural vapours.

Exposure to corrosive chemical fumes such as chlorinated and/or fluorinated hydrocarbons can reduce the life of a water heater. Cleaners, bleaches, air fresheners, refrigerants, aerosol propellants, dry-cleaning fluids, de-greasers and paint-removers contain vapors that can form corrosive acid compounds when burned in a gas flame. Also avoid airborne chlorides such as those released with the use of laundry detergents.

Avoid installing the unit where water leakage may damage the area (for example, above carpeting). If a location such as this cannot be found, a suitable drain pan should be installed under the appliance.

Water heater fastening

Approximate weight for the empty water heater is 68 lbs / 31 kg. For support fasteners, use the two of the four supplied ¼" x 2½" long lag screws. Installers will supply ¼" bolts if metal mounting systems are used. Attach fasteners to solid material that are capable of supporting the combined weight of the unit and piping assembly components.

Water heater clearance

Other factors affecting potential mounting sites:

- Ensure minimum clearance requirements for combustible materials (see Table 2) are satisfied.
- For ease of access, we recommend a minimum 24" clearance at the front and 10" above. Check local codes for additional access and service clearance requirements.
- **At a new construction site, or during renovations, protect the unit from drywall dust or other construction related contaminants. Combustion air must be drawn from a CLEAN source (e.g. outdoors) and the unit must be isolated from interior dust sources.**

⚠ DANGER

Do not common vent the SFT series water heaters with any other existing or new appliance.

⚠ WARNINGS

Exposed water piping and associated components (relief valves, circulators, etc.) should not be in contact with combustible materials. Check local codes for required clearances and/or provide adequate insulation.

DO NOT MOUNT THIS UNIT TO HOLLOW WALL STRUCTURES - The combined weight of the unit, its water contents and associated piping components can exceed 150 pounds. Fasteners must be rated for this strain, and must be firmly anchored into solid material that will support this weight.

Take precautions to avoid injury during the installation of this unit.

SURFACE	DISTANCE FROM COMBUSTIBLE SURFACES	RECOMMENDED DISTANCE FOR INSTALLATION AND SERVICE
Front	2"	24"
Rear	0"	0"
Left Side	1.5"	6" (labels may be difficult to read with reduced clearance)
Right Side	4"	6" (labels may be difficult to read with reduced clearance)
Top	2"	24"
Bottom	8"	24"

Table 2: Clearance from the unit cabinet

You must provide a minimum distance below the water heater of 8" to allow clearance for the supplied condensation trap assembly. More clearance will typically be required to accommodate associated water and gas piping.

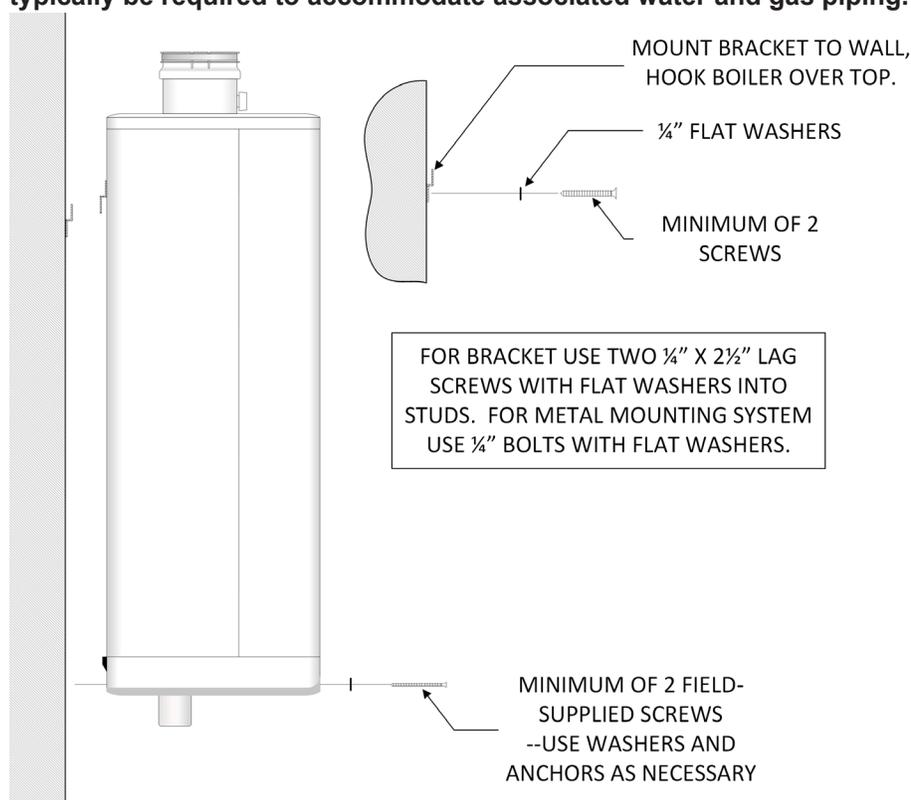


Figure 2: Wall mounting of unit

1.3.1 Mobile Home Installations

Units installed in a mobile or manufactured home must conform to the Manufactured Home Construction and Safety Standard, Title 24 CFR, Part 3280 and/or CAN/CSA Z240 MH Series, Mobile Homes.

⚠ WARNING

Venting, condensate drainage, and combustion air systems for all IBC units must comply with applicable codes and the instructions of their respective Installation manuals.

Inspect finished vent and air piping thoroughly to ensure all are airtight and comply with the instructions provided and with all requirements of applicable codes.

Failure to comply will result in severe personal injury or death.

⚠ NOTE

The minimum wall thickness for venting is 1" and the maximum wall thickness for venting is 14".

Do not connect a water heater to a chimney flue serving a separate appliance designed to burn solid fuel.

1.4 EXHAUST VENTING AND AIR INTAKE

When you plan the installation, ensure that you consider appropriate venting materials, travel and termination decisions. In particular, you should manage the impact of the steam plume typically at the exhaust terminal of a condensing unit. Generally, intake and exhaust pipes terminate at a rooftop or sterile wall location. Keep exhaust plumes well away from all building air intakes including those of neighbouring properties.



Figure 3: Basic exhaust vent assembly

Install venting in accordance with the requirements of the jurisdiction having authority: in Canada, Part 8, *Venting Systems* of the B149.1-10 Code and any other local building codes are to be followed. In the USA the National Fuel Gas Code, ANSI Z223.1, latest edition, prevails. Where there is a discrepancy between the installation instructions below, and the code requirements, you must apply the more stringent of the two.

Provisions for combustion and ventilation air in accordance with the section "Air for Combustion and Ventilation," of the *National Fuel Gas Code, ANSI Z223.1/ NFPA 54*, or Clause 8.2, 8.3 or 8.4 of *Natural Gas and Propane Installation Code, CAN/CSA B149.1*, or applicable provisions of the local building codes.

IMPORTANT

When an existing appliance is removed from a common venting system, the common venting system is likely to be too large for proper venting of the appliances remaining connected to it.

When re-sizing any portion of the common venting system, the common venting system should be re-sized to approach the minimum size as determined using the appropriate tables in the National Fuel Gas Code, ANSI Z223.1 - latest edition. In Canada, use the B149.1 Installation Code - latest edition.

Removal of an existing appliance

For each appliance remaining connected to the common venting system, you must follow the steps below. Before you begin, ensure that any other appliances connected to the common venting system are not in operation.

- Seal any unused opening in the common venting system.
- Inspect the venting system for proper size and horizontal pitch, and determine that there is no blockage or restriction, leakage, corrosion and other deficiencies that could cause an unsafe condition.
- Where practical, close all building doors and windows. This includes closing the doors of the appliances remaining connected to the common venting system. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
- Place in operation the appliance being inspected. Follow the lighting instructions. Adjust the thermostat, so that the appliance operates continuously.
- After determining that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliance to their previous conditions of use.
- Correct any improper operation of the common venting system to ensure that the installation conforms to the National Fuel Gas Code, ANSI Z223.1 - latest edition. In Canada, all installations must conform to the current CAN/CGA - B149.1 Installation Code and/or local codes.

1.4.1 Applications

All SFT series models must be installed as a Direct Vent venting system. The combustion air must be piped in from the outdoors and connected directly to the unit's combustion air connection. *See section 1.4.7 for air intake piping requirements.*

1.4.2 Exhaust Vent Material

Exhaust Vent Material – CANADA

Use only PVC, CPVC, or Polypropylene (PPs) vent components. Venting components must be approved for use with a Category IV appliance, listed under ULC 636 and must comply with CSA B149.1 (latest edition).

- ULC-636 - PVC
- ULC-636 - CPVC
- ULC-636 - PPs

Exhaust Vent Material – USA

Use only PVC, CPVC, or Polypropylene (PPs) vent components. Venting components must be approved for use with a Category IV appliance, (UL1738 or ULC636).

- PVC Schedule 40 – Solid Core
- CPVC Schedule 40 or 80 – Solid Core
- Approved Polypropylene venting materials

NOTE

The flue gas temperature sensor reports the current flue gas exhaust temperature to the unit's controller. If necessary, the controller will reduce the input of the water heater to meet the flue gas exhaust temperature requirements of PVC material. The controller locks out the unit if this temperature is exceeded, and displays F003.

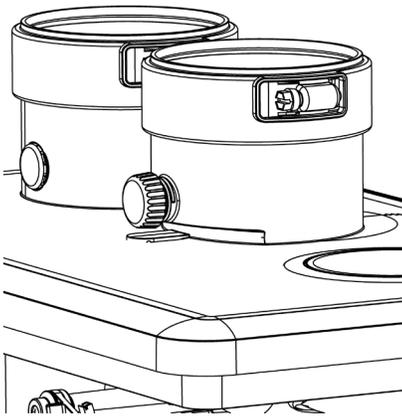
⚠ WARNINGS

- Do not mix venting materials from different Polypropylene manufacturers.

These venting materials are designed to be installed as part of a complete system.

Failure to comply may result in severe personal injury or death.

- Fully insert the approved venting material into the unit's exhaust outlet and tighten clamp to ensure the venting connection is locked in place.



Exhaust Venting Material – Other

Do not use ABS or any cellular core pipe for exhaust venting.

Use of cellular core PVC (ASTM F891), cellular core CPVC, or Radel® (polyphenolsulfone) in venting systems are prohibited.

The unit offers 3" venting connections. Use fittings to adapt to the appropriate diameter (*see Vent Travel below*). Insert CPVC or PVC exhaust venting directly into the 3" female fitting on the unit's top panel. To secure the pipe into the fitting, tighten the clamp. If PPs materials are being used, ensure the proper adapter is used to transition from the Schedule 40 diameter to the PPs-size diameter.

For PPs material, use the 3" transition/adaptor fitting (Sch 40 to PPs) offered by the respective PPs manufacturers Centrotherm/*Innoflue*[™] (their part # ISAA0303), M&G Dura Vent/PolyPro #3PPS-AD, or #3PPS-3PVCM-3PPF. For PPs material exposed to outdoor weather, follow the venting suppliers' recommendations on UV protection.

Combustion air piping is inserted directly into the 3" female plastic fitting on the right (*see Section 1.4.7*).

Venting must be supported in accordance with applicable code.

Manufacturers of stainless steel Type BH venting systems must submit their approved transition fitting to IBC for evaluation and written approval.

1.4.3 Vent Travel

PVC, CPVC or PPs (Rigid Single Wall) piping is the standard venting option that enables units to be vented up to 120 equivalent feet from the vent termination using 3". The actual vent travel allowance is reduced for fittings in accordance with *Table 3*.

Example: For the models listed above, using 6 x 90° CPVC long sweep elbows, the maximum lineal measure of pipe allowed using 3" pipe is 90 feet (120' – (6 x 5' = 30) = 90').

For 3" Flexible PPs, up to 35 actual lineal feet are allowed in a nominally vertical orientation (>45°). The equivalent length of 3" Flexible PPs shall be computed using a multiple of 1.4:1, e.g. 35' x 1.4 = 49' equivalent. The balance of the venting allowance is still available for use with rigid PPs piping material. 2" Flexible PPs is not allowed.

EXHAUST PIPE SIZE/FITTINGS	MAXIMUM EQUIVALENT LENGTH
Schedule 40 PVC, CPVC or PPs – Allowances are for each side separately.	
2"	35'
3"	120'
2" or 3" 90' Long Sweep Vent Elbow	Allow 5 equivalent feet
2" or 3" 90' Short Sweep Vent Elbow	Allow 8 equivalent feet
2" or 3" 45' Vent Elbow	Allow 3 equivalent feet
PPS	
PPs 87-90' Elbow	Allow 8 equivalent feet
Flex PPS – Factor = 1.4	
3" PPs Flex	(Max. 35) actual feet times 1.4

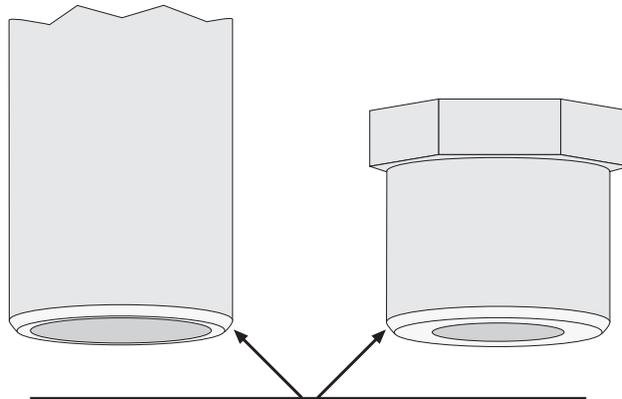
Table 3: Maximum Exhaust Venting Length

Follow all installation instructions supplied by the pipe and fitting manufacturer. Prior to assembly, ensure all venting components are clean of burrs/debris. Take care to avoid ingestion into the fan of PVC debris left in the combustion air piping.

General Venting/Piping Requirements

Slope exhaust venting towards the unit with a pitch of at least 1/4" per foot. Follow PP's manufacturer requirements, so condensate runs back towards the trap. Support should be provided for intake and vent piping, particularly for horizontal runs (follow the local code).

Insert exhaust piping directly into the 3" female plastic fitting on the top center of the unit, and run it horizontally or vertically to the outdoors. We recommend using a bird screen of 1/4" stainless steel or plastic mesh (e.g., IPEX System 636 drain grate for CPVC systems) to guard against foreign objects.



**ENSURE PIPE AND FITTINGS ARE BEVELED
FOR TROUBLE-FREE INSERTION THROUGH
EXHAUST AND INTAKE PIPE GASKETS
WET GASKETS AND PIPE BEFORE INSERTION**

! BEST PRACTICES

To reduce the possibility of expansion noise, allow a 1/4" gap around the exhaust and air intake piping.

Figure 4

Secure joints using appropriate solvent cement to bond the respective pipe material (Canada: PVC/CPVC cement approved under *ULC-S636*, in accordance with its manufacturer instructions; USA: PVC (ASTM D2564), or PVC/ABS (D2235). Use transition glue anywhere that PVC and CPVC are joined. Follow the cement manufacturer's instructions closely when joining various components. For PPs, connections must be secured using approved retainer clips supplied by the respective PPs manufacturer.

Ensure that all vent connections are liquid and pressure tight. Prior to firing the unit, and before any of the venting run is concealed by the building construction, you must test the exhaust joints, using a soap/water solution. You must fill the condensate trap before testing.

⚠ CAUTION

Vent termination clearances in this section are code minimum, or IBC recommended minimum requirements, and may be inadequate for your installation. You must examine building envelope details, and take measures to avoid admission of moisture into building structures. Serious structural damage may occur if adequate precautions and clearances are not allowed for.

These precautions are to be observed for neighbouring structures as well as for the structure the unit(s) are installed in.

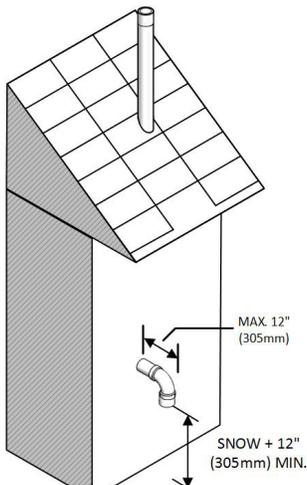


Figure 5a: Rooftop vent terminal configurations

⚠ WARNING

Condensate can cause corrosion of metal roofing components and other roofing materials. Check with the builder or roofing contractor to ensure that materials are resistant to acidic condensate. pH levels can be as low as 3.0

1.4.4 Venting Passage Through Ceiling and Floor

- Confirm material meets local codes including fire stopping requirements. Some local jurisdictions require that a minimum initial length of pipe be exposed or accessible for inspection.
- Pipe clearances - no IBC requirements, but best practice allows a minimum 1/4" gap around the pipe to prevent binding and expansion noise. Follow local codes.
- All piping must be liquid and pressure tight.

1.4.5 Rooftop Vent Termination

Direct Vent - Two Pipe

Rooftop vents must terminate as follows:

- The exhaust pipe can terminate in an open vertical orientation without concern about rain infiltration; rain will drain away through the condensate trap.
- The intake air pipe is not typically drained, so it must be terminated with a down-turned elbow (see Figure 5b). The intake pipe does not need to penetrate the roof at the same elevation as the exhaust (as shown); lower down the roof is OK.
- The air intake pipe may terminate on the side wall of the building as long as the air intake terminal is turned down and the side wall of the building is not exposed to large wind loads i.e.: prevailing winds.
- Optional bird screen may be placed in a termination fitting. Leave unglued, and hold in place with a short nipple to allow easy access for cleaning.
- For roof top venting of multiple unit sets, group all intake terminals together for a common penetration through a custom cap. Alternatively, place in the closest proximity achievable using commonly available pipe flashing. Similarly, group the exhaust pipes and place the 2 separate groups of pipes at least 3' apart (the closest intake and exhaust pipes must be 36" - or more - apart). Use the same 12" (minimum) vertical separation for 2 pipe option. For alternative group terminations, contact the IBC Factory for written guidance.
- **DO NOT exhaust vent into a common venting system.**

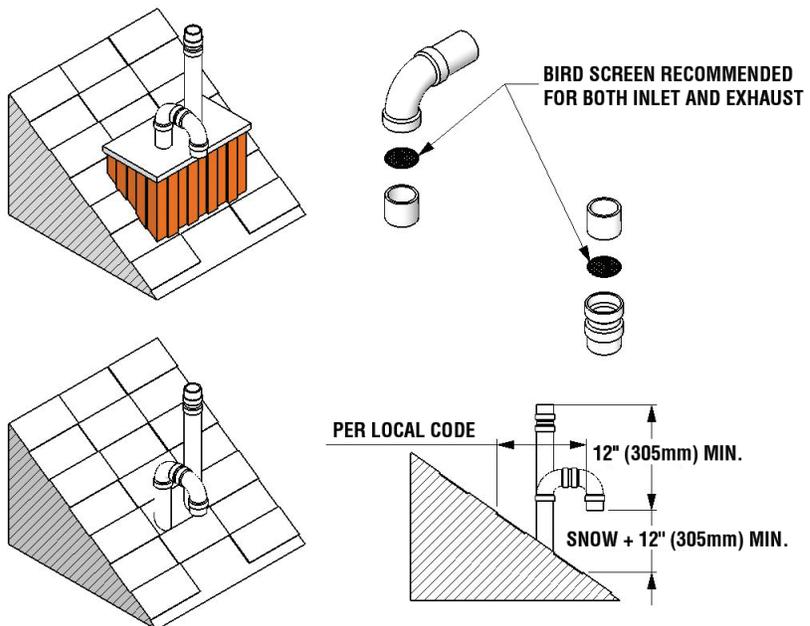


Figure 5b: Rooftop vent terminal configurations

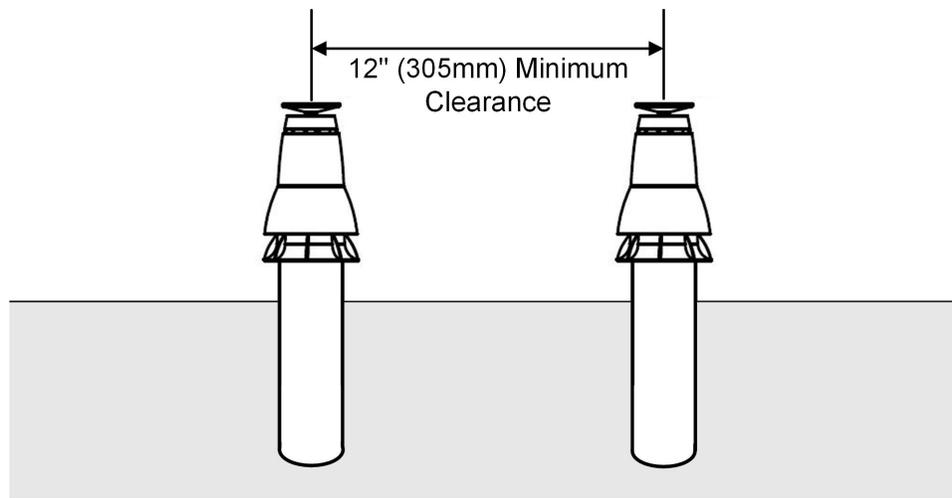


Figure 6: Vertical Concentric Termination - Two Kits

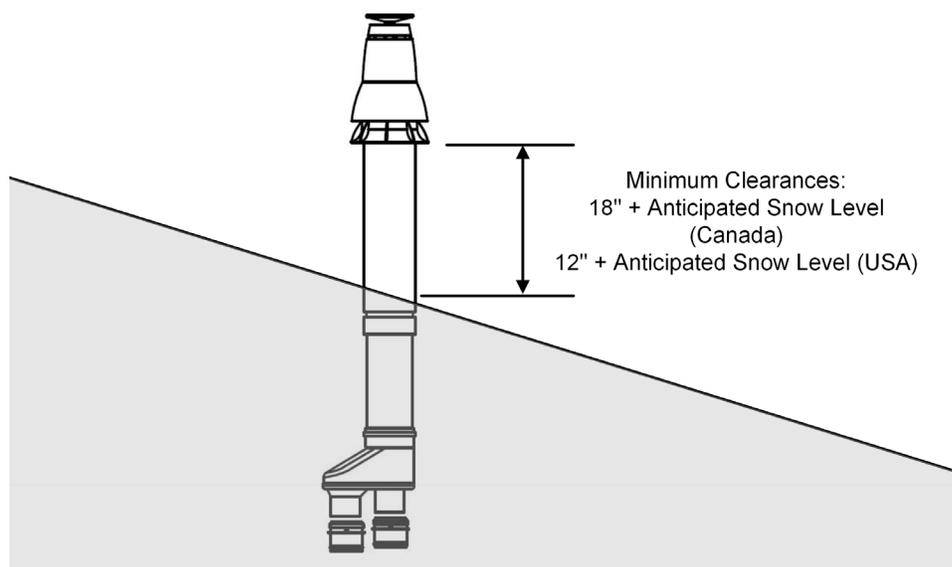


Figure 7: Vertical Concentric Termination - Single Kit

DIRECT VENT CONCENTRIC ROOF TOP TERMINATION

Roof Top Concentric Termination kits are approved for use with this unit. For vertical roof top concentric terminations, you must follow the installation instructions supplied with the venting material manufacturer. Care must be taken to install the termination kit a minimum horizontal distance of 10' (305cm) away from any portion of the building and a minimum of 18" (46cm) above the roof line plus the anticipated snow line (see Figures 6 and 7).

⚠ WARNINGS

- You must maintain at least the minimum separation of exhaust vent termination from unit's intake air as illustrated in figures 5, 8 and 12. Failure to do so can result in a dangerous situation where exhaust gases are re-ingested with combustion air. Damage to the unit can result from a failure to maintain these separations. Improper installation will void the warranty.

- You must not cover non-metallic vent pipe and fittings with thermal insulation.

- In areas of high snowfall, users must be advised to check side wall vent and air intake terminations on a regular basis to ensure blockage does not occur.

1.4.6 Sidewall Vent Termination

Direct Vent - Two Pipe

Sidewall direct vent applications must be vented as follows:

- Both the inlet and exhaust terminations should normally be located on the same plane (side) of the building.
- The exhaust outlet is to be placed so as to reach 12" minimum above the down-turned intake - to avoid intake re-ingestion of exhaust gases.
- The elevation of both pipes can be raised in "periscope style" after passing through the wall, then configured as in *Figure 8*, to gain required clearance.
- Use a 45° elbow on the exhaust termination to launch the plume up and off the sidewall, for protection of wall.
- Bird screen of 1/4" stainless steel or plastic mesh eg. (IPEX System 636 drain grate for CPVC systems) is useful to guard against foreign objects.

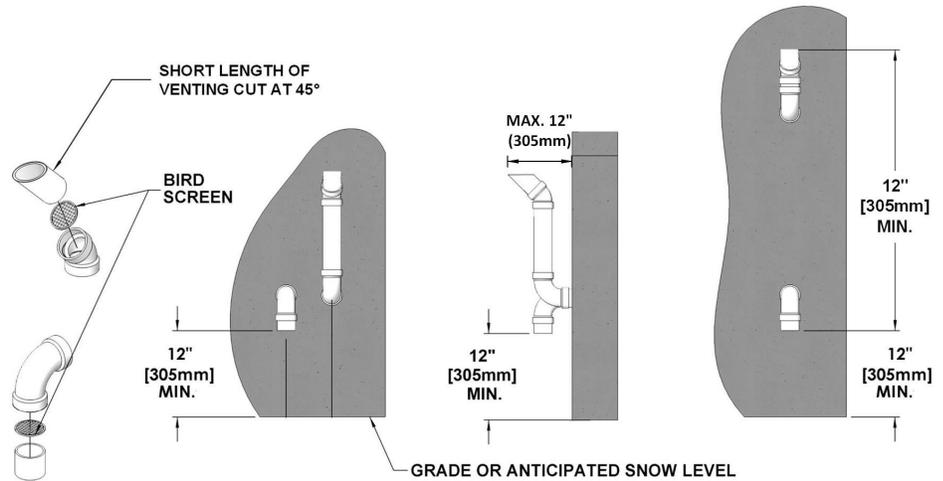


Figure 8: Sidewall vent termination - piping configuration

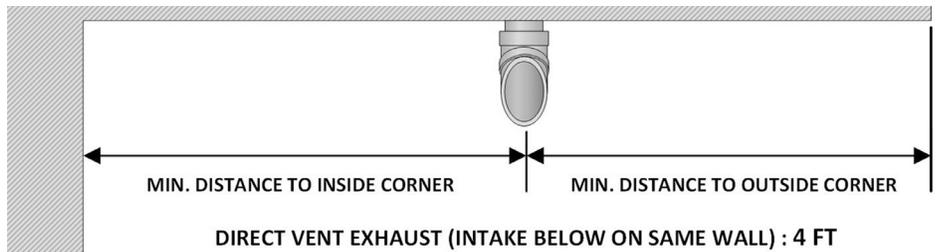


Figure 9: Top view - minimum distance of exhaust vent to inside and outside corners.

DIRECT VENT SIDE WALL TERMINATION KITS

The Side Wall Termination kits approved for use with the SFC series units are subject to restrictions. **NOTE:** Some jurisdictions may not allow this type of side wall termination due to close proximity to the neighboring properties. See *Figures 10, 11a and 11b* on page 1-12.

Approved Side Wall Termination Kits are listed below: (Alternative vent termination kits must be submitted to IBC for approval prior to installation.)

- Ipex - #196984 – 2" PVC low profile termination kit
- Ipex - #196985 – 3" PVC low profile termination kit

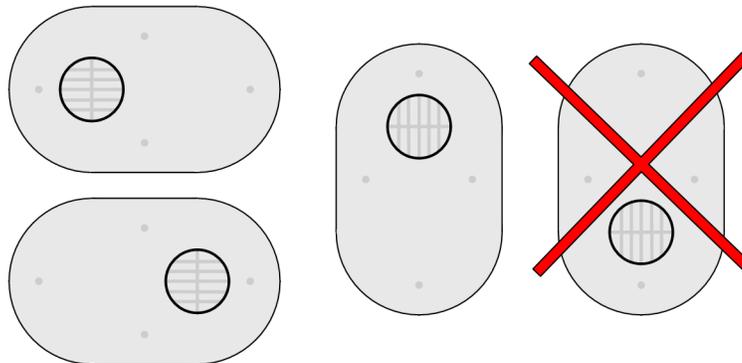


Figure 10: Non-Concentric kits - Ipex #196984 2" PVC and #196985 3" PVC

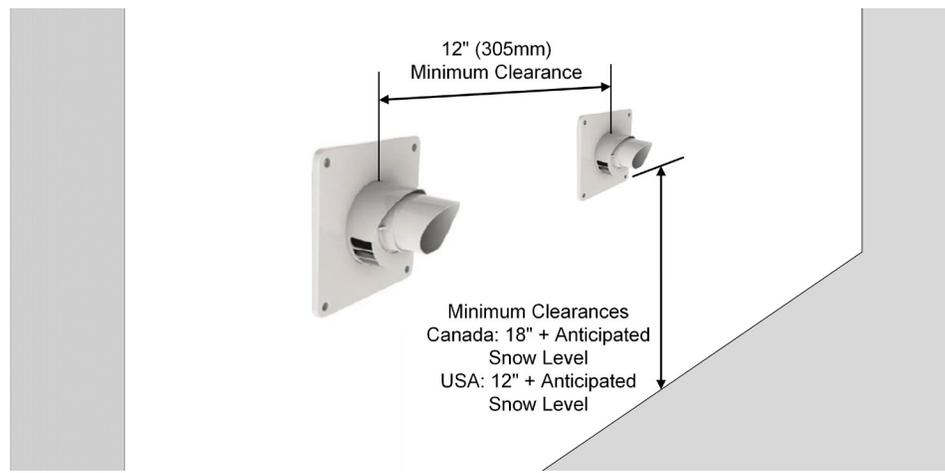


Figure 11a: Horizontal Concentric Termination - Two Kits

⚠ WARNING

The vent for this appliance must not terminate:

1. Over public walkways.
2. Near soffit vents or crawl space vents or other areas where condensate or vapor could create a nuisance or hazard or cause property damage.
3. Wherever condensate vapor could cause damage or could be detrimental to the operation of regulators, relief valves, or to other equipment.

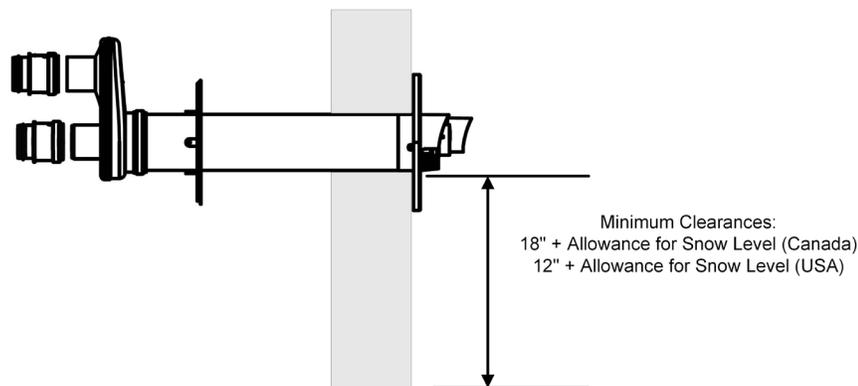


Figure 11b: Horizontal Concentric Termination - Single Kit

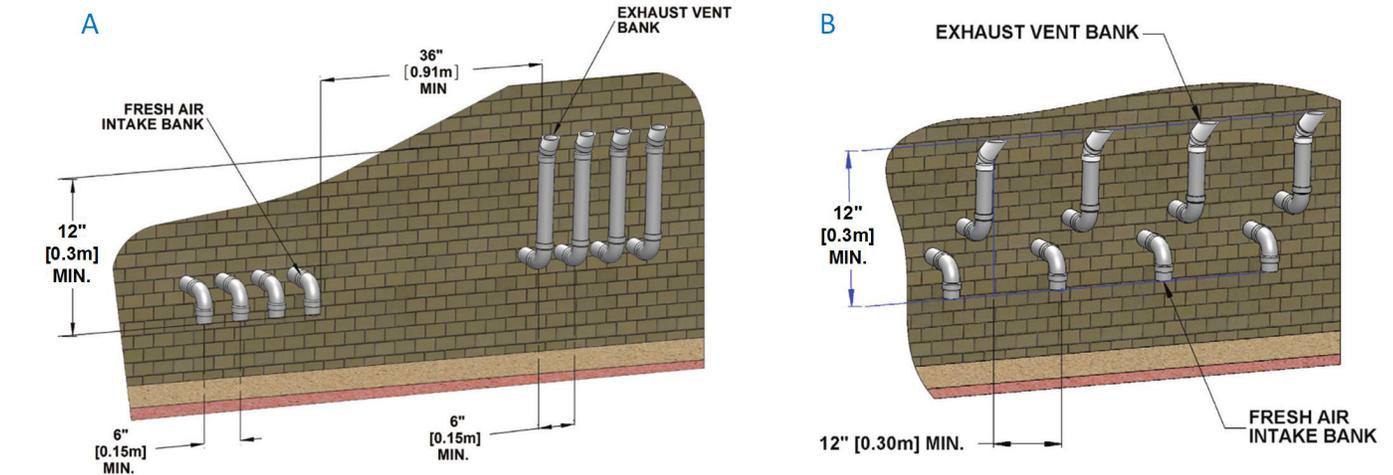


Figure 12: Sidewall vent termination - multiple vent piping configuration

For side venting of multiple units, group all intake terminals together with 6" (minimum) lateral spacing, and similarly group the exhaust pipes. Place the 2 groups on the same plane of the building (e.g., north facing wall). Place the 2 groups of pipes at least 3' apart (the closest intake and exhaust pipes must be 36" - or more - apart). Use same 12" (minimum) vertical separation (see A in Figure 12). Alternatively, as long as the units are identical models - intake and exhaust terminals can maintain a minimum of 12" of separation horizontally from any exhaust or inlet termination of an adjacent unit (see B in Figure 12). For alternative group terminations, contact the IBC Factory for written guidance.

Figure 13: IBC recommended minimum vent terminal clearance under ventilated soffit

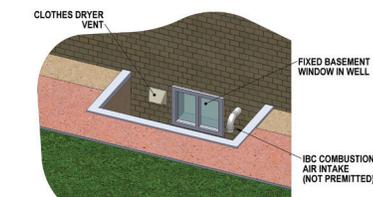


Figure 14: Prohibited installation

Concentric Side Wall Termination Kits

Install the Concentric Side Wall Termination kits:

- On the same horizontal line (not stacked)
- With a minimum vertical separation of 12" center to center

Refer to local code requirements or restrictions when installing concentric side wall termination kits. Ensure that the termination and venting are sloped back to the unit.

You must follow the clearances recommended by the vent termination manufacturer.

Approved concentric side wall termination kits are listed below: (Alternative vent termination kits must be submitted to IBC for approval prior to installation.)

- Centrotherm – Innoflue #ICWT242 (2" termination) + ICTC0224 (2" transition to 2 pipe)
- Centrotherm – Innoflue #ICWT352 (3" termination) + ICTC0335 (3" transition to 2 pipe)
- Duravent – Polypro #3PPS-HK – Horizontal Termination Kit – Concentric
- Ipex #197006 – 3" PVC Concentric Termination kit
- Ipex #197009 – 3" CPVC Concentric Termination kit

⚠ WARNINGS

- In addition to preventing ingestion of chemical contaminants, care must be taken to ensure air intake terminals are not installed in locations where contamination might occur due to ingestion of particulate foreign material (dust, dirt and debris).

- Intake air openings must be configured such that rain or other forms of moisture cannot enter the air intake piping system. Otherwise serious damage to the unit may result.

⚠ NOTE

Care must be taken when installing air intake piping to ensure that a “trap” is not formed in the piping so as to allow a build-up of water, and blockage of intake air.

Such blockage will result in a unit’s safety shut-down.

Vent terminal clearance minimums are as follows:

	CANADIAN INSTALLATIONS^{1, 3}	US INSTALLATIONS^{2, 3}
A= Clearance above grade, veranda, porch, deck, or balcony	12 in (30 cm)	12 in (30 cm)
B= Clearance to window or door that may be opened	6 in (15 cm) for appliances ≤ 10,000 Btuh (3 kW), 12 in (30 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 100,000 Btuh (30 kW), 36 in (91 cm) for appliances >100,000 Btuh (30 kW)	6 in (15 cm) for appliances ≤ 10,000 Btuh (3 kW), 9 in (23 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 50,000 Btuh (15 kW), 12 in (30 cm) for appliances > 50,000 Btuh (15 kW)
C= Clearance to permanently closed window	*	*
D= Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 ft (61 cm) from the center line of the terminal.	*	*
E= Clearance to unventilated soffit	*	*
F= Clearance to outside corner	*	*
G= Clearance to inside corner	*	*
H= Clearance to each side of center line extended above meter/regulator assembly	3 ft (91 cm) within a height 15 ft above the meter/regulator assembly	*
I= Clearance to service regulator vent outlet	Above a regulator within 3 ft (91 cm) horizontally of the vertical center line of the regulator vent outlet to a maximum vertical distance of 15 ft (4.5 m)	*
J= Clearance to nonmechanical air supply inlet to building or the combustion air inlet to any other appliance	6 in (15 cm) for appliances ≤ 10,000 Btuh (3 kW), 12 in (30 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 100,000 Btuh (30 kW), 36 in (91 cm) for appliances >100,000 Btuh (30 kW)	6 in (15 cm) for appliances ≤ 10,000 Btuh (3 kW), 9 in (23 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 50,000 Btuh (15 kW), 12 in (30 cm) for appliances > 50,000 Btuh (15 kW)
K= Clearance to a mechanical air supply inlet	6 feet (1.83 m)	3 ft (91 cm) above if within 10 ft (3 m) horizontally
L= Clearance above paved sidewalk or paved driveway located on public property	7 ft (2.13 m) †	Vents cannot be located above public walkways or other areas where condensate or vapor can cause a nuisance or hazard.*
M= Clearance under veranda, porch deck, or balcony	12 in (30 cm) ‡	*

1 In accordance with the current CSA B149.1 Natural Gas and Propane Installation Code

2 In accordance with the current ANSI Z223.1 / NFPA 54 National Fuel Gas Code

3 If locally adopted installation codes specify clearances different than those illustrated, then the most stringent shall apply.

† A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings.

‡ Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor.

* Clearance in accordance with local installation codes and the requirements of the gas supplier. The minimum distance from adjacent public walkways, adjacent buildings, openable windows, and building openings shall not be less than those values specified in the National Fuel Gas Code, ANSI Z223.1/NFPA 54, and/or the Natural Gas and Propane Installation Code, CSA B149.1

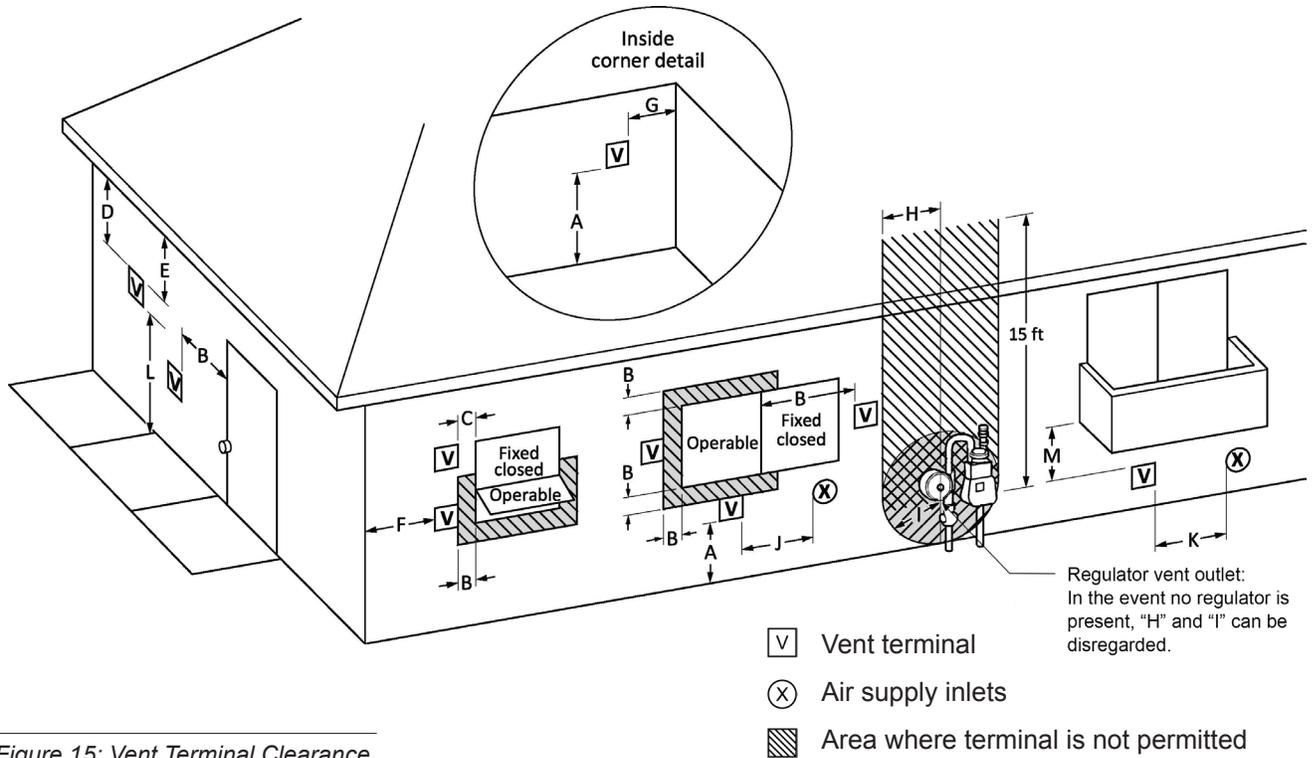


Figure 15: Vent Terminal Clearance

1.4.7 “Direct Vent” Combustion Air Intake Unit’s Piping

The unit must always be installed as a Direct Vent venting system with the combustion air piped directly from the outdoors to the unit’s combustion air connection. Provisions for combustion and ventilation air are in accordance with the section “Air for Combustion and Ventilation,” of the *National Fuel Gas Code, ANSI Z223.1/NFPA 54*, or Clause 8.2, 8.3 or 8.4 of *Natural Gas and Propane Installation Code, CAN/CSA B149.1*, or applicable provisions of the local building codes.

Combustion air connection may be moved from one side to the other:

- Lift tab at back of plug
- Rotate counter-clockwise 1/8th of a full turn
- Lift plug out of cabinet and move to other opening; rotate plug and push down tab to lock into place.

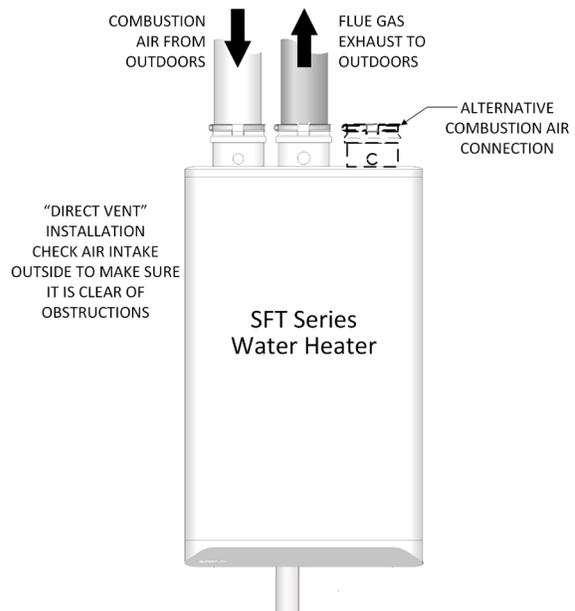


Figure 16: Direct vent combustion air intake

Intake Pipe Sizing

For 3" Flexible PPs, you can use up to 35 actual lineal feet in a nominally vertical orientation (>45°). The equivalent length of 3" Flexible PPs must be calculated using a multiple of 1.4:1, e.g. 35' x 1.4 = 49' equivalent. The balance of the venting allowance is still available for use with rigid PPs piping material. 2" Flexible PPs is not allowed.

INTAKE PIPE SIZE/FITTINGS	MAXIMUM EQUIVALENT LENGTH
Schedule 40 PVC, ABS, CPVC or PPs – Allowances are for each side separately.	
2"	35'
3"	120'
2" or 3" 90' Long Sweep Vent Elbow	Allow 5 equivalent feet
2" or 3" 90' Short Sweep Vent Elbow	Allow 8 equivalent feet
2" or 3" 45' Vent Elbow	Allow 3 equivalent feet
PPS	
PPs 87-90' Elbow	Allow 8 equivalent feet
Flex PPS – Factor = 1.4	
3" PPs Flex	35 actual feet

Table 4: Maximum intake piping length.

For **inlet** air, you can use Schedule 40 PVC, CPVC, ABS or PPs piping of any type. Use the same diameter as vent piping.

Insert combustion air piping directly into the 3" female plastic fitting on the top of the unit, and run it horizontally or vertically to the outdoors. We recommend using a bird screen of 1/4" stainless steel or plastic mesh (eg. IPEX System 636 drain grate for CPVC systems) to guard against foreign objects.

Care must be taken to ensure adequate separation is maintained between the air intake inlet and the vent terminal. Refer to the vent terminal configuration drawings in the "Vent Termination" section above.

Support should be provided for intake piping, particularly for horizontal runs (follow local code).

1.4.8 "Indoor Air" 1.4.8 "Indoor Air" Combustion Air Intake

Indoor combustion air is not approved for use with the SFT series units.

1.4.9 Closet Installations

For installations in a confined space (such as a closet), ventilation openings may be needed through a door or wall to prevent build-up of excessive heat from inside the space.

The unit must not be exposed to surrounding conditions above 122°F (50°C) or below 32°F (0°C).

⚠ WARNING

Fill the trap with water before first firing the unit to prevent exhaust fumes from entering the room. Never operate the water heater unless the trap is filled with water.

Failure to comply will result in severe personal injury or death.

⚠ NOTE

It is the responsibility of the installing and/or service Contractor to advise and instruct the end user on how to perform the Trap cleaning procedure, and to advise that the trap be checked at least every two months and cleaned as required.

1.5 CONDENSATE REMOVAL

IBC's specified vent configuration promotes the safe drainage of moisture from the unit and exhaust venting without flowing liquids back through the heat exchanger.

Reliable system operation requires (1) proper design and installation of exhaust venting to allow condensate to run back to the drain/trap; (2) acid neutralization as appropriate. To achieve these:

1. Allow for a minimum 1/4" per foot slope back to the vent connection, with appropriate hangers to maintain that gradient (check with the venting manufacturer as their slope requirement may be stricter).
2. Ensure the supplied trap is correctly installed and filled with water.
3. When required, add (and maintain in good condition) a pH neutralization tank.

1.5.1 Condensate Trap

The condensate trap must be installed on the drain connection at the base of the unit.

1.5.2 Installing the Condensate Trap

1. Fill the condensate trap cup with water.
2. Place the condensate trap cup into the condensate trap base and twist toward the right.
3. Attach the drain hose to the condensate trap outlet located to the left of the condensate trap.

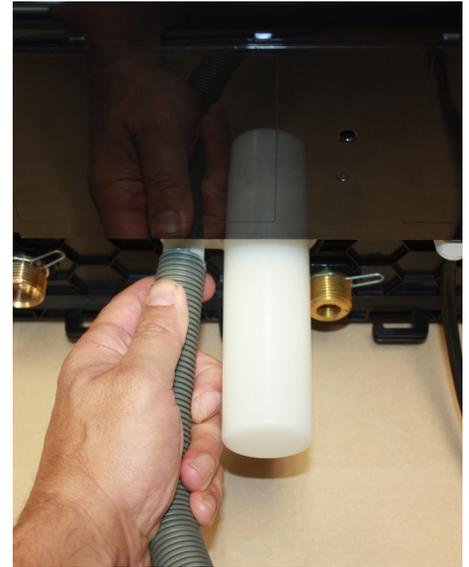


Figure 17: Condensate trap installation

⚠ DANGER

The water in the condensate neutralizer can cause severe burns to the skin. Use extreme caution when servicing the condensate neutralizer. Wear protective gloves and eyewear.

⚠ CAUTION

When a condensate neutralization package is installed, the pH of the condensate discharge must be measured on a regular schedule to ensure the neutralizing agent is active and effective.

⚠ WARNING

If condensates are to be discharged into building drain piping materials that are subject to corrosion, a neutralization package must be used.

1.5.3 Cleaning the Condensate Trap

1. Turn off the power to the water heater and allow it to cool down.
2. Twist the condensate trap cup toward the left and lower the trap cup.
3. Rinse out the trap cup and refill with water. Inspect the trap, and clean the interior portion of the trap (attached to the unit).
4. Re-install the condensate trap cup, and twist to the right.

1.5.4 Further Installation Details

- Pipe the condensate drain to within 1” of a drain, or connect it to a condensate pump.
- Slope the drainage line down to the drain at a pitch of 1/4” per foot, so that the condensate runs towards the drain.
- Check the condensate traps every 2 months, and clean and refill as necessary.

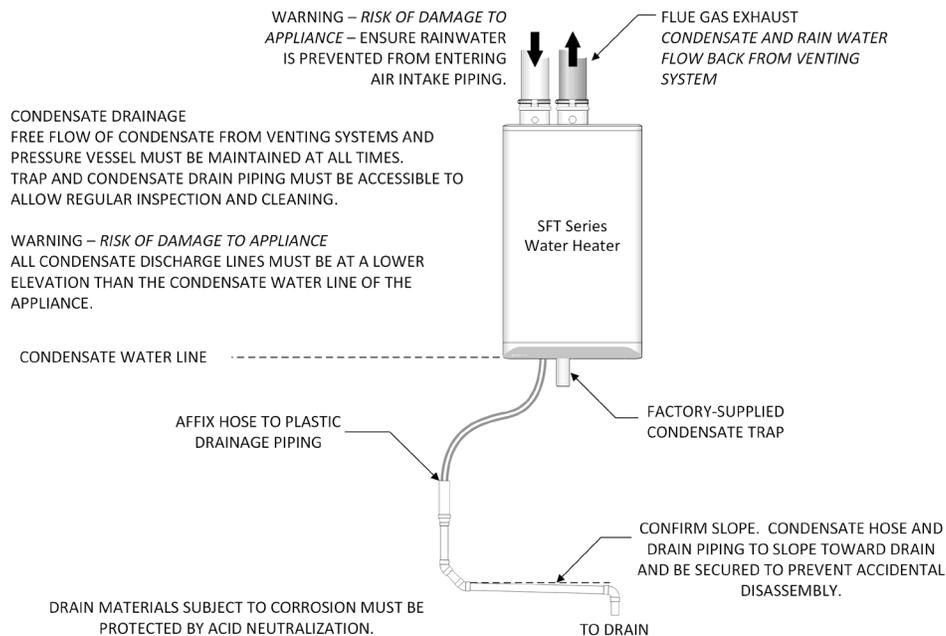


Figure 18: Condensate trap drainage

MAINTENANCE DETAILS FOR
NT-1S CONDENSATE NEUTRALIZATION TANK

REFER TO MANUFACTURER'S MAINTENANCE INSTRUCTIONS FOR OTHER
MAKES AND MODELS OF CONDENSATE NEUTRALIZATION TANKS.

WARNING – RISK OF INJURY
TANK FLUID CAN BE HIGHLY ACIDIC. DO NOT USE HANDS TO STIR MATERIAL.

WARNING – RISK OF DAMAGE TO APPLIANCE
NEUTRALIZATION TANK INLET AND DISCHARGE MUST BE AT A LOWER
ELEVATION THAN THE CONDENSATE WATER LINE OF THE APPLIANCE.

**NOTE – ACCESS TO THE DISCHARGE BEFORE THE DRAIN IS NECESSARY FOR
PROPER MAINTENANCE IN ORDER TO CHECK THE EFFECTIVENESS OF THE
NEUTRALIZING AGENT. A SIMPLE pH TEST SHOULD BE PERFORMED ANNUALLY
TO ENSURE NEUTRALIZING AGENT IS STILL EFFECTIVE. IF pH FALLS BELOW
6.5 THE NEUTRALIZING MATERIAL SHOULD BE REPLACED. THE AGENT
(LIMESTONE CHIPS WITH A MINIMUM CALCIUM CARBONATE CONTENT OF 85%)
CAN BE PURCHASED FROM A LOCAL SUPPLIER.**

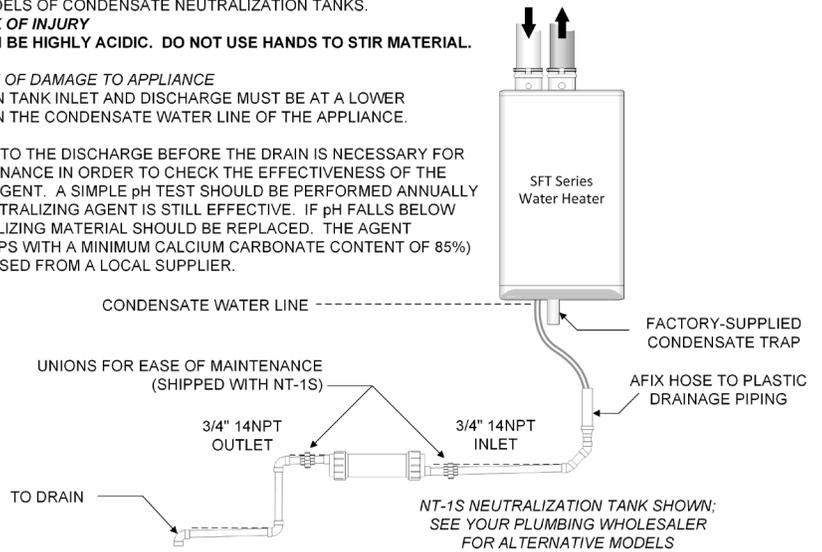
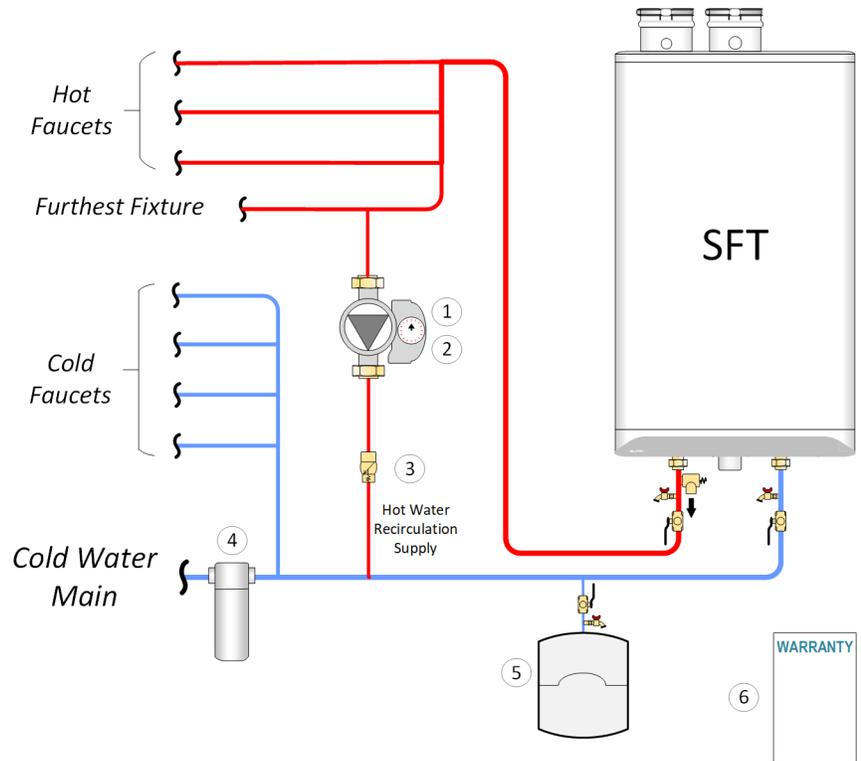


Figure 19: Condensate neutralization tank

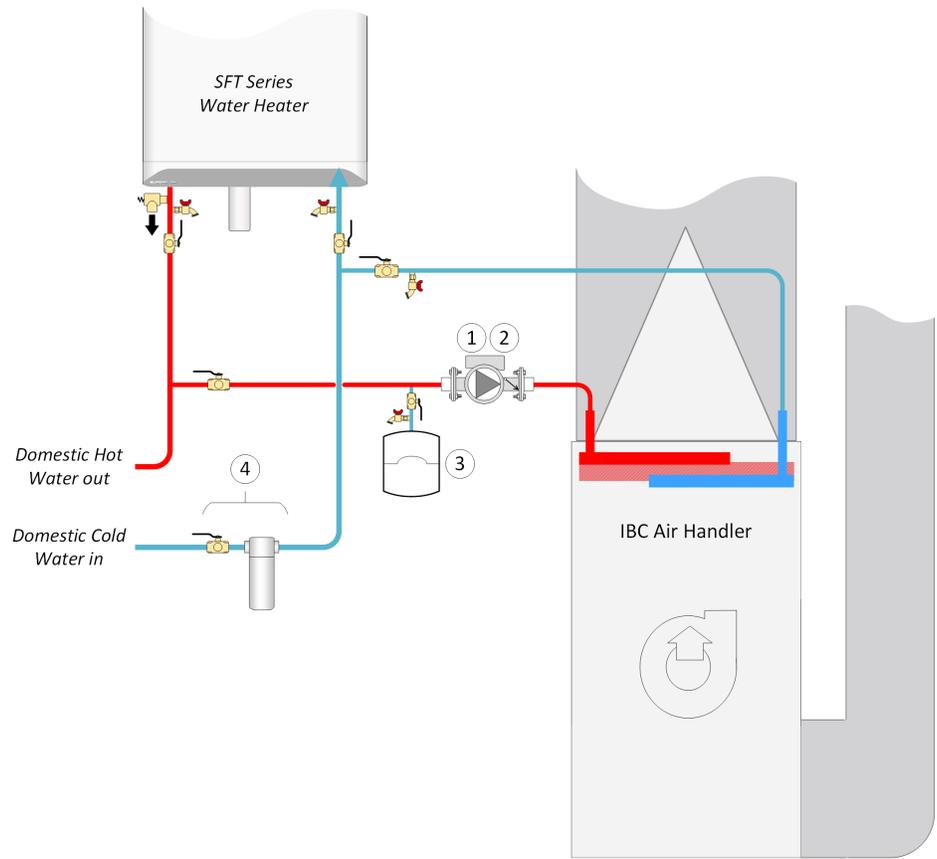
1.6 WATER PIPING - SPACE HEATING

The SFT series water heaters are approved for use as a space heating appliance. All piping system components must be approved for use in a domestic water piping system. To manage thermal expansion, you need to use an expansion tank suitable for DHW or a valve designed for this purpose.



①	<i>The domestic hot water recirculation pump must be activated by a timer or by a temperature sensor. Two or three 5-minute cycles per hour are recommended for peak-use periods. The pump must be designed for use in potable water systems. The recirc pump must be powered using an independent power source - not drawing power from the boiler.</i>
②	<i>Recirc pump sizing: the recirc pump should not operate continuously above 3.0 gpm as this would keep the water heater in on-demand mode. Approximately 3 ft-head from the recirc pump activates on-demand heating: see Table 6 for head loss of the water heater. When pump is sized below this trigger flow rate, the water heater should be placed into Comfort Mode (see section 2.4). A globe valve can ensure recirc flow doesn't trigger DHW operation.</i>
③	<i>If the recirc pump does not contain a check valve, an external check valve must be added to the recirc line.</i>
④	<i>Y-strainer or cartridge-type filter recommended (required on well systems)</i>
⑤	<i>Potable expansion tank: Required where backflow check valves are installed.</i>
⑥	<i>Using a recirc line affects the terms of your warranty; refer to Warranty document for details.</i>

Figure 20: Space heating with recirc pump



①	Non-ferrous pump (sized for combined head loss of water heater and air handler), for example, where total length of tubing to coil is under 50 feet, Taco 0C0 stainless steel or bronze.
②	Check valve (may be built into pump)
③	Potable water expansion tank
④	Filter required where contaminants are present in the supply water.
⑤	Using a recirc line affects the terms of your warranty; refer to Warranty document for details.

Note: Connection to space-heating circuit through potable water system as shown may be prohibited by local code.

Figure 21: Recirc pump with air handler

1.7 DOMESTIC HOT WATER SYSTEM


DANGER



- Water temperature over 125°F (52°C) can cause severe burns instantly or death from scalds.
- Children, disabled, and elderly are at highest risk of being scalded.
- See instruction manual before setting temperature at water heater.
- Feel water before bathing or showering.
- Temperature limiting valves are available, see manual.

WATER HEATER INSTALLATION GUIDELINES

WARNING

- This unit must be installed in accordance with local codes, if any; if not follow the National Fuel Gas Code, ANSI Z223.1/NFPA 54, or the Natural Gas and Propane Installation Code, CAN/CSA B149.1, as applicable.
- Failure to correctly install and operate this appliance can result in severe personal injury or death.
- The unit shall have a pressure relief valve installed within 6" [152mm] of the DHW HOT outlet connection.
Refer to the unit's User Manual before operating the relief valve.
- The unit requires a pressure relief valve identified with the ASME V or HV symbol and set to relieve at or below 150psi of domestic water pressure and a minimum relieving capacity of 199,000 Btu/hr with 3/4" NPT threads. For safe operation of the unit, the relief valve must not be removed from its designated point of installation or plugged.
- Read and follow warnings and instructions.

CAUTION

- Hotter water increases the risk of scald injury. Before changing the temperature setting, see instruction manual.

ADJUSTABLE TEMPERATURE SETTING

- Touch the panel above the white dot twice, then touch the Tap  Adjust the water temperature with the Plus + and Minus - then touch the Return button  to save the changes.

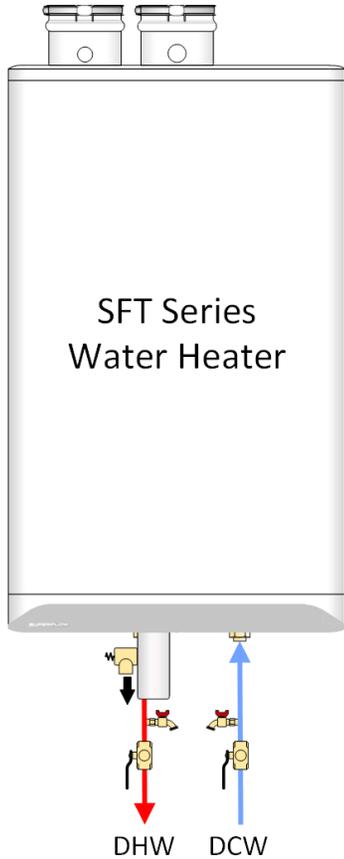


Figure 22: Overview of piping connections

⚠ WARNING

HOT WATER CAN SCALD!

Water Temperatures over 125°F / 52°C can cause severe burns instantly or death from scalds.

Children, disabled, and elderly are at highest risk of being scalded.

- Never leave them unattended in or near the shower, bathtub or sink.
- Never allow small children to use a hot water faucet or draw their own bath.

TO AVOID INJURY:

- Feel and adjust water temperature before bathing or showering.
- Water drained from the system drain valve may be extremely hot.
- Make sure all connections are tight.
- Direct water flow away from any person.

1.7.1 Domestic Hot Water System

The SFT series tankless water heaters have an independent piping circuit for efficiently generating Domestic Hot Water. When a faucet is opened to draw hot water, water flow is detected with a flow sensor and the unit fires up to begin generating domestic hot water.

The heat exchanger has copper water passageways encased in the aluminum heat transfer block. The aluminum heat exchanger acts as a heat buffer, eliminating the “cold water sandwich effect” when turning on and off the water repeatedly.

While the SFT series unit is less susceptible to lime scale build-up than other units on the market, always consider water quality in the installation. We strongly recommend treating hard water and adjusting the pH to 6.5 and 8.5. As a reference *Table 5* represents some of the drinking water guidelines published by the US EPA. Consult a water treatment adviser in your area to assess your local needs. Proper water treatment will aid in the longevity of the unit and ensure maximum efficiencies.

When installing and maintaining the water heater, you must consider water quality. Water conditions outside of the levels specified below may damage the water heater.

NOTE: The limited warranty provided with the water heater does not cover defects, malfunctions or failures resulting from water conditions that are not in accordance with the specifications in the table below.

DESCRIPTION	MAX	MIN
Water Pressure	150 psi	40 psi
Programmable water temperature	149°F (65°C)	104°F (40°C)
Minimum Flow Rate to Activate DHW Sensor	N/A	0.5 GPM
Acceptable pH range	8.5 pH	6.5 pH
Total Dissolved Solids	500 mg/L	
Total Hardness	200 mg/L 11.68 gr/gal	
Aluminum	0.05 to 0.2 mg/L	
Chlorides	250 mg/L	
Copper	1.0 mg/L	
Iron	0.3 mg/L	
Manganese	0.05 mg/L	
Zinc	5 mg/L	

Table 5: Recommended Water Quality Levels

⚠ WARNING

- Bacteria growth can develop in domestic hot water tanks and indirect water heaters if the minimum water temperature is not set high enough to prevent its growth.

1.7.2 Domestic Hot Water Piping

The domestic water piping connections are located at the bottom of the unit, see *Figure 25 - Gas Piping*. The connections are 3/4" male NPT threads. The cold water inlet is on the right side and the hot water outlet is on the left side.

A pressure relief valve must be installed:

- With a maximum pressure setting of 150PSI and rated for a minimum capacity of not less than the rated input of the unit (NOT supplied with the unit) on the domestic hot water outlet piping within 6" of the unit.
- Between the unit's outlet and any isolation valve to ensure the pressure relief valve cannot be isolated by closing a valve. We recommend a valve kit designed for this purpose to reduce installation time and to reduce the space required.

The SFT series units can be connected to the pressurized 1/2" or larger domestic cold water supply piping and the domestic hot water piping in the home. The minimum domestic water pressure required is 40PSI and recommended to be 50PSI or higher. Generating domestic hot water with a water pressure lower than 40PSI reduces the amount of hot water generated and increases the risk of scaling in the heat exchanger.

The domestic water piping must be installed with isolation valves and flushing taps installed on both the cold and hot domestic connections.

Thermal expansion of the water in the domestic hot water piping and unit can cause excessive pressures to build in the piping system. This can cause the pressure relief valve to discharge on a regular basis. This condition must be prevented with the installation of a properly sized and installed domestic water expansion tank or other device designed for the purpose.

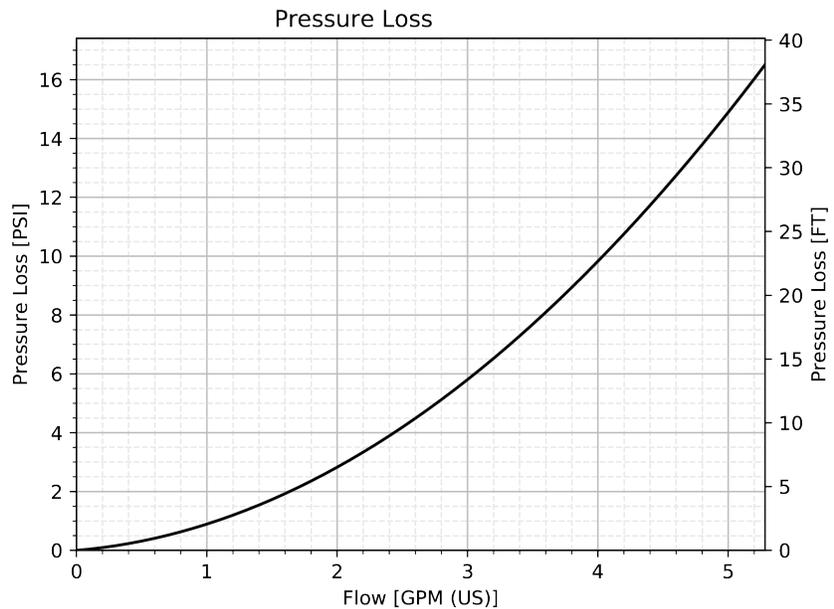


Table 6: Water Heater Pressure Drop

A filter is required where contaminants are present in the supply water (see A in Figure 23).

CAUTION

The *field supplied* thermostatic mixing valve may be installed on the domestic hot water piping connections at the unit or at the outlet of a domestic hot water storage tank.

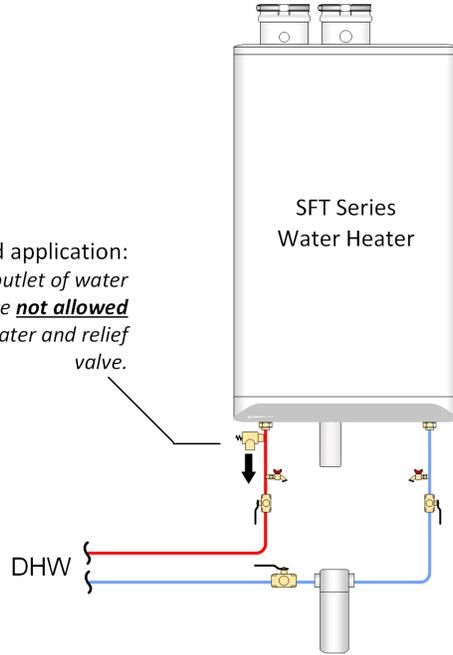
DOMESTIC HOT WATER DELIVERY

@ 67°F / 37.2°C temperature rise

SFT-199	5.4 GPM
---------	---------

A

DHW on-demand application:
DHW relief valve on outlet of water heater. Isolation valve **not allowed** between water heater and relief valve.



B See section 2.5.1

DHW Buffer Tank application:
DHW Temperature and Pressure Relief Valve is placed within 6" (15 cm) of top of storage / buffer tank.

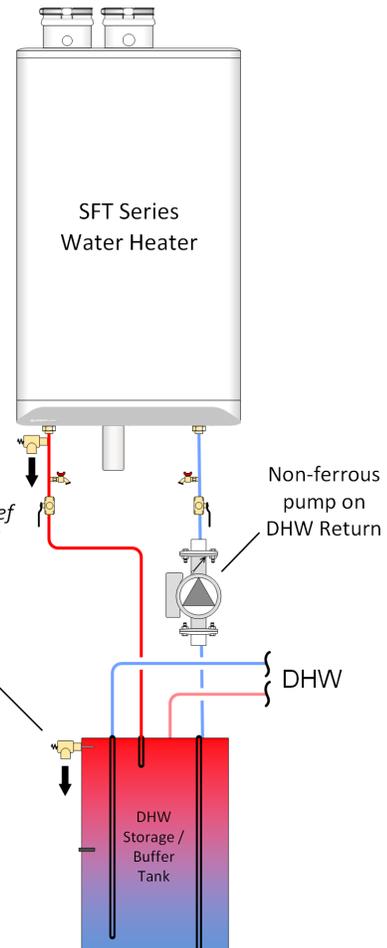


Figure 23: Tankless DHW Piping Options – concept drawing. This drawing is only a simple schematic guide.

⚠ WARNING

This water heater model can burn either natural gas or propane. Refer to section 3.3 for further instruction. If converting a water heater from one fuel to another, you must order a conversion kit prior to the conversion. Install the conversion kit according to the detailed instructions supplied with the kit. Failure to perform the required fuel conversion correctly can result in serious injury or death.

⚠ NOTE

It is essential to check gas supply pressure to each unit with a manometer or other high-quality precision measuring device. Pressure should be monitored before firing the unit, when the regulator is in a “lock-up” condition and during operation, throughout the unit’s full modulation range.

Pay special attention to retrofit situations where existing regulators may have an oversized orifice and/or worn seats, causing pressure “creep” and high lock up pressures.

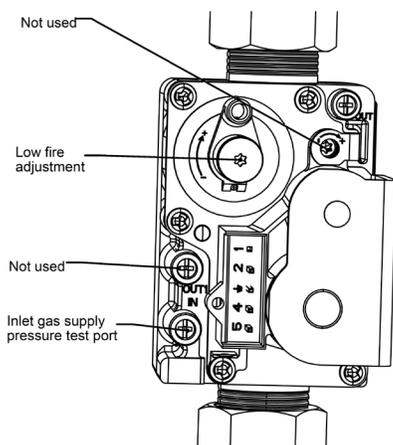


Figure 24: Gas Valve

1.8 GAS PIPING

The unit must have an inlet gas pressure of at least 4.0" w.c. for natural gas and propane. For either fuel, the inlet pressure shall be no greater than 14.0" w.c. Confirm this pressure range is available with your local gas supplier.

The inlet gas connection of the unit’s gas valve is ¾" NPT (male).

Adequate gas supply piping must be provided with no smaller than 1/2" Iron Pipe Size (e.g. Iron Pipe Size (IPS) and a 1" w.c. pressure drop used, in accordance with the following chart:

MODEL	1/2" IPS	3/4" IPS	1" IPS
SFT 199 (Natural Gas)	10'	40'	150'
SFT 199 (Propane)	30'	125'	400'

Table 7: Maximum Pipe Length (ft) – SFT 199

Gas piping must have a sediment trap ahead of the unit’s gas valve (see Figure 25). A manual shutoff valve must be located outside the unit, in accordance with local codes/standards. All threaded joints in gas piping should be made with an approved piping compound resistant to the action of natural gas/propane. Use proper hangers to support gas supply piping as per applicable codes.

The unit must be isolated from the gas supply piping system by closing, disconnecting and capping its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or greater than 1/2 psi (3.5 kPa). Dissipate test pressure prior to reconnecting.

The gas valve is provided with pressure taps to measure gas pressure upstream (supply pressure) and downstream (manifold pressure) of the gas valve (see Figure 24). Note that manifold pressure varies slightly in accordance with firing rates with the modulating series units, but will always be close to 0" w.c.

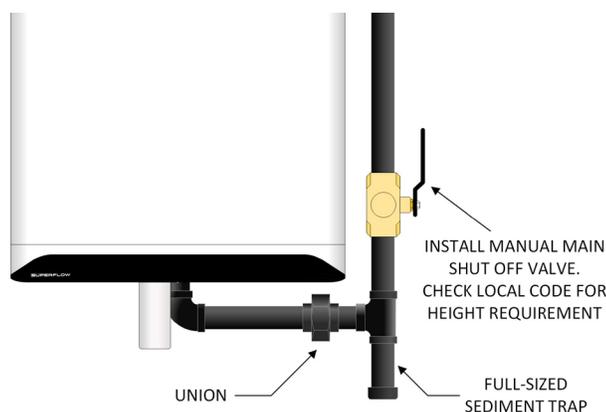


Figure 25: Gas Piping

⚠ WARNING

Do not apply power to any connection point on the controllers terminal strips. A hazardous situation could occur resulting in possible serious injury or death.

⚠ NOTE

- The IBC unit (like any modern appliance that contains electronic equipment), must have a “clean” power supply, and can be disabled by power surges and spikes, lightning strikes and other forms of severe electrical “noise”. Power conditioning equipment (surge protectors, APC or UPS devices) may be required in areas where power quality is suspect.

1.9 ELECTRICAL CONNECTIONS

Electrical wiring to the unit (including grounding) must conform to local electrical codes and/or National Electrical Code, ANS/NFPA No. 70 – latest edition, or The Canadian Electrical Code, C22.1 - Part 1.

If using an external electrical source, the unit, when installed, must be electrically bonded to ground in accordance with the requirements of the authority having jurisdiction or, in the absence of such requirements, with the *National Electrical Code, ANSI/NFPA 70, and/or the Canadian Electrical Code Part I, CSA C22.1, Electrical Code.*

1.9.1 120VAC Line Voltage Hook-up

(Refer to Section 6.2. Wiring Diagram on page 6-5). Connect the unit to the grid power, using the supplied appliance plug in a separate, fused circuit and on/off switch within sight of the unit.

1.9.2 Power Quality and Electrical Protection

In areas of unreliable power, appropriate surge protectors and/or power conditioning equipment should be installed to protect the unit.

1.9.3 Removing the Cover

To remove the cover, unscrew the two 5mm hex bolts on the undersides of the front corners. Lift the cover up firmly.

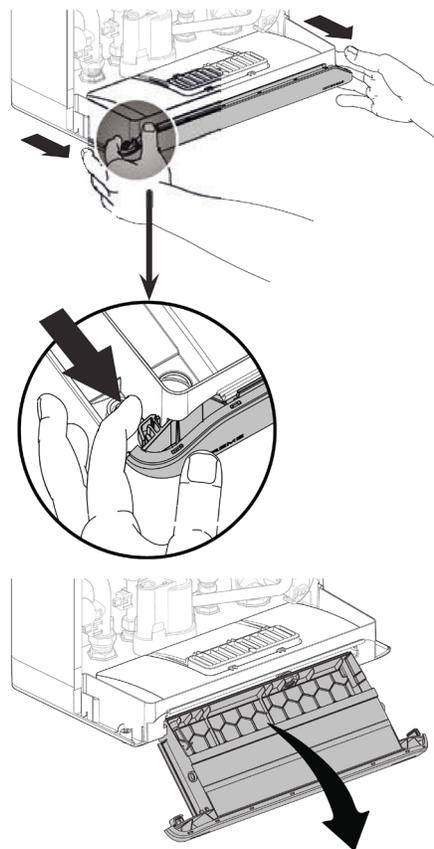


Figure 26: Pulling out the tray

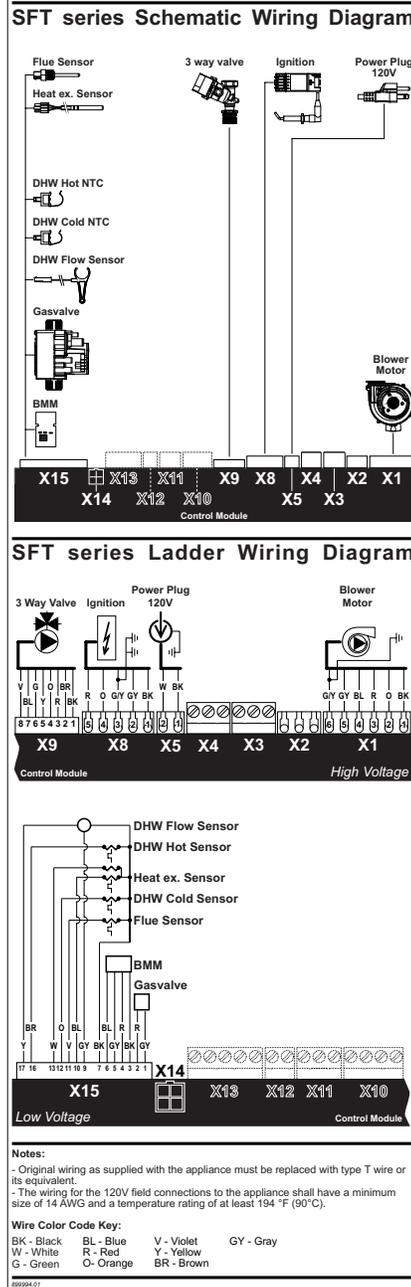


Figure 27: Electrical Wiring Connections (full page ladder diagram at back of this manual)

2.0 UNIT SYSTEM OPERATION

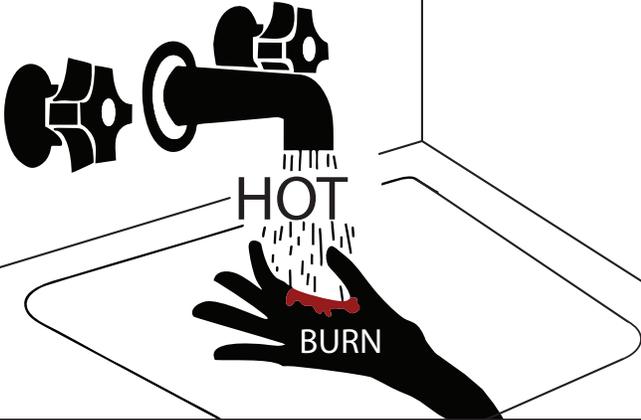
2.1 GENERAL

The SFT units can be used as a tankless water heater, with or without a storage tank.

The unit is equipped with an electronic unit controller that ignites the burner and continuously monitors the flame throughout each call for heat. The controller also displays the current operating conditions of the unit and any error messages should a problem occur.

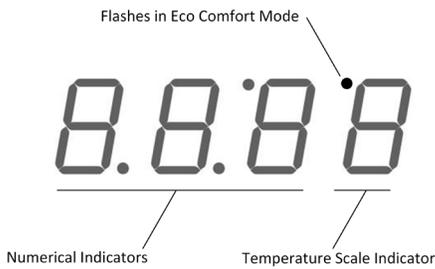
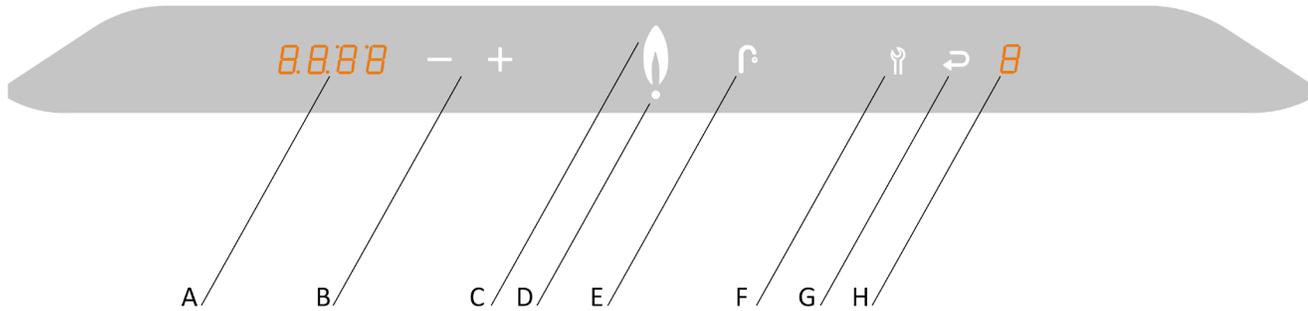
The unit's controller also provides frost protection. When the unit's heat exchanger temperature becomes too low the burner switches on to keep the heat exchanger warm. Ensure that the condensate trap is protected from freezing. The unit must be installed indoors in a heated space.

! **DANGER**



- Water temperature over 125°F (52°C) can cause severe burns instantly or death from scalds.
- Children, disabled, and elderly are at highest risk of being scalded.
- See instruction manual before setting temperature at water heater.
- Feel water before bathing or showering.
- Temperature limiting valves are available, see manual.

2.2 CONTROL



ICON	FUNCTION	
A	Numerical Display	Main Display
B	Plus & Minus	Temperature Adjustment
C	Flame	Burner ON Indicator
D	Dot	Power ON Indicator
E	Faucet	DHW Indicator
F	Wrench	Service / Reset
G	Return Arrow	Enter / Save
H	Numerical Display	Service Display

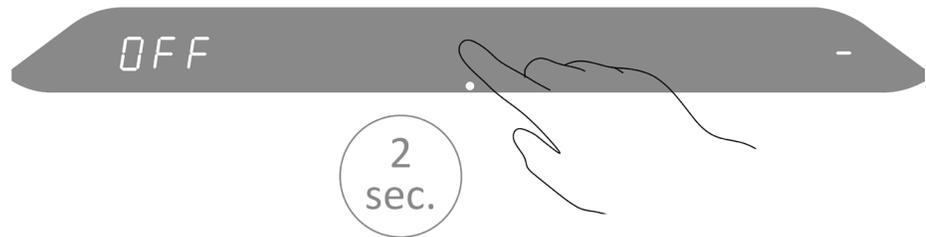
Table 8: Controller Indicators and Touch Pad

2.3 INSTALLER INTERFACE

2.3.1 Turning Appliance ON/OFF

To turn on the unit, touch the area above the dot for 2 seconds. Now only the dot is illuminated.

To turn off the unit, touch the area above the dot for 2 seconds. A dash appears on the right and the text "OFF" is displayed on the left.



NOTE

The domestic hot water thermostat is adjusted to its lowest temperature position when shipped from the factory. It's recommended to set the domestic hot water thermostat to 120°F/49°C as an initial setting and further adjust as required. For energy efficient operation, this setting should be set as low as practical for the consumer's needs.

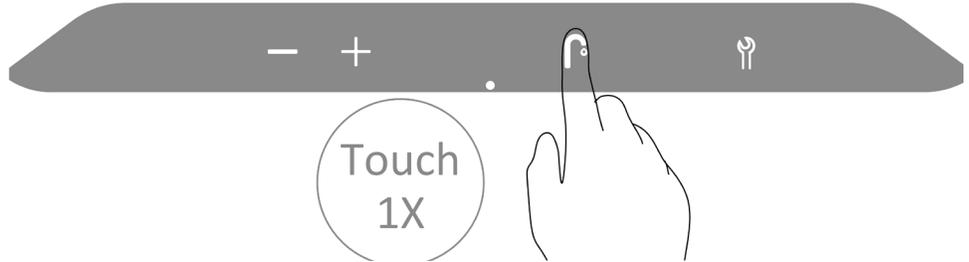
2.3.2 Programming Mode

There are two parameters available in the User Setup Menu.

Adjusting the Domestic Hot Water Temperature

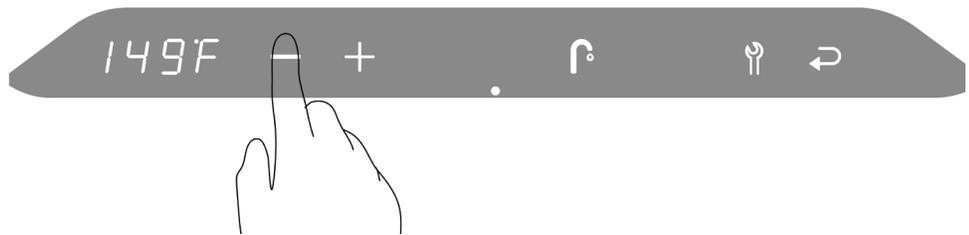
To adjust the DHW:

1. Touch the area above the dot.
2. Touch the Faucet button.



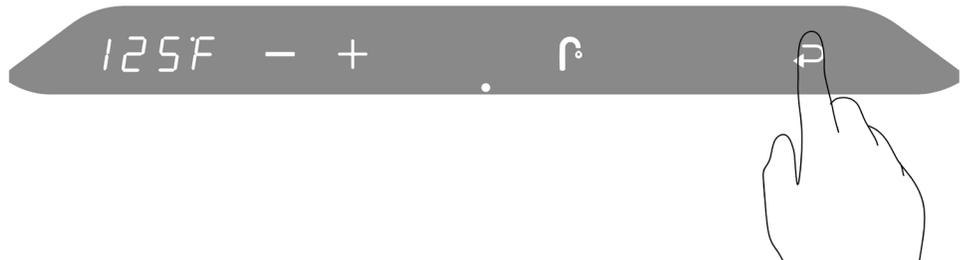
The tankless domestic hot water temperature target appears on the main display.

3. To change the DHW temperature target, touch the Plus or Minus buttons.



4. To:

- Save the changes, touch the Return button.
- Exit without saving the changes, touch the area above the dot.



2.4 TANKLESS DOMESTIC HOT WATER MODES

2.4.1 Tankless Domestic Hot Water - Standard and ECO Comfort Modes

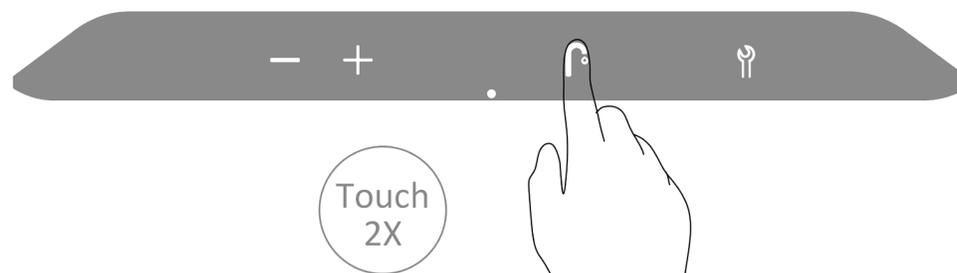
Standard Mode (OFF): The water heater's heat exchanger will not maintain its domestic hot water temperature between demands for hot water.

Comfort Mode (ON): The water heater's heat exchanger is maintained at the DHW temperature.

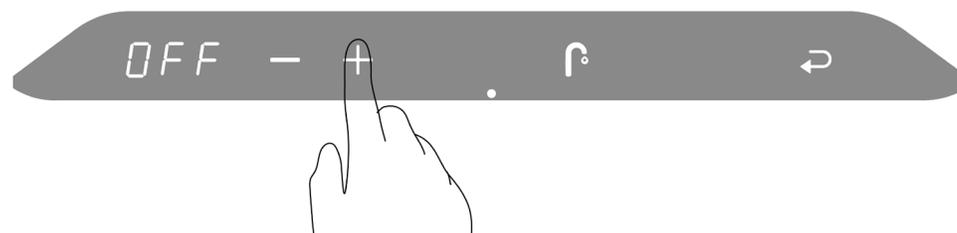
ECO Comfort Mode (ECO): This mode operates like the Comfort Mode but has the added advantage of learning when the domestic hot water is used. During the low use periods, the heat exchanger is allowed to cool.

To switch between the 3 modes:

1. Touch the area above the dot.
2. Touch the Faucet button twice.



3. Select the Plus or Minus buttons.



4. To:

- Save the changes, touch the Return button.
- Exit without saving the changes, touch the area above the dot.



2.5 ADDING DOMESTIC HOT WATER STORAGE

2.5.1 Tankless Domestic Hot Water with a Storage Tank

The SFT series unit has the ability to connect a domestic hot water storage tank to the unit to provide larger volumes of domestic hot water during peak demands.

The storage tank is piped to the unit's domestic hot and cold water piping connections. You must install a bronze or stainless steel pump to circulate water from the storage tank through the unit's domestic hot water coil.

In this case, (see fig. 21) you will wire the pump and aquastat together without connecting to the unit. When the line-voltage aquastat energizes the pump, the flow sensor detects the flow of domestic water and activates the water heater to heat to its programmed temperature.

2.6 SEQUENCE OF OPERATION

When the unit is powered up the controller enters a self-diagnostic mode, and displays "2" in the Service Display.

The sequence of operation is as follows:

1. The unit receives a call from domestic hot water heating from the internal flow sensor.
2. The unit does a safety check and energizes the fan for a pre-purge (*Service Display = 3*).
3. Once the 5-second pre-purge is complete, the unit enters a 5-second trial for ignition (*Service Display = 4*). If the unit fails to ignite, the unit will complete a 5-second inter-purge then another 5-second trial for ignition. This is repeated 4 times before a hard lock-out occurs. The Return button must be pressed to reset the controller and to allow for another attempt.
4. Once the burner is lit and flame has been proven the unit operates as it is programmed (*Service Display =*  +  for domestic hot water).
5. If the unit reaches its target temperature and there is still a call for hot water the burner will turn off. (*Service Display = 1*)
6. If the burner is on to maintain the heat exchanger temperature for DHW Comfort mode (*Service Display = 7*).
7. If the burner is on for frost protection (*Service Display = 9*).

⚠ NOTES

The unit is equipped with a frost protection feature. This feature operates the unit's burner to help protect the unit from freezing. If the unit is in a hard lock-out condition the burner will not operate. IBC is not responsible for damages to the unit, and/or related components, nor property damages that may result from freezing conditions.

MAIN DISPLAY	LIT DISPLAY	DESCRIPTION
OFF	-	The unit is OFF. Press the space above the white button to turn on the unit.
(blank)	(blank)	No Call for Hot Water - Standby
XXX	2	Self-test – When power is applied to the unit the controller enters a self diagnostic mode for 5 seconds
XXX	3	Fan Pre-purge , Inter-purge and Post-purge
XXX	4	Trial for Ignition and Flame Proving
XXX	 + 	Heating – DHW
XXX	7	Burner on for Comfort mode
XXX	9	Freeze Protection mode

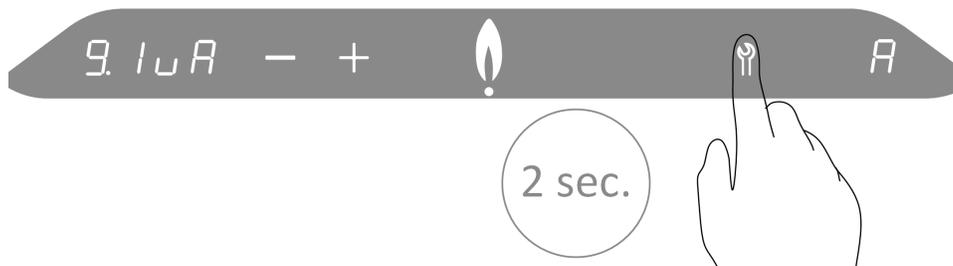
Table 9: Operating Display and Service Display Codes.

2.7 ACCESSING THE INFORMATION MENU

The Information menu provides sensor readings as well as other operating conditions in the form of codes.

To access the Information menu:

1. Touch the area above the Dot twice to access the Main menu.
You'll need to access the Information menu via the Service menu.
2. To access the Service menu, touch and hold the Wrench button for two seconds.
The Minus, Plus, Wrench and Enter indicators are displayed.

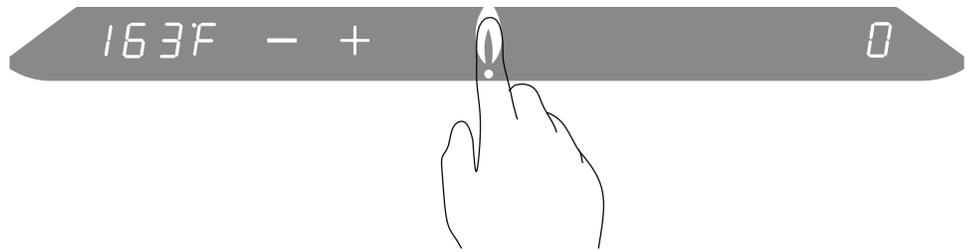


3. Again, touch and hold the Wrench button for two seconds.

You are now in the Information menu. Note that the Enter button has disappeared indicating that you are in read-only mode and cannot enter values.

In the Information menu, the code "A" indicates the flame current in DC μ A (see table 10 for a list of codes and corresponding description).

4. To scroll through the list of codes, use the Minus or Plus button.
5. To switch out of the Information menu (and to return to the Service menu), press the Flame button or area above the Dot.



See below for a description of the codes:

CODE	DISPLAY	EXAMPLE
A	flame current in μ A	9.80A
b	DHW flow in L/min or Gallon/min	8.0.98
F	estimated power input in kW or MBH	8.116
t	last lock-out code	F031
-	main processor software	2.1.63
=	DSP software	2.1.20
0	Temp. S0 (Heat Exchanger)	134F
1	Temp. S1 (Supply) -boiler models only	8.8.8F
2	Temp. S2 (Return) -boiler models only	8.8.8F
3	Temp. S3 (Hot Water)	125F
4	Temp. S4 (Cold Water In)	8.50F
5	Temp. S5 (Flue)	142F
6	Temp. S6 (Outdoor)	8.8.8F
7	Temp. S7 (DHW tank)	8.30F

Table 10: Information Menu

Note that display parameters may differ depending on the configuration. Where there is no DHW sensor, the display reading can be ignored.

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3.0 STARTUP & COMMISSIONING

3.1 LIGHTING & SHUTTING DOWN THE UNIT

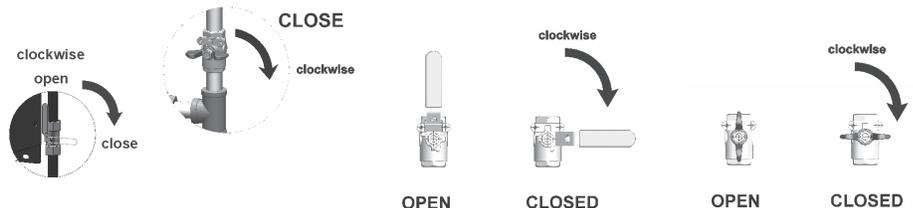
FOR YOUR SAFETY READ BEFORE OPERATING

WARNING: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life

- A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
- B. **BEFORE OPERATING** smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.
WHAT TO DO IF YOU SMELL GAS
 - Do not try to light any appliance.
 - Do not touch any electric switch; do not use any phone in your building.
 - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
 - If you cannot reach your gas supplier, call the fire department.
- C. Use only your hand to turn the gas control valve. Never force using tools. If the valve will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

OPERATING INSTRUCTIONS

1. **STOP!** Read the safety information above on this label before doing anything.
2. Set the thermostat to lowest setting.
3. Turn off all electric power to the appliance by selecting main power switch to OFF.
4. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
5. Locate manual gas shut-off valve (see pictures below) and turn clockwise to "CLOSE".
6. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, **STOP!** Follow step "B" in the safety information above on this label. If you don't smell gas, go to the next step.
7. Turn gas control valve to OPEN.
8. Turn on electric power to appliance by selecting main power switch to ON.
9. Set thermostat to desired setting.
10. If the appliance will not operate, follow the instructions "TO TURN OFF GAS APPLIANCE" and call your service technician or gas supplier.



TO TURN OFF GAS APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance by selecting main power switch to OFF.
3. Turn gas control valve to CLOSE.

⚠ DANGERS

- Fill trap with water before unit is first fired to prevent exhaust fumes from entering room. Never operate the unit unless the trap is filled with water.

Failure to comply will result in severe personal injury or death.

- It is forbidden to make adjustments to the gas valve except with a properly calibrated gas combustion analyzer by persons who are trained and experienced in its use. Failure to use an analyzer can result in an immediate hazard.

ALTERNATIVE NATURAL GAS ORIFICES FOR CALORIFIC VALUES 750-900 BTU/FT³

MODEL NUMBER	ORIFICE SIZE
SFT-199	725 (P-840)

3.2 PRIOR TO START-UP

3.2.1 Pre-Ignition Checks

1. Fill the condensation trap. Ensure the venting system is complete and seal-tested. Confirm that any common venting system at the installation site is isolated and independent of the SFT unit, that any holes left from removal of a previous unit have been sealed, and that any resizing of the old flue has been done.
2. Check that the water piping system is fully flushed and charged, and that all air has been discharged. Confirm that the pressure relief valve is installed and safely drained.
3. Check to see that adequate gas pressure is present at the inlet gas supply test port. With the manual gas valve, using a Torx 15 screwdriver, open the test port by turning its center-screw 1 full turn counterclockwise. Connect a manometer and open the manual gas valve. Requirements are minimum 5" w.c. and maximum 14" w.c. Check that there are no gas leaks.
4. Perform a final check of electrical wiring and provide power to the unit to initialize operation.

3.2.2 Test Ignition Safety Shutoff

With the unit in operation, test the ignition system safety shutoff device by shutting the manual gas valve immediately outside the unit case. Ensure that the unit has shut off and that the appropriate error information is displayed on the main display screen. To restart the unit, reset the power.

3.3 COMMISSIONING

The SFT water heaters are factory calibrated to operate with natural gas at sea level. High Fire adjustment is only required if the calorific value of the fuel is out of the normally expected range of (NG range 900-1100 Btu/ft³). Consult your local fuel provider for your fuel's calorific value. Low fire is field adjustable, but must be done with caution. No mixture adjustment may be performed unless done by a qualified technician using properly functioning and calibrated combustion analyzing equipment.

This unit model can burn either natural gas or propane if equipped with the correct specified orifice. Examine the rating plate of the unit to ensure it is configured for the fuel you are using. If the unit is to be converted from natural gas to propane or from propane to natural gas a fuel conversion kit must be installed. For the correct fuel conversion kit part number, see the table below:

MODEL NUMBER	NATURAL GAS TO PROPANE	PROPANE TO NATURAL GAS
SFT-199	P-802	P-803

Table 11: Fuel conversion kits

The gas valve will automatically de-rate the maximum input in accordance with the density altitude, by approximately 2% per 1,000' above sea level. The gas valve's zero governor will ensure that the gas-air mixture is not be affected at altitude.

⚠ WARNING

Check the rating plate of the unit to ensure it is configured for the fuel you are using. If the fuel is incorrect for the appliance, a conversion kit must be ordered from IBC and the gas valve adjusted accordingly.

Failure to perform the required fuel conversion can result in an immediate hazard.

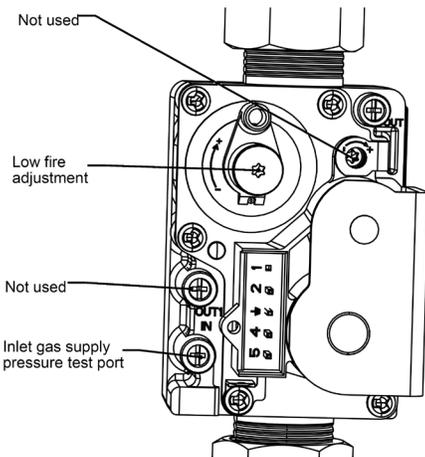


Figure 28 Gas Valve Adjustment

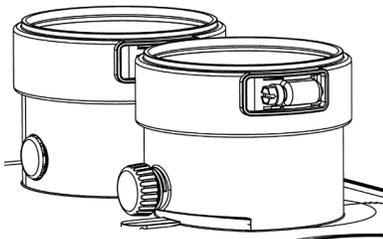


Figure 29: Flue gas test port plug

To verify the proper operation of the gas valve in the field, the following procedure can be carried out by a qualified technician (see diagrams on this page).

1. Turn off the unit's manual gas valve. With a Torx 15 screwdriver, open the inlet gas supply pressure test port by turning its screw 1 full turn counterclockwise. Attach a manometer to the pressure test port. Turn on gas to the appliance. Static manometer reading should be ideally 7" w.c., for natural gas and 11" w.c. for propane. Minimum and maximum static pressure must be between 5" and 14" w.c. Monitor pressure throughout the commissioning procedure. Pressure may droop up to 1" at high fire.
2. Allow the unit to ignite / run against a large load, to maintain high fire. To set the high-fire manually, press and hold the Service icon for two seconds. Then while holding the Service icon press the Plus + button twice. "H" will show in the service display as the unit enters high fire.

NOTE: Allow the unit to operate at high fire for 3 minutes to stabilize. (The unit operates in manual mode for 10 minutes then switches back to the normal operating mode. To extend manual mode operation, press the Service icon and Plus + together twice while the unit is operating in manual mode to reset the timer for 10 more minutes.) Do not make adjustments if the service display shows an "h".

3. Clock the gas meter to confirm full maximum rating plate input. With a combustion analyzer probe in the flue gas test port, check the measured results against Table 12 - High Fire. If the results are outside the permitted range, check the inlet pressure, and confirm that the correct orifice and venturi are installed. For areas of lower calorific value natural gas, install the alternative orifice listed on page 3-4.
4. Switch the unit to low fire by pressing the Service button and Minus = buttons at the same time. The unit will drop to low fire. "L" will show on the service display. Compare the readings with Table 12 - Low Fire. If adjustment is necessary, remove the low fire adjustment cap to reveal a Torx head screw. Make minimal adjustments, typically less than 1/8th of a turn at a time. Turn the screw clockwise to increase CO₂ and counter-clockwise to reduce CO₂. If the target cannot be met, even after a full turn, contact the factory. When finished, replace the low fire cap, and leave the manual mode by pressing + AND - simultaneously.
5. Switch off the unit by pressing the space above the white dot for two seconds. Turn off the gas at the unit's manual gas valve. Remove the flue gas analyzer from the test port and reinstall the test port cap. Remove the gas pressure manometer from the gas valve and fully close the test port. Turn on the gas at the manual gas valve. Ensure that there are no gas leaks and reinstall the front cover. Turn on the unit by pressing the space above the dot for two seconds.

⚠ DANGER

Operating any IBC appliance using a fuel other than the fuel listed on its rating plate is prohibited. If the information in this section related to conversion to alternative fuels is not followed exactly, a dangerous situation can result, leading to fire or explosion, which may cause property damage, personal injury, or loss of life.

PROPANE ORIFICE CHART

MODEL NUMBER	ORIFICE SIZE
SFT-199	535

NATURAL GAS ORIFICE CHART

MODEL NUMBER	ORIFICE SIZE
SFT-199	660

ALTERNATIVE NATURAL GAS ORIFICES FOR CALORIFIC VALUES 750-900 BTU/FT³

MODEL NUMBER	ORIFICE SIZE
SFT-199	725

VENTURI IDENTIFICATION

MODEL NUMBER	ID NUMBER
SFT-199	375

3.4 FUEL CONVERSION

The SFT series modulating water heater is factory fire-tested to operate with natural gas. The rating plate is marked to indicate which fuel the particular unit has been set up with. Firing a unit with a fuel other than what is listed on the rating plate is prohibited unless the following conversion procedure is completed by a qualified technician.

Refer to the preceding section 3.3 - COMMISSIONING. The low fire (zero-offset) valve adjustment cap on the gas valve has been factory set.

Fuel conversion requires hardware adjustments (orifice replacement) as well as measurement and possible tuning of the low fire mixture. Detailed instructions including parts and labeling are found in Fuel Conversion kits. Refer to Table 11 for the correct kit number.

	NATURAL GAS	PROPANE
CO₂ VALUE (%) AT HIGH FIRE WITH THE FRONT COVER OPEN		
Max. CO ₂ value	10.1%	11.5%
Min. CO ₂ value	9.1%	9.8%
CO₂ VALUE (%) AT LOW FIRE WITH THE FRONT COVER OPEN		
Max. CO ₂ value	= value at High	= value at High – 0.3%
Min. CO ₂ value	9.1%	9.5%

Table 12: CO₂ Values and High and Low Fire

The following procedure must be carried out by a qualified technician.

1. Ensure that the gas supply is turned off at the manual gas valve.
2. Disconnect the electrical power.
3. Disconnect the nut at the gas valve outlet (top of the gas valve) and remove the orifice and O-ring.
4. Insert the correct orifice into the O-ring, and re-install into the nut at the gas valve outlet (top of the gas valve) and then tighten the nut.
5. Restore the gas supply by opening the manual gas valve.
6. Test for leaks by using an approved leak detection solution on all joints.
7. Carefully follow the “Prior to Start-Up” – Section 3.2 and “Commissioning” – Section 3.3 procedures on the preceding pages 3-2 and 3-3.

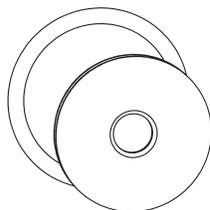


Figure 30: Orifice and O-ring

⚠ WARNING

Each SFT series unit is equipped with a back flow valve installed at the outlet of the fan. Inspect the back flow flapper annually.



Figure 31: Back Flow Valve

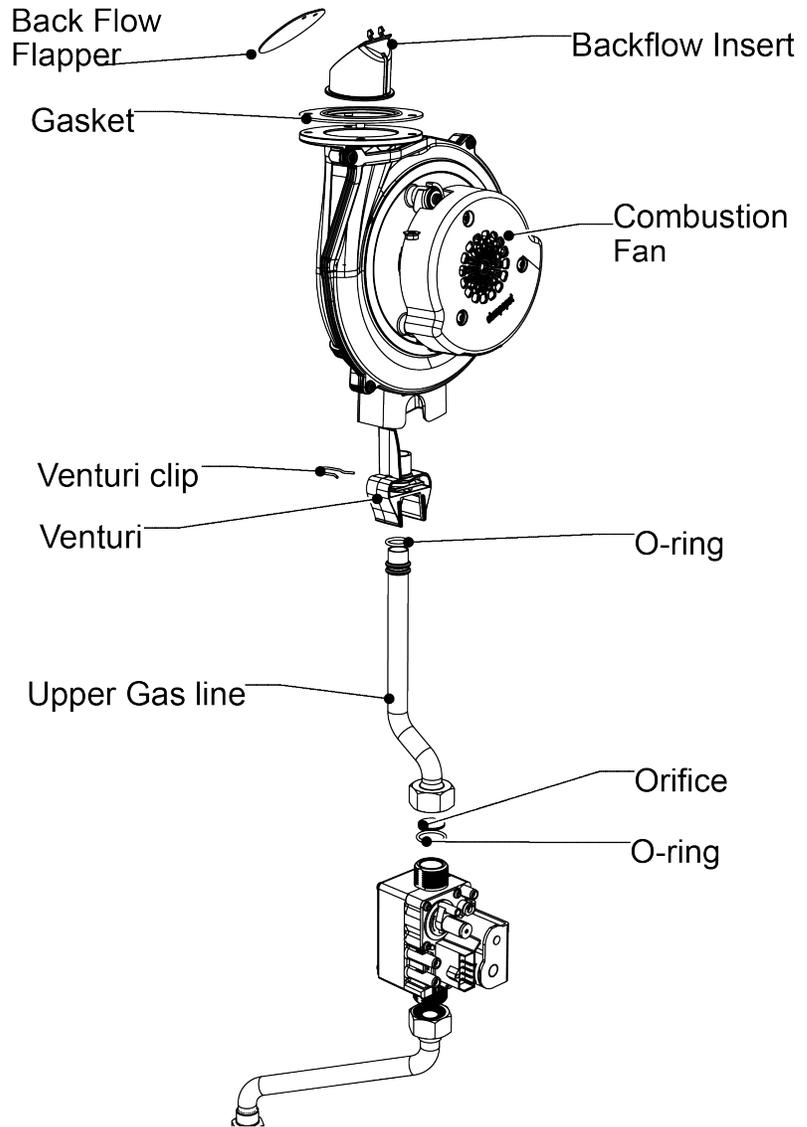


Figure 32: Blower and Gas Valve Assembly

3.4.1 Gaining access to combustion chamber, burner removal instructions

DISASSEMBLY

1. Turn off the main power switch to the unit.
2. Turn off the gas supply valve to the unit.
There is no need to drain the unit unless the unit will be exposed to freezing conditions while off.
3. Remove the front cover, and allow the unit to cool.
4. Unplug the electrical connector at the gas valve and fan.
5. Loosen the lower gas valve connection nut.

NOTE: There is an O-ring in the lower gas connection and an O-ring and orifice in the upper gas valve connection. Place these in a safe location to be used for reassembly. Cover the gas piping connections to prevent debris from entering the gas piping.

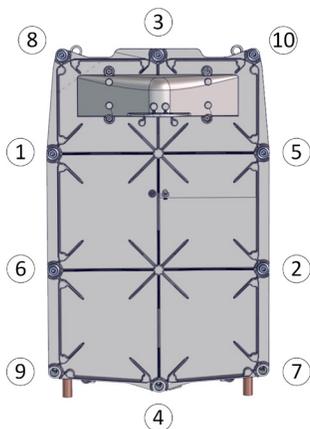


Figure 33: Tighten hex bolts in cross pattern direction.

CAUTION: When removing the heat exchanger cover in step 6, be careful not to damage the burner and refractory material located on the opposite side of the heat exchanger cover. Use caution when handling refractory materials. See *Caution on page 4-2*.

6. Remove all 6mm hex bolts and lock washers from the heat exchanger cover and carefully remove the front cover complete with the fan and the gas valve attached. Carefully inspect the gasket sealing the heat exchanger to the heat exchanger cover for damage, hardness, cracks, and/or discoloration. If damaged in any way, you must replace the gasket.
7. Place the heat exchanger cover in a safe location.

REASSEMBLY

1. Replace the heat exchanger gasket. Inspect, and when needed change other gaskets. If necessary, inspect and clean the gasket mating surface.
2. Place the heat exchanger cover onto the heat exchanger and loosely install the 6mm hex bolts and lock washers removed in step 6. Tighten the 6mm hex bolts in a cross pattern as shown in the Figure 33.
3. Connect the gas line to the gas valve ensuring the O-ring is in place. Tighten the gas valve nut. Ensure the upper gas valve connection is tight. Re-connect the gas valve electrical connection.
4. Re-connect the electrical connection to the fan.
5. Inspect the condensate trap for debris. Remove and clean if necessary. Fill the condensate trap with water.
6. Turn on the gas supply valve to the unit and inspect for gas leaks. Use an approved leak detection solution. Soap test all joints.
7. Ensure the unit is full of water and purged of air if the unit was drained during disassembly.
8. Turn on the power to the unit and create a call for domestic hot water.
9. Inspect the gasket around the unit cover.
10. Check flue gases for proper combustion. See *Section 3.3 Commissioning* for proper adjustments.
11. Re-install the unit's cover and set the unit into normal operation.

⚠ WARNINGS

- Fill the trap with water before the unit is first fired to prevent exhaust fumes from entering the room. Never operate the unit unless the trap is filled with water.

Failure to comply will result in severe personal injury or death.

- Whenever the burner is removed for inspection or servicing, examine the sealing gaskets and replace if damaged.

⚠ CAUTION

- The owner is responsible for general care of the unit. Improper maintenance of the unit may result in a hazardous condition.

- When servicing controls, label all wires prior to disconnection. Wiring errors can cause improper and dangerous operation.

4.0 MAINTENANCE

4.1 WATER HEATER MAINTENANCE

4.1.1 General Care

- Keep combustible materials and flammable liquids and vapors away from the unit.
- Keep vent terminals clear of obstructions (snow, dirt, etc.).

4.1.2 Inspection

Inspection of the unit is to be performed annually by a qualified service technician.

4.1.3 Venting

- Check vent terminals for any obstructions (e.g. leaves, dust, other debris).
- Check and clean or replace intake air filters or screens as required.
- Check for holes or leaks in venting. Replace venting as needed.
- Examine for any signs of moisture caused by sweating intake air pipes. Insulate as required.
- Ensure proper resealing or reinstallation of venting at each servicing.

4.1.4 Condensate Trap

- Examine the condensate trap every two months to see if cleaning is necessary (*refer to trap cleaning instructions, section 1.5.3 of this manual*). Ensure that the trap has been re-filled completely before firing the unit.
- Check the pH level of the condensate discharge if using condensate neutralization.

4.1.5 Burner

- At the first annual service, remove the burner to inspect the extent of fouling (*refer to burner removal and reassembly instructions, section 3.4.1 of this manual*). Blow clear using compressed air. Evaluate the magnitude of clearing required, and establish a reasonable burner inspection schedule. Some installations may call for annual service, others showing clean burners will only need attention every 2 years. Consider adding air filtration if the burner requires cleaning every year. In alternate years, visually inspect burner through the sight glass. Ensure the flame is stable and without excessive fluttering. Normal flame pattern is evenly distributed over the burner surface.
- If the burner is operating improperly, remove and clean or replace. Use a CO₂ analyzer to determine proper combustion. *See Table 12 for correct values.*

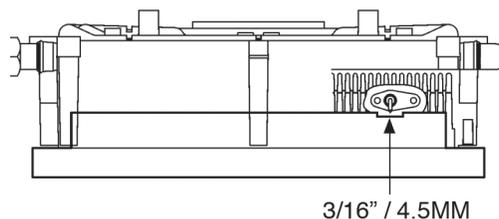


Figure 34: Ignitor Gap - 3/16" / 4.5mm

⚠ CAUTION

The heat exchanger has a small amount of combustion chamber insulation (refractory) that contains ceramic fibers.

When exposed to extremely high temperatures, the ceramic fibers, which contain crystalline silica, can be converted into cristobalite, classified as a possible human carcinogen.

Avoid disturbing or damaging the refractory. If damage occurs, contact the factory for directions.

Avoid breathing in fumes and contact with skin and eyes. Follow these precautions:

1. For conditions of frequent use or heavy exposure, you need a respirator. For respirators certified by NIOSH, refer to the “NIOSH Guide to the Selection and Use of Particulate Respirators Certified under 42 CFR 84”.

For current information, contact NIOSH on 1-800-356-4676 or on the web at www.cdc.gov/niosh.

2. Wear long sleeved, loose fitting clothing, gloves and eyes protection.
3. Assure adequate ventilation.
4. Wash with soap and water after contact.
5. Wash potentially contaminated clothes separately from other laundry, and rinse clothes thoroughly.
6. Discard used insulation in an air tight plastic bag.

NIOSH first aid guidelines:

- Eye contact - Irrigate and wash immediately.
- Breathing in fumes - Provide fresh air.

4.1.6 Heat Exchanger

During annual inspection (with the heat exchanger cover removed), examine the heat exchanger for signs of contamination and clean if necessary. In areas of poor gas quality or contaminated combustion air, there may be a build-up of black plaque (typically sulfur). Other fouling agents are airborne dust, debris and volatiles. Clean the heat exchanger surface with a stiff plastic bristle brush only.

During maintenance, the heat exchanger gasket needs to be replaced. Inspect other gaskets, and change when needed. *Refer to the heat exchanger cover removal instructions in Section 3.4.1* for access to the combustion chamber and heat exchanger. **Observe the safety warning regarding the burner refractory on this page.**

4.1.7 Gas Piping

Check for damage or leaks, and repair as needed.

4.1.8 Control Module

- Check that unit operation is consistent with the steps in *Section 2.6 Sequence of Operation*.
- Check that water temperature target is satisfactory, and that it has not been adversely amended.
- Check that the domestic hot water generation is performing as expected. Fouling of the interior of the domestic heating coil can cause poor performance.

4.1.9 Freeze Protection

The controller operates the unit as needed to protect it from freezing.

4.1.10 Relief Valve - Maintenance and Testing

Relief valve manufacturers require that under normal operating conditions a “try lever test” must be performed every two months. Under severe service conditions, or if corrosion and/or deposits are noticed within the valve body, you must test more often. Also perform a “try lever test” at the end of any non-service period.

Test at or near maximum operating pressure by holding the test lever fully open for at least 5 seconds to flush the valve seat free of sediment and debris. Then release the lever and permit the valve to snap shut.

If the lever does not activate, or there is no evidence of discharge, discontinue use of equipment immediately, and contact a licensed contractor or qualified service personnel.

If the relief valve does not completely seal, and fluid continues to leak from the discharge pipe, perform the test again to try and flush any debris that may be lodged in the valve. If repeated attempts fail to stop the leakage, contact a licensed contractor or qualified service personnel to replace the valve.

⚠ CAUTION

Before testing the relief valve, make certain the discharge pipe is properly connected to the valve outlet, and arranged to contain and safely dispose of equipment discharge.

4.1.11 Domestic Hot Water System

Quality of the domestic cold water is very important to the longevity of the unit. The recommended pH of the domestic water is between 6.5 and 8.5. The internal domestic water heat exchanger tubing and the flow sensor is subject to fouling if exposed to hard water (over 1.68 grains of hardness) or has a TDS of 500mg/L or higher. See *Table 13*.

DESCRIPTION	MAX	MIN
Water Pressure	150 psi	40 psi
Programmable water temperature	149°F (65°C)	104°F (40°C)
Minimum Flow Rate to Activate DHW Sensor	N/A	0.5 GPM
Acceptable pH range	8.5 pH	6.5 pH
Total Dissolved Solids	500 mg/L	
Total Hardness	200 mg/L 11.68 gr/gal	
Aluminum	0.05 to 0.2 mg/L	
Chlorides	250 mg/L	
Copper	1.0 mg/L	
Iron	0.3 mg/L	
Manganese	0.05 mg/L	
Zinc	5 mg/L	

Table 13: Domestic Water Quality Guidelines

4.1.12 Fan and gas valve removal instructions

1. Turn off the power and the gas supply to the unit.
2. Remove the front cover, and allow the unit to cool down.
3. Disconnect the electrical plug attached to the fan.
4. Loosen the union nut at the top of the gas valve. Carefully remove the orifice and O-ring, and keep in a safe place for re-installation later. Ensure you protect the gas valve outlet from dust and debris.
5. Remove the 2 hex nuts connecting the fan to the burner housing, and carefully remove the fan. You will find a gasket attached to the fan outlet as well as an internal check valve. Keep these items in a safe place for re-installation.
6. If the removed fan is to be re-installed, ensure the fan and venturi are clean and dust free.

4.1.13 Fan and gas valve re-assembly instructions

1. Place the fan gasket on the outlet of the fan housing. The gasket has 2 locator pins to ensure the gasket does not move during installation.
2. Place the check valve on the fan gasket, and attach the fan to the burner housing and install the 2 hex nuts. Tighten the 2 hex nuts with a wrench.
3. Insert the orifice and O-ring between the gas valve outlet and the gas line to the fan. Tighten the gas valve union nut with a wrench. Ensure that the gas valve inlet (lower) nut is tight.

- 4.** Connect the electrical plug to the fan.
- 5.** Restore the gas supply to the unit, and test the gas valve inlet for gas leaks.
- 6.** Restore the power to the unit, and create a call for hot water.
- 7.** Check for leaks at the gas valve outlet and the connection between the fan and the burner housing.
- 8.** Install the cover to the unit.
- 9.** Reset the unit to normal operation.

5.0 TROUBLESHOOTING

NOTE

This appliance is equipped with a blocked vent shut-off system that closes the gas supply when it detects an irregular venting condition.

The troubleshooting section is divided into four sections:

- 5.1 Preliminary Checks
- 5.2 Electronic Components
- 5.3 Warnings and Faults
- 5.4 Other Faults

Often, you can identify and solve a problem through simple checks of the basics: confirming the electrical power supply and gas flow. To help with preliminary checks, the unit's control module offers a visual display of the status of the various control circuit components.

Should a problem remain unsolved after applying the preliminary checks, proceed to the detailed system review in this guide. The Troubleshooting chapter covers potential error conditions, grouped into the following categories:

- 5.3.1 Warning Codes
- 5.3.2 Fault Codes
- 5.4.1 Burner does not Ignite
- 5.4.2 Burner Ignites Noisily
- 5.4.3 Burner Resonating
- 5.4.4 The Power is Reduced
- 5.4.5 No Hot Water (DHW)
- 5.4.6 Hot Water Does Not Reach Temperature

Below each section is a list of symptoms, diagnoses, and solutions.

Some diagrams (see *Section 6.0*) are included for use with troubleshooting including:

- Electrical wiring diagrams
- Water heater component layout diagrams

5.1 PRELIMINARY CHECKS

As a first step in troubleshooting, you should review the controller's display screen. Diagnostic features incorporated in the software evaluate system integrity, display error conditions, and indicate initial troubleshooting action.

In addition to checking the controller's display, try these troubleshooting steps:

1. Confirm power to the unit: check that control module display is on (e.g., display is lit).
2. Check that unit is not in a safety lockout.
3. Ensure that wiring is clean and secure.
4. Check that gas is reaching the unit.
5. Confirm that the domestic water system is properly charged to a minimum 40 psig.

5.2 ELECTRONIC COMPONENTS

This section details the method for troubleshooting the non-standard electronic components on the unit.

5.2.1 Temperature Sensors

The resistance of the temperature sensors varies inversely with temperature. To test, measure the temperature of the sensed environment and compare with the value derived from the measurement of the resistance (obtained by connecting a good quality test meter capable of measuring up to 5,000 K Ω (5,000,000 Ω) at the controller end of the sensor lead).

To obtain a resistance reading, remove power to the unit. For the water sensors, remove the wire leads by disconnecting their respective Molex connectors. Place multi-meter probes into the sensor's male Molex connector socket. Do not apply voltage to the sensor as damage may result.

12K Ω temperature sensors are supplied with the unit. See Table 15 for resistance values.

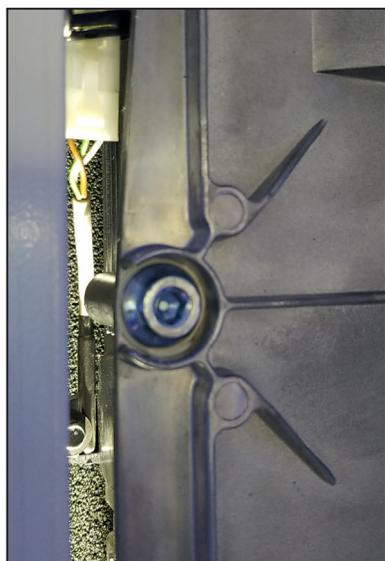


Figure 35: Heat exchanger temperature sensor

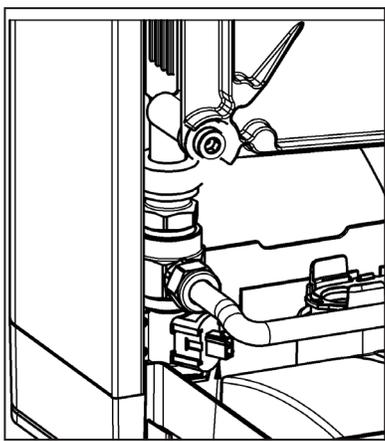


Figure 36: DHW sensor

SENSOR	TYPE	PURPOSE	LOCATION
S0	NTC 12K Ω	Heat Exchanger Temperature	Upper Left of Heat Exchanger
S3	NTC 12K Ω	Domestic Hot Water	DHW Supply Pipe
	NTC 12K Ω	Domestic Cold Water	DCW Supply Pipe
S5	NTC 12K Ω	Flue Gas Temperature	Top of rear Flue passage

Table 14: Temperature Sensors

TEMPERATURE	RESISTANCE	TEMPERATURE	RESISTANCE	TEMPERATURE	RESISTANCE
F / C	Ω - ohm	F / C	Ω - ohm	F / C	Ω - ohm
5F / -15C	76,020	77F / 25C	12,000	149F / 65C	2,752
14F / -10C	58,880	86F / 30C	9,805	158F / 70C	2,337
23F / -5C	45,950	95F / 35C	8,055	167F / 75C	1,994
32F / 0C	36,130	104F / 40C	6,653	176F / 80C	1,707
41F / 5C	28,600	113F / 45C	5,522	185F / 85C	1,467
50F / 10C	22,800	122F / 50C	4,609	194F / 90C	1,266
59F / 15C	18,300	131F / 55C	3,863	203F / 95C	1,096
68F / 20C	14,770	140F / 60C	3,253	212F / 100C	952

Table 15: Temperature Sensor Resistance Values – 12K Ω sensors.

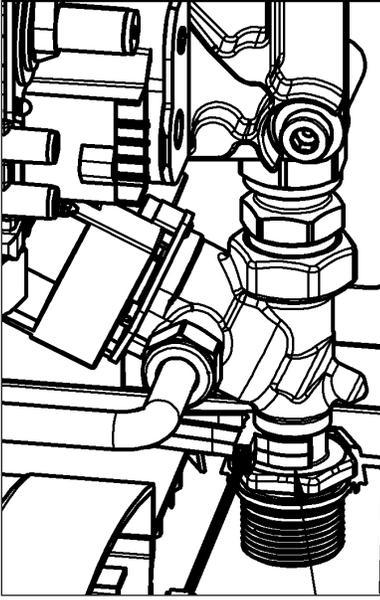


Figure 37: Domestic Water Flow Sensor

5.2.2 Fan/Blower

Control and power to the fan is provided via a single wiring harness to the controller.

5.2.3 Flue Gas Temperature Sensor

This sensor ensures that the unit shuts down safely if the heat exchanger or the venting system becomes blocked.

The flue gas temperature sensor is located at the top of the rear flue passage, below the top panel. To remove the sensor, unclip from the wiring harness and unscrew from the rear flue passage.

5.2.4 Domestic Hot Water Flow Sensor

The SFT series units are equipped with a flow sensor to measure water flow through the domestic hot water circuit in the water heater. The minimum flow required to activate the water heater is 0.5 GPM or 2 L/min.

To service or replace the water flow sensor:

1. Disconnect power to the unit.
2. Turn off the cold and hot water valves below the unit, release the water pressure and then drain the domestic hot water circuit. Leave the drain valves open.

5.2.5 Domestic Hot Water Sensor

The units are equipped with a domestic hot water temperature sensor. The sensor is surface mounted on the hot water outlet pipe.

5.3 WARNINGS AND FAULTS

5.3.1 Warning Codes

During operation the controller can detect unusual situations and can take action to avoid damage to the heat exchanger or other unsafe operations. During these situations, the controller limits the temperature and power output of the burner, or temporarily disables operation entirely.

These warnings are shown flashing and visible on the main display, and displayed only when an unusual reading is currently detected.

FAULT CODE	DESCRIPTION	POSSIBLE CAUSE / SOLUTION
F000	Heat exchanger temperature sensor S0 is defective.	Replace heat exchanger sensor S0.
F002	Temperature too high during DHW demand.	<ul style="list-style-type: none"> • Check wiring of domestic hot water sensor S3 for breakage/ shutdown • Check whether domestic hot water sensor S3 is installed correctly. • Check for the correct operation of domestic hot water sensor S3. • Replace the domestic hot water sensor S3.
F003	Flue gas temperature is too high.	<ul style="list-style-type: none"> • Check the heat exchanger for contamination.
F004	No flame during start-up.	<ul style="list-style-type: none"> • Gas valve is closed. • Gas inlet pressure lower than 4" or sometimes disappears. • Gas valve or ignition unit is not receiving electricity. • Poor internal grounding.
F005	Flame disappears during operation.	<ul style="list-style-type: none"> • Condensation drain is blocked. • Gas inlet pressure lower than 4" or sometimes disappears. • Check adjustment of gas valve. • Check the air supply duct and flue for possible recirculation or blockage of flue gases. • Poor internal grounding.
F006	Flame simulation.	<ul style="list-style-type: none"> • Replace the gas valve. • Replace the burner controller.
F007	No or insufficient flame current.	<ul style="list-style-type: none"> • Check the ignitor. • Check the wiring of the ignitor for breakage/shutdown. • Replace the ignitor.

F008	Incorrect fan speed	<ul style="list-style-type: none"> • Check the fan cable. • Check and/or replace the fan. • Replace the burner controller.
F009	Internal fault in burner controller	<ul style="list-style-type: none"> • Replace the burner controller.
F010, F011	Sensor fault S0.	<ul style="list-style-type: none"> • Check the wiring of heat exchanger sensor S0 for breakage/shutdown. • Check whether the heat exchanger sensor S0 is connected correctly. • Check for the correct operation of heat exchanger sensor S0. • Replace the heat exchanger sensor S0.
F012	Sensor fault S5.	<ul style="list-style-type: none"> • Check the wiring of flue gas sensor S5 for breakage/shutdown. • Check whether the flue gas sensor S5 is connected correctly. • Check for the correct operation of flue gas sensor S5. • Replace the flue gas sensor S5.
F013	<i>DHW inlet sensor fault S4</i>	<p>DHW inlet sensor is defective. Replace the sensor.</p> <ul style="list-style-type: none"> • Check wiring of DHW inlet sensor for breakage. • Check the DHW inlet sensor connection. • Check that the DHW inlet sensor is operating correctly.
F014	Mounting fault sensor S0	<ul style="list-style-type: none"> • Heat exchanger sensor S0 is not mounted correctly. Mount the sensor correctly.
F016	Mounting fault S3	<ul style="list-style-type: none"> • Domestic hot water sensor S3 is not mounted correctly. Mount the sensor correctly.
F018	Flue and/or air supply duct is blocked.	<ul style="list-style-type: none"> • Check the flue and the air supply duct. • Clean the flue and/or the air supply duct.
F019	Memory Module (BMM) fault	<ul style="list-style-type: none"> • Check BMM wiring for breakage/shutdown. • Replace the BMM.
F028	Reset error	<ul style="list-style-type: none"> • Check the reset button for unintentional operation (e.g. cleaning of the control panel). • Replace the burner controller.
F029	Gas valve fault.	<ul style="list-style-type: none"> • Check the gas valve for leakage. • Replace the burner controller.
F030	Sensor fault S3.	<ul style="list-style-type: none"> • Check the wiring of the domestic hot water sensor S3 for breakage/shutdown. • Check whether the domestic hot water sensor S3 is connected correctly. • Check for the correct operation of domestic hot water sensor S3. • Replace the domestic hot water sensor S3.

5.4 OTHER FAULTS

5.4.1 No heat (central heating) fault codes

POSSIBLE CAUSES	ANALYSIS	POSSIBLE SOLUTION
The power LED is not shown.	→ Yes ↓No	<ul style="list-style-type: none"> • Check the power supply. • Check the fuse (see Electrical schematic). • Check wiring for breaks.
The right display shows a line (-). The unit is off.	→ Yes	<ul style="list-style-type: none"> • Switch on the unit by touching just above the power LED and holding for 2 seconds.

5.4.2 No domestic hot water (DHW)

POSSIBLE CAUSES	ANALYSIS	POSSIBLE SOLUTION
The power LED is not shown.	→ Yes ↓No	<ul style="list-style-type: none"> • Check the power supply. • Check the fuse (see electrical schematic).
Flow sensor does not work.	→ Yes ↓No	Replace the flow sensor.
Domestic hot water flow < 0.5 gpm	→ Yes ↓No	Increase the domestic hot water flow.
Domestic hot water sensor S3 is defective.	→ Yes ↓No	Replace the domestic hot water sensor S3.
No electricity on the flow sensor (5V DC).	→ Yes	Check the wiring according to the schematic.

5.4.3 Domestic hot tap water does not reach the correct temperature

POSSIBLE CAUSES	ANALYSIS	POSSIBLE SOLUTION
Domestic hot water flow is too high.	→ Yes ↓No	Reduce the domestic hot water flow.
Setting for domestic hot water temperature is too low.	→ Yes ↓No	Increase the domestic hot water temperature.
Insufficient heat transfer due to calcium or contamination in the domestic hot water-sided central heating unit.	→ Yes ↓No	De-calcify or flush the domestic hot water-sided central heating unit.
<i>The central heating system becomes warm while running hot water. SFC only</i>	→ Yes ↓No	Undesirable circulation during domestic hot water demand in the central heating circuit due to thermo-siphon of the second pump in the central heating circuit. Place a check valve (in the case of thermo-siphon) or a two-way valve (if there is a second pump).
<i>The flue is blocked.</i>	→ Yes	Check the flue.

5.4.4 Burner ignites loudly

POSSIBLE CAUSES	ANALYSIS	SOLUTION
Inlet pressure is too high.	→ Yes ↓No	The home pressure regulator may be defective. In that case, contact the energy company.
Ignition distance is incorrect.	→ Yes ↓No	Replace the ignitor including the ignition cable.
Gas-air control is not correctly adjusted.	→ Yes	Check and/or replace the ignition cable. Replace the ignition unit in the top cover. Replace the ignitor.

5.4.5 Burner resonates

POSSIBLE CAUSES	ANALYSIS	SOLUTION
Gas inlet pressure lower than 5" w.c. or sometimes disappears.	→ Yes ↓No	The home pressure regulator may be defective. Contact the energy company.
There is recirculation of flue gases.	→ Yes ↓No	Check the flue and air supply duct.
Gas-air control is not correctly adjusted.	→ Yes ↓No	Check the adjustment
Burner seal is defective.	→ Yes ↓No	Replace the burner seal.
Burner is defective.	→ Yes	Replace the burner.

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6.0 DIAGRAMS

6.1 - PARTS DIAGRAMS

6.2 - WIRING DIAGRAMS

6.1 PARTS DIAGRAMS

SFT Series water heater - Parts assembly

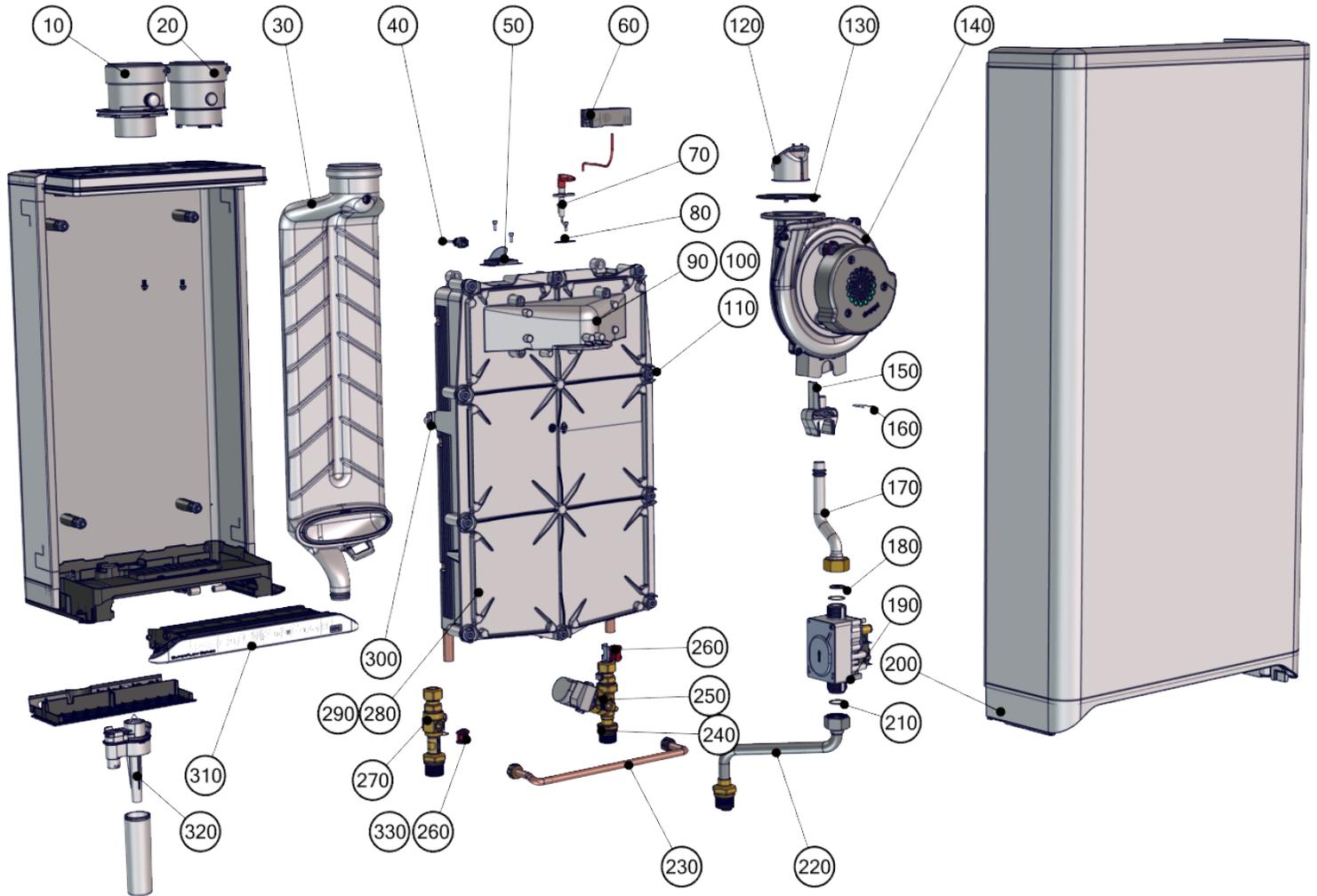


Diagram 6.1-1: Unit assembly parts

BOM ID	Part Description	Part #	Replacement Kit Numbers
10	Flue exhaust fitting	180-204	P-810
20	Combustion air intake fitting and screen	180-203	P-809
30	Rear flue duct	180-239	P-813
	*Flue / Heat exchanger gasket	150-312	
	*Flue Pipe Outlet Gasket	150-313	
40	Flue gas temperature sensor	180-205	P-814
	*NTC shaft 1/8" SW15	150-314	
50	Sight glass	250-626	P-730
60	Ignition module	180-202	P-811
70	Ignitor and cable	180-201	P-815
80	*Ignitor gasket	250-622	
90	Burner	180-170	P-841
100	*Burner gasket	250-808	
	Screws x 4	150-344	
	Spring x 1	150-241	
	*O-ring x 4	150-343	
110	*Heat exchanger gasket	250-807	P-850
120	Back flow insert	180-178	P-817
	*Backflow valve flapper (viton)	180-184	
130	*Fan gasket	250-627	P-818
140	Fan	240-114	
150	Venturi insert # 375	180-168	P-858
160	Venturi clip	150-244	
170	Gas line (gas valve to fan)	180-245	P-842
	*Gas line O-ring	150-245	

* See next page for gasket package for SFT-199; includes all gaskets asterisked above

BOM ID	Part Description	Part #	Replacement Kit Numbers
180	*O-ring and orifice	150-175 included with conversion kits	
	Orifice - Natural Gas - #660	180-173	P-803
	Orifice- Propane - #535	180-174	P-802
	Alternative low calorific Natural Gas Orifice - # 725	180-108	P-846
190	Gas valve	180-215	P-824
	*Inlet gasket	150-206	
	*Outlet O-ring	150-175	
200	Front panel assembly 160/199	180-261	P-819
210	*Gas valve inlet gasket	150-206	P-847
220	Inlet gas tube	180-246	
230	Bypass water pipe	250-787	
240	Bypass Valve / Flow Sensor		P-851
250	By-pass valve	240-121	P-851
260	Return water temperature sensor	240-070	P-729
270	Outlet water connection	180-250	P-853
280	Heat exchanger (replacement kit)	170-031	No replacement
290	Heat exchanger refractory plate	180-208	P-830
300	Supply temperature sensor heat exchanger	180-206	P-832
310	Control unit	180-247	P-855
320	Condensate trap	180-176	P-833
	Condensate hose	180-128	
330	Supply water temperature sensor	240-117	P-852
	Wall bracket	250-809	P-837
	Screw x 4	150-345	
*	Gasket package for SFT-199; includes all gaskets asterisked above		P-843

6.2 WIRING DIAGRAMS

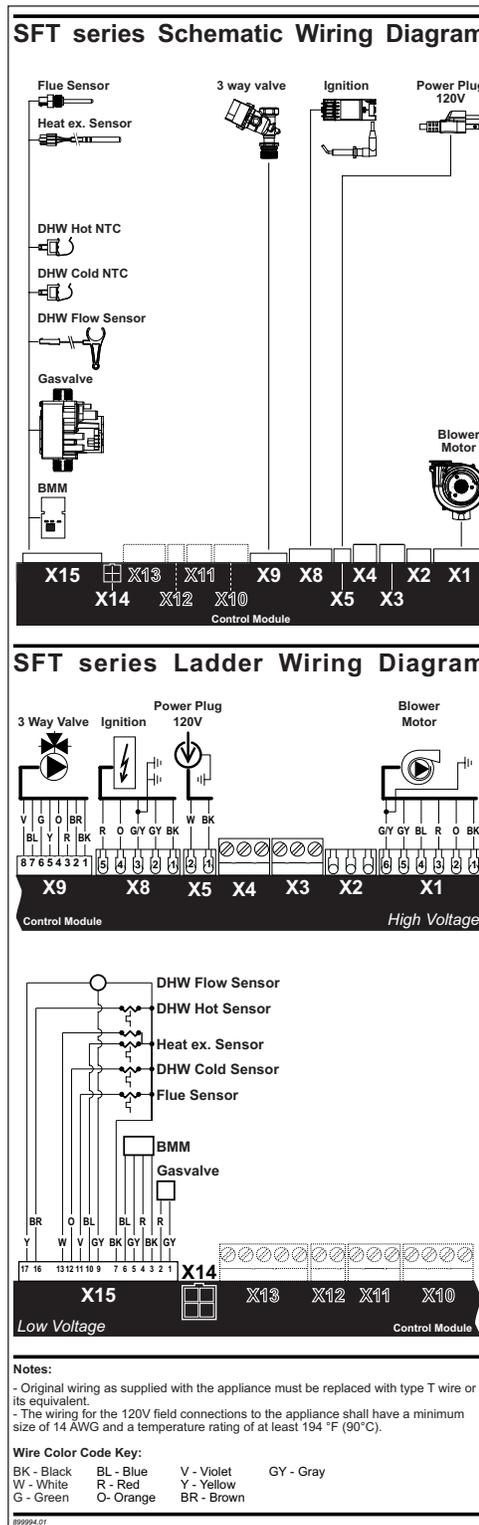


Diagram 6.2-1: Pictorial wiring diagram

INSTALLATION & COMMISSIONING REPORT

Water Heater Details:

Model Number _____ Serial Number _____

Date of Installation _____ Address of installation _____

User contact information _____

Installer Information Company _____

Address _____

Phone/Fax/E mail _____

Fuel Natural Gas Propane

Gas Supply Pressure (high fire) _____ Inches w.c. Measured Rate of Input (high fire) _____ Btu/hr

Installation instructions have been followed and completed (Section 1 of Installation and Operating Instructions).

Check-out procedures have been followed and completed (Section 3 of Installation and Operating Instructions).

Leak testing completed gas piping venting system Fan and combustion components

Air purge completed

Relief Valve correctly installed and piped Relief valve "try lever" test performed

Condensate trap filled Condensate drain clear and free flowing Condensate Neutralization? Yes/No

Ignition Safety Shutoff test completed. Flame current reading - High fire _____ μ A - Low fire _____ μ A

Owner advised and instructed in the safe operation and maintenance of the unit.

Information regarding the unit and installation received and left with owner

Combustion Readings - recommended, but optional (required for fuel conversion):

CO₂ _____ % O₂ _____ % CO _____ ppm

Flue temperature _____ Return water temperature (measure simultaneously with flue temp.) _____

Installers: send this completed sheet - Fax to 604 877 0295 - or - scan and Email to info@ibcboiler.com.

Commissioning has been completed as listed on this report - Installer Signature _____

REVISION HISTORY

R0	DECEMBER 2018	Initial release.
R1	FEBRUARY 2019	Miscellaneous minor revisions made.
R2	MARCH 2019	Dimension drawings updated and minor revisions.
R3	APRIL 2019	References to SFT as being designed for domestic purposes only and need for replacement of heat exchanger gasket during maintenance.
R4	JUNE 2019	Updated Electrical diagram, various images, and some minor editing.
R5	NOVEMBER 2019	Amended Specifications table and updated concept drawings.
R6	MARCH 2020	New concept drawings on recirc installations: Figures 20 and 21.
R7	APRIL 2020	Figure 1b (bracket and bottom dimensions), Figure 2, Figure 33, and figure 46.
R8	SEPTEMBER 2020	Parts list updated, minor text revision. Amended Specifications table.
R9	FEBRUARY 2021	Vent termination section updated, minor revisions



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