



SYNesso

Technical Manual 14.1

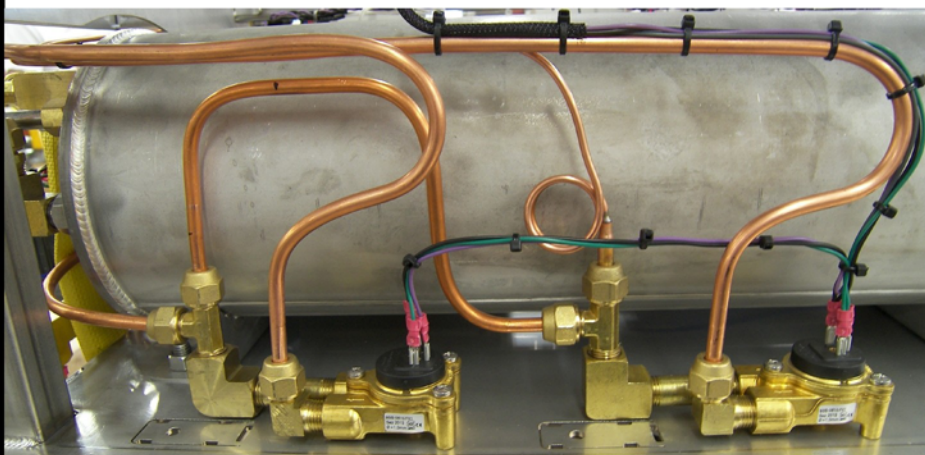
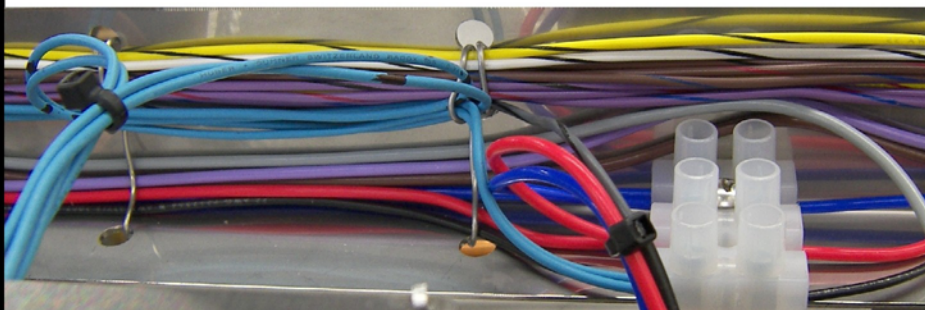
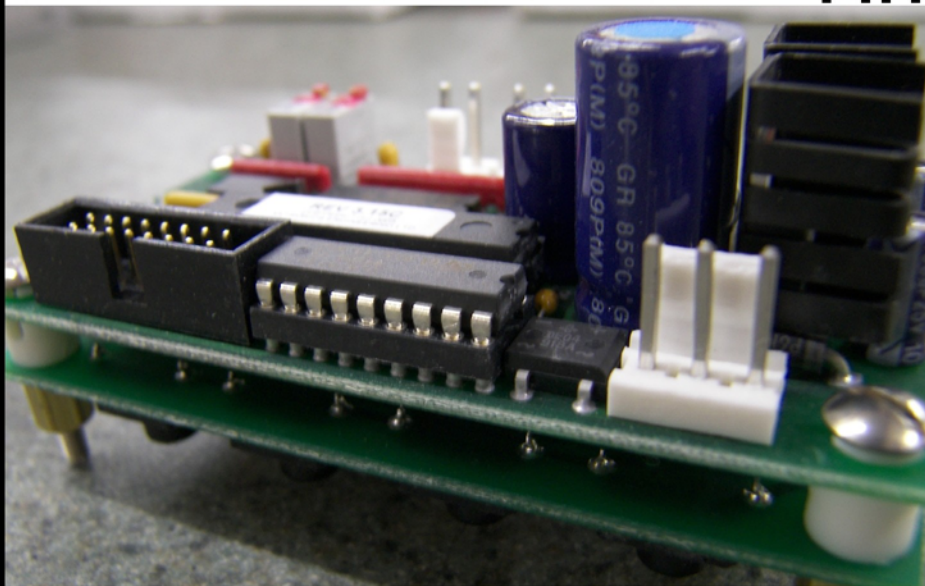


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INTRODUCTION

Congratulations on the purchase of your Synesso™ espresso machine. Please read this Owner's Manual and retain it in a safe location for future reference. If you have any questions about your machine, please contact Synesso™ and our knowledgeable staff will assist you.

Factory Contact information:

Synesso™ Inc.
5610 4th Ave South
Seattle, WA 98108
Tel: 206.764.0600
Fax: 206.764.0601
E-mail: info@synesso.com
Web: www.synesso.com

Please have your Serial Number available
BEFORE calling for service or technical support.

Thank you.

S/N: _____

The offsets for this machine are:

BG1: _____°F / BG2: _____°F / BG3: _____°F

Steam Tank: _____°F

Included in the package with this machine you will find the following:

- Thumb Drive containing the Owner's Manual and other technical documents
- Pump/Motor Combination + hoses (3/8" compression fittings on all hoses)
- 8' Flexible 3/4" ID drain hose + hose clamp (attached)
- Fitting, 1/4" male NPT x 90° x 3/8" Compression (if not CE/Ctick)
- Accessory Package: Portafilters (per customer specification), blind basket, Synesso™ 3 oz. (90ml) shot glass, JoeGlo™ cleaning kit, 58mm tamper, 4 rubber leg pads
- Electrical plugs are ONLY included on CSA Certified machines (Canada).
For all other machines, the owner of the machine must purchase an appropriate plug end for their machine. Please see the installation instructions starting on page 8 for more information.

Serial Number

Your espresso machine has a unique serial number, located on the left inner frame of the machine, just under the drain tray on a serial plate. The number can also be read on the display during start-up or on the "SYNESSO" screen (page 37). Please have this serial number available for reference when contacting the factory.

This manual applies to all Synesso™ models: Cyncra, Sabre, Hydra and Hybrid machines. The Cyncra is Synesso's™ manual machine, available in 2 and 3 group models. The Sabre is a volumetric machine, also available in 2 or 3 group models. Hydra machines have an individual pump and motor per group head and can accommodate 4-stage pressure ramping on all groups. The Hybrid is a Hydra configured to use a combination of the manual and volumetric machines: customers can choose either a manual or volumetric configuration for each of the one to three group heads.

SAFETY WARNINGS

IMPORTANT Information for Synesso™ Espresso Machines:

- DISCONNECT FROM POWER BEFORE SERVICING.
- Read the entire manual before operating this machine.
- Steam and condensation from the steam wand discharge are very hot and may cause burns.
- The steam wand tips and bases become hot during use: do not touch these surfaces.
- Cover the steam wand tip or submerge in a filled pitcher to safely divert the steam before opening the steam valve.
- Never remove the steam wand from the product that is being heated when the valve is open.
- Never remove the portafilter from the machine during the active brewing process.
- Keep water and moisture away from any electrical device or live power.
- Steam tank water is heated to 260°F (126°C) or more; Use caution near steam tank.
- The brew groups deliver water as hot as 210°F (99°C). Avoid exposure to this water.
- The hot water mix valve can be adjusted to deliver water as hot as 212°F (100°C), which can cause severe burns: please use caution when activating this water source.

Safety Label Locations:

Synesso™ complies with UL regulations by posting the following labels on its machines:

Electrical box:	WARNING: Disconnect from power supply before servicing AVERTISSEMENT: Couper l'alimentation avant l'entretien et le dépannage.	California only:	CALIFORNIA PROPOSITION 65 WARNING WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. (California law requires this warning to be given to customers in the State of California.)
Electrical cord:	The conductors of the power supply cord are marked "L1", "L2" for the ungrounded ("hot") supply conductors and "G" for an equipment grounding lead. Warning: Risk of Fire. Use UL Listed Grounding Type Plug rated for 220 Volts, _____ Amperes, _____ Phase, # _____ Wire. Plug to be Selected and Installed only by Qualified Service Personnel.		
Under drain tray inside right frame:	This equipment is to be installed to comply with the applicable federal, state or local plumbing codes.		

Materials information for Synesso™ machines:

- All stainless steel coming into contact with the water supply is 300 series
- All brass fittings are low lead per the CA360 specifications or better
- All electronic devices are lead free
- All gaskets are made from food-contact safe material

Test Information

- Brew (coffee) tanks are hydrostatically tested to 375 psi
- Steam tanks are pressure tested to 75 psi
- The electrical system is subject to an electrical withstand test of:
1.20 kvac, at 5.00 mA, for 1 second

BREW AND STEAM TANK SAFETY

Safety Precautions:

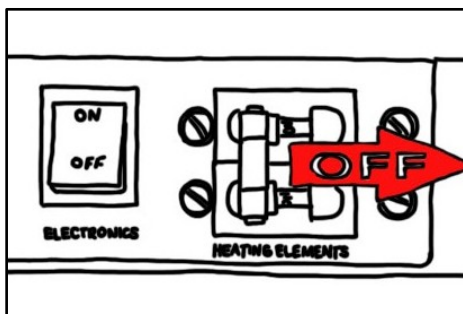
Espresso machines have numerous potential hazards, and it is of paramount importance to Synesso™ that people servicing our machines take all necessary precautions to ensure their personal safety. When working on the machine's boilers (unless otherwise instructed in the directions):

- Turn the machine off and shut off the incoming water supply.
- Depressurize the boilers as shown below.

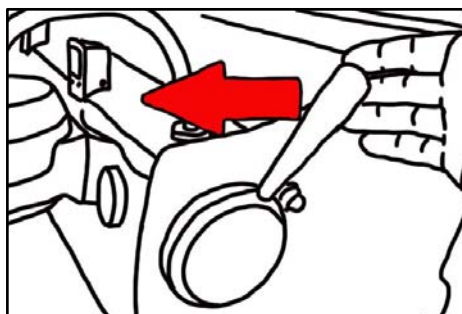
When working on any electrical wiring (unless checking voltage or amperage readings or otherwise instructed in the directions) ensure that the machine is switched off at the electrical box and the machine is unplugged.

To depressurize the steam tank:

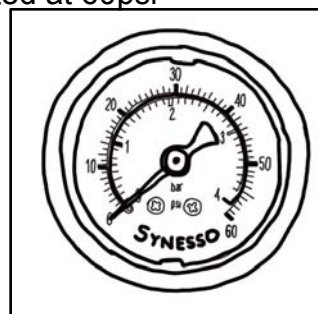
Turn off the element circuit breaker located under the machine.



Open the steam valve by moving the steam wand lever forward.

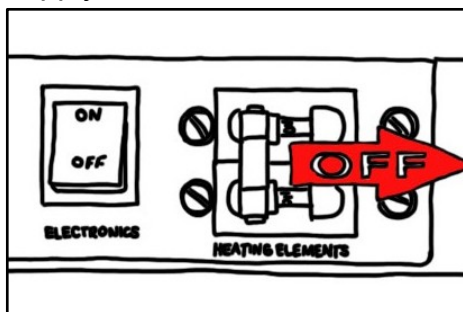


The steam tank is depressurized once the steam gauge reads zero. Note – the steam gauge is rated at 60psi

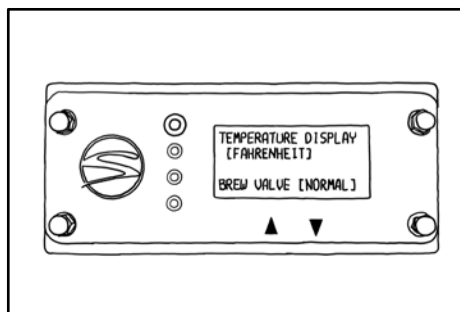


To depressurize the brew tanks:

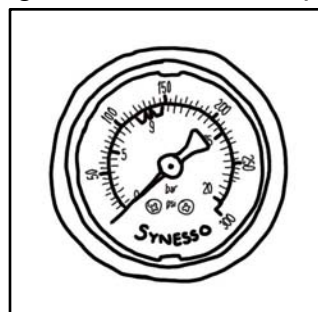
Turn off the element circuit breaker located under the machine. Also turn off the water supply to the machine.



In MENU LEVEL 2, turn the BREW VALVES [ON].



The coffee tanks are depressurized once the pressure gauge reads zero. Note – the brew gauges are rated at 300psi



TOOLS AND SUPPLIES

Tools and recommended items required to fully diagnose, service and maintain Synesso™ machines

- Multi Meter – reads volts, amps and ohms. (The Fluke T5-600 is recommended)
- Heat Shrink Gun or Torch
- Vacuum with a Hose
- Compressed Air
- Descaler – Citric Acid
- Flashlight
- Box Knife
- Thread Sealant – Red and Blue Loctite
- Food Grade Grease
- Tube Bender
- Flare Tool - 45°
- Tube Cutter
- Brass Bristle Brush
- Socket Wrench with 1/2" and 9/16" sockets
- Hammer
- Wire Stripper / Crimper
- Small Punch and Chisel
- Small Files – Round and Triangular
- Small Picks – Straight and Curved (great for replacing portafilter gaskets)
- Die and Tap, 1/8" NPT and 1/4" NPT
- Tap for Threads, 10 - 32 and 3/8 - 16
- Set of Allen Wrenches – 3/32" (brass flow jet), 9/64" (brew valves), 1/4" (steam valve seat)
- Wrenches: 2x11/32, 1/4, 5/16, 3/8, 2x7/16, 1/2, 2x9/16, 5/8, 11/16, 3/4, 12mm & 17mm
- Large, Medium and Small Adjustable Wrenches (Crescent Wrenches)
- Pliers: Channel Lock, Standard and Side Cutters
- Philips Head Screwdrivers: #2 short, #2 long and #1
- Flat Head Screwdrivers: #2 short, #2 medium, #1 medium, #0 medium
- A large flat head screwdriver (or nail puller) to use as a pry bar or wedge.
- Pen and paper
- Hand cleaner
- Towels



WARRANTY

Limited One-Year Non Wearing Parts Warranty

Synesso™, Inc and/or your Distributor warrants to the original purchaser that Synesso™ espresso machines are free from defects in materials and workmanship under normal use and service for the period commencing upon the date of shipping and continuing for 12 months from the original date of shipment. Synesso™ will make a good faith effort for prompt correction or other adjustment with respect to any non-wearing part that proves to be defective within the limited warranty period. This Limited Warranty is conditional upon proper use of the machine by the purchaser.

This Limited Warranty does not cover defects or damage resulting from: accident, misuse, abuse, shipping damage, neglect, unusual physical, electrical or electromechanical stress, unauthorized customer modifications or improper water filtration.

Proper water filtration and regular filter changes are a requirement to keep your factory warranty valid and your machine functioning properly. It is highly recommended that you contact a professional water filtration specialist in your area and have your water tested to determine the proper filtration system. It is important to note that many municipalities change their water sources throughout the year, so additional water tests may become necessary.

Water Standards to keep your warranty valid:

Total Dissolved Solids (TDS)	30 to 200 ppm (parts per million)
Total Hardness - in ppm	Less than 85 ppm
Total Hardness – in grains	3 to 5 grains (divide ppm by 17.1 to get grains)
pH	6.5 to 7.9 pH
Chloride	0 ppm – Chloride can damage the boilers
Total Alkalinity	Less than 100 ppm
Chlorine	0 ppm
Iron	0 ppm

In Synesso's™ experience, Everpure Claris and Cirqua formulator systems can produce a result that can damage the Synesso™ boilers. Use of either of these systems is discouraged, and will void the water-related parts of the machine warranty.

Any part which is determined to be defective in materials or workmanship should be returned to Synesso™ or to an authorized service location, shipping costs prepaid, as Synesso™ designates. Synesso™ may repair or replace the product or part with new or factory refurbished equipment at Synesso's™ sole discretion. If the product or part is determined to be defective and in compliance with the Limited Warranty conditions, the replacement part or product will be returned to the purchaser with shipping prepaid **.

Many jurisdictions have codes and regulations governing sales, construction, installation, and/or use of products for certain purposes, which may vary from area to area. While Synesso™ attempts to assure that its products comply with such codes, it cannot guarantee compliance and cannot be responsible for how the product is used or installed.

Synesso's™ liability is limited to the purchase price of the product and Synesso™ shall not be held liable for damages that extend beyond the product itself. Synesso's™ liability of consequential, incidental damages, indirect or direct damages for personal injury, inability to properly use this product, loss of business profits or interruption to business is expressly disclaimed.

** Regarding equipment sold or residing outside the United States: purchaser maybe required to pay for the shipping and associated costs for warranty parts, repairs and services. Please contact your local distributor to resolve the issue regionally, if possible.

INSTALLATION

To maintain the 1 year warranty, an authorized or certified espresso service representative must perform the installation of this espresso machine.

Site Preparation - See Diagram p.9

The machine must be placed on a level horizontal surface that can be easily cleaned and is capable of sustaining a minimum of 300 lbs.

The counter top requires a depth of 28", which provides a minimum clearance of 1" behind and 3" in front of the machine.

Make a 2 ½" minimum diameter hole through the counter top located 4" from the rear and 7" from the right side of the machine. The hoses, drain tube, and electrical lines will all pass through this hole.

A 3/8" min. diameter cold water supply line from the filter with a shut off valve is required within 5' of the machine. The valve should be easily accessed for machine service.

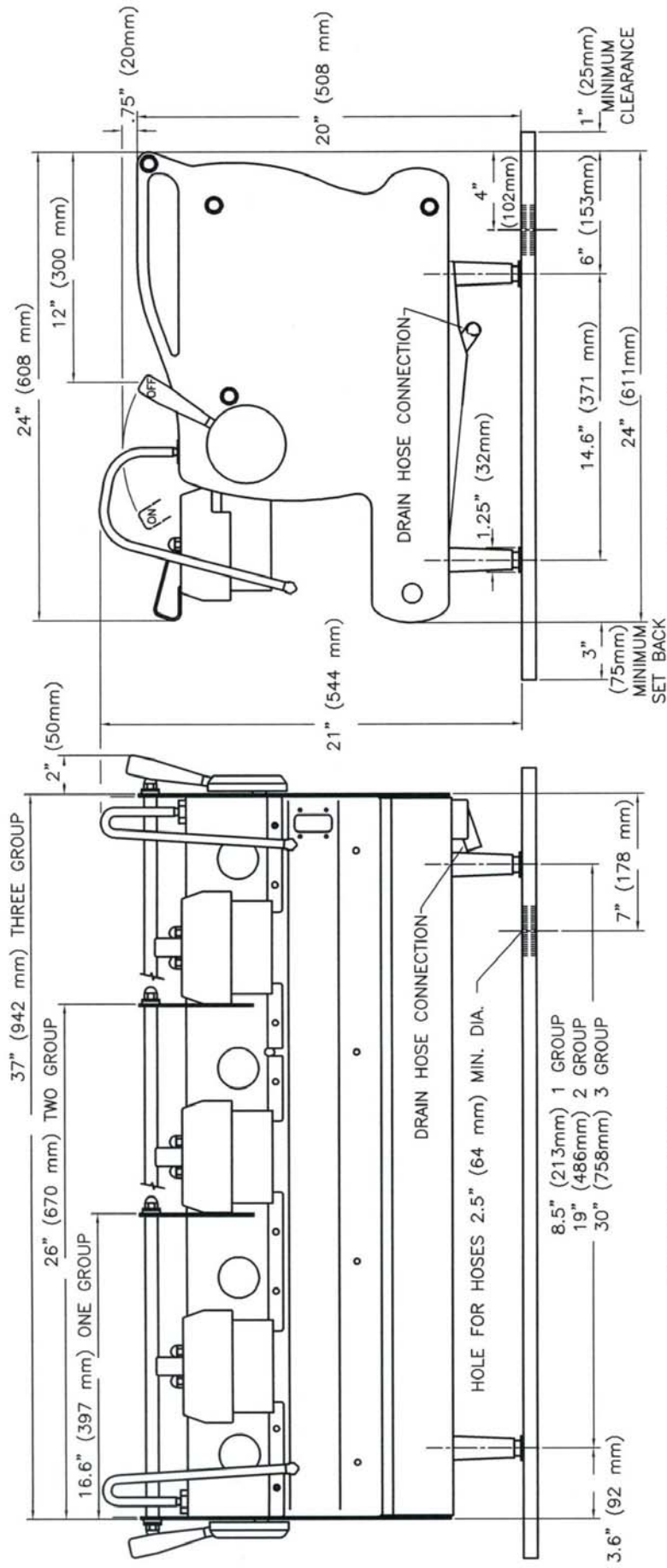
The machine supply hose and pump fittings are 3/8" tube compression fittings.

A proper water filtration or softening system must be installed on the incoming water supply. Water treatment requirements will vary, and it is important to use a system designed to match the needs of your specific area. Water filtration systems require periodic maintenance, including cartridge or filter replacement. Proper filtration and service is vital to the function of the machine and the quality of the espresso served. Follow the instructions provided by your water treatment system for proper installation.

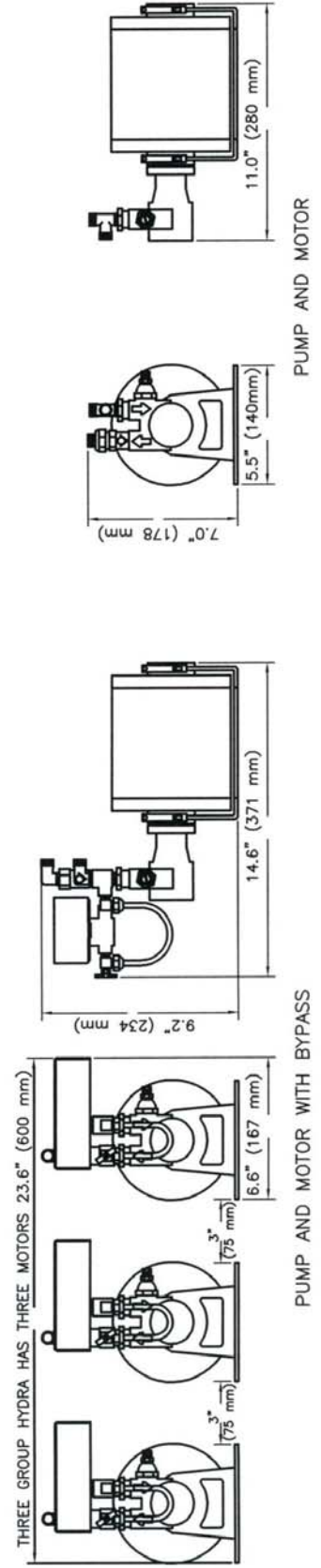
Note: Improper water filtration can result in severe damage to the machine including scale deposits and corrosion. **DAMAGE CAUSED BY IMPROPER WATER TREATMENT WILL NOT BE COVERED BY THE MACHINE WARRANTY.** See page 7.

There must be adequate room under the counter to locate each motor and pump. The pumps must be easily accessible for adjustment and motors must have a minimum of 3" clearance on all sides for air flow.

A floor drain or sink must be available. The best location is directly under the machine. The 3/4" drain hose should descend as vertically as possible for optimal drainage. An air gap is required between the end of the drain hose and the highest water position of a clogged drain. This is to prevent the possibility of drain water backing up into the machine.



RIGHT HAND END VIEW



PLUMBING REQUIREMENTS

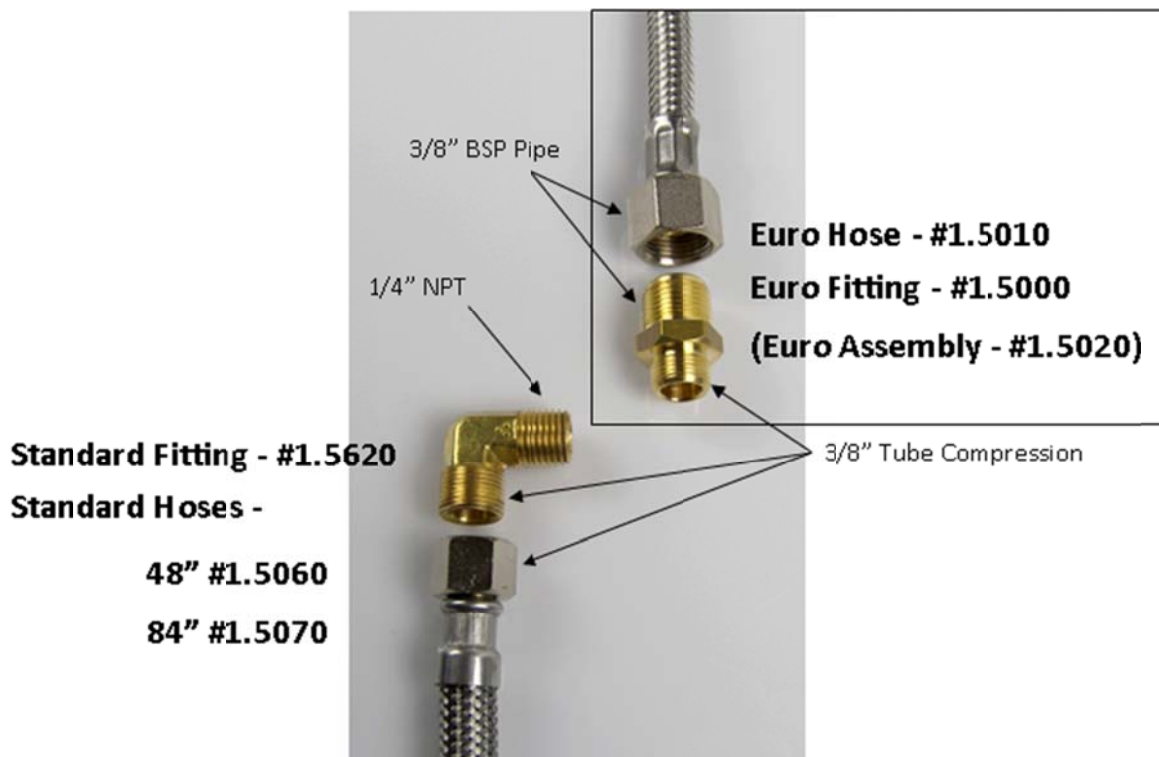
This equipment must be installed to comply with the applicable federal, state or local plumbing codes. **WATER TREATMENT IS REQUIRED TO PRESERVE THE FULL MACHINE WARRANTY.** Please ensure that the incoming water complies with the warranty requirements listed on page 7.

Using the provided stainless steel braided hose, connect the pump to the shutoff valve on the filtered cold water line. Fittings on the hoses and pumps are 3/8" tube compression. Thread sealant or Teflon tape is not necessary. Make connections snug, but do not over tighten.

Turn incoming water ON and check for leaks.

Synesso™ machines require a minimum of 50 PSI (3.5 bar) of line pressure at 30gal (120L) per hour to have the auto-fill system for the steam tank function properly. Please ensure that the incoming water meets this requirement or contact Synesso™ for alternative methods of boosting water pressure.

NOTE: Synesso™ sells a "Euro-hose" adaptor hose and fitting (part number is 1.5020) which converts from a 3/8" tube fitting to a pipe fitting, suitable for most non-US plumbing. Please refer to the picture below to identify the differences between the standard and Euro-style fittings and hoses.



ELECTRICAL REQUIREMENTS

All Synesso™ machines are rated to operate on 220v AC with a 50 or 60 Hz frequency, single phase. Machines will operate between 208v and 240v.

Listed amp ratings are all measured at 220v. Incorrect voltage can cause malfunction or damage to the machine.

An electrical socket and matching plug, rated at the proper voltage and amperage are required within three feet of the machine. Plug ends are NOT included with the machine unless required by CSA or other certification.

Model	Cord Plug Rating (UL Listed)	Machine Max Amp Draw
2 Group Cyncra / Sabre	30 amp	28 amp
3 Group Cyncra / Sabre	50 amp	36 amp
1 Group Hydra	20 amp	16 amp
2 Group Hydra / Hybrid	30 amp	30 amp
3 Group Hydra / Hybrid	50 amp	40 amp

North American Wire Color		Worldwide Wire Color	
Green	Ground	Green and Yellow	Ground (Earth)
White	110v Line 1	Brown	220v
Black	110v Line 2	Blue	Neutral

Attach the plug end per manufacturer's instructions.

Make sure that the red electronics switch and the heating element breaker on the front of the electrical box are in the OFF position, then plug the power cord into the receptacle.

OPTIONAL: If recovery time is slow, install an In-Line Buck-Boost transformer to increase voltage below 208v to optimize machine recovery time. Buck-boost transformers come in different sizes. Please choose the appropriate one for your machine if required. 1 and 2 Group Machines require a 1.0 KVA transformer, 3 Group Machines require a 1.5 KVA transformer.

SPECIAL ELECTRICAL INFORMATION FOR EMC-COMPLIANT MACHINES

(C-TICK FOR AUSTRALIA, CE FOR EUROPE AND OTHER LOCATIONS)

To comply with EMC (Electromagnetic Compatibility) regulations, Synesso™ is required to install a capacitor in the electronics box across the main power IN. **To avoid an electric shock from the charge held in the capacitor, unplug the cord, taking care to NOT touch the metal prongs on the plug end. Turn the electronics ON/OFF red rocker switch to the ON position and wait a few seconds until the red switch "goes dark." At that point, the electrical charge has dissipated.**

HYDRA / HYBRID

The Hydra is a machine model with a pump and motor for each group head. This includes changes in internal plumbing and wiring to accommodate separate and distinct pressures in each brew group. In contrast, a Cyncra or Sabre has a single pump and motor for the entire machine. Having individual pumps and motors allows the operator to set a separate brewing pressure per group head, and each group functions independently without affecting the pressure at the other groups.

Hydras can be built as fully manual machines (multiple manual group heads), fully volumetric (all group heads have programmable keypads), or a mixture of group heads to match your requirements. Hydras with mixed group head configurations are referred to as Hybrids.

Hydra Installation requirements:

Electrical:

The Hydra package has a slightly greater amp draw than the single pump machines; please note the max amp draws and plan your electrical installation accordingly. See table on page 11.

Each pump motor has a distinct color association, which is indicated throughout the machine by colored wires and zip ties. The colors are as follows:

- Group 1: Grey

- Group 2: Purple

- Group 3: Brown

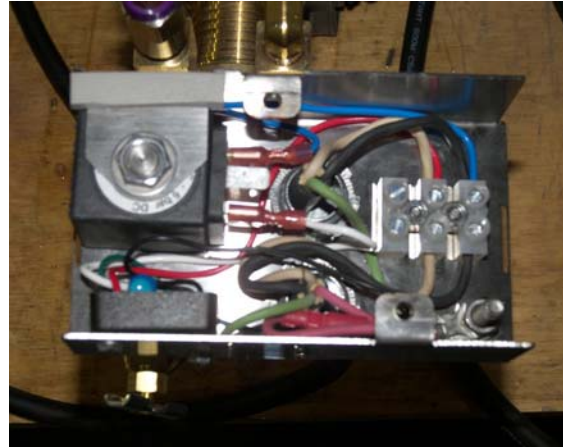
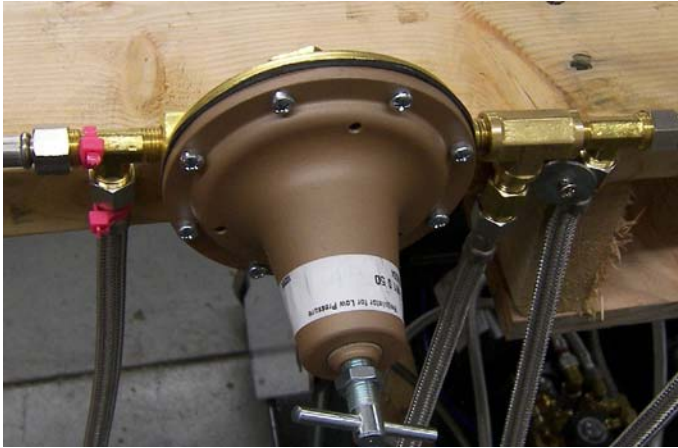
- Water inlet for the steam tank: Pink

Wherever these colors are seen, it is critical for proper functioning that they are matched up correctly (grey to grey, etc.) for both electrical and plumbing systems.

Plumbing:

Hydra packages require one incoming water source like single pump machines. The water passes through a manifold (commonly part of the line pressure regulator) and is distributed to each pump. Once again, follow the color coding for proper installation of the hoses from the output of each pump to the machine.

HYDRA BYPASS INSTALLATION AND SETUP



Pump cord installation: Insert the color coded pump cable into the opening of the matching bypass box and attach the wires to the terminal as shown in the picture above: green wires stacked on the ground bolt, white to white/red, black to black/blue, connect the bullet connectors.

Pressure regulator: Used to achieve the stage 1 low pressure pre-infusion. It is set and tested at 50 psi in the Synesso™ factory. This pressure setting can be lowered if desired, but 50psi is the maximum output pressure. To adjust the pressure regulator, first loosen the nut on the threaded post, then turn the post counter-clockwise to decrease pressure.



Pump Bypass: First, set the pump and regulator to the desired pressures.

Manual group: Turn the associated brew group actuator to brew (2nd) position, then back to the first position.

Volumetric group: set stage 1 time and bypass percent to zero. Press the pitcher button.

The pin valve on the pump may then be adjusted until the brew gauge indicates the desired pressure. 7 bar is our factory setting. Adjust to taste.

The Stage 1 (Pre-infusion) time and Stage 2 (Bypass) time are set on the Temperature Control screen of the display by following the directions on page 33. Stage 1 time is set to 7 seconds and Stage 2 is set to 3 seconds at the factory. Adjust to taste.



Once these settings are in place, you will be able to taste the effects of four stage pressure ramping applied to each shot. Start the shot to begin the Stage 1 pre-infuse timer. In this stage, low pressure water will saturate the puck, swelling it to reduce channeling. After the stage 1 time has elapsed, stage 2 bypass will begin. In this stage, the bypass system will help create a slow rise in water pressure by diverting high pressure water away from the brew group. After the stage 2 time has ended, the bypass will close and stage 3, full pump pressure (9 bar) will begin. Stage 4 is a return to bypass pressure. In the case of manual groups, entering stage 4 is determined by the operator and is achieved by moving the group top actuator back to position 1. Volumetric groups can be programmed to automatically begin stage 4 at a set percentage of the shot as described on page 57.

OPERATION

Start-Up Instructions

1. To fill the machine, connect the water lines, set the drain hose and turn the water ON.
2. Switch the red electronics On/Off switch to ON. This activates the machine's water auto-fill feature for the steam tank and the electronics, but NOT the heating elements.
3. The water level sight glass for the steam tank is located on the right side of the machine. As the tank fills, the water level will rise in the sight glass and will automatically stop when the preset level is reached.
4. Bleed the group heads of air:
Manual machines: Turn each group head handle left into the BREW position, (see pictures below) allow the group to run until there is a steady flow of water. Return the group head to the OFF position.
Volumetric machines: Activate the pitcher button on the right side of the keypad. Once the water flows in a steady stream, press the pitcher button again to stop the water.
5. Wait until the steam tank has stopped filling and the level in the sight glass reads at least $\frac{1}{2}$ full. Turn the heating element breaker to the ON or (1) position. All the heating elements (brew and steam) are now activated.
6. To adjust the pump pressure, activate the pump by turning the brew group to the BREW position. On volumetric machines, activate the pump with the pitcher button.
7. Locate and read the pump pressure / brew gauge located to the right of the rightmost group on Cyncras and Sabres or to the right of each group on Hydras.
8. Set the pump pressure to 9 Bar:
Locate the pump adjusting screw on the right side of the brass pump housing.
Loosen the lock nut and turn the screw with a screwdriver:
 - Clockwise to INCREASE pressure
 - Counterclockwise to DECREASE pressureOnce the desired pressure is reached, retighten the lock nut.
9. Please allow at least 30 minutes of "warm up" time before using your Synesso™ espresso machine to brew shots or steam milk. The steam gauge (the left hand gauge) should read a minimum of 1.1 Bar.



Off



Pre-infusion



Brew

OPERATION

Prepare a Portafilter

1. For best results, use fresh coffee. Ground coffee should be brewed as soon as possible after grinding.
2. Select the correct spout and basket configuration. Single, double and bottomless portafilters are available through Synesso™. The single spout portafilter is used with a single (7g) basket to brew a single shot. The double spouted or bottomless portafilters can be used with double (14g) or triple (18g or 21g) baskets to brew triple, double, or 2 single shots of espresso.
3. Fill the portafilter basket just above level and wipe off the excess.
4. Press straight down evenly on top of the grounds with the tamper.

NOTE: When not in use, keep the portafilter engaged in the group head to keep it warm.

Espresso Brewing

1. Grind a dose of coffee appropriate to the basket you will be using.
2. Dispense into the portafilter basket.
3. Level the mound and compress using a tamper. (A tamper is supplied with the machine.)
4. Engage the portafilter into the brew group that has the correct temperature setting for this espresso roast and pull firmly to the right to set the seal.

(Manual)

5. Pre-infuse the coffee puck by turning the brew group clockwise to the center position. This allows line pressure to saturate the puck.

NOTE: If a stage 1 or 2 time is set on the display, they will begin automatically when the actuator is switched to the brew position, so the pre-infusion position should be skipped.

6. When a drip shows at the spout (or on the basket if bottomless), Turn the group cap clockwise again to the brew position. This engages the pump.
7. When the stream of coffee turns from brown to “blonde”, end the shot by returning the group cap to the far right position. Machines using pump bypass hardware may move back to the preinfuse (center) position just before the shot blonds to extend the extraction and delay blanding.

(Volumetric)

5. Press one of the first 4 buttons on the button pad.
6. If stage 1 or 2 timers have been set, the machine will execute these times automatically, then move into the brew stage. Machines equipped with pump bypass systems can use an automatic bypass at the end of the shot. See page 34.
7. The shot will automatically end once the set volume of water has been dispensed.

OPERATION

Milk Steaming

1. Fill the pitcher halfway with fresh, cold milk. Smaller pitchers are recommended for drink sizes less than 10oz. Steamed, unused milk should be discarded.
2. Condensation can collect inside the wand. Activate the steam handle to blow the wand clear before steaming milk.
3. Insert the tip of the steam wand deep into the milk pitcher. This will prevent milk from splashing once the steam is turned on.
4. Open the steam valve by pulling the handle towards you.
5. Place one hand on the side of the steam pitcher to feel the rising temperature of the milk.
6. As the milk agitates and heats, lower the pitcher to keep the tip of the steam wand closer to the surface. Allow the steam jets to push some air beneath the surface, then raise the pitcher to lower the tip of the wand deeper into the milk. This will continue the heating process and minimize further foaming. Do not touch the steam wand to the bottom of the milk pitcher; this can create an inaccurate temperature measurement.
7. Heat milk to approximately 150F to 170F (65°C to 76°C). If you are using your hand to help determine the temperature, it will feel about as hot as you can stand without burning yourself. Milk thermometers are also an excellent way to determine the temperature of the milk. Caution: Do not overheat the milk and scald it. Scalded milk should not be used.
8. Remove the wand from the milk, purge, and wipe clean immediately after each use.

NOTE: Although Synesso™ steam wands are made with a proprietary double-walled process that helps to keep the outer wall cooler, the tip and base can become very hot and caution must be used.

NOTE: Whole Milk, 2%, 1%, Non-Fat, Soy Milk, Rice Milk and other milk type products may require different techniques to foam properly. In general, the higher the fat content, the easier it is to steam.

HYDRAULIC SYSTEM

Overview

The hydraulic system in the Synesso™ is comprised of all parts through which water flows starting with where it enters the machine from the water treatment/filtration system. This chapter will detail the flow of water and some of the associated electrical components.

Synesso™ utilizes 3/8" braided stainless hoses (supplied with machine) to connect to the water treatment system. Once the machine is set up and the water quality is checked, the machine is ready to connect to the water treatment system. The water then passes to the pump and motor.

On single inlet machines, the water then travels through one hose to the machine and supplies both the coffee boiler system and the steam boiler.

On dual inlet machines, the water diverts at the pump: the water for the coffee boiler goes through the pump and the water for the steam boiler travels through a separate line. The next 3 pages show the dual, single, and Hydra inlet water paths.

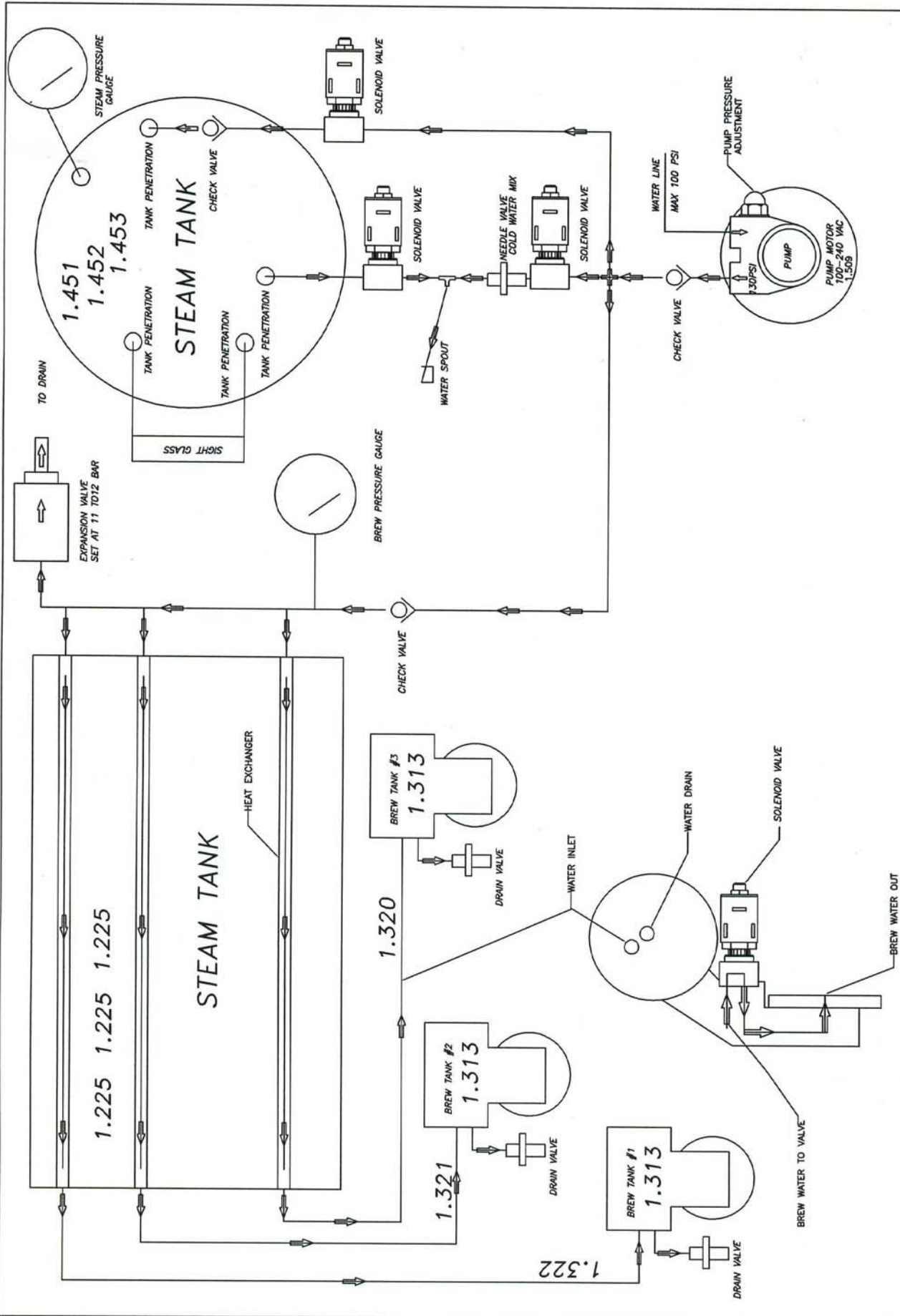


THEORY

ALL DIMENSIONS IN MILLIMETERS	
DRAWN BY: MB	DATE: 10/31/08

SCALE NOT	DWG. NO. 1.22X
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HYDRAULIC SCHEMATIC - SINGLE INLET

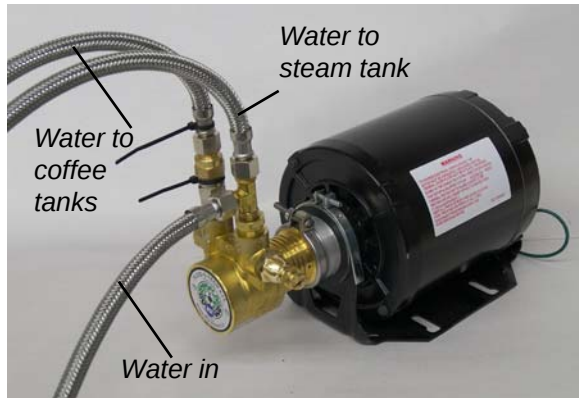


WATER PATH LAYOUT		SYNESO INC.		ALL DIMENSIONS IN MILLIMETERS		DWG. NO.	
REVISION	DESCRIPTION	DATE	BY	DRAWN BY: MB	DATE: 02-11-05	SCALE: NOT	1.22X

Continued on next page



HYDRAULIC SYSTEM

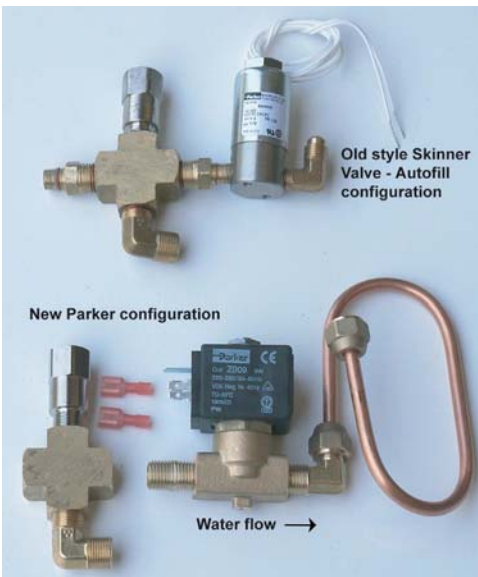


Pump and Motor:

Synesso™ uses a Fluid-o-tec rotary vane pump which boosts incoming water pressure to 9 bar when the motor is activated. Pressure can be adjusted by loosening the nut on the right side fitting and then turning the adjustment screw clockwise (increasing pressure) or counter-clockwise (decreasing pressure).

Pump configurations:

Until serial number 356, Synesso™ machines had a single inlet configuration as the standard. After 356, the dual inlet configuration is the standard. Hydras have a separate pump and motor per group, therefore all Hydras come equipped with single inlet style pumps.



Water Inlet control valves:

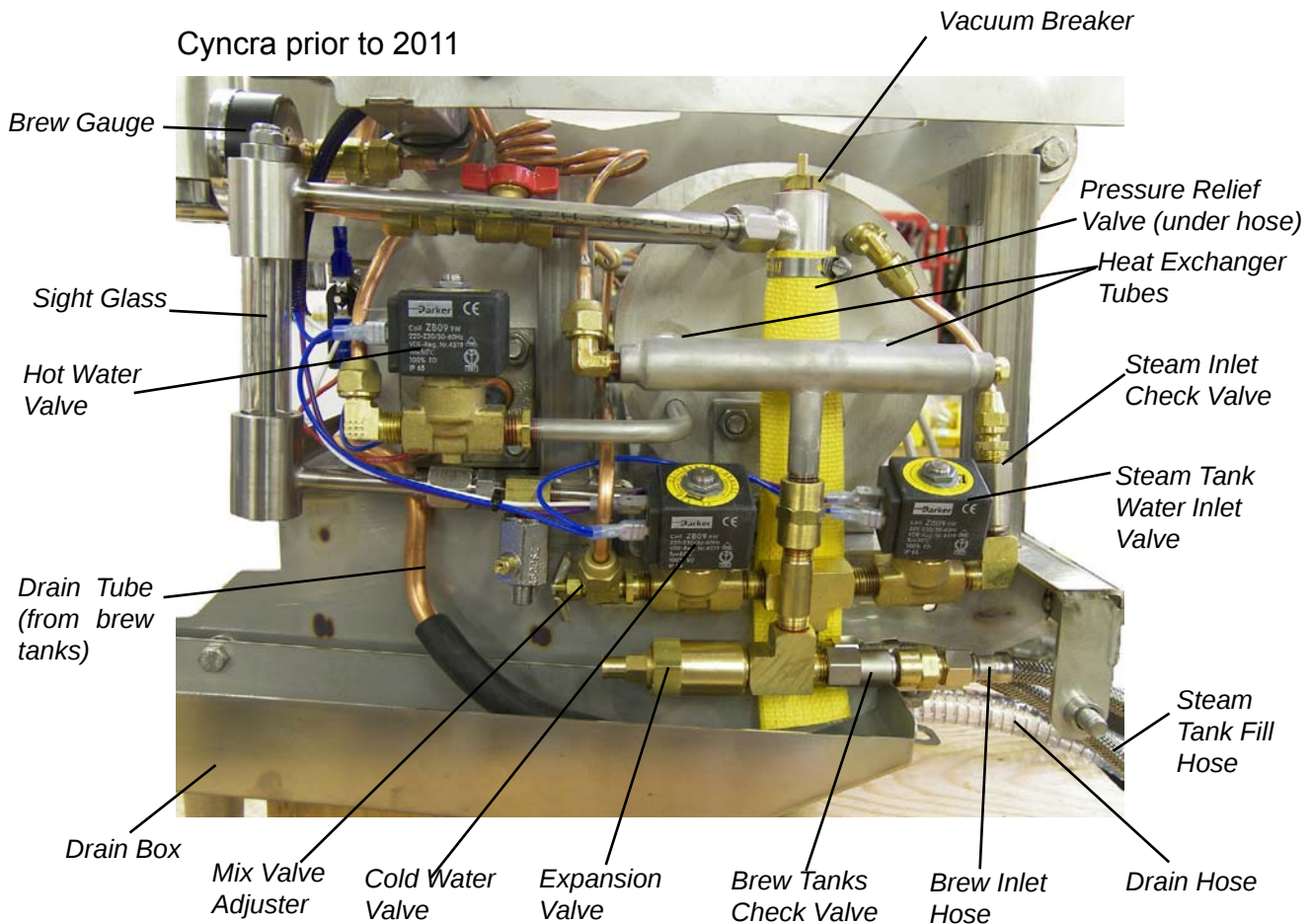
Serial numbers 1-340 feature the Skinner-style valves shown in the upper part of the picture on the left. These were replaced on serial number 341 onwards with the Parker ZB09 for ease of repair or replacement.

Both valve styles feature electronic coils which, when energized, move a piston which allows water flow through the valve. When deactivated, the piston's presence in the valve stops the flow of water.

The picture on the next page shows the steam tank autofill configuration. All 3 of the water control valves are now Parker ZB09. Upgrade kits are available through Synesso™.

HYDRAULIC SYSTEM

MAJOR COMPONENTS OF THE WATER INLET SYSTEM



Water Inlet Components:

Brew Gauge:

The brew gauge reflects pressure in the brewing system. On a Cyncra or Sabre, there is one gauge for the entire brew system; on a Hydra, each brew tank has its own brew gauge. The gauge normally moves between 3-5 bar (line pressure) to 9 bar (brewing pressure) and up to 12 bar (expansion pressure) at which point the *expansion valve* releases the excess pressure.

Brew Tank Check Valve:

Check valves are one-way valves which ensure that pressurized water cannot overwhelm the incoming water pressure and exit the machine through the inlet lines.

Brew Inlet Hose: (Hydra models have up to 3 of these)

Supplies the brew system with water from the pump(s).

Drain Box:

Water flows into this box prior to going through the drain hose to the floor drain. Periodically pour small quantities of hot water down this drain box to clear coffee oil buildup.

HYDRAULIC SYSTEM

MAJOR COMPONENTS OF THE WATER INLET SYSTEM (CONT.)

Drain Hose:

Waste water and some grounds go down this tube to the drain. Keep this free of clogs and maintain a steep vertical path to the floor drain.

Drain Tube (from brew tanks):

This copper manifold allows water from the brew valves to discharge safely down the drain after shots are completed.

Expansion Valve:

The brew tanks are completely saturated with water. As they heat, the water expands and the pressure increases. The expansion valve allows this water to release safely into the drain box. The release point is 12 bar and is adjustable by turning the end of the valve with a wrench clockwise to increase or counterclockwise to decrease.

Heat Exchanger Tubes:

In order to maintain extremely stable brewing temperatures, Synesso™ incorporates heat exchanger tubes which run through the steam tank, then supply water to each coffee boiler. The heat exchangers are precisely designed to aid in the energy efficiency and thermal stability of the brew system.

Cold Water Valve:

Synesso™ machines have 2 valves which provide water to the americano / tea spout: the hot and cold water valves. Mixing in cold water allows the user to moderate the temperature at the spout. Boiling water is not appropriate for all beverages.

Hot Water Valve:

This valve supplies hot water from the steam tank (which is mixed with cold water from the cold water valve) to the Americano / tea spout.

Mix Valve Adjuster:

This pin valve allows the user to increase or decrease the flow of cold water (from the cold water valve above) going to the Americano / tea spout. Turning this valve completely clockwise shuts the cold water off, while turning it counterclockwise allows more cold water in.

Pressure Relief Valve (PRV):

The PRV is a safety release for the steam boiler which opens and releases pressure if the boiler rises above 3.5 bar (50 psi). The PRV is housed inside the yellow tubing which directs any releases to the drain box.

Sight Glass:

Connected to the steam tank by two tubes, the sight glass provides a visual representation of the level of water in the steam tank. It should be 1/2 to 2/3 full during normal operation.

HYDRAULIC SYSTEM

MAJOR COMPONENTS OF THE WATER INLET SYSTEM (CONT.)

Steam Inlet Check Valve:

See Brew tank check valve description. (Page 22).

Steam Inlet Water Control Valve:

When the *upper level probe* (Page 25) detects an absence of water, the control board will send a signal to open this valve and allow water into the steam tank. 1st generation machines have a manual fill switch to open this valve at the operator's discretion in addition to the autofill system.

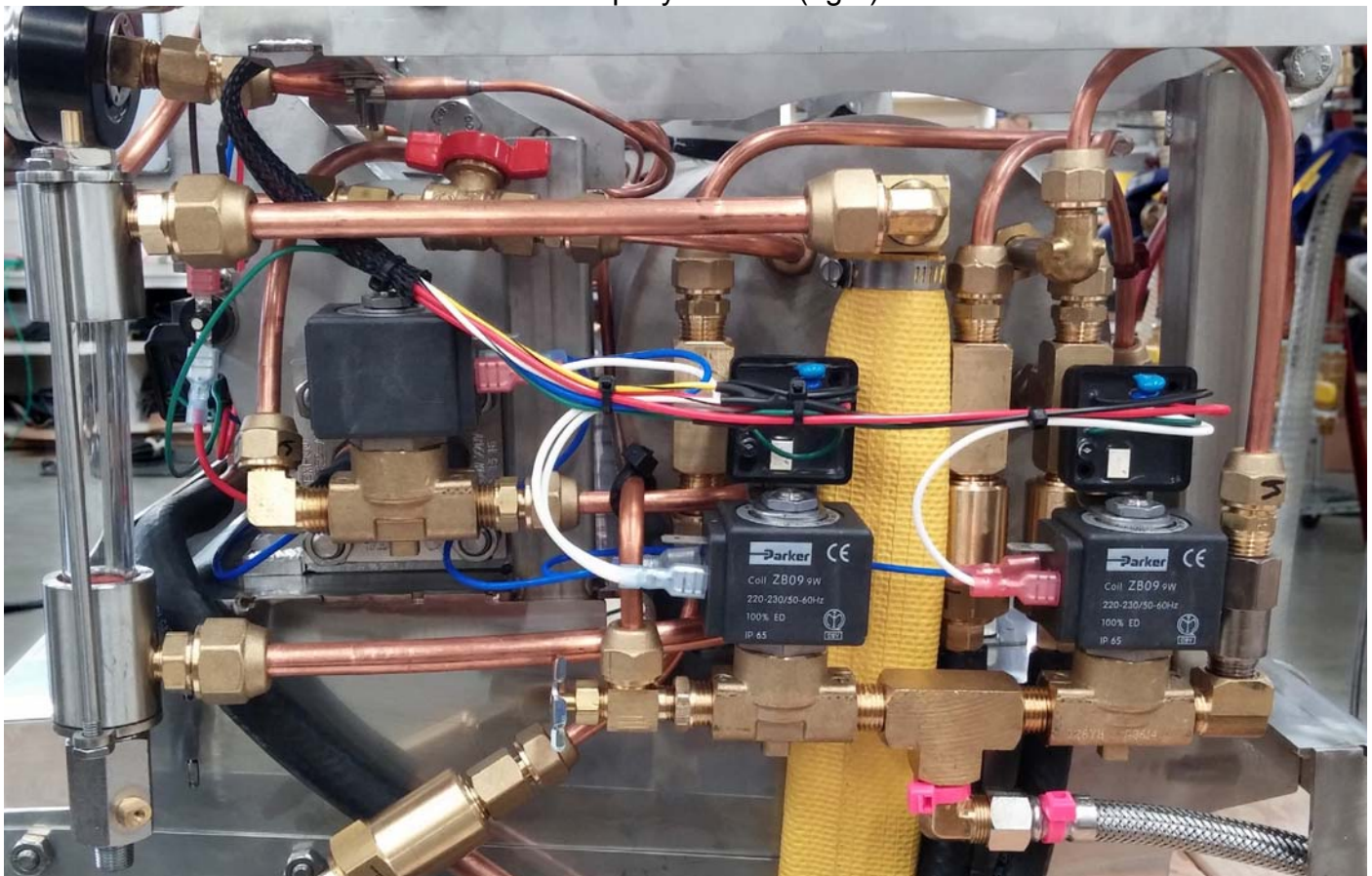
Steam Tank Inlet Fill Line: (Combined with Brew Inlet on single inlet machines))

This is the incoming 3/8" steel braided line which supplies the steam tank with water. May be labelled with a pink tag on Hydras.

Vacuum Breaker:

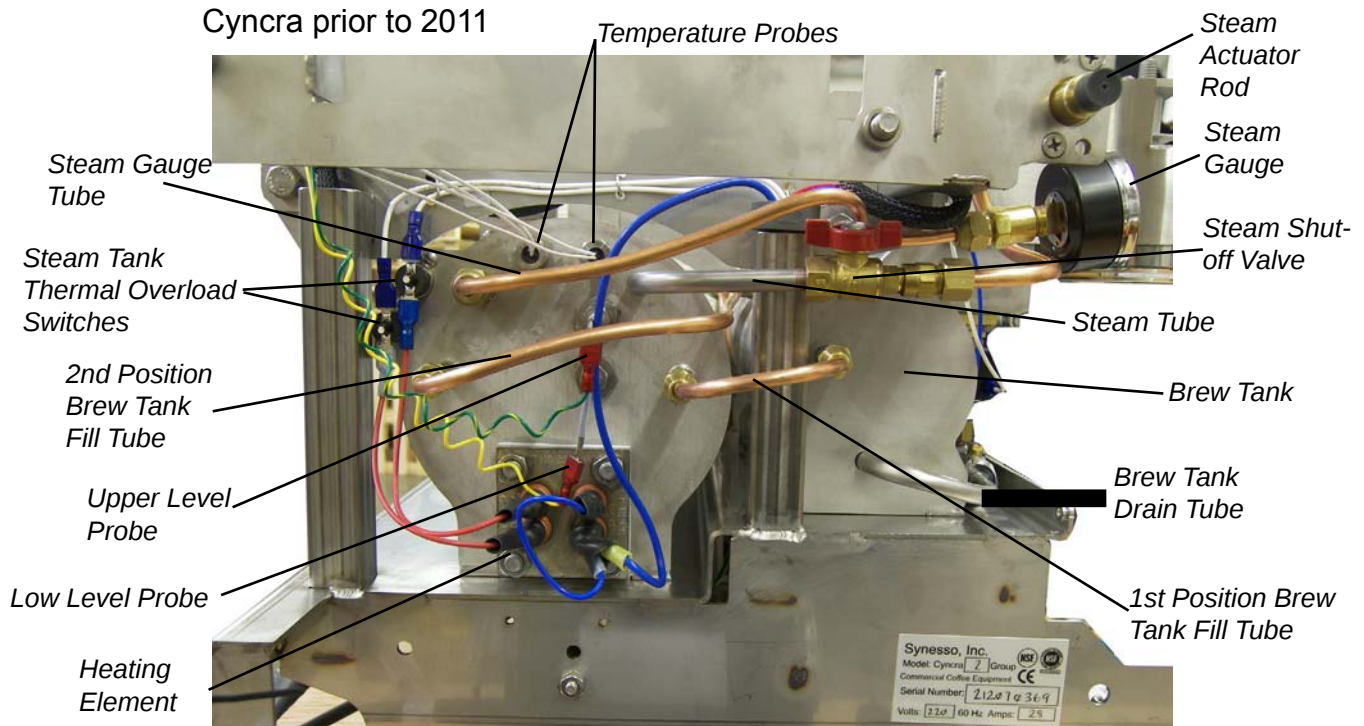
Prevents steam tank pressure from dropping below atmospheric pressure. As the tank heats, the pressure from the steam pushes an internal rod and o-ring up, sealing the vacuum breaker. When the tank cools below the boiling point, steam will condense and shrink in volume potentially pulling a vacuum in the steam tank. At this point, the internal rod and seal will drop down and allow air into the tank to replace the cooling steam, preventing a vacuum.

2014 3 Group Hydra Inlet (right) side



HYDRAULIC SYSTEM

MAJOR COMPONENTS OF THE WATER OUTLET (LEFT) SIDE



Brew Tank Fill Tubes: (there will be one per group, the picture above shows a 2 group)

Heat exchangers exit on the left side of the steam tank and tubes (currently copper, were stainless steel until serial number 352) deliver the water to the brew tanks.

Brew Tank:

Synesso's™ brew tanks are entirely stainless steel, welded internally and externally to be water tight and thermally stable. Each brew tank has its own temperature probe and element which allows the user to set different temperatures on each group, as well as operate without a group if a serious service issue arises. Attached to each group is a 3-way brew valve which controls the flow of water from the group head to the brew chamber.

Brew Tank Drain Tube:

Each group head is fitted with a drain tube to easily drain the tank. Early machines use a stainless steel tube with a ball valve attached. The first brew group drain was attached to the drain manifold line. 2nd generation machines use a brass fitting with a copper seal. These are not connected to the drain manifold.

Heating Element:

A 2-leg incoloy and stainless steel heating element which provides the heat for the steam boiler. It is controlled by the thermal probes and will be shut off in the case of over-heating or low water levels.

HYDRAULIC SYSTEM

MAJOR COMPONENTS OF THE WATER OUTLET (LEFT) SIDE (CONT.)

Low Level Probe:

Detects when the water in the steam tank is very close to the element. The controller board immediately cuts power to the heating elements, registers an “STLW00” error on the display (gen 2 only) and begins an audible alarm to alert the operator to the problem.

Steam Actuator Rod:

This rod is pushed in when the steam handle is activated. The rod opens the internal seal, releasing steam through the valve.

Steam Gauge:

Displays the pressure in the steam tank. The gauge reads between 0 and 4 bar (0-60psi). Normal operating pressure is about 1.3 bar at 250° F.

Steam Shut-off Valve:

Shuts off steam to the steam valve for safety during field repairs.

Steam Tube:

Delivers steam from the steam tank to the steam valve to heat and foam milk.

Steam Tank Thermal Overload Switch:

Cuts power to the element if the temperature exceeds 280° F. Must be manually reset if triggered.

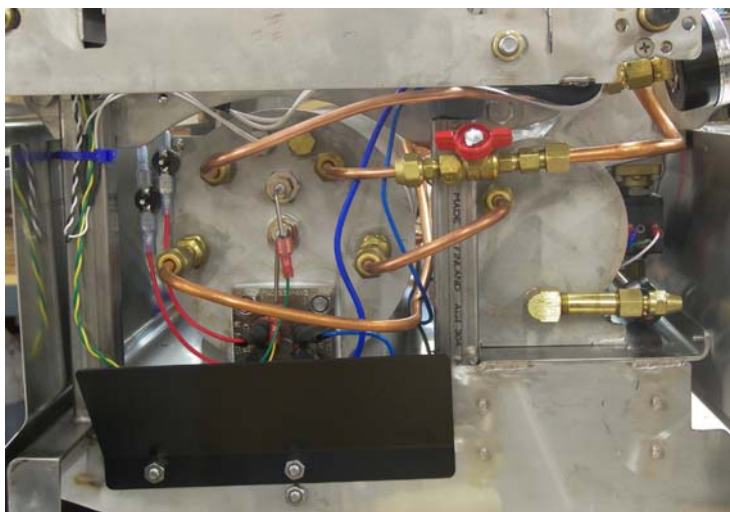
Thermal probes:

Send thermal data to the controller board to regulate the temperature within the steam tank. Prior to machine 229, use 100Ω probes. Use 2000Ω on all other machines. 100Ω systems can be set in 0.5° F increments, while 2000Ω systems can be set in 0.1° F increments.

High level probe:

Detects whether the desired water level has been reached. Water level is adjustable by rotating the entire probe to raise the tip out of the water. The tank will then fill to the new set height.

2011 3 Group Cyncra outlet (left) side



ELECTRICAL SYSTEM

This chapter will cover the fundamentals of the electrical layout and function of the electrical features of the machine.

SAFETY NOTE: Please use caution when working on any part of the Synesso™ electrical system. Live current poses the risk of electrical shock, harm, permanent injury or death. Take all appropriate precautions, including turning off the machine, breaker, and/or unplugging the unit prior to working on the machine.

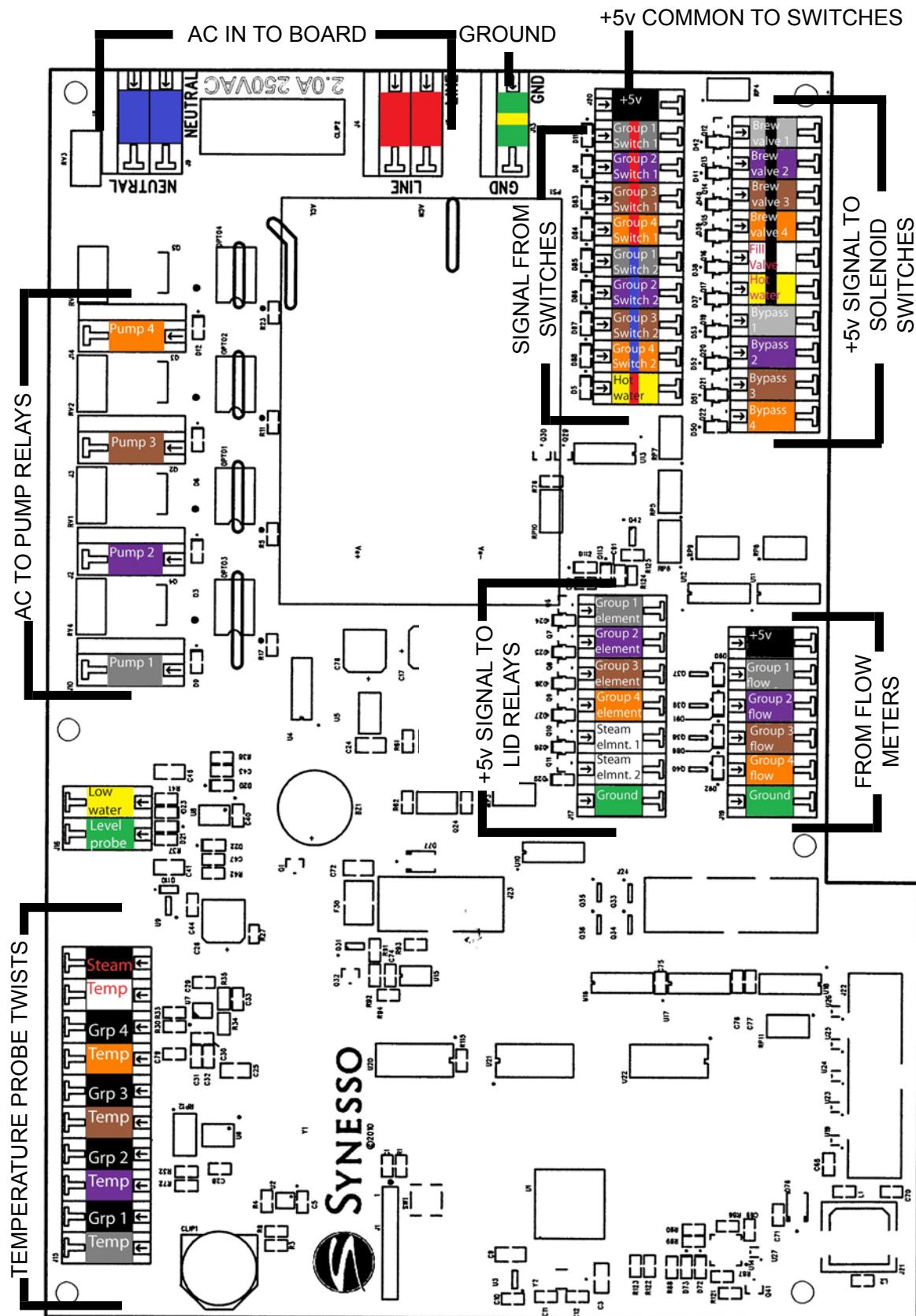
The major components of the electrical system can be broken down into the following functional categories:

1. Heating components (temperature probes, elements, thermal resets, and various parts of the CPU)
2. Water control (water inlet valves, brew valves, mix and hot water valves, water level probes and various parts of the CPU, rocker and brew/pre-infusion switches, pump, and motor)
3. Operator feedback (visual display)

The locations and descriptions of the components above were covered in the chapter “Hydraulic System,” with the exception of the CPU and display, which will be covered in this chapter.

ELECTRICAL SYSTEM

POWER / CONTROL BOARD

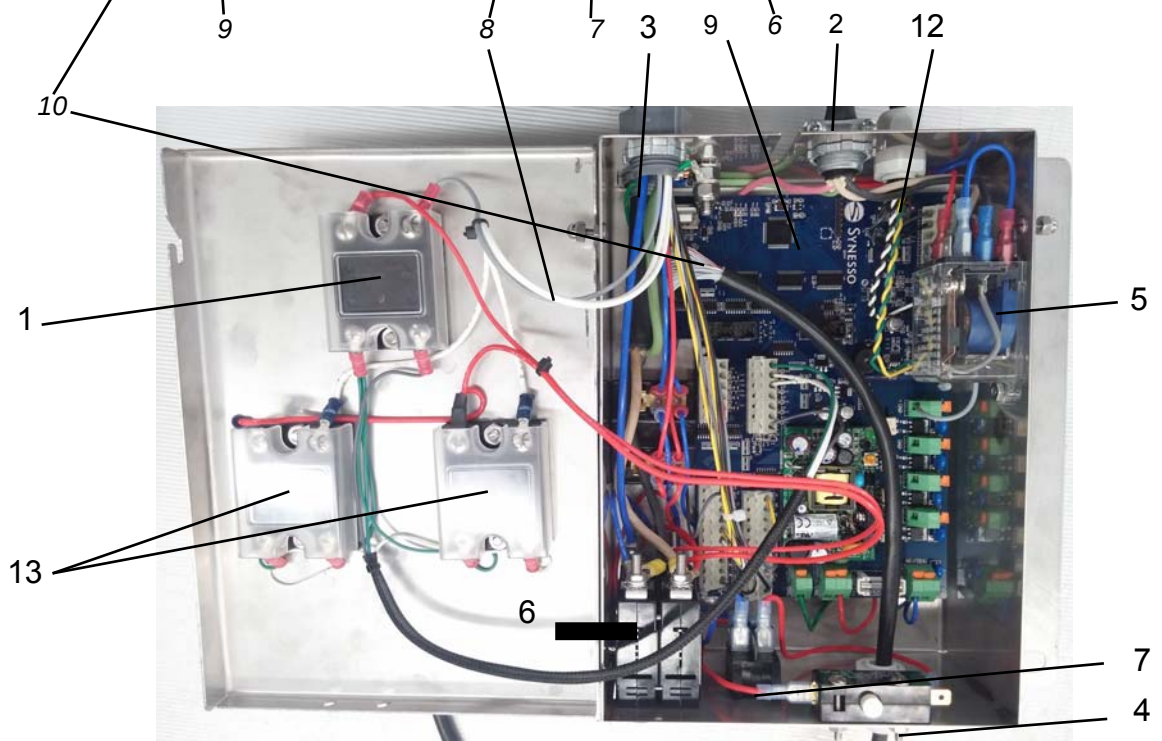
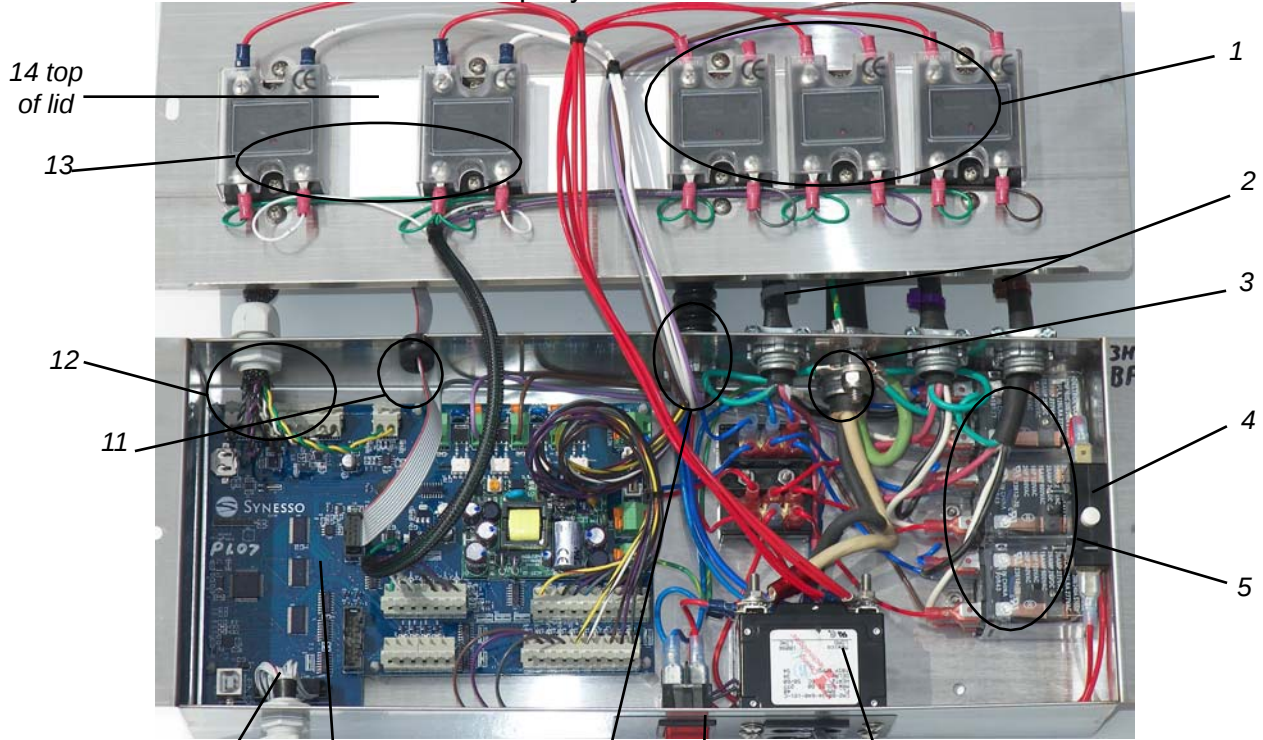


ELECTRICAL SYSTEM

ELECTRICAL BOX

located underneath the machine, the electrical box contains all the power and signal wiring running to and from the Synesso™ machine. Since the 2 boxes represented below have many of the same components, they have been labeled with numbers for matching components and the descriptions follow in the next pages.

3 Group Hydra Electrical Box



1 Group Electrical Box

ELECTRICAL SYSTEM

ELECTRICAL BOX (CONT.)

1. *Brew Relays:*
Switches high voltage onto the brew tank heating elements.
2. *Pump Wire(s):*
Carries 220v to the pump motors from the electrical box. Contains 3 wires: black (110v), white (110v) and green (ground). A fourth wire (Red), is used for bypass system control when appropriate.
3. *Power Wire:*
Provides 220v power to machine.
4. *Lid Safety Switch:*
Cuts power to the control board and other electronics when the lid is removed.
5. *Pump Relays:*
Switches high voltage onto the pump motors.
6. *Element Breaker:*
Disconnects voltage from all heating elements.
7. *Electronics Power Switch:*
Turns the machine off and on. If the machine is plugged into an electrical source, the switch will be illuminated when in the "On" position.
8. *Conduit Tube:*
Protects power and signal lines from abrasion and other damage.
9. *Power Board:*
Controls all automated systems throughout the 2nd generation machine. In 1st generation machines, the controller was in the display, not the power board.
10. *Ribbon Cable:*
Transfers signals from display board to power board. Volumetrics and shot timers use additional ribbon cables. 1st generation machines used a ribbon cable to communicate between power board and display.
11. *Level Probe Wires and Connectors:*
Connect level probes to power board and ground.
12. *Temperature Probe Connections:*
Connect temp probes to display board.
13. *Steam Tank Element Relays:*
Switches high voltage onto the steam tank heating elements.
14. *Heat Sink:*
Dissipates heat produced by the element relays. Located on lid.

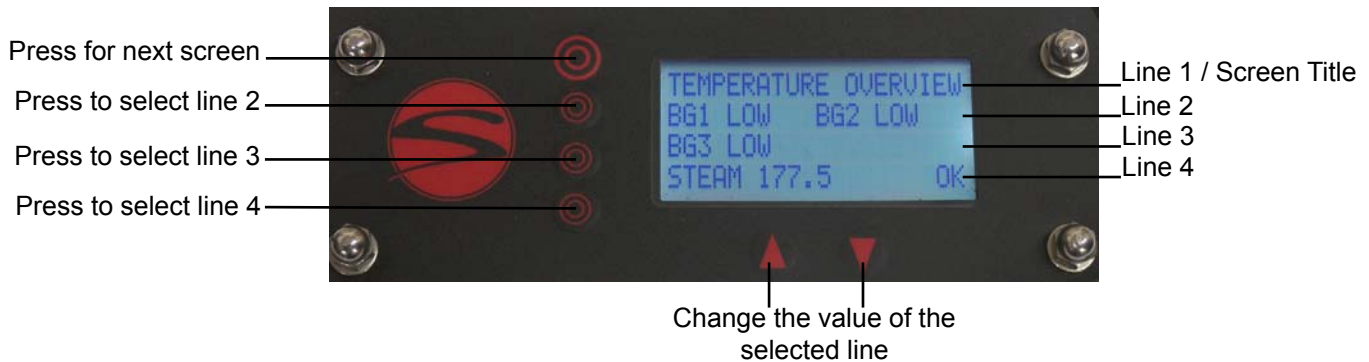
ELECTRICAL SCHEMATIC



PROGRAMMING

This programming section applies to all Synesso™ machines after machine #1051. These machines have a hand held (wired) keypad, pictured below, to allow the user to comfortably view and change the machine settings.

This is the first screen of the display: Temperature Overview



Line 1 indicates the screen title, in this case **Temperature Overview**.

Line 2 indicates brew groups 1 and 2 and the associated temperature(s).

Line 3 indicates the temperature of brew group 3, if applicable.

Line 4 indicates the steam tank temperature to the left and error codes (if any) to the right.

On Line 2 of this Temperature Overview display screen, brew group 1, represented as BG1, is reading 'LOW'. This indicates that BG1 is below the temperature probe's range of measurement (170F-270F / 76.6C-132.2C). Readings above the indicated range will show as 'HIGH'.

The lowest **programmable** temperature for a brew group is 180F (82.2C) and the highest **programmable** temperature for a brew group is 220F (104.4C). The factory set temperature is 203F (95C). To change brew group set temperatures, refer to page 33.

The steam tank is set by the factory to a default setting of 250F(121.1C). To change this temperature, see page 35.

The [OK] on the right hand side of line 4 is indicating that there are no errors being detected by the control system. If, in place of the [OK] you find an error code (EX: STLW01), refer to the Error Log codes on page 37.

To cycle to the next display screen in the menu level, the 'BG1 Temperature Control' screen in this case, press the button to the left of line 1.

PROGRAMMING



This is the second screen of the display: **BG1 Temperature Control**

Line 1 of the BG1 Temperature Control screen indicates the current temperature being recorded by the first position brew group's temperature probe, LOW in this example. Once this temperature reaches the set point, it will continuously cycle up and down by small increments as the electronics balance the temperature.

Line 2 is indicating the set point of 203.0F (95.0C).

Line 3 indicates the length of time that the stage 1 timer (timed pre-infusion) will run.

Line 4 indicates the length of time that the stage 2 timer will run. This option will **ONLY** be available on machines that are equipped with pump bypass systems.

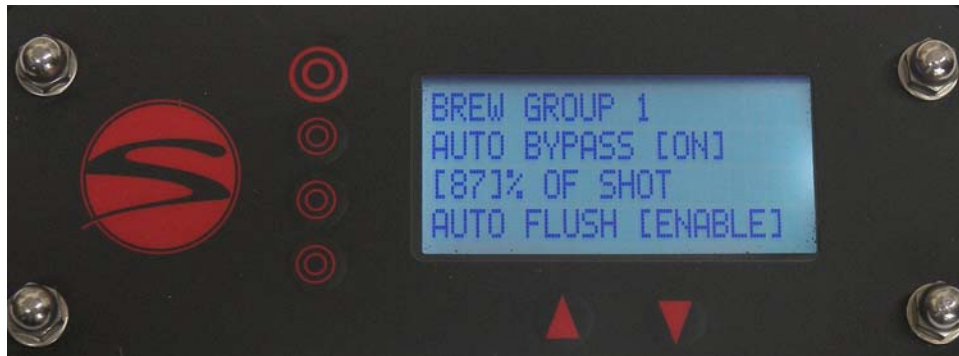
To change the temperature set point, press the button for **line 2**. The current temperature setting (203.0F) will begin to flash. To alter the temperature, press the '▲' or '▼' buttons until the desired temperature is reached. Press the button to the left of line 2 to confirm the temperature point. The number will stop flashing.

Line 3 indicates the amount of Stage 1 or "Line Pressure Pre-infuse" time that will elapse before the pump is initiated. (Line pressure can be altered with either a pressure regulator or a boost pump.) To change the Stage 1 time, press the button associated with line 3. The current time will begin to flash. To alter the time on the indicator, press the '▲' or '▼' buttons until the desired time is reached. Setting the Stage 1 timer to 00 will automatically set the Stage 2 timer, if present, to 00. Once the desired time is set, press the line 3 button to save the new Stage 1 time. The number will stop flashing. If a time is set for Stage 1, the user will be able to activate the timed preinfusion program by moving the group head handle all the way to the left into the brew position. The brew valve will open and the pump will turn on after the set time for Stage 1 has elapsed.

Line 4 indicates the amount of time that the pump bypass (if present) will operate. Stage 2 time begins once the Stage 1 time has finished. Opening the bypass valve while the pump is running reduces the brew pressure by an adjustable amount. To change the Stage 2 time, press the button for line 4. The current set time will begin to flash. To alter the time on the indicator, press the '▲' or '▼' buttons until the desired time is reached. Once the desired time is reached, press the button associated with line 4 to confirm the Stage 2 time. The number will stop flashing.

To cycle to the next display screen in the menu level, press the button to the left of line 1.

PROGRAMMING



This is the third screen of the display: **BG1 Auto Bypass and Auto Flush**

Line 1 indicates the brew group to be adjusted.

Line 2 indicates whether the automatic bypass is currently [ON] or [OFF]. **This feature is only available on volumetric machines with bypass hardware installed.**

Line 3 indicates the percentage of the shot that will be completed before the bypass turns on. **This option only appears when the 'Auto Bypass' indicator on line 2 is set to [ON].**

Line 4 indicates the option to do an automatic back-flush.

To program Auto Bypass, press the button associated with line 2. The indicator ([ON] in this case) will begin to flash. Use the '▲' '▼' buttons to select [ON] or [OFF]. Press the line 2 button again to confirm the selection. If the Auto Bypass on line 2 is set to [OFF], nothing will be displayed on line 3.

To set the percentage level on the bypass, press the button associated with line 3. The percentage indicator will begin to flash, showing it is ready to be adjusted. Use the '▲' '▼' buttons to set the desired percentage, followed by the line 3 button once again to confirm the new setting. The bypass will now turn on after the set percentage of the shot is complete.

The **Auto Flush** can be activated by pressing the button associated with line 4.

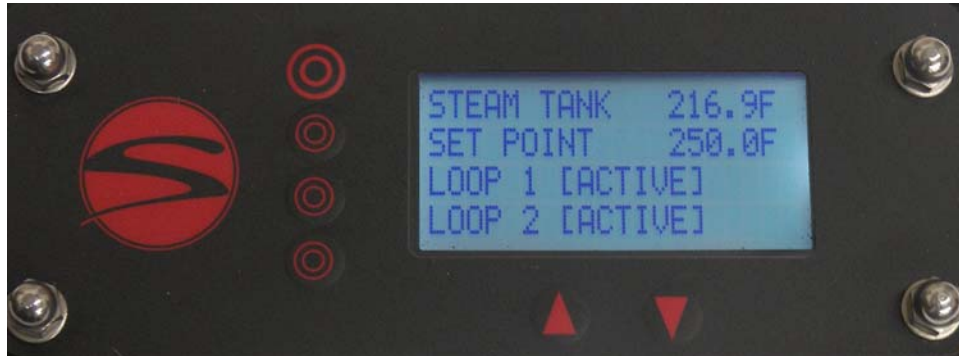
Volumetric: If the machine has volumetric capabilities, the indicator lights on the button pad of the brew group selected will all light up. Place the portafilter used for back-flushing into the selected brew group and press any button on the lit pad. The machine will now back flush 10 seconds on, followed by 10 seconds off for 5 cycles. While cycling, the button pad lights will go into chase mode to let you know it is currently engaged in the Auto Flush process. Once the Auto Flush is completed, remove the portafilter and thoroughly clean the diffuser screen. The machine is now ready for use.

Manual: If the machine does not have volumetric capabilities, place the portafilter used for back-flushing into the selected brew group and turn the actuator to the on position. The machine will now back flush 10 seconds on, followed by 10 seconds off for 5 cycles. Once the Auto-Flush is completed, turn off the brew group to allow it to reset, remove the portafilter and thoroughly clean the diffuser screen. The machine is now ready for use.

The Auto Flush can be interrupted mid-cycle by pressing any button on the selected brew group's button pad (with a volumetric machine) or by turning the brew group actuator to the off position (on a manual machine). Interrupting the program will cancel the Auto Flush process, turning the indicator on the control panel back to [Enable], and resetting the program.

PROGRAMMING

(NOTE: Options for adjustments to brew groups 2, and 3 if applicable, will appear on the following screens of the control panel interface. Adjustments for 'Temperature Control' as well as 'Optional Features' on these brew groups will be the same as the instructions for brew group 1. These screens are omitted from this manual for simplicity.)



Line 1 The **Steam Tank Temperature Control** screen indicates the current temperature being recorded by the steam tank temperature probe (216.9F in this example). Once this temperature reaches the set point, the digital display will continuously cycle up and down by small increments as the electronics balance the temperature.

Line 2 is indicating the factory set point of 250.0F (121.1C). The adjustable set range for the steam tank is between 170F and 270F (76.6C and 132.2C).

Line 3 and 4 are indicating that loops 1 and 2 of the elements are activated.

To change the temperature set point, press the button next to line 2. The current set temperature (250.0F), will begin to flash. To adjust the temperature settings, press the '▲' or '▼' buttons until the desired temperature is reached. Press the button next to line 2 to confirm the new temperature setting.

To turn off loop 1 or 2 of the element, press the button associated with the appropriate line. The indicator reading [Active] will begin to flash. Press either the '▲' or '▼' button to select [off], followed by the line 3 or 4 button accordingly, to confirm the selection.

NOTE: Turning off either loop 1 or 2 of the element can be used as a troubleshooting procedure and is not a recommended method of energy conservation.

To cycle to the next display screen in the menu level, press the button to the left of line 1.

PROGRAMMING



Line 1 indicates that you are on the **Hot Water Tap** control screen.

Line 2 indicates the adjustable amount of time that the hot water tap will run before shutting off.

Line 3 gives the option of setting the hot water time on line 2 by activating the tap and letting the water flow, then shutting it off. The machine will retain the duration of this pour and dispense water for the same length of time when the hot water switch is activated again.

To change the 'Hot Water Tap' time by tenths of a second, press the button associated with line 2. Use the '▲' '▼' buttons to select the desired time, followed by the line 2 button once again to confirm the selection. The hot water tap will now dispense hot water for the allotted amount of time.

By selecting the **line 3** 'Program Time' you may set the desired time by placing the cup size you wish to fill under the hot water tap, press the hot water button on the top of the machine, let it reach the desired level and then press the hot water button again. This will automatically set the amount of water just dispensed as the 'Program Time', and the actual time in seconds will appear on line 2.

To cycle to the next display screen in the menu level, press the button to the left of line 1.



Line 1 of the **Serial Number Display** indicates the software revision number (Ex: v1.04)

Lines 3 and 4 on the display will indicate the serial number given to this machine.

This screen will show when starting up the machine. Please have this number available if you contact technical support to aid in more rapidly identifying your machine.

PROGRAMMING



Error codes are displayed here

In an effort to prevent damage to machines and to help operators troubleshoot issues, Synesso™ has engineered several safeguards into the programming. These codes will help users identify operational issues with the machine as well as automatically prevent greater problems from occurring. By understanding these codes, operators can remedy issues more quickly.

Error code key (See Pages 38-44 for more info)

BR – Brew System Codes

BV – Brew Valve has been on for 5 minutes. Valve will be disabled until group is turned off.

OT – Over Temperature. (220F)

UT – Group reads under 180F for 1 minute while trying to heat (Under Temp.)

PR – Pump Relay coil has been on for 5 minutes. Relay will be disabled until group is turned off.

BP – Bypass Valve has been held on for 5 minutes.
Valve will be disabled until group is turned off.

01, 02, or 03 – Indicate which brew group is reporting an error.

ST – Steam System Codes

LW – Low Water probe is not in contact with water (an audible alarm will also sound)

FP – Fill Probe is not in contact with water for 1 minute.

FV – Fill Valve has been held on for 5 minutes.
Valve will be disabled until machine is turned off.

OT – Over Temperature (270F)

01 – All Steam System Codes end in **01**

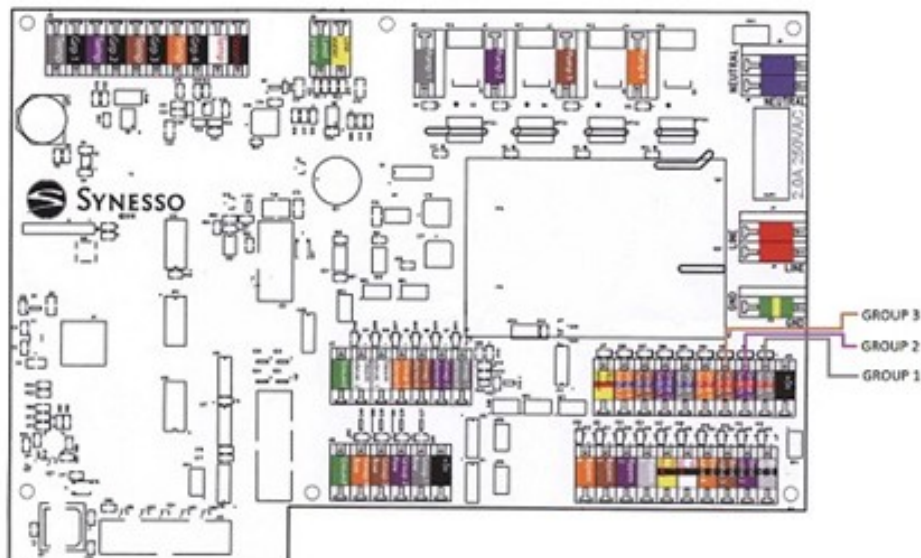
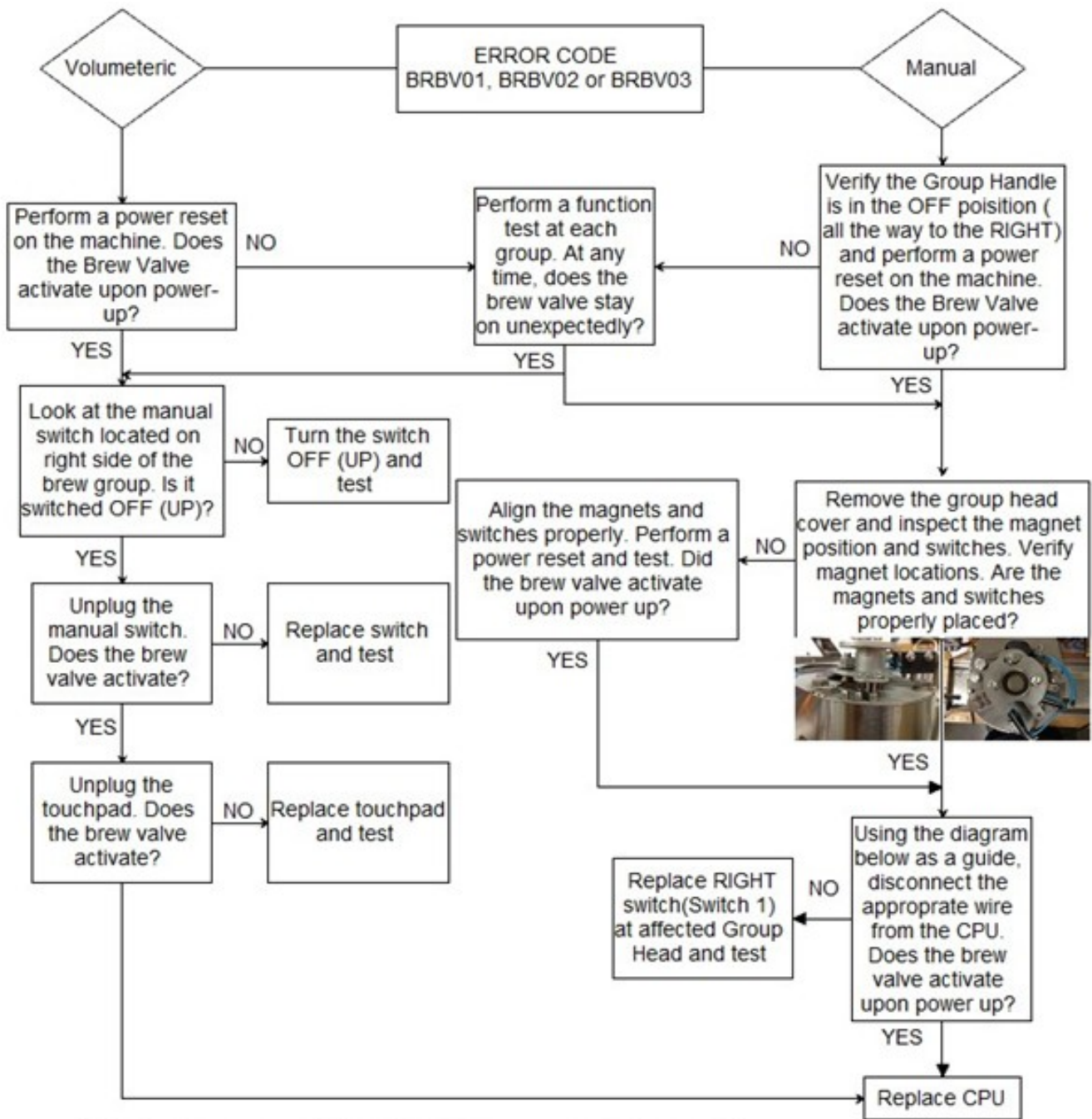
VM – Volumetric System Codes

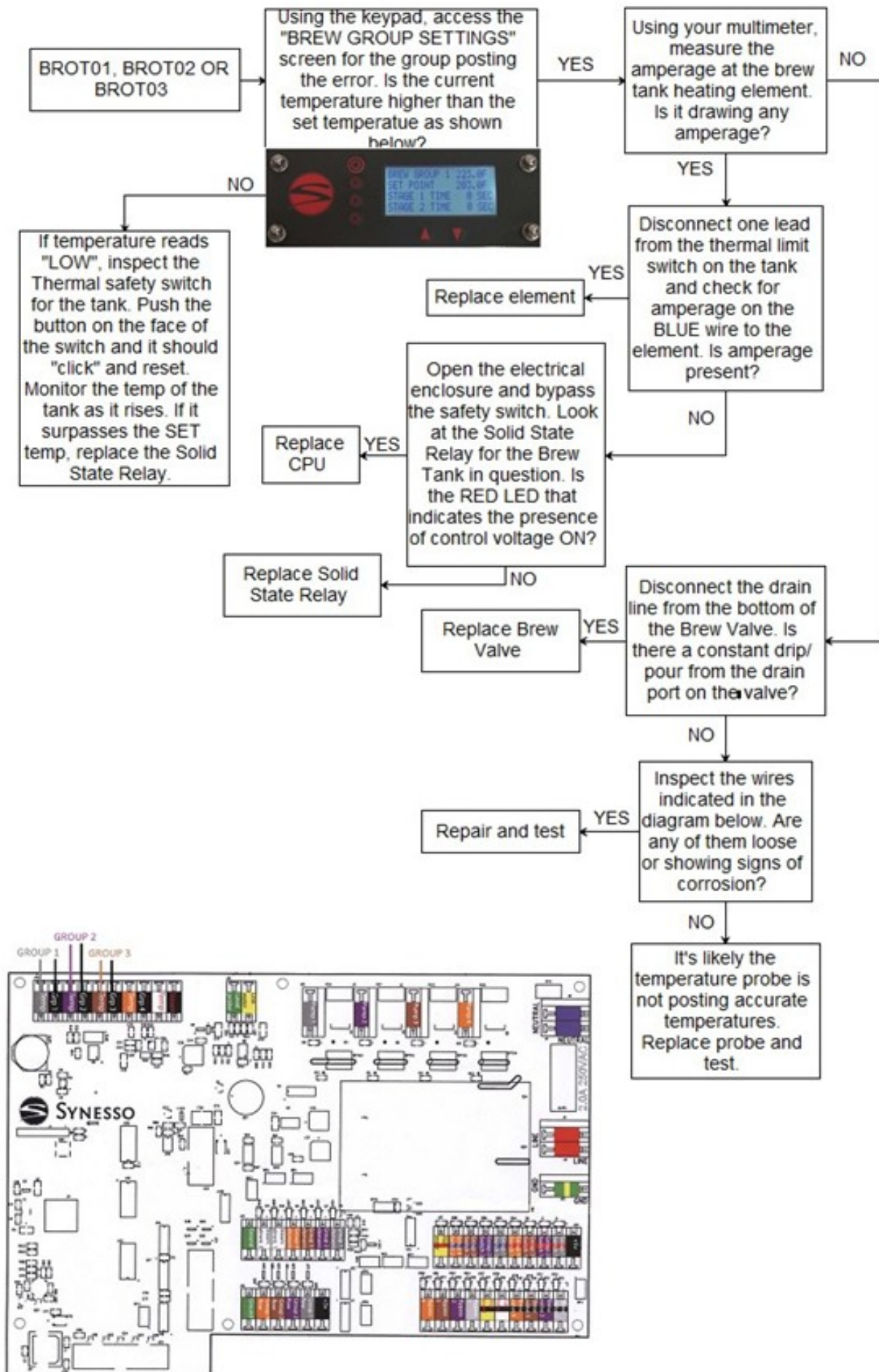
UF – Unexpected flow while group is off.

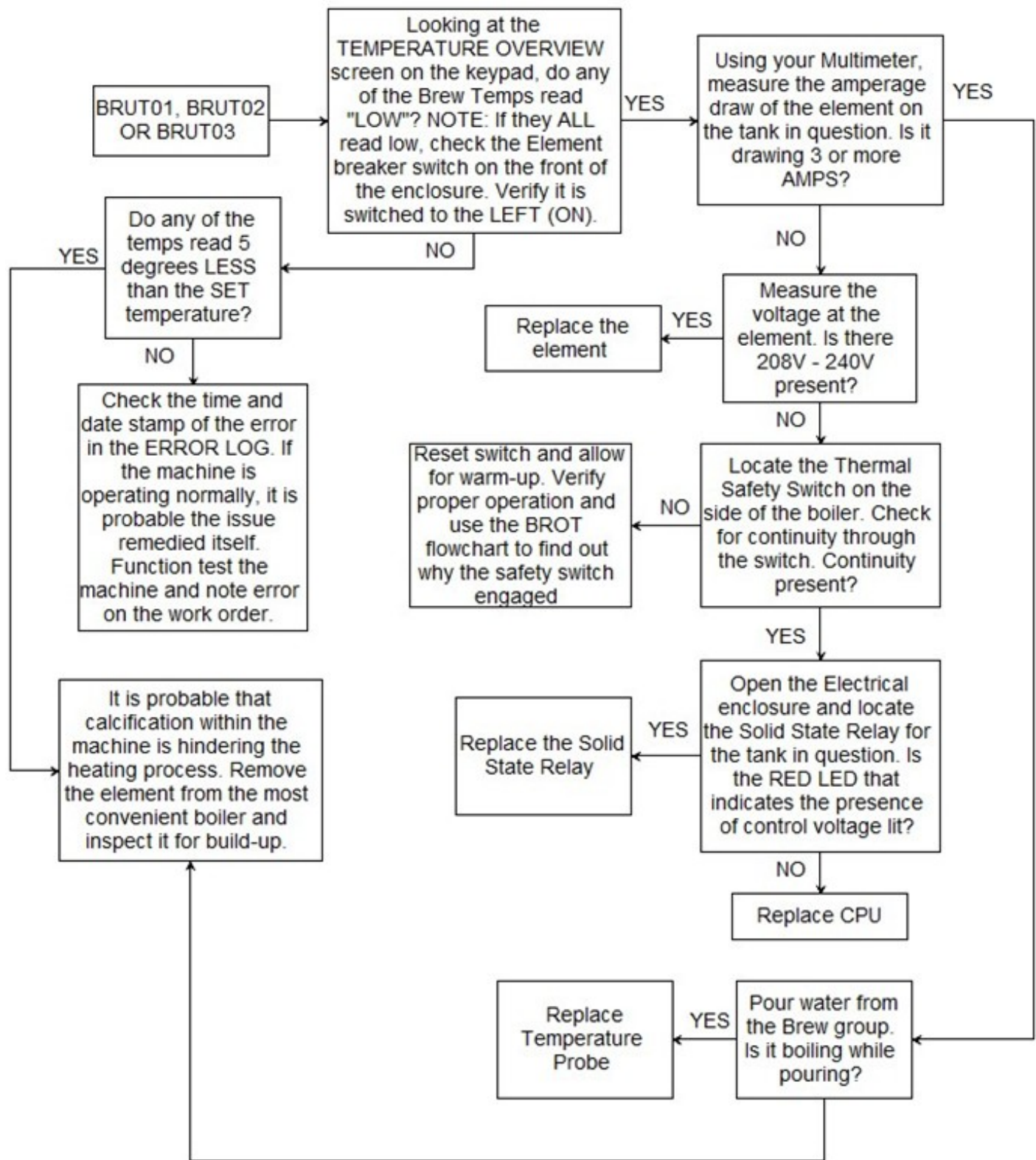
01, 02, or 03 – Indicate which flow meter is reporting an error.

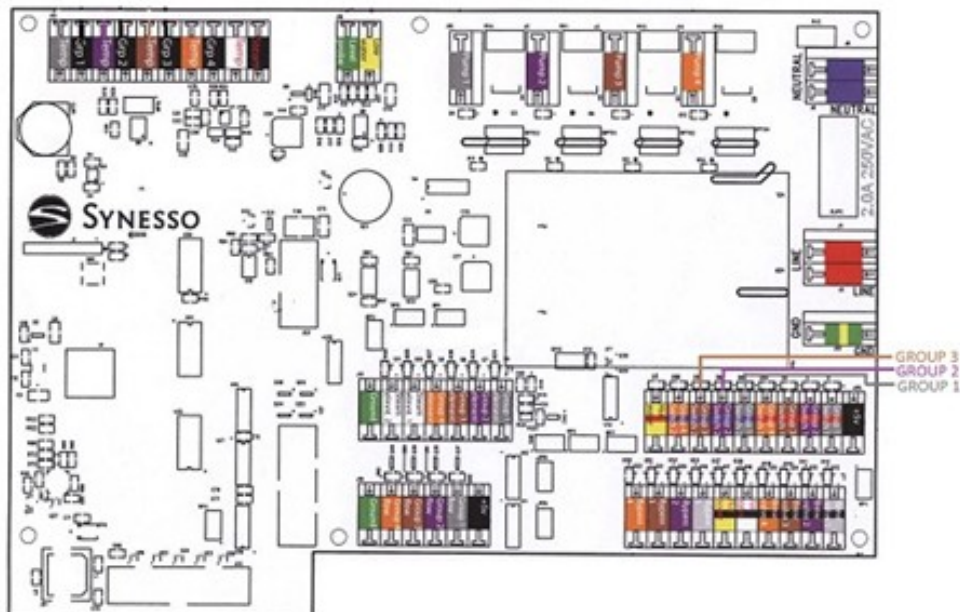
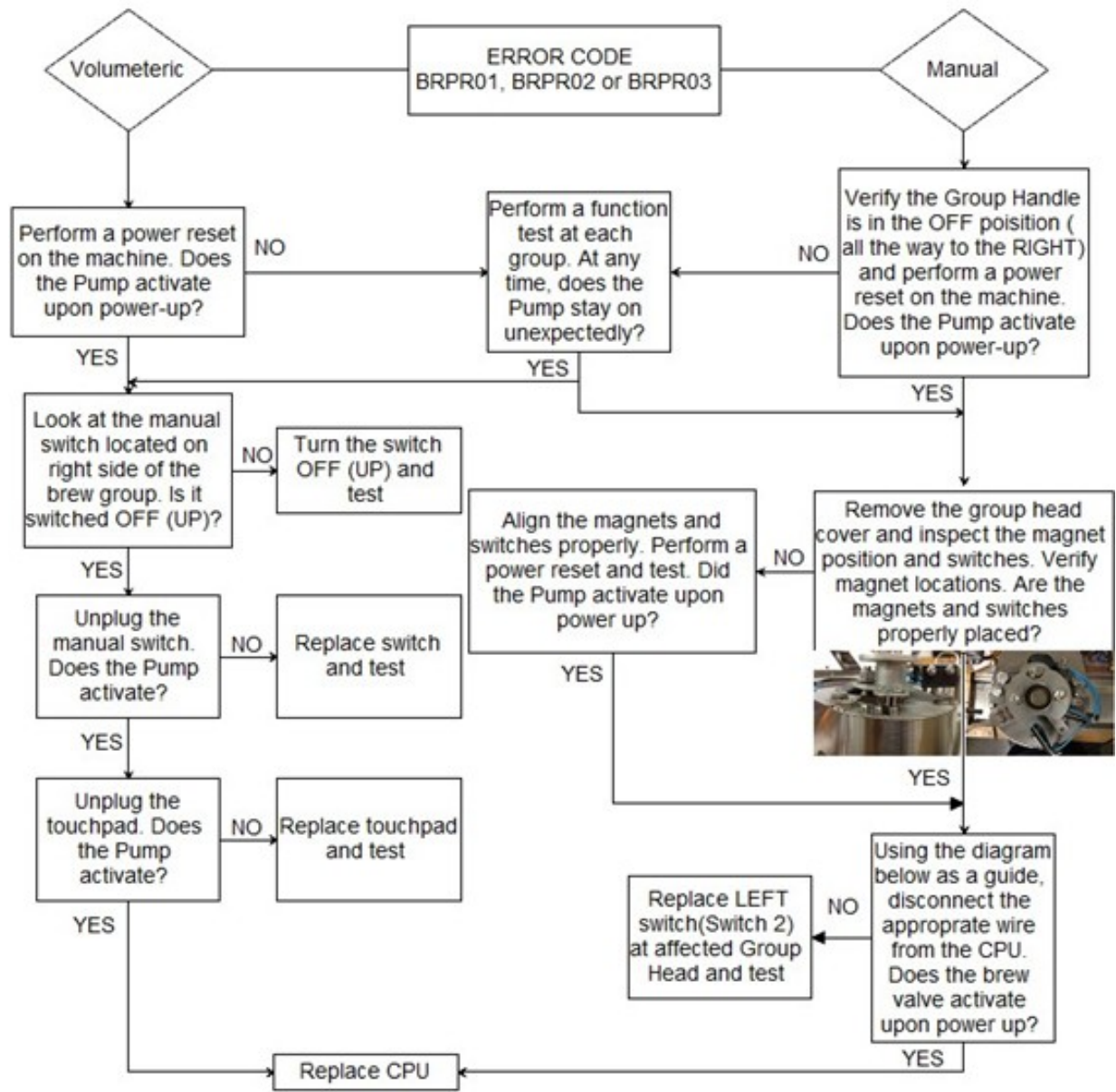
Example:

After brewing a shot, group 2 was left in the brew position. After 5 minutes, the machine will register a **BRBV02** and a **BRPR02** error; which translate to “Brew System, Brew Valve Group 2” and “Brew System, Pump Relay is timed out, Group 2.” At this time the machine will automatically shut off both the brew valve and the pump relay to ensure they will not be damaged. They will remain off until the group is returned to the off (far right) position, which allows the group to return to normal operation.





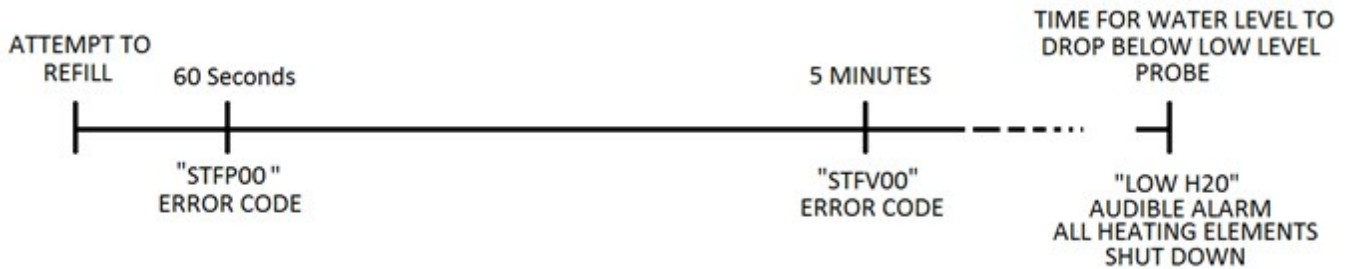




PROGRAMMING

STEAM SYSTEM ERROR CODES

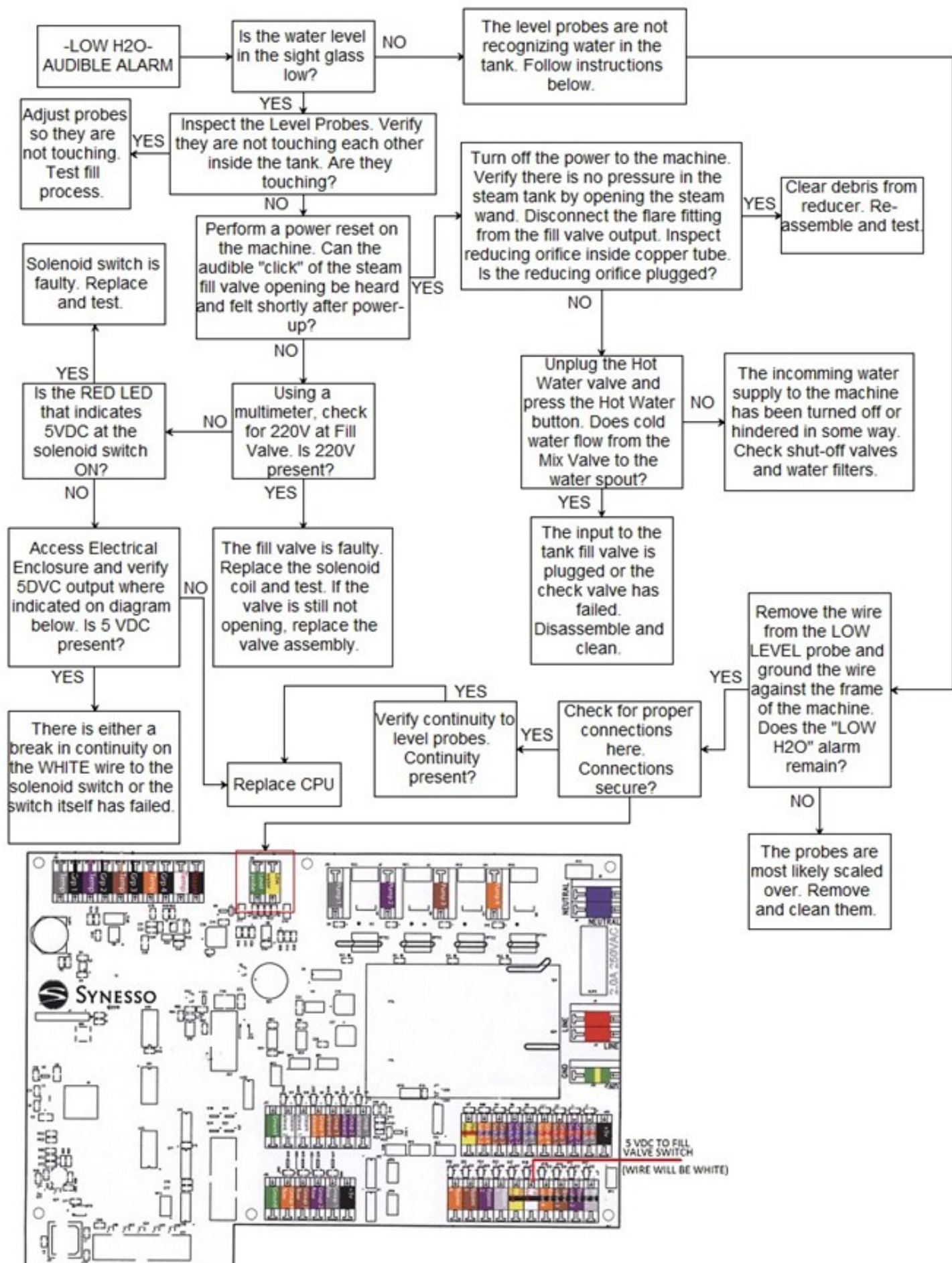
With regard to the error codes associated with water level control, there is a cascading effect as the water level in the boiler drops. For example, if the water inlet to the tank is clogged or the fill solenoid fails, the system will be unable to re-fill the boiler. Look at the timeline of this scenario below:

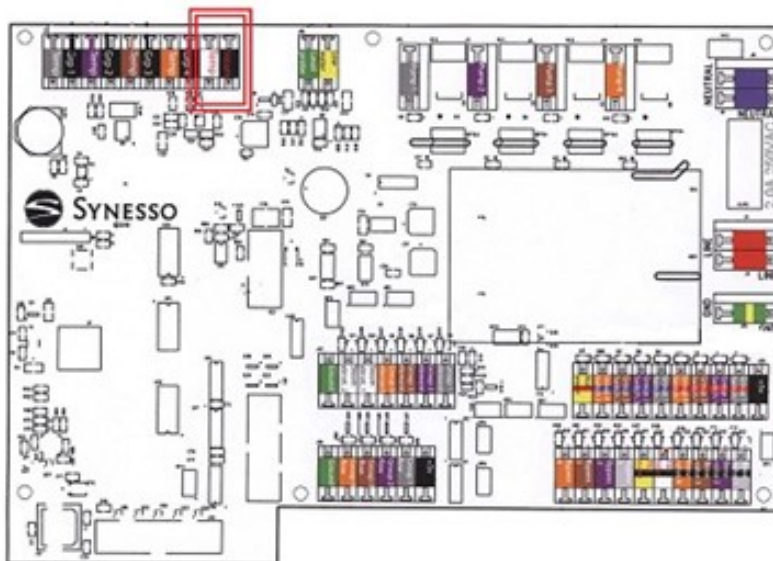
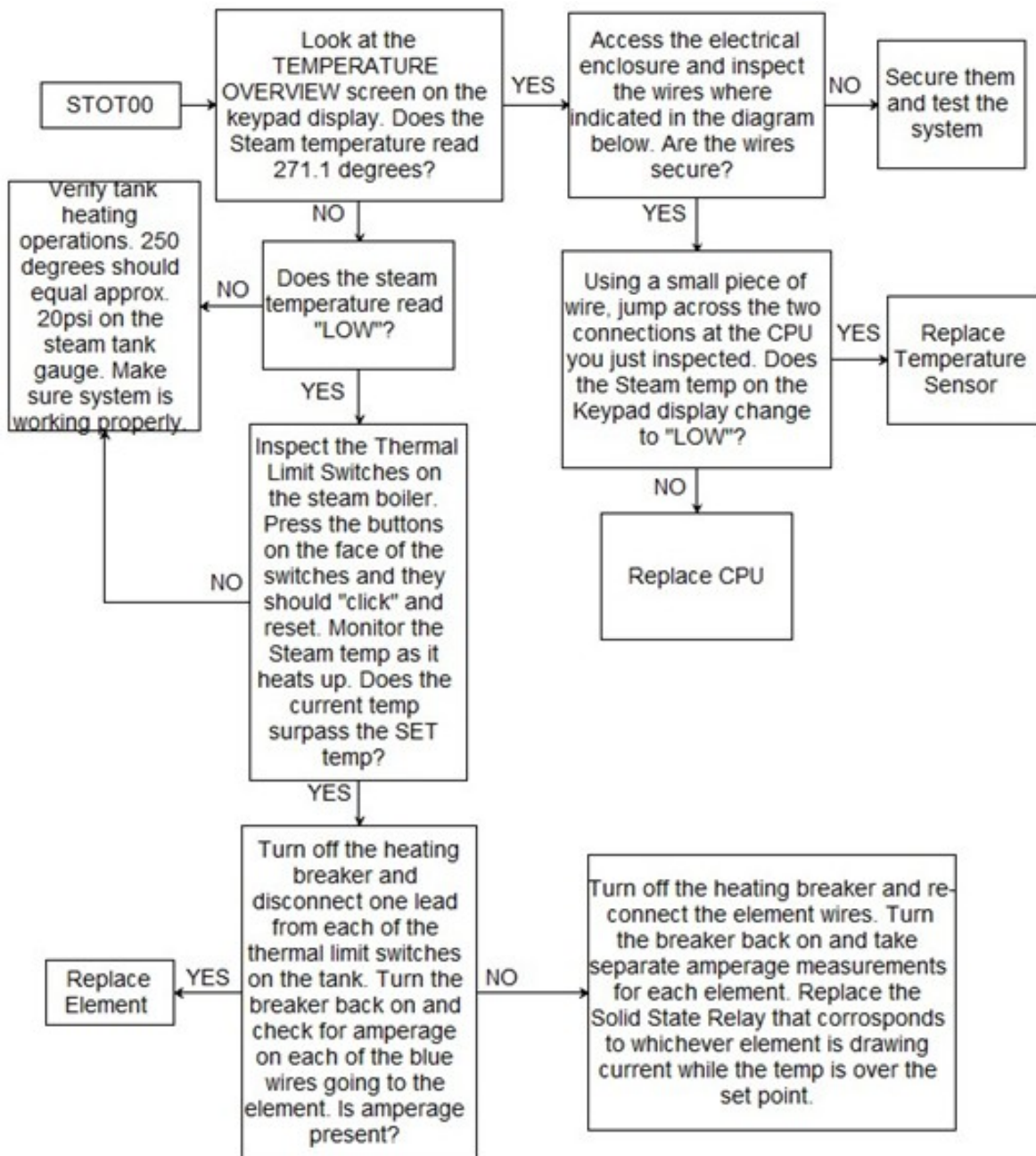


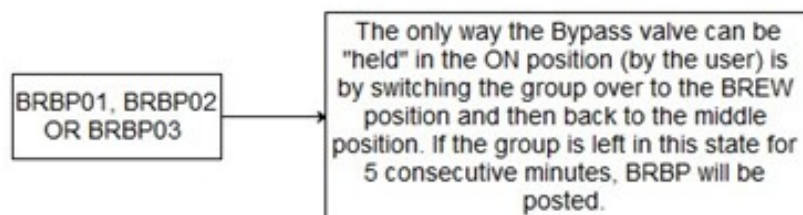
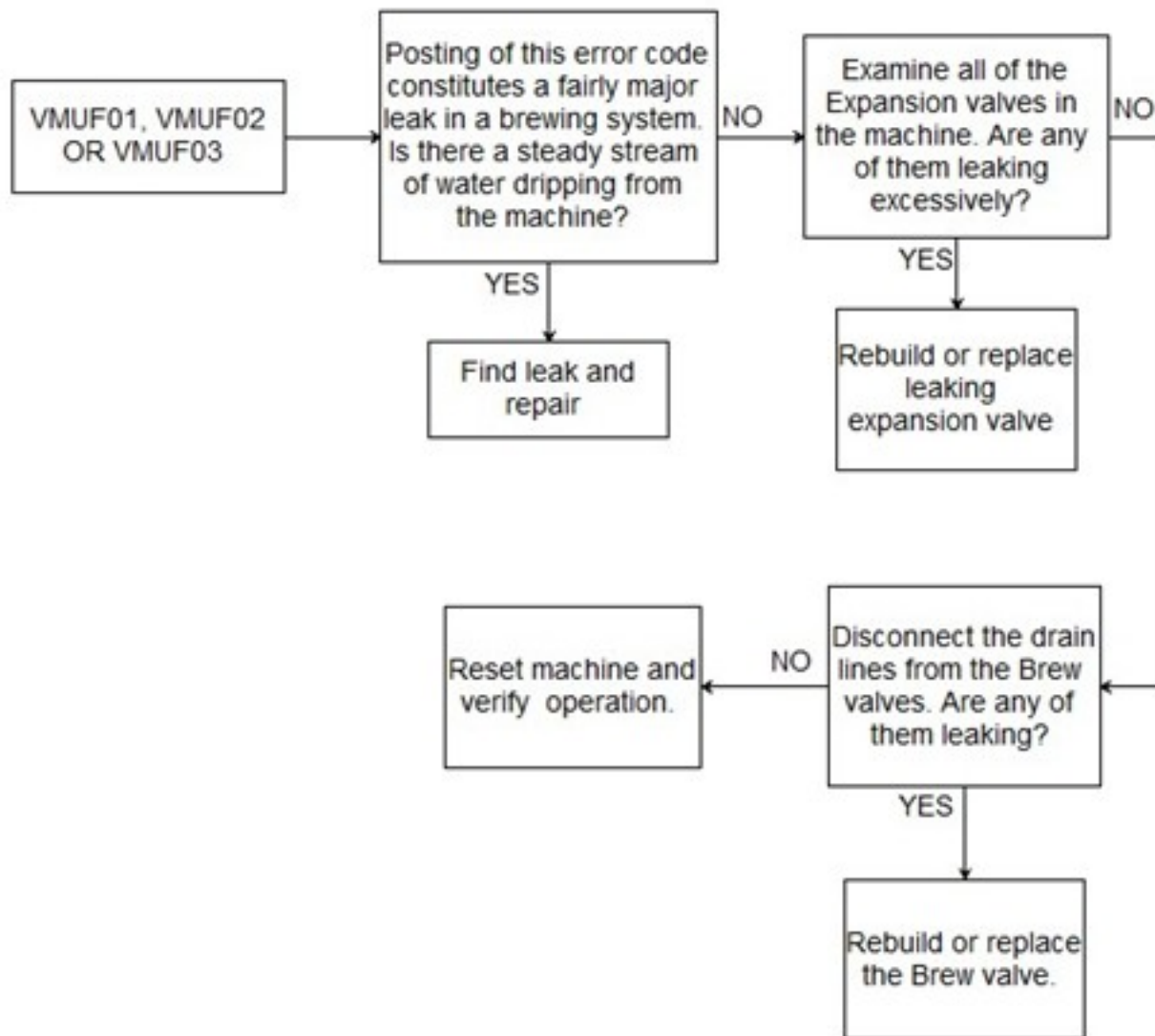
This timeline shows that all three error codes will be posted for this issue. The time it takes for the water level to drop below the LOW LEVEL probe and post the "LOW H2O" error depends upon the water and steam usage of the machine during operation.

The following flowchart will begin with the "LOW H2O" heading because that is the error likely to be seen on a machine that has ceased to heat the boilers. However, the flowchart will cover all three of these Error codes as they are all tied to the same general issue.

To view the timeline of these failures on the wired display, access the Level 2 Programming and scroll to the ERROR LOG screen. Once there, the Date/Time stamps can be viewed for all past errors on the machine. Use the up and down arrows to scroll through errors.







PROGRAMMING

There are 3 menu levels accessible to technicians. Menu level 2 may only be reached from level 1 and level 3 may only be reached from level 2.

To access menu level 2 - From the 'Temperature Overview' screen, press and hold both the line 4 button and up arrow, for approximately 4 seconds. The screen will cycle to the 'Temperature Display' screen. This is screen 1 of menu level 2.

Menu Level 2: Temperature Display



Line 1 indicates that you are on the Temperature Display screen.

Line 2 indicates the Temperature scale that you are currently in (Fahrenheit or Celsius).

Line 4 indicates the operation status of the machines Brew Valve(s).

To Change between temperature scales, press the button associated with line 2.

Use the '▲' '▼' buttons to select the desired scale (Fahrenheit/Celsius), followed by the line 2 button once again to confirm the selection. All temperature readings on the machine will now be in the selected scale.

The Brew Valves can be set to the [ON] or [NORMAL] position in order to help with draining the brew groups. Setting the Brew Valve function to the [ON] indicator will activate the brew valves, allowing the pressure to be bled from the brew group(s). Once the pressure is bled, turn the Brew Valve setting back to [NORMAL] and attach the appropriate drain hose to the brew groups drain tube. Set the Brew Valve indicator back to [ON] once the drain hoses are securely attached. This will allow the water in the brew group(s) to fully drain in approximately 5 minutes. When the brew groups are finished draining, set the Brew Valve indicator back to the [NORMAL] setting. If the draining process takes longer than 5 minutes, the machines safety programming will automatically turn the brew Valve indicator to the [NORMAL] setting while exiting back to the Display Default Overview screen. An error message will also be sent to the Error Log that the brew valves have timed out. If more time is needed, return to the Temperature Display screen and set the Brew Valve display back to the [ON] position to finish the procedure.

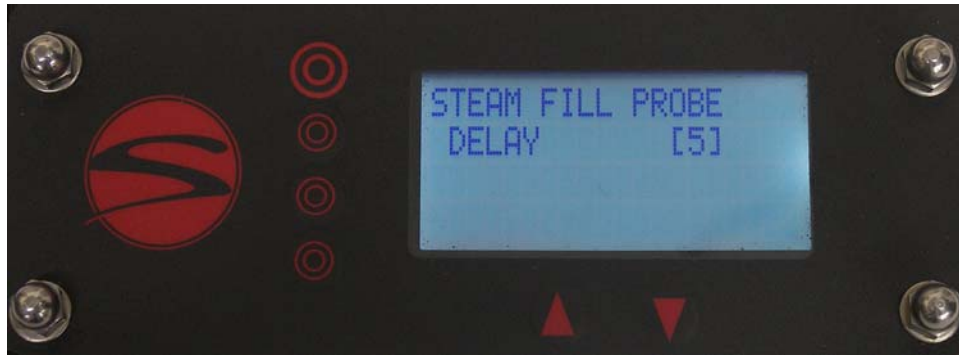
To set the brew valves to [ON] or back to [NORMAL], press the button associated with line 4.

Use the '▲' '▼' buttons to select the desired operation mode, followed by the line 4 button once again to confirm the selection. Once finished with the draining procedures, make sure the Brew Valve indicator is set back to the [NORMAL] position.

To cycle to the next display screen press the button to the left of line 1.

PROGRAMMING

Menu Level 2: Steam Tank Fill Probe



Line 1 indicates that you are on the Steam Tank Fill Probe control screen.

Line 2 of this display screen is showing a 5 second delay indicating that the fill probe will wait this long before turning on or off the steam tank fill valve.

To change the delay time, press the button associated with line 2.

Use the '▲' '▼' buttons to select the desired time and then confirm the selection.

To cycle to the next display screen press the button to the left of line 1.

PROGRAMMING

Menu Level 2: Brew Group 1 Offset



Line 1 indicates that you are now in the Brew Group 1 Offset screen.

Line 2 indicates the actual water temperature at the selected brew group's temperature probe as it is maintaining your Set Temperature.

Line 3 represents the actual temperature reading of water flow through the puck.

Line 4 indicates the temperature adjustment made at the Synesso™ factory, in order to create the exact temperature desired at the puck.

Puck Temperature on line 3 is determined at the factory, according to the standard Synesso™ testing method. Adjustment to this setting is not recommended without thorough testing.

The Synesso™ testing method is as follows:

Using a bottomless portafilter, dose out 16-18 grams of coffee into a 14 gram basket with a thermal probe inserted 1/8th of an inch from the surface and in the middle of the puck, packing and tamping the grounds in the basket as usual.

The thermal probe is then wired to a FLUKE thermometer to relay the actual temperature of the water flowing through the puck while pouring a 2 ounce shot. This process is repeated a minimum of 3 times per brew group in order to get the most accurate reading.

This reading is then applied to line 3 by pressing the corresponding button.

Use the '▲' '▼' buttons to select the desired setting and then confirm the selection.

Inserting the temperature on line 3 will automatically set the line 4 offset.

The Offset on line 4 can be altered to achieve the same effect as inputting a temperature on the Puck temperature line. Changing the offset will correspondingly alter the puck temperature. This offset point should not be altered without thoroughly testing the puck temperature, as mentioned above.

To cycle to the next display screen press the button to the left of line 1.

PROGRAMMING

Menu Level 2: Steam Tank Offset



Line 1 indicates that you are on the Steam Tank Offset screen.

Line 2 indicates the actual water temperature at the steam tank temperature probe, as the electronics maintain your Set Temperature.

Line 4 indicates the temperature adjustment made at the Synesso™ factory, in order to create the exact temperature desired in the steam tank. This offset should not be altered without first consulting Synesso™.

To cycle to the next display screen press the button to the left of line 1.

Menu Level 2: System Clock



Line 1 indicates that you are currently on the System Clock screen.

Line 2 indicates the programmable time for the machine in a 24 hr format.

Line 3 indicates the programmable date settings.

Line 4 stores the programmed date in the format indicated on line 3

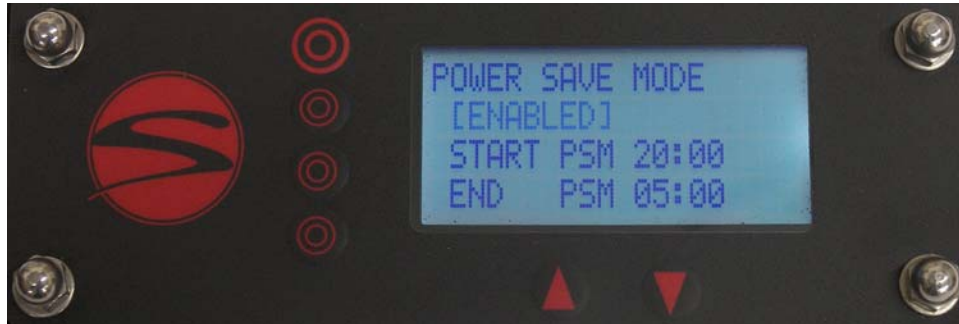
Press the line 2 button followed by the '▲' '▼' buttons to make appropriate adjustments to the 24 hr clock so that any alarms programmed will work correctly.

To adjust line 4, press the corresponding button followed by the '▲' '▼' buttons to select the appropriate date.

To cycle to the next display screen press the button to the left of line 1.

PROGRAMMING

Menu Level 2: Power Save Mode Setup



Line 1 indicates that you are on the Power Save Mode screen.

Line 2 of the Power Save Mode in this example is indicating the timers are [ENABLED], making adjustments to lines 3 and 4 available. If line 2 reads [DISABLED], no further programs will be available on this screen.

Line 3 indicates the settable time at which your power save mode will start.

Line 4 indicates the settable time at which your power save mode will end.

Enabling the power save mode will drop the temperature in the brew group(s) to 180F (82.2C) and the steam tank to 220F (104.4C) for the time span set. This will help conserve energy while preventing maintenance issues that occur due to depressurizing and re-pressurizing, when machines are turned off and on. This will also allow the machine a shorter amount of time to reach full temperature and stabilize, after the power save mode has ended. We suggest using this feature only if the machine can be in power save mode for more than **3 hours** at a time.

To cycle to the next display screen press the button to the left of line 1.



PROGRAMMING

Menu Level 2: Error Log



Line 1 indicates that you are on the Error Log screen.

Line 2 indicates the last error that occurred. If no error has occurred, this line will simply read 'NO ERROR'.

Line 3 indicates the date and time that the last error has occurred. If no error has occurred, this line will be blank.

Line 4 gives the option to clear the Error Log.

To cycle through the Error Log, use the '▲' '▼' buttons. Cycling through the Error Log will change the date and time on line 3 to match the displayed Error Code time of occurrence.

To clear the Error Log, press the button associated with line 4.

See page 37 for descriptions of the error codes you may see.

To cycle to the next display screen press the button to the left of line 1.

Menu Level 2: Return To Level 1



Line 1 and 2 indicate that you are on the Return To Operation Mode screen.

Pressing the line 1 button will cycle back to the 'Temperature Display' screen on menu level 2.

Pressing the line 3 button will cycle back to menu level 1's 'Display Default Overview' screen.

Access to level 3 is only available from this screen.

To reach menu level 3 - press and hold both the line 4 button and the up arrow at the same time. The screen will cycle to the 'Volumetrics' screen which is screen 1 of level 3.

PROGRAMMING

Menu Level 3: Volumetrics



Volumetric functions (such as Automatic Bypass) are only applicable on machines with volumetric hardware.

If the machine has volumetric hardware installed, this indicator should be left [ON].

Menu Level 3: Brew Groups



The Brew Groups Present will be set to correspond directly to the physical definition of your machine and should not be altered.

PROGRAMMING

Menu Level 3: Reset



The Full Reset to Defaults option can be achieved by pressing the line 3 button. This option will undo ALL changes that have been made to the machine. This includes the Synesso™ programmed offsets, serial number and machine configuration information. It is highly recommended that you make note of all Synesso™ programmed settings before doing a full reset of the machine.

Reset cannot be undone. Be careful.

Menu Level 3: Bypass



The Bypass Hardware on the pump can be activated and deactivated from this screen. If your machine has bypass hardware installed, this setting should be [ON], as indicated above.

Menu Level 3: Hydra



In the case of a Hydra / Hybrid, the correct pump configuration is [MULTIPLE]. Cyncra and Sabre models use [SINGLE].

PROGRAMMING

Menu Level 3: PID Tune



Line 1 indicates that you are on the PID Tune screen. The proportional–integral–derivative controller (PID controller) is a sequence of algorithms using separate, finely tuned parameters to achieve a desired set point.

Synesso™ strongly recommends against altering these parameters.

Line 2 indicates the P Gain (Proportional Gain) value.

Line 3 indicates the I Gain (Integral Gain) value.

Line 4 indicates the D Gain (Derivative Gain) value.

The default values are shown in the picture above.

Menu Level 3: Serial Number



The Machine Serial Number is the designated identification given to the machine according to the month/year and order of completion.

This method of identification may be used to help diagnose any issues or determine any specific needs that may arise during the life of this machine. For this reason, the machine serial number should not be altered.

PROGRAMMING

Menu Level 3: Return



Line 1 indicates that you are on the Return screen
Line 2 will return to menu level 1 (Operation menu).
Line 3 will return to menu level 2 (Settings menu).

PROGRAMMING

VOLUMETRIC PROGRAMMING

This section contains instructions for programming the volumetric dosing on Sabre machines and Hybrid machines with volumetric group heads. Basic machine programming is found on page 31.



To enter programming mode, press and hold any 2 shot buttons. After 3 seconds, the indicators for each button will illuminate. At this point, you can press the continuous flow (or pitcher) button on one or more groups to **exclude** that specific group from programming. This will turn off the upper indicators on the deselected group. A red indicator will remain lit on the deselected group's continuous flow button. Pressing this button again will exit the programming mode. If a group has been deselected in error, you must exit and reenter programming mode to re-select the group for programming.

While in programming mode, press any shot button with a lit indicator to begin a shot. As the shot flows, the indicator at each button receiving a program will blink. Once the desired volume has been reached, press the same shot button a second time to end the shot. The indicator light(s) will turn off. You may now program another button or exit the programming mode. If an error has been made, you may reprogram a button without leaving programming mode. Pressing a previously programmed button overrides the original program.

To exit the programming mode, press any continuous flow button on a deactivated group. As noted above, pressing a continuous flow button on an active group will deactivate it. When you exit programming mode, all lit indicators will turn off.

Notes:

- o The continuous flow / pitcher button cannot be programmed. During normal operation, pressing the pitcher button will stop a currently flowing shot, or start a continuous flow of water from the group.
- o Any stage 1 or 2 times (see Programming, page 17) set up prior to entering volumetric programming mode will be active during programming. Water dispensed during stage 1 and 2 counts toward total shot volume.
- o Shot timers, if present, are not active during volumetric programming. The timers return to normal function once the machine leaves programming mode.

Low Flow Error:

- o If a shot button is pressed but flow is not detected by the flow meters, the two indicators on the pitcher button will light and flash. If inadequate flow persists for 30 more seconds, the brew valve will close, cancelling the shot. The lights will continue to flash and the group cannot be used until the low flow error has been acknowledged by pressing the pitcher button. The most common reason for this error will be grind/tamp mistakes, but the incoming water may be restricted. If this error occurs frequently, please check the incoming water lines.

MAINTENANCE

DAILY MAINTENANCE

Proper and regularly scheduled cleaning and maintenance procedures are CRITICAL for trouble-free and optimum quality performance from your espresso machine.

Back-Flushing

This process forces water through the inlet tube and drain system. This should be performed on EACH brew group daily. On the current generation of Synesso™ machines, back-flushing can be automated. See page 18.

To back-flush manually:

1. Replace the filter basket with the 'blind' basket, which has no filter holes.
2. Engage the portafilter, turn the head to the BREW position for 10 seconds. Then turn the group off again for 3 seconds. Repeat several times.
3. When using an approved espresso industry detergent during back-flushing, follow the manufacturer's instructions. It is extremely important to thoroughly rinse the blind filter basket and repeat back flushing several times with clean water to clear the system of any detergent residue. Failure to rinse can cause valve problems and bad flavor.

NOTE: NEVER remove the screen and screw when backflushing. Remove and clean them after backflushing is complete. Do not forget to reinstall.

General machine cleaning

1. Clean the surface of the machine using a soft damp cloth. Avoid using abrasive cleaners or cleansing pads. Take extra care on the mirror finish stainless steel surfaces. A "micro-fiber" towel is recommended to avoid scratches.
2. Make sure the steam wands and tips are free of milk build-up. It is always best to clean the steam wand and tip after each use. Approved espresso industry cleaners can be used to dissolve milk build-up. Tips can be removed to soak.
3. The drip tray, drip tray grates, and portafilters should be removed and cleaned every day. If you clean the portafilters in the dishwasher, first remove the filter baskets and springs before washing.

MAINTENANCE

MAINTENANCE SCHEDULE

Daily

1. Back flush each brew group without detergent throughout the day.
2. Back flush with an espresso industry approved detergent during the final cleaning of the night (or after a busy period), and then again without detergent to rinse.
2. Wipe down the entire machine with a soft cloth.
3. Remove portafilters, baskets and springs, drip tray and grates and clean thoroughly. These items are all dishwasher safe.
4. Slowly pour a pitcher of hot water down the drain to clear grounds debris and prevent blockage.

Weekly

1. Soak portafilters and the removed filter baskets in an approved espresso industry detergent and water solution overnight. Rinse thoroughly before reassembling and using your portafilters.
2. Carefully remove screens from each brew group using a short handled screwdriver and soak overnight in a similar solution as the portafilters.
3. Rinse screens thoroughly before installing and using. **Make sure you install the screens before brewing any shots of espresso. Failure to do so may plug the drain lines with coffee grounds.**

Monthly

1. Check your water filtration system and make sure the cartridges and filters are changed as needed. In areas of high mineral content, hard water, high particulate count or in very busy locations, the filtration systems will need to be checked more often.

Quarterly

1. **Change** portafilter gaskets and closely **inspect** diffuser screens and filter baskets, If these items are showing wear, please replace them as soon as possible. Change these items if they show damage or overuse.
2. Briefly inspect the machine for leaks or potential issues. Contact Synesso™ or your local distributor or service agent to order parts and/or request service.

Synesso™ recommends that you contact your distributor or service agent for periodic maintenance. The frequency of maintenance visits will depend on a variety of factors including how much use the machine receives, but at least one preventative maintenance visit a year is required. During this yearly service, all body panels must be removed and all connections both electrical and hydraulic must be inspected. Small problems can become large if not caught early.

TROUBLESHOOTING

This is a troubleshooting guide for some of the common issues that operators might encounter when using their machine. For more detailed assistance with technical issues, contact your distributor or local service agent.

The machine may be reset by powering off for 10 seconds.

Brewing problems

The shot is pouring too slowly:

- o Tamp pressure was too firm
- o Too much coffee is in the basket
- o The grind is too fine
- o Diffusion screens are clogged; clean or replace
- o Pump pressure is too low. Ensure that it is set between 8-9.5 bar
- o Brew jet is clogged; when operating properly, 60ml should flow out within 8 seconds

The shot is pouring too quickly:

- o Tamp pressure is too light
- o Not enough coffee in the basket
- o Grind is too coarse
- o Portafilter baskets are worn or cracked; replace
- o Brew temperature is too cold

Crema is thin with large bubbles and tastes astringent:

- o Coffee is old
- o Grinder burrs are dull
- o Brew temperature may be set too low

Diffuser screen is loose:

- o This is most likely caused by over filling the portafilter basket with coffee. This causes the expanding coffee puck to push against the diffuser and bend the screen-to-screw contact point away from the screw.

No pump pressure when water flows from the group:

- o Check position of group head: ensure that it is in the brew position.
- o Pump relay may have failed
- o Stage 1 time may be set to run too long.

The pump comes on, gauge reads full pressure, but no water comes out:

- o Diffuser screen/screw, or brew jet is clogged (can be caused by soap residue not fully flushed after cleaning).
- o The water filter is clogged and needs changing
- o Brew solenoid has been sealed shut by dried soap or has failed.

TROUBLESHOOTING

Brew Gauge

Brew Pressure gauge needle value changes often:

- o This is normal. The lowest number (usually 3-5 bar) reflects the incoming line pressure. When brewing the needle reflects brew pressure (8.5-9 bar). When the brew tanks heat, the water expands and the expansion valve relieves the pressure at 11 or 12 Bar.

Brew Pressure is Low:

- o Check pump to make sure pressure is properly set
- o Water supply hose to the pump is kinked
- o Water filter is plugged. Check and replace if necessary

Pump Motor Runs; No Brew Pressure:

- o Failed pump, needs to be replaced
- o Brew Solenoid is stuck (can be caused by soap residue not fully flushed after cleaning).
- o Brew Solenoid has failed
- o The line between the pump and the water supply has collapsed or is kinked
- o Hose to the pump is kinked
- o Water filter is plugged. Check and replace if necessary
- o Water supply is inadequate

Readout for Brew Water Temperature Varies by a Few Degrees:

- o The control must “see” the increment just above the set point before it sends a signal to turn off the heating element. This will allow the electronics to show a reading just above the set point. The energy from the heating element and the tube for the preheated incoming water are within 1” or 25mm from the location of the temperature sensing probe in the coffee tank. The water pick up tube for brew water is at the top of the brew group and is in the most temperature stable water in the tank. Meaning, the readout can show a temperature of a few degrees above your set point, and may fluctuate due to the heat from the element or heat exchanger, but your brew water is actually at the set point.

Electronics

All zones read LOW:

- o Check to make sure the element breaker is ON (element switch is to the left). Zones will read low until the temperature in that zone reaches 175° F. Please allow 20-30 minutes to heat up initially.

TROUBLESHOOTING

Steam Wand

Drip at the Steam Wand Tip:

- o Steam valve seal is worn. Replace by installing steam valve rebuilt kit.
- o Steam valve is filled with milk residue. Disassemble steam valve and clean.

Wand is Hard to Move or Sticky:

- o Remove wand at the nut, clean and lubricate moving parts with food grade grease

Steam

Sudden loss of steam pressure:

- o Commonly caused from drawing large amounts of hot water while steaming milk. Allow the machine time to recover pressure. Check temperature settings on Steam 1 and 2 to make sure they are high enough for your application. Watch the steam gauge when the pressure drops; allow the heating elements to heat the incoming cold water. When it reads above 1.1 bar, hot water and steam may be dispensed again.
- o Check the programming keypad to make sure all temperatures, especially in the steam tank, are close to their set points.
- o Check the element breaker on the electronics box to make sure the heating elements are ON (element switch is to the left).

Steam Tank is overfilling:

- o Water is too soft; this occasionally happens with reverse osmosis water filtration systems. The water level (auto fill) probe needs a minimum mineral content in order to detect water.
- o Debris caught in the water control valve or worn out valve.
- o Calcium deposits on the fill probe are preventing the probe from detecting the water level.

Steam Valve Stem Seals Leak:

- o Replace O-rings. Purchase Rebuild Kit

The Sight Glass shows over or under filled steam tank

- o Machine is not level. Check to make sure the surface that holds the machine is level. Slightly adjust leg height to level the machine.
- o Water level is too high; use the hot water spout to drain water from the steam tank. Continue releasing hot water until the autofill system activates. Once autofill stops, recheck the water level.
- o Debris is stuck in the water control fill valve.

Category	Symptom	Possible Reasons and Solutions
Brew Pressure or Flow	Brew Gauge Reads 11 to 12 Bar when Machine is Not Brewing	• This is normal. When the brew tanks heat, the water expands and the expansion valve is set to relieve excess water pressure at 11 to 12 Bar.
	Brew Pressure is Low	• [SINGLE INLET MACHINES ONLY] see "Brew pressure drops when steam tank fills" below
		• [SINGLE PUMP MACHINES ONLY] When brewing on one group and another group is activated some water will be diverted to the second (or third) group. This will slightly reduce available brew pressure.
		• Expansion valve may be set too loose. Check that the pressure in the brew system reaches 10-12 bar while heating from a cold state. If the pressure does not exceed brew pressure, the expansion valve will need to be tightened, cleaned, or rebuilt.
		• Check pump to make sure pressure is properly set.
		• Water supply hose to the pump may be kinked
		• Water filter may be plugged. Check and replace if necessary
	Brew Pressure drops when Steam Tank fills (SINGLE INLET MACHINE ONLY)	• This is common to all single inlet espresso machines. The water source is the same for the steam and brew tanks. The pump is configured for a set amount of pressure and when the steam tank fills, it diverts water and pressure away from the brewing process and into the steam tank. If this is an unacceptable situation, there are a few things you can do to minimize or eliminate the pressure drop.
		• There is an auto fill probe delay setting in the programming that is set at the factory to 5 seconds. This means that the auto fill probe waits to fill until it senses a continuous signal to fill for 5 seconds, and it does not stop filling until it senses a continuous signal to stop filling for 5 seconds. This stops the auto fill valve from turning off and on if the water in the steam tank is making intermittent contact with the probe (due to internal water movement).
		• Minimize: Increase your auto fill probe delay setting to 10 seconds. This will reduce the number of times that your steam tank fills. It will also increase the fill time each time the valve opens. The water level in the steam tank will vary more.
		• Eliminate: If you can provide 2 separate sources of water (a steam tank source and source run through the pump for brewing), it is possible to custom plumb your machine so that this issue is eliminated. This takes time, skill and extra parts. All machines made in 2008 and after have this dual inlet system as a standard feature. Retrofit kits are available, check with your dealer, service provider, or the Synesso™ factory for more information about this upgrade.
	No Brew Pressure, Pump Motor is Running	• Failed pump, needs to be replaced
		• The line between the pump and the water supply may be collapsed or kinked.
		• Water filter may be clogged and should be changed
		• Brew valve may have timed out.(BRBV0#) Turn brew group off to reset.

	No Brew Pressure, Pump Motor is Not Running	• Check that the pump reset button on the face of the control box (white button with “10” on it) is not tripped (popped out).
		• Check the pump switch in the group top to make sure it is engaging and has not failed. See Brew Switch Adjustment
		• Check that the pump relay in the electrical box functions correctly.
		• Pump relay may have timed out.(BRPR0#) Turn group off to reset.
	No Water Flow While Pump is on	• Check in the group top that the brew solenoid switch is engaging and has not failed. See Brew Switch Adjustment section for more info.
		• Brew Solenoid is stuck closed (may be caused by soap residue not fully flushed after cleaning).
		• Brew Solenoid coil may have failed. Check that coil magnetizes when group is in preinfuse and brew positions.
		• Jet may be plugged. See Jet Clearing Procedure
		• Water filter may be plugged. Check and Replace if necessary.
		• Brew valve may have timed out.(BRBV0#) Turn brew group off to reset.
	Slow Water Flow (more than 10 seconds to pour 2 ounces of water)	• Debris is stuck in the water flow restrictor jet. See Jet Cleaning Procedure.
		• Water filter may be clogged and should be changed
	Brew Gauge Flutters or Vibrates	• Water is in the gauge or tube. Remove the gauge and tube, blow out the water, and reinstall. Machines made after #240 use a thinner, longer gauge tube which eliminates flutter. If your machine is made before #240 and this issue becomes unacceptable, contact your dealer, service provider, or the Synesso™ factory to purchase a retrofit tube.
Brew Temperature	Readout for Brew Water Temperature Varies by a Few Degrees	• The control must detect a temperature one increment (0.5°F on original machines, or 0.1°F on current machines) above the set point before it sends a signal to turn off the heating element. This will allow the electronics to show a reading just above the set point. The energy from the heating element and the tube for the preheated incoming water are within 1” (25mm) from the location of the temperature probe in the brew tank. The pickup tube for brew water is at the top of the brew group and is in the most temperature stable water in the tank. The readout can show a temperature of a few degrees above your set point, but your brew water is actually at the set point.
	Brew Temperature Reads Low (error: BRUT0#)	Be sure to allow 20 - 40 minutes from the time the machine is powered up as the temperatures need to stabilize. Ambient temperature and airflow can change how quickly the machine reaches stability.
		Check that the element breaker is in the ON position
		Check that the fuse on the power board, as well as the relay, are both functioning properly.
		Check that the brew tank thermal overload switch has not been tripped
		Check that the connection to the temperature probe is intact and secure.
		Make sure the set point has not been changed.
	Brew Temperature Reads High (error: BROTO#)	Display temperature will climb during brewing as hot water from the steam tank heat exchanger enters the brew tank. This is normal, and the water dispensed will be at your set point, not the displayed temperature.

		Make sure the set point has not been changed.
		Check that the relay is functioning properly.
		Check that the connection to the temperature probe is intact and secure.
		Brew tank may be leaking. Check brew valve and fittings.
Steam Pressure	Steam Pressure is set for 1.8 Bar or Higher	The machine can be set for steam pressure at over 2.0 Bar but there can be side effects in the brewing process. A small amount of water is preheated in the steam tank for brewing. If the temperature in the steam tank is set very high then this could allow for the preheated brew water to be too hot and cause some erratic brew temperature spikes. There are ways to make this work if it is absolutely necessary to have a very hot steam tank. Contact Synesso™ for more info.
	Sudden loss of Steam Pressure	Too much hot water has been used for Tea, Americano, rinsing, or warming cups while still steaming milk. Allow the machine to recover. Check temperature setting on the steam tank to make sure they are high enough for your application. Watch steam gauge, when pressure drops, allow the heating elements to heat the cold water being introduced into the steam tank
		Check to make sure all Set points, especially steam tank settings, are accurate and functioning.
		Check that the element breaker on the electrical box is in the ON position
	Steam Tank is not filling (error: STFP01)	Check for STFV01 error, which indicates the tank has been filling for over 5 minutes. If so, power cycle machine, check inlet hoses for kinks/pinches, check filter.
		Debris caught in the water control valve or worn out valve
		Water level probe (auto fill) needs to be de-scaled or cleaned. This probe is located behind the left side panel
		Make sure level probe (auto fill) is working. See Test Level Probe
		Water is too hard. The water level (auto fill) probe requires a low level mineral content in order to detect the water and relay the information to the CPU. Do not use deionized water in the machine.
		On machines built prior to 01-01-2011, adjustment can be made to the level probe sensitivity control on the power board in the electronics box. See Probe Sensitivity Photo
	Steam Valve Stem Seals Leak	Replace O-Rings. Purchase Rebuild Kit. See Steam Valve Rebuild instructions for more info.
	Auto Fill Valve (Solenoid) is turning OFF and On without Filling the Steam Tank	Check that the water to the machine has not been cut off or restricted.
		Confirm that auto fill delay is set to at least 5 seconds. See Programming Guide
		If the machine is installed on a boat or other mobile platform, increase the autofill delay as the water may “slosh” inside the tank and confuse the level probe.
		Working from a static tank and there is no pressure available to fill the steam tank. Dual inlet machines will need a line boost pump or custom plumbing to operate from a static tank with no line pressure.

		Machine is not level. Check to make sure the surface that holds the machine is level. Slightly adjust leg height to create a level machine
	The Sight Glass Shows that the Water Level in the Steam Tank is either too High or too Low	Water level probe (auto fill) needs to be de-scaled or cleaned. This probe is located behind the left side panel
		On machines built prior to 01-01-2011, The manual fill switch located on the front of the electrical box may have been depressed. Use the hot water spout to drain the steam tank until the fill solenoid opens and the tank begins to refill.
		If you are working from a static tank then you must use a line pressure boost pump to provide the pressure needed to fill the steam tank. Contact your dealer, service provider, or the Synesso™ factory for more information regarding static tank installations.
		Machine is not level. Check to make sure the surface that holds the machine is level. Slightly adjust leg height to create a level machine
		Debris is stuck in the water control fill valve. See Water Control Valves
	Steam Tank is Slow to Recover Pressure	- Test first steam loop (S1 or zone 4) functionality: - Turn down the set point for S2 a few degrees below S1 - Turn up S1 by a few degrees and confirm that the temperature rises to the new set point. - If the temperature has risen, then S1 is functioning properly.
		Test S2 (zone 5) functionality. See S1 test above for instructions.
		If either zone is not working properly, then see “Cold Zone” and “Tanks will Not Heat to Full Temperature” in the Electronics section.
		Calcium and scale buildup can insulate and cause reduced efficiency in heating elements. If calcium and scale buildup is an issue, be sure to descale your machine on a regular basis.
Steam Wand	Drip at the Steam Wand Tip	Steam valve seal is worn. Replace by installing steam valve rebuilt kit.
		Steam valve handle needs to be adjusted. See Steam Valve Handle Adjustment
		Steam valve is filled with milk residue. Disassemble steam valve and clean.
	Water bubbles out around wand pivot ball	Wand ball o-ring is worn, replace with new teflon o-ring from steam valve rebuild kit.
	Wand is Hard to Move or Sticky	Remove wand mounting nut, clean and lubricate wand ball with food grade grease, replace wand ball o-ring
	Steam Valve does not Open Fully	Steam valve handle needs to be adjusted. See Steam Valve Handle Adjustment
Hot Water Tap	No Water Flows When the Switch is On	If there is pressure in the steam tank, and water to the machine is not restricted, this indicates the switch has failed. Replace the switch.
	Only Cold Water Flows when Switch is On	Turn the mix valve clockwise until it stops. This will cut off all cold water flow. If no water flows with the mix valve off, the water control valve on the hot side of the mix valve has failed.

	Only Hot Water Flows when Switch is On	• Check that the mix valve is not fully closed. A fully closed mix valve will only allow steaming water out to the hot water tap.
		• If the mix valve is open a full turn and a half and the water flow is still steaming and sputtering, the water control valve on the cold side of the mix valve has failed.
Electronics	All zones read LO	• Check to make sure the element breaker is ON. Zones will read LO until the temperature in that zone reaches 175° F.
	An individual zone reads LO	• Test the connections at the probe and display.
		• Test thermal overload (over temperature) switch
		• On machines built prior to 01-01-2011, Test the fuse for that zone. Test continuity between the ends to check for a blown fuse. Test that voltage from ground to the fuse reads 110v.
		• [DISCONNECT POWER TO THE MACHINE FOR THIS TEST] Test continuity from the heating element posts to ground, and the resistance between the posts.
		• If all these tests prove to be ok and the LED for the relay (on the power board inside the electrical box) is ON, then the relay has failed.
	An Individual Zone Reads HI or Above 250° F and the Corresponding Tank is Cooling	• Test the connections to the probe
		• Test probe for failure with ohm meter and compare reading to neighboring probe
	Tanks will Not Heat to Full Temperature	• Clean dust and debris from electronics box. Take a soft brush (clean paint brush) to loosen debris and use a small vacuum hose to remove loose debris.
	Cold Zone	• Solid State Relays can fail in either the ON or Off position
		TRAINED OR AUTHORIZED PERSONNEL ONLY:
		• Relay has failed in the ON position: The heating elements will not turn off and they will overheat to a point where the thermal overload switch will trip and break the circuit to the element. With power ON, test for voltage at the fuse:
		■ If voltage is present and the LED at the control board is not lit, then the relay has failed ON.
		■ If voltage is not present: TURN THE POWER OFF TO THE MACHINE and test element leads for continuity to ground and for resistance across the leads.
		• Relay has failed in the OFF position: Heating element turns off because of lack of signal. No other parts should be affected. Remember, when testing for voltage, the solid state relay requires some load to function. A failed open heating element, a tripped switch or a failed fuse will make a solid state relay appear to have failed or be OFF. If the LED at the relay is ON and there is no power at the relay:
		■ On machines built prior to 01-01-2011, Test the fuse
		■ Check the reset switch on the tank

		■ TURN THE POWER OFF TO THE MACHINE and test element leads for continuity to ground and for resistance across the leads.																					
		● If all of these tests are ok, the relay has failed OFF																					
	Display is Blank, No LEDS are lit	● If the red power switch is in the ON position and is NOT lit, there is lack of power to the machine. Check your circuit breaker. Check the wall plug if applicable.																					
		● If the red power switch is in the ON position and is lit, check that the lid of the electronics box is tightly secured to the box. There is pressure switch on the right side of the box which interrupts power to the electronics when the lid of the electronics box is loose or removed.																					
		● On machines built prior to 01-01-2011, If the power switch is lit, the safety switch is properly engaged, and the display is still dark. Either the low voltage transformer has failed (see voltage output table below), or the wires from the transformer to the display have been disconnected.																					
		● On machines built prior to 01-01-2011, Proper transformer voltages (to ground):																					
		Blue: 110v																					
		Red: 110v																					
		Grey: 12-15v																					
		Black: 12-15v																					
		The green wire is connected to ground and should have no voltage potential																					
Heating Elements	Testing Heating Elements	DISCONNECT MACHINE FROM POWER SUPPLY BEFORE TESTING																					
		● Test with an ohm meter across the element posts:																					
		<table> <tr> <th>Voltage</th><th>Wattage</th><th>Ohms</th></tr> <tr> <td>110v</td><td>700</td><td>15 to 19</td></tr> <tr> <td>110v</td><td>1000</td><td>11 to 13</td></tr> <tr> <td>220v</td><td>700</td><td>64 to 72</td></tr> <tr> <td>220v</td><td>2000</td><td>46 to 52 each loop</td></tr> <tr> <td>220v</td><td>4000</td><td>23 to 26 each loop</td></tr> <tr> <td>220v</td><td>5000</td><td>18 to 22 each loop</td></tr> </table>	Voltage	Wattage	Ohms	110v	700	15 to 19	110v	1000	11 to 13	220v	700	64 to 72	220v	2000	46 to 52 each loop	220v	4000	23 to 26 each loop	220v	5000	18 to 22 each loop
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		● Test the element post to the element body and you should not get a reading of any kind. If you get even a quick flash reading, remove element and inspect.																					
Leaks	Hot Water Tap	● If the drip is cold water, the water control valve on the cold side of the mix valve is leaking. Open and clean the cold water valve.																					
		● If the drip is warm or hot water, the water control valve on the hot side of the mix valve is leaking. Open and clean the hot water valve.																					
	Steam Wand	● A small amount of water will naturally accumulate in the steam wand between uses if it is allowed to cool. This is normal for any machine. Make a habit of purging the steam wand of all accumulated liquids before and directly after steaming a pitcher of milk.																					
		● If the steam wand constantly drips warm water and is warm to the touch even after an extended time without use, the valve will require a new seal. Obtain and install a steam valve rebuild kit from your dealer, service representative, or the Synesso™ factory.																					

		• Steam and/or water bubbling out from around the steam wand pivot ball indicates that the steam wand ball o-ring needs to be replaced. This o-ring is included in a steam valve rebuild kit. Machines produced before #510 will likely benefit from the new teflon o-ring, which provides an improved seal and wear resistance.
		• If water leaks from the space between the steam wand handle assembly and the side panel, o-rings on the brass pusher rod are worn and need to be replaced. These o-rings are included in the steam valve rebuild kit. The pusher rod can be accessed by removing the side panel and pulling the pusher out from the steam valve.
	Brew Groups	• A Leaking diffuser indicates the brew valve is not sealing properly. Open the valve and clean the sealing faces with a soft cloth. Inspect the valve for scale and calcium buildup.
		• If water bypasses the portafilter gasket and leaks out around the portafilter when properly engaged and brewing, the portafilter gasket will need to be cleaned. Use a soft brush and scrub any grounds from the surface of the gasket. Rinse with hot water. If the issue persists, replace the portafilter gasket.
	General / Nondescript	• Dirty / brown water under the machine indicates the drain box is clogged or overloaded. Remove the right side panel and clear any obstructions in the drain box. Be sure the drain hose has an even, steady slope toward the floor drain. Kinks, dips, or flat runs will slow or stop the flow of waste water from the machine drain.
		• A small amount of water may splash between frame panels during a steam wand purge, or when rinsing the drip pan. The water will then drip onto the countertop or frame of the machine. This is normal.
		• Clean water under the machine or on top of the electrical box indicates an internal leak. Remove the side panels and facias until the source of the leak is determined. Contact your dealer, service representative, or the Synesso™ factory for more info on fixing your specific leak.
	Vacuum Breaker	• Normal for the VB to sputter until the steam tank is near full pressure. • If sputtering continues, replace it.
Volumetric System	VMUF0# error	• The flowmeter has detected flow when not brewing a shot. this can indicate a leak in the brew system. Check brew valves and visually inspect brew system.
General	Coffee Crema is Thin with Large Bubbles & Tastes Astringent	• Grinder burrs are dull. Replace immediately
		• Coffee is old
		• Brew temperature may be set too low
	Beeping machine	• Low Water error (STLW01). See page 31 “steam tank not filling”
	Portafilter	• Portafilter “ears” will wear over time allowing the handle to swing further before the basket is fully engaged. Use of taller gaskets (8.5mm or even 9.0mm) will extend the usable life of the portafilter. Ask your dealer, service provider, or the Synesso™ factory for more info.
	Diffuser Screen is Loose	• This is most likely caused by over filling the portafilter basket with coffee. This causes the expanding coffee puck to push against the diffuser and bend the screw contact point away from the screw.