

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 Bumble Bee** ΔT VFD pump for the heating circuit, as it is most appropriate for getting the lowest return water temperatures. If there are zone valves, don't use the IFC that comes with the Bumble Bee. 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.

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.

Controls

The Riello burner does not have a TT control. To make it a "cold start" system you need to interrupt power to the boiler.

On radiant systems, to turn on the boiler and start the pumps, I use the **Taco SR501 to 506** switching relays depending on the number of pumps. The zone controllers can also be used if only two pumps are used, but one must be used as in priority mode or external relays will be needed. On base board systems where temperature control is more likely needed the **Tekmar 402** series with outdoor reset and indoor feedback is great.

Existing temperature control of the boiler is provided by a bulb type aquastat mounted on the control panel. It is the one with the rotatable black knob. It is set for 50° to 70° C but is not the most reliable device. So, I recommend the use of a Johnson A419 ABC (120V) controller when using the Tacos switching relays. It should be put in series with the existing aquastat as it is not rated as a primary. The existing aquastat would

then serve as a secondary high temperature safety. The advantages of the 419, is that they are more accurate, the differential can be adjusted, the differential can be set upwards or downwards of the limits, and it also displays boiler core temperature, a feature not built in. The thermistor that measures the temperature is placed in the third temperature well of the primary heat exchanger.

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. The balanced system eliminates any issues of negative pressures caused by HRV's wood stoves etc.

A single wall system can be used in non living spaces or if exit is through the roof at the highest point. Separate combustion air must be supplied with a cold air trap.

If in doubt, contact me.

Setup

The Riello burner can usually be ran at the default settings, but will not be optimally set. The pump pressure is usually set to 140 psi, while the optimal pressure is 185 psi. Changing this will necessitate the adding of more air to the burn or the boiler will soot.

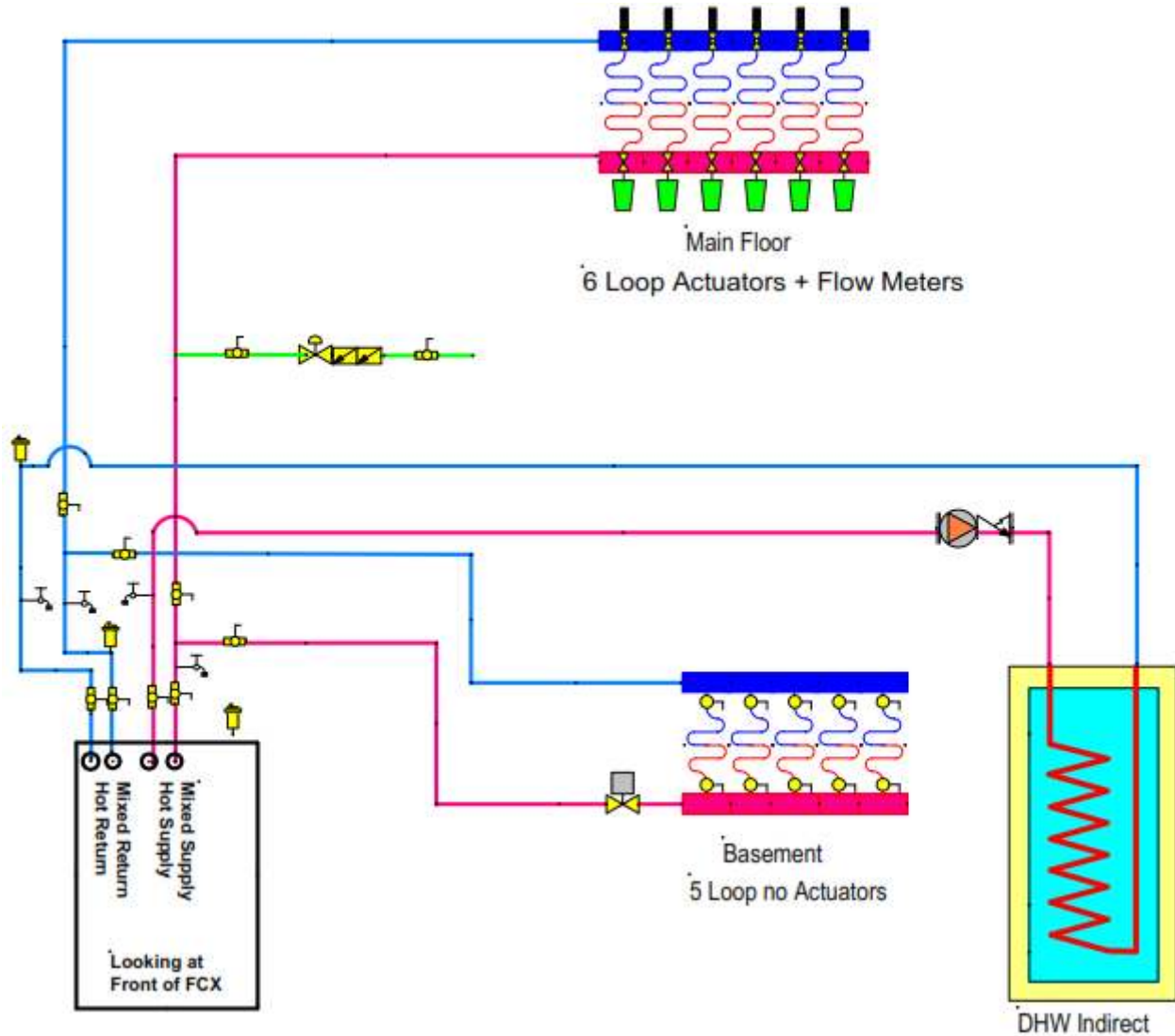
The condenser lid has a tendency to stick to the gasket so lightly coat it with Teflon pipe dope to serve as an anti-seize. The site glass also. To initially remove a stuck site glass use a knife blade as a wedge between the boiler and the glass, tapping it with a small hammer to pop it off. Check for shards stuck to boiler. If any, remove and use reverse side of glass. 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 not 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

The following pages include a simple radiant system, typical parts lists, symbol key, and wiring diagrams for the popular Taco SR502 Switching Relay used with the Johnson 419 Relay, the Tekmar 402 Controller, and the domestic side of the DHW tank.

Typical Radiant with DHW Installation

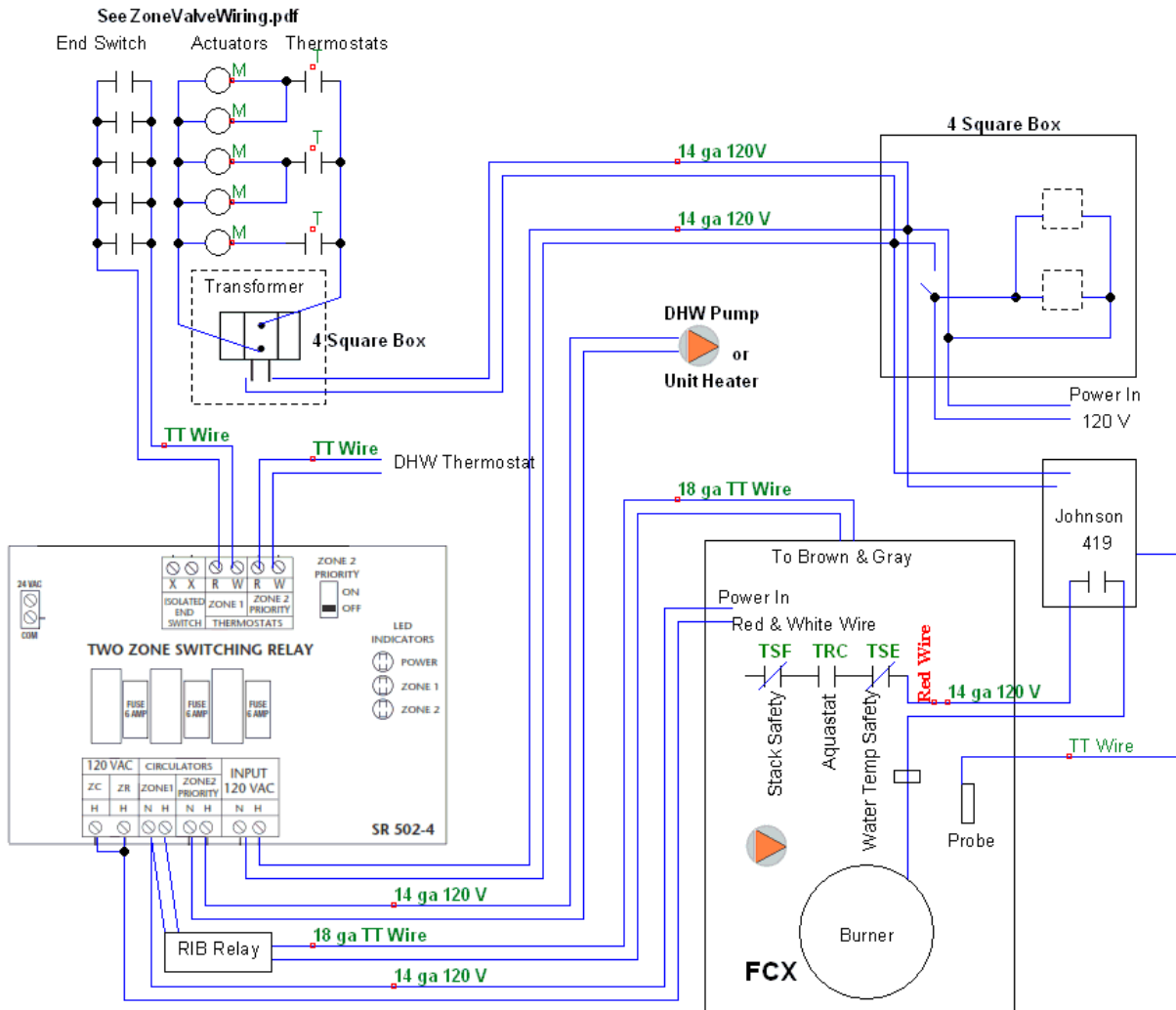


Typical List of Materials

Boiler Side

1	Stand	2	1/2 Ball Valves Before/After Caleffi
1	6 Port Rahau Manifold	1	3/4 Taco Sentry Zone Valve
1	5 Port Rahau Manifold	1	Condensate Pump
6	Rahau Actuators	25'	Plastic Tubing For condensate
2	Temperature Gages (Dry Well)	1	1 1/2 ABS, Rubber couplings for trap
1	Pressure Gage 0-50 1/4 NPT	1	40 VA Transformer
2	Auto Air Vents	1	RIB Relay u1c
8	3/4 Ball Valves	1	Taco SR502 Switching Relay
2	Valved Flanges	25'	14-2 w ground armored cable
4	3/4 No Kink		4 square boxes, connectors etc.
	Various 3/4 Cu Tee, 90, etc.		Flux, flux brush, mesh sanding,
2	3/4 Female Adaptors	1	Tigerloop Ultra
1	Taco Bumble Bee Pump	2	36" Flex fuel lines for Riello
20'	3/4 Cu Pipe	1	Caleffi Pressure Reducer/Backflow Preventer
	Various Brass Adaptors	1	Johnson 419A controller

FCX Wiring with Taco SR502



This sample controls 5 zones using 3 thermostats.

RIB relay on FCX internal pump converts the SR502's 120V output to dry contacts.

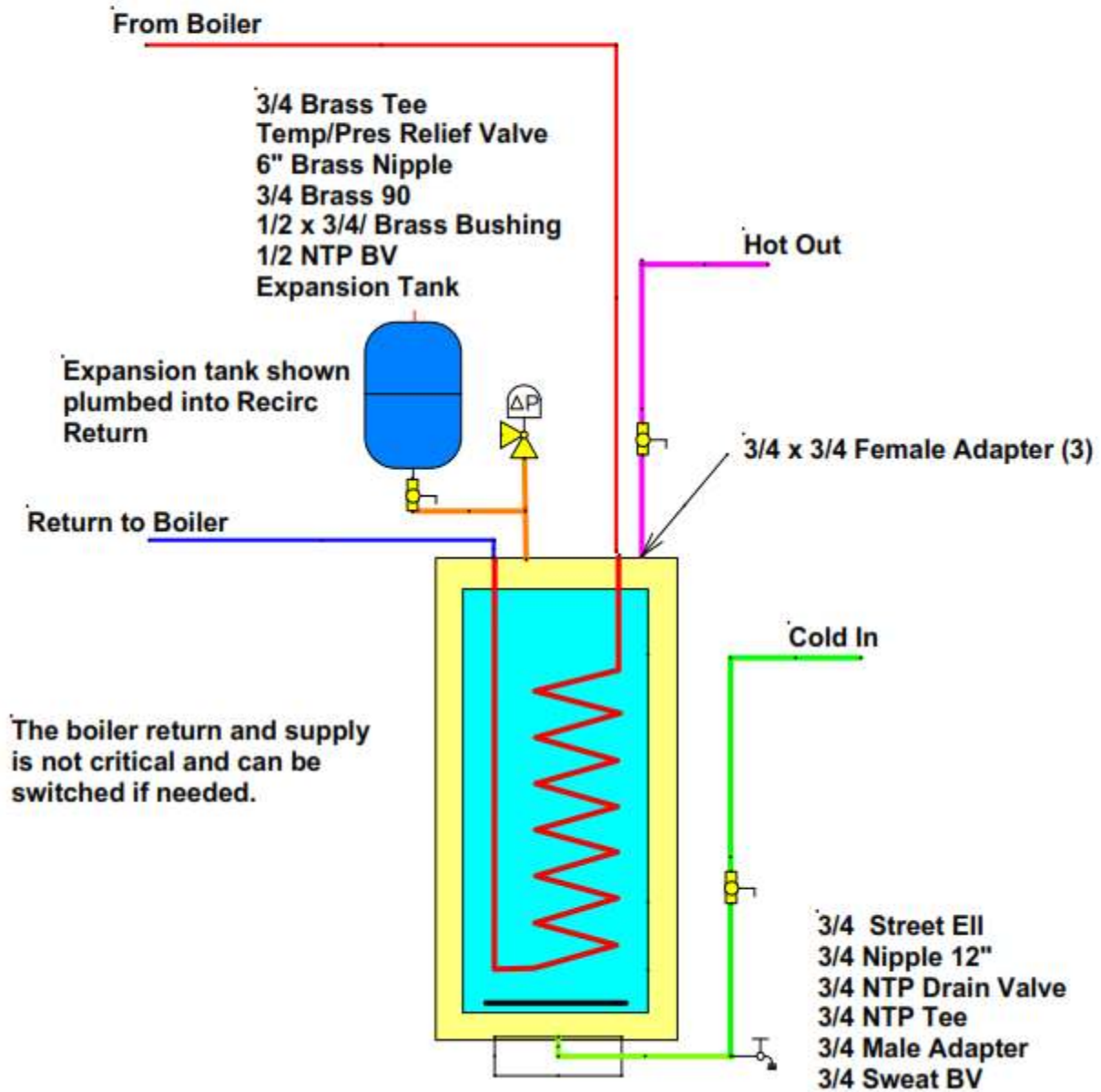
The SR 502 also directly controls the DHW pump also.

On a call for heat from any zone or DHW, contactors ZR/ZC on SR502 provide power to the FCX and activate the needed pump.

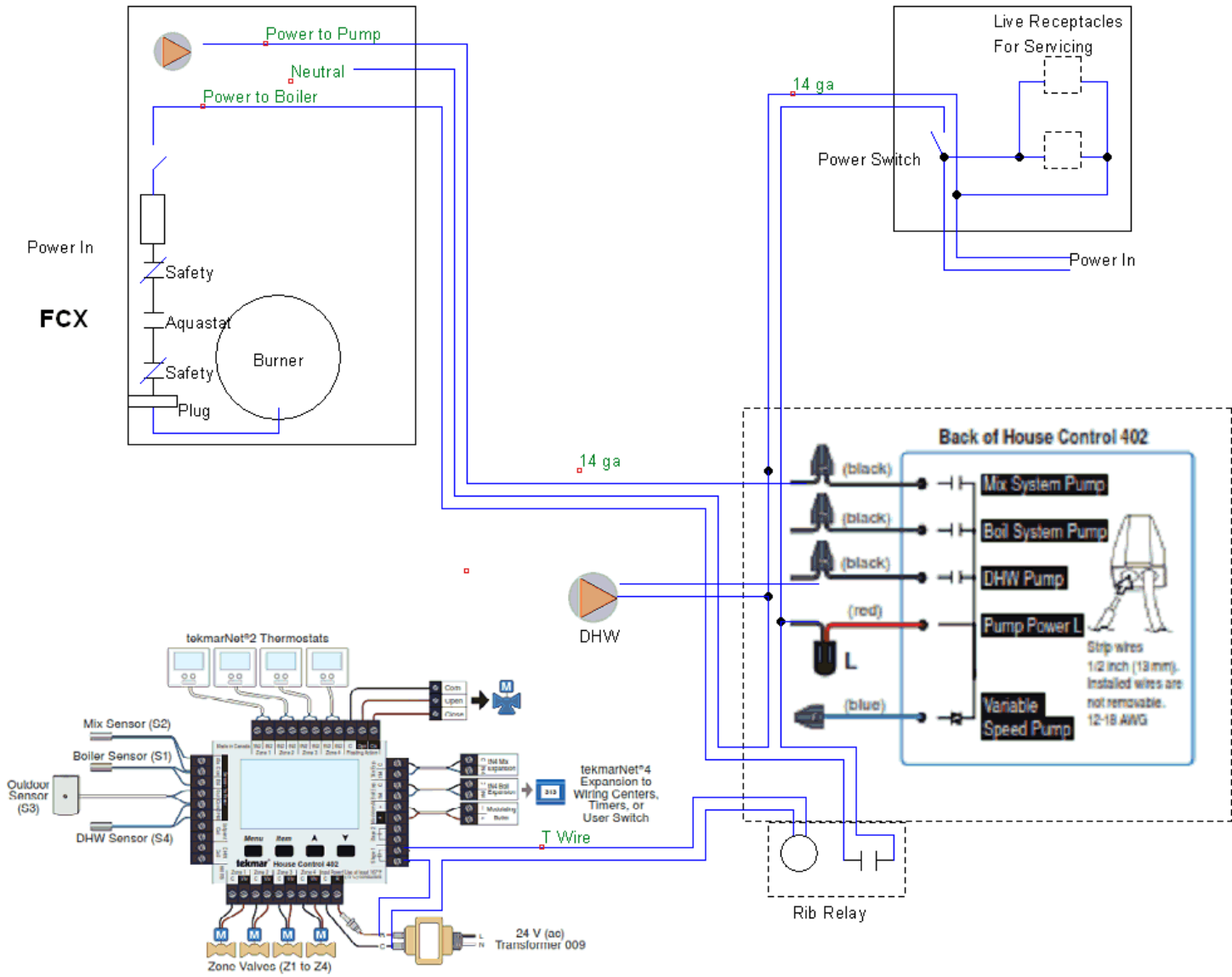
The Johnson 419 provides additional accuracy to temperature control and allows reading of boiler core temperature. It is spliced in series with the existing aquastat and safeties as it is not rated as a primary controller.

Core temperature needs to be maintained at a minimum of 120° F to prevent condensing in the primary.

Domestic Plumbing and Parts for BS Tanks



FCX with Tekmar 402



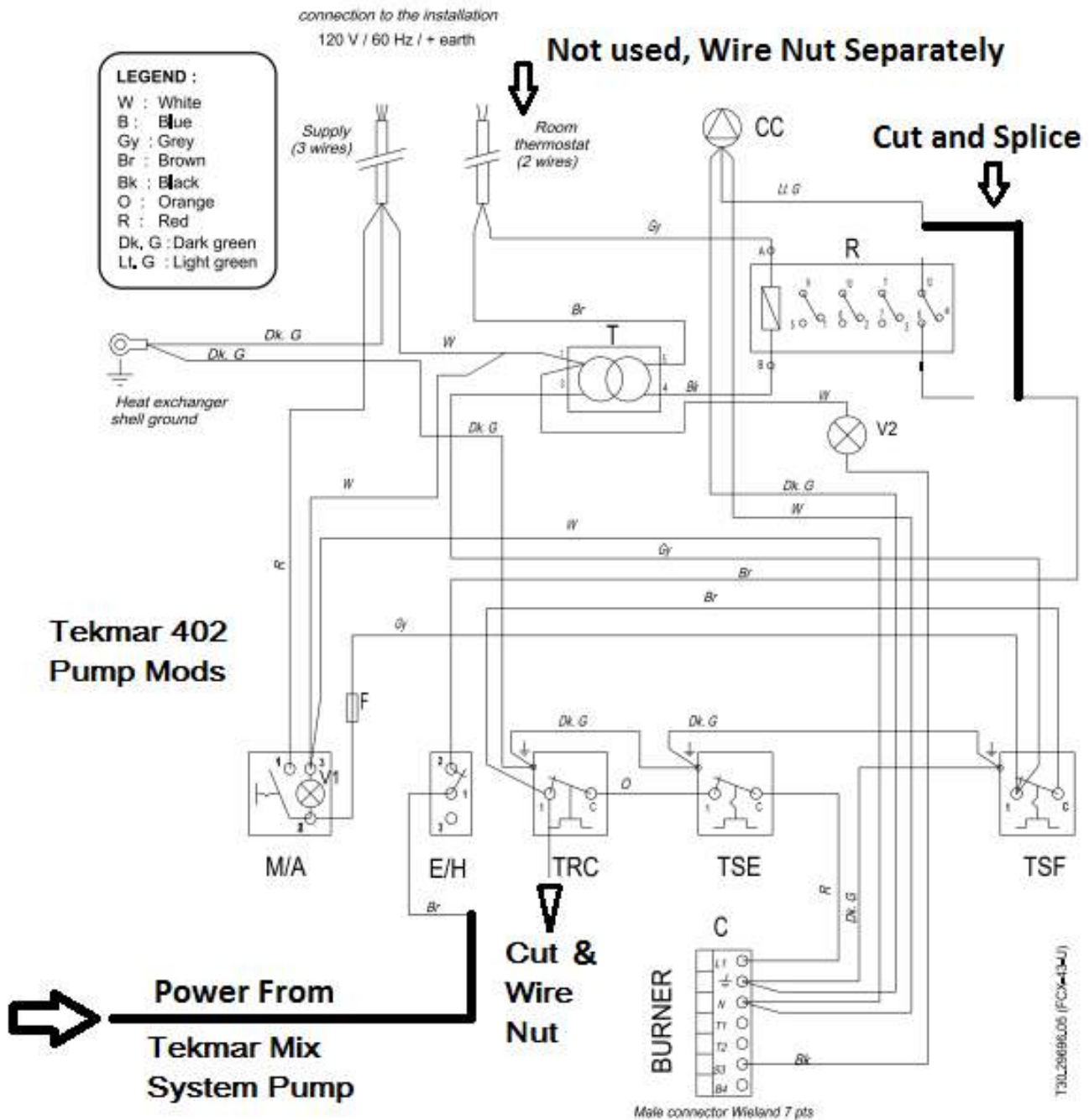
Notes:

The FCX has no TT on its controller, it is turned off and on by interrupting power to the boiler using a RIBU1C relay. These changes are necessary because the pump is powered separately from the boiler with the Tekmar 402.

It is adequate to use 14 gage, 3 conductor cable with ground as only one neutral is required.

The internal aquastat now functionally becomes a secondary high limit. It must be left in the circuit as the Tekmar is not rated as a primary controller.

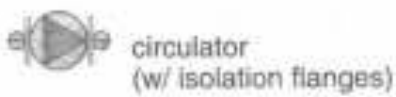
Tekmar 402 / FCX Wiring Details



LEGEND :
 L : Phase
 N : Neutral
 M/A : On/Off switch
 E/H : Summer/Winter switch
 TSE : Overheat safety cutout aquastat
 TRC : Adjustable thermostat
 TSF : Flue gas safety cutout thermostat

V1 : On light
 V2 : Burner safety shutdown light
 C : Burner connector
 F : Fuse (6,3 A)
 R : Relay
 T : Main transformer 120/24 volts
 CC : Circulating pump

Schematic Symbols for Piping Components



circulator
(w/ isolation flanges)



gate valve



globe valve



ball valve



swing-check
valve



flow-check valve



spring-loaded check valve



hose bib / boiler drain



TRV
(straight)



TRV angle



circuit
setter



manual 3-way
valve



zone valve



air
separator



diaphragm-type
expansion tank



pressure reducing valve



diff. pressure bypass



3-way
thermostatic



pressure
gauge



4-way motorized
mixing valve



3-way motorized
mixing valve



pressure relief valve



backflow
preventer



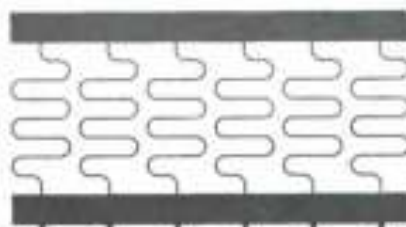
float-type
air vent



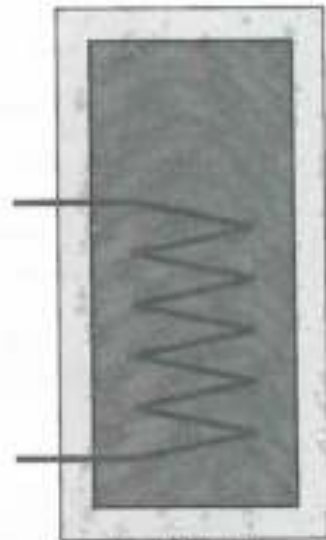
union



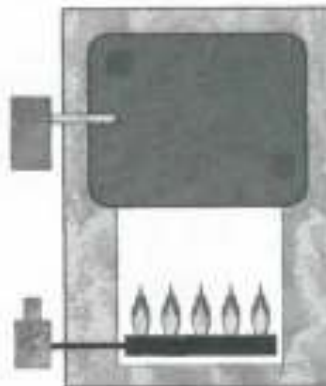
heat
exchanger



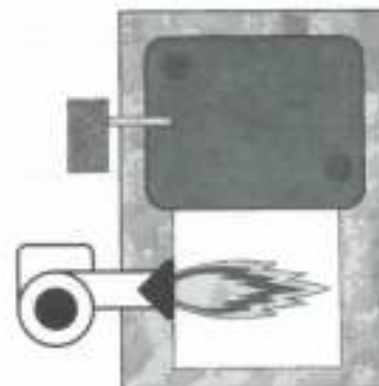
manifold station



indirect DHW
tank



gas-fired boiler



oil-fired boiler