

# FCX Best Practices

## Fuel

A **Tigerloop Ultra** with 36" long flex lines is recommended. Install the Tigerloop lower than the fuel pump. This prevents the fuel from draining when the bleed plug is removed to check the pressure. A common location is on the side of the boiler. Lines can be run either through the back or under the front cover.

## Pumping

The best choice is to remove the existing constant 3 speed Grundfos 15-42 pump and use it on the domestic circuit. In most cases, I recommend the **Taco Viridian 2218** T VFD pump for the heating circuit, as it is most appropriate for getting the lowest return water temperatures. If there are zone valves, you do not need the IFC that comes with the 2218. It can be used in the DHW circuit pump as it also fits the Grundfos. Make sure it is not put in backwards.

## Piping

All connections except for the auto air eliminator to the FCX are gasketed and should be checked for tightness. The four 90s supplied for the connections to the FCX need to be modified slightly as they are not quite 3/4 inch. A Uponor/Wirsbo or Rahau manual expander works well. Don't use a power expander.

Check valves or zone valves need to be installed in both circuits to prevent induced backflows and sympathetic flow. An additional Expansion tank may be necessary.

Temperature gages should be installed in both supply and return lines (you can't tell what is happening if you don't). A pressure gage should be installed in the supply line and not the return. This location will help prevent over pressuring when charging the system.

The condensate trap should be at least 8 inches deep. See the paper on Handling the Condensate.

## Controls

It has been proven that controlling water temperatures to the absolute minimum needed for heating comfort maximizes efficiency.

We now (2019) have specific recommendations. This is based on extensive use of the FCX with varying control systems with different heat emitters and a multitude of plumbing configurations.

The Tekmar 400 series of controls have been chosen because it has been shown to provide the most efficient utilization of the operating characteristics of the FCX. It provides outdoor reset with indoor feedback and insures optimal efficiency. This is coupled with either a Tekmar or ESBE/Danfoss mixing valve actuator (the mixing valve is an ESBE VRG or 3MG model). This system guarantees the optimal operation of the FCX.

The Taco switching relays and zone controllers have also been used in combination with the Johnson 419 and 421 digital temperature controllers. They provide cold-start and pump control but are not optimum based on

our current knowledge and observations. Caution should be exercised to keep the core temperature of the primary welded steel heat exchanger above the condensing point. These controls do not do this. The Tekmar 400 series of controllers provide boiler protection through modulating the mixing valve.

While only the addition of digital temperature is needed to more accurately set boiler temperatures, they do not control temperature based on actual needs. Controlling core temperature and mix temperature based on heat demand is absolutely essential to monitoring and controlling the operation of the system to optimum efficiency.

## Stacks

See in depth discussion on website. In a nut shell: A side exit when the boiler is located in the living area must be a balanced system of which one type is a concentric direct vent (exhaust in center pipe and combustion air on the outside), or a two pipe system where one is exhaust and one is combustion air. When installing a 2 pipe system at least 6 feet of concentric pipe is necessary to adequately warm the incoming combustion air. The balanced system eliminates any issues of negative pressures caused by HRV's, wood stoves, etc.

## Setup

The Riello burner can usually be ran at the default settings but will be dirty. The pump pressure is comes set to 140 psi and needs to be adjusted to 185 psi. Changing this will necessitate the adding of more air to the burn or the boiler will soot.

The condenser lid tends to stick to the gasket, so lightly coat it with Teflon pipe dope or other anti-seize. The site glass also. To initially remove a stuck site glass, use a knife blade as a wedge between the boiler and the glass, tapping it with a small hammer to pop it off. Check for shards stuck to boiler. If any, remove and use reverse side of glass or get a new glass. Do NOT try to remove a stuck glass with a pliers. The top four bolts of the primary heat exchanger should have anti-seize on them as they are stainless and will gall. Teflon pipe dope is a good anti-seize as it is water based, and high temp, but when it dries out it leaves a non-stick film.

## Tuning

The CO2 should be set to 12.5 to 13.0. If in Fairbanks, I normally do the initial tuning if I know when the install is complete. Call me. Jim Romersberger 907-388-2094

## Drawings

See the Technical page on [www.fcxalaska.com](http://www.fcxalaska.com)