SYNESSO

Technical Manual

Synesso™, Inc.
309 S. Cloverdale, C41/ Seattle, WA 98108
tel. 206.764.0600 / fax 206.764.0601
www.Synesso.com / info@Synesso.com

This Service Manual is intended for use by
qualified service technicians only.

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SAFETY AND TOOLS

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. Please note and follow the safety stickers on the machine.

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 (the steam boiler can be depressurized by opening both steam wands, and the coffee boilers can be depressurized by shutting off the water and heating element breaker and turning the group top to the pre-infuse position.

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.

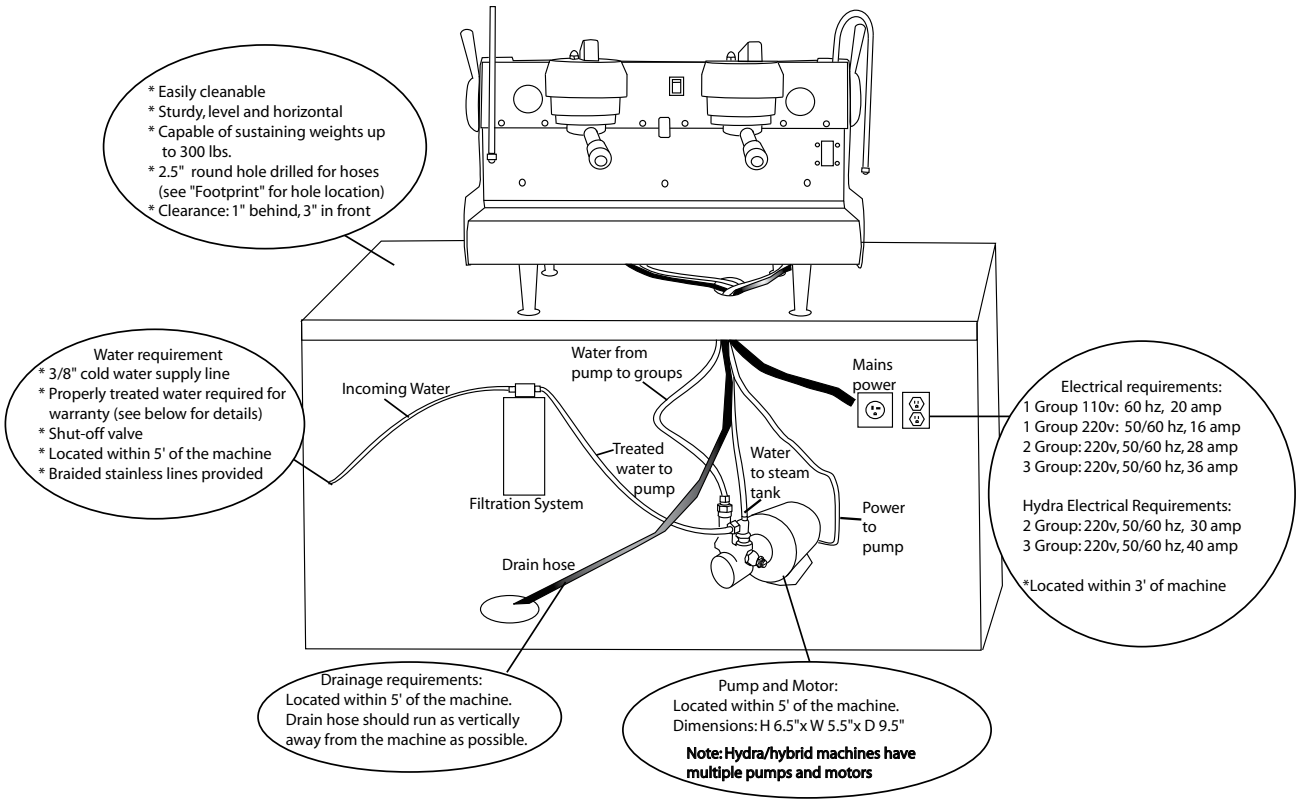
Tools and recommended Items required to fully diagnose, service and maintain Synesso™ machines

- Multi Meter – reads volts, amps and ohms. The Fluke T5-600 is an excellent tool
- 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
- Flair 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" is for the brass flow jet, 9/64" for the brew valves, 1/4" for steam valve seat

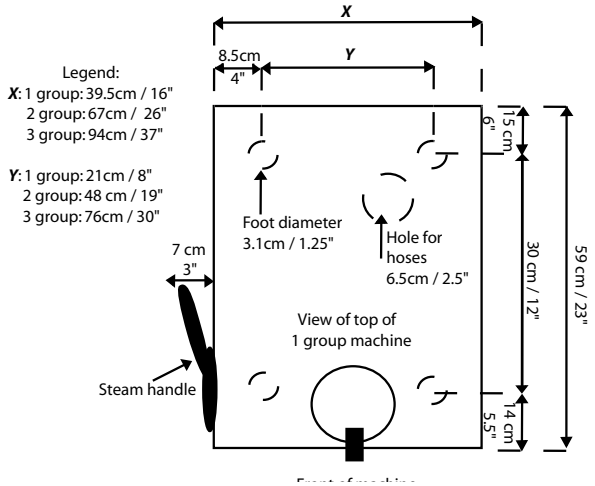
- Wrenches: 11/32, 1/4, 5/16, 3/8, 7/16, 1/2, 9/16 , 5/8, 11/16, 3/4, 12mm & 7mm + 1 extra 9/16 and 5/8
- Large, Medium and Small Adjustable Wrenches (Crescent Wrenches)
- Pliers: Channel Lock, Standard and Side Cutters
- Philips Head Screwdrivers: #2 short, #2 long and #1
- Flat Head Screwdrivers: #2 short, #2 medium, #2 long, #1 and large screwdriver to use as a pry bar
- Pen and paper
- Hand cleaner
- Towels

SYNESSO

INSTALLATION DIAGRAM



MACHINE FOOTPRINT



Legend:
X: 1 group: 39.5cm / 16"
2 group: 67cm / 26"
3 group: 94cm / 37"

Y: 1 group: 21cm / 8"
2 group: 48 cm / 19"
3 group: 76cm / 30"

INSTALLATION

Water Requirements

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 periodic water tests may be 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 pH to 8 pH
Chloride 0 ppm - any Chlorides can be corrosive and harmful
Total Alkalinity Less than 100 ppm
Chlorine 0 ppm
Iron 0 ppm

INSTALLATION

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

Site Preparation

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. of weight.

The surface depth should allow for a minimum clearance of 1” behind and 3” in front of the machine.

Make a 2 ½” round hole through the counter top, 4” from the back center of the machine. This should provide ample room for the hoses and electrical lines.

A 3/8” cold water supply line with a shut off valve is needed within 5’ of the machine, preferably located directly underneath the machine.

A proper water filtration or softening system must be installed on the incoming water supply. Water treatment systems will vary, and it is important to use a system designed to match the needs of your specific area. Most water filtration systems require periodic maintenance, including cartridge or filter replacement. This is vital to the proper functioning 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 water damage inside the machine causing scale and corrosion. **DAMAGE CAUSED BY IMPROPER WATER TREATMENT WILL NOT BE COVERED BY THE MACHINE WARRANTY**.

There must be adequate room under the counter to locate the motor and pump. This should be within 5’ of the cold water supply line. The pump should be easily accessible for potential adjustments and should have proper ventilation and a minimum of 3” clearance on all sides. Dimensions of the pump and motor are: 6 ½” Height x 5 ½” Width x 9 ½” Depth.

A floor drain or sink should be readily available. The best location is directly under the installation site of the machine. The drain hose should descend steeply for proper drainage.

An electrical receptacle and matching plug, rated at the proper voltage and amperage is required within 3’ of the location of the machine. Plug ends are not included with the machine. Below are the recommended cord plug ends for the Synesso™ machines:

- 1 Group, 110 V – UL-listed 20 amp
- 1 Group, 220 V – UL-listed 20 amp
- 2 Group, 220 V – UL-listed 30 amp
- 3 Group, 220 V – UL-listed 50 amp

Plumbing Instructions

This equipment is to be installed to comply with the applicable federal, state or local plumbing codes.

Connect the 3/8” compression fitting of the provided stainless steel braided hose to the connection from the filtered, cold water line.

The ¾” inside diameter clear vinyl ribbed hose connects the outlet fitting of the drain box to the drain (located on the right hand, bottom, rear corner). Run this hose to the floor drain or floor sink.

Fittings on the hoses are 3/8” compression type fittings, thread sealant or Teflon tape is not necessary. Make connections snug, but do not over tighten.
Turn water ON and check for leaks.

NOTE: The Synesso™ requires a minimum of 35 PSI of line pressure to have the steam tank auto-filling system function properly.

Electrical Instructions

After you make sure your receptacle and circuit are rated for the proper voltage and amperage (see specifications chart on page 9) for your model, install a matching plug on the power cord provided with the Synesso™ machine.

North American Configuration		**Outside of North America**	
Green	Ground	Green	Ground
White	110 V	White	220 V
Black	110 V	Black	Neutral

Make sure that the On/Off electronics switch (red rocker) and the heating element breaker on the Synesso™ are in the OFF (0) position, then plug the power cord into the receptacle.

IMPORTANT - If the voltage on the receptacle used is less than 210 Volts, it may be necessary to install an in-line Buck-Boost transformer to increase this voltage.

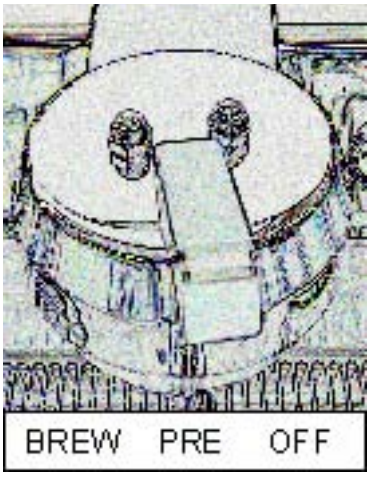
- 1 and 2 Group 220 Volt Machines require a 1.0 KVA transformer
- 3 Group 220 Volt Machines require a 1.5 KVA transformer.

Specifications for the Synesso™ Line of Semi Automatic Espresso Machines

Model	1 Group	1 Group	2 Group	3 Group
Voltage	110	220	220	220
Hertz	60	50 / 60	50 / 60	50 / 60
Amps - max draw	20	16	28	36
Brew and Steam Specifications:				
Watts per Element, Steam Tank	1000	1000 x 2	2000 x 2	2500 x 2
Total Steam Element Wattage	1000	2000	4000	5000
Steam Tank Capacity (Liters)	3.2	3.2	7.7	12.3
Watts per Element, Brew Tank	700	700	700 x 2	700 x 3
Brew Tank Capacities (Liters)	1.9	1.9	1.9 x 2	1.9 x 3
Machine Dimensions:	**Inches / mm**	**Inches / mm**	**Inches / mm**	**Inches / mm**
Height (Steam Wand 21", Handle 20.5")	18" / 457	18" / 457	18" / 457	18" / 457
Width (Steam Handle to Handle add 3")	18" / 457	18" / 457	29" / 736	40" / 1016
Depth	23" / 584	23" / 584	23" / 584	23" / 584
Weights & Dimensions:	**Lbs / Kgs**	**Lbs / Kgs**	**Lbs / Kgs**	**Lbs / Kgs**
Machine Weight, Empty	106 / 48	106 / 48	154 / 70	190 / 86
Machine Weight, Full of Water	115 / 52	115 / 52	173 / 77	215 / 98
Shipping Weight (approximate)	175 / 80	175 / 80	225 / 103	270 / 123
Boxed Dimensions: L" x W" x H"	20"x30"x31"	20"x30"x31"	41"x32"x31"	49"x32"x31"
Boxed Dimensions: L x W x H m/m	508x762x787	508x762x787	1042x762x787	1245x813x787
Plumbing (Compression)	3/8" OD	3/8" OD	3/8" OD	3/8" OD

- Certified by ETL for Sanitation to NSF / ANSI Standard 4
- Certified by ETL for Electrical Safety to ANSI / UL Standard 197
- Certified by ETL for Electrical Safety to CSA Standard C22.2 No. 109
- CE Compliant (By request)
- C-Tick Compliant (By request)

Start-Up Instructions



1. To fill the coffee brew tanks, turn the water ON.
2. Switch the 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. Turn the brew group to the BREW position, (see sketch on the right) allow the air to escape and return the brew group 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. Make sure the water level in the sight glass reads at least ½ full and then turn the heating element breaker to the ON or (1) position.
6. To adjust the pump pressure, activate the pump infusion by turning the brew group to the BREW position.
7. Locate and read the pump pressure on the brew gauge. The brew gauge is found on the right hand side of the brew group.
8. Set the pump pressure to 9 Bar. To do this, locate the pump adjusting screw on the right side of the brass pump housing. Loosen the lock nut and turn screw with a screwdriver.
    - Clockwise to INCREASE pressure
    - Counterclockwise to DECREASE pressure
9. Please allow at least ½ hour of "warm up" time before using your Synesso™ espresso machine to brew shots or steam milk. The steam gauge, located on the left side of the first brew group, should read a minimum of 1.1 Bar.

INSTALLATION

Unplugging EMC Compliant Machines
(C-Tick for Australia and NZ, CE for Europe)

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**

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 componentry.

Water requirements:

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. Good water treatment systems will remove tastes and odors as well as particulate matter that can block valves and cause issues with the machine. Hard water will cause scale to develop inside the machine which adversely affect the water flow and heating processes, so it is vital to have water hardness in the recommended range. It is important to note that many municipalities change their water sources throughout the year, so additional water tests may become necessary.

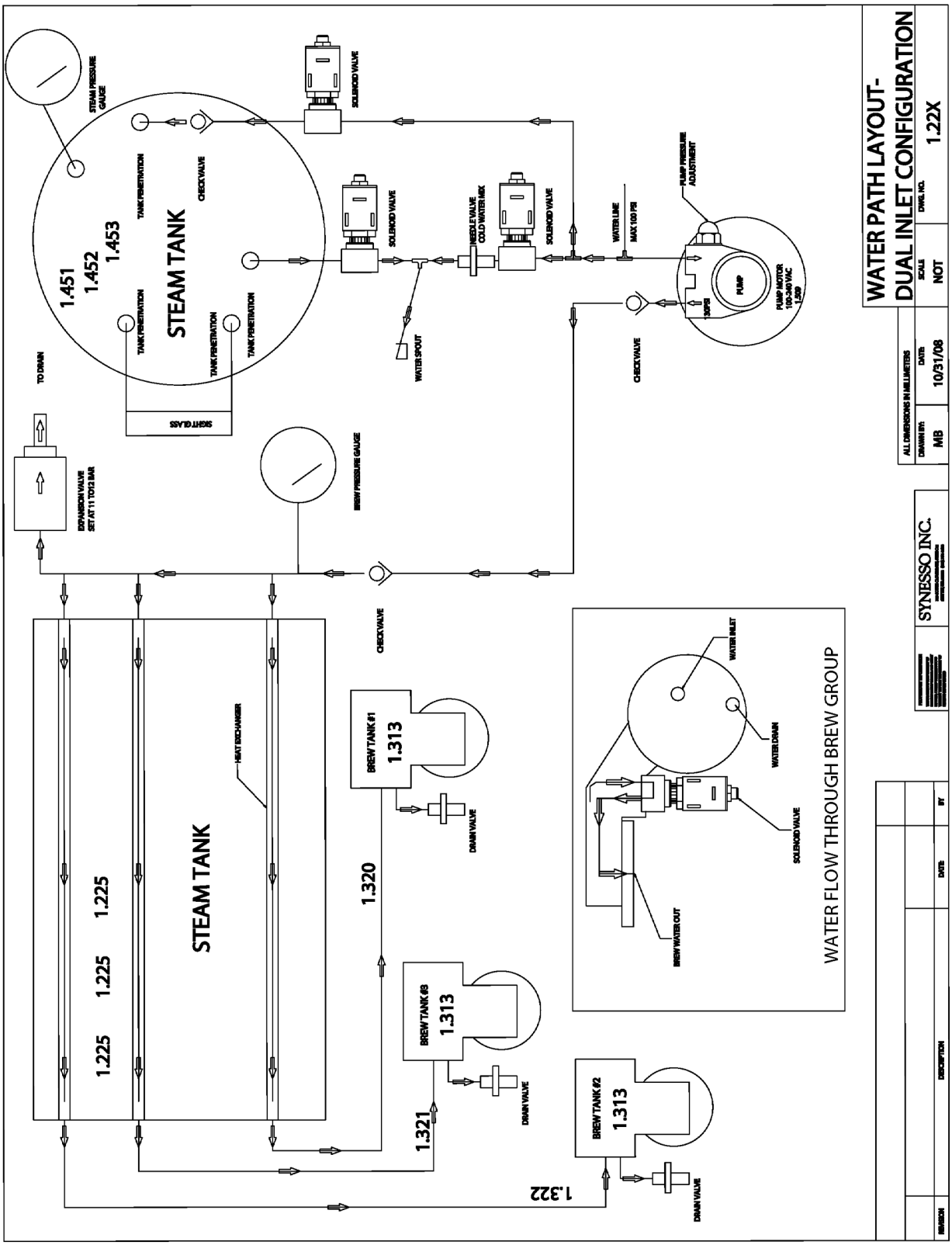
Water Standards to keep your warranty valid:
Total Dissolved Solids (TDS) 30 to 200 ppm (parts per million)
Total Hardness -(in ppm) Less than 85 ppm
Total Hardness – (in grains per gallon) 3 to 5 grains (divide ppm by 17.1 to get gpg)
pH 6 pH to 8 pH – above 8 is very harmful
Chloride 0 ppm – any Chlorides can be corrosive and harmful
Total Alkalinity Less than 100 ppm
Chlorine 0 ppm
Iron 0 ppm

Synesso™s utilize 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 be connected 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.

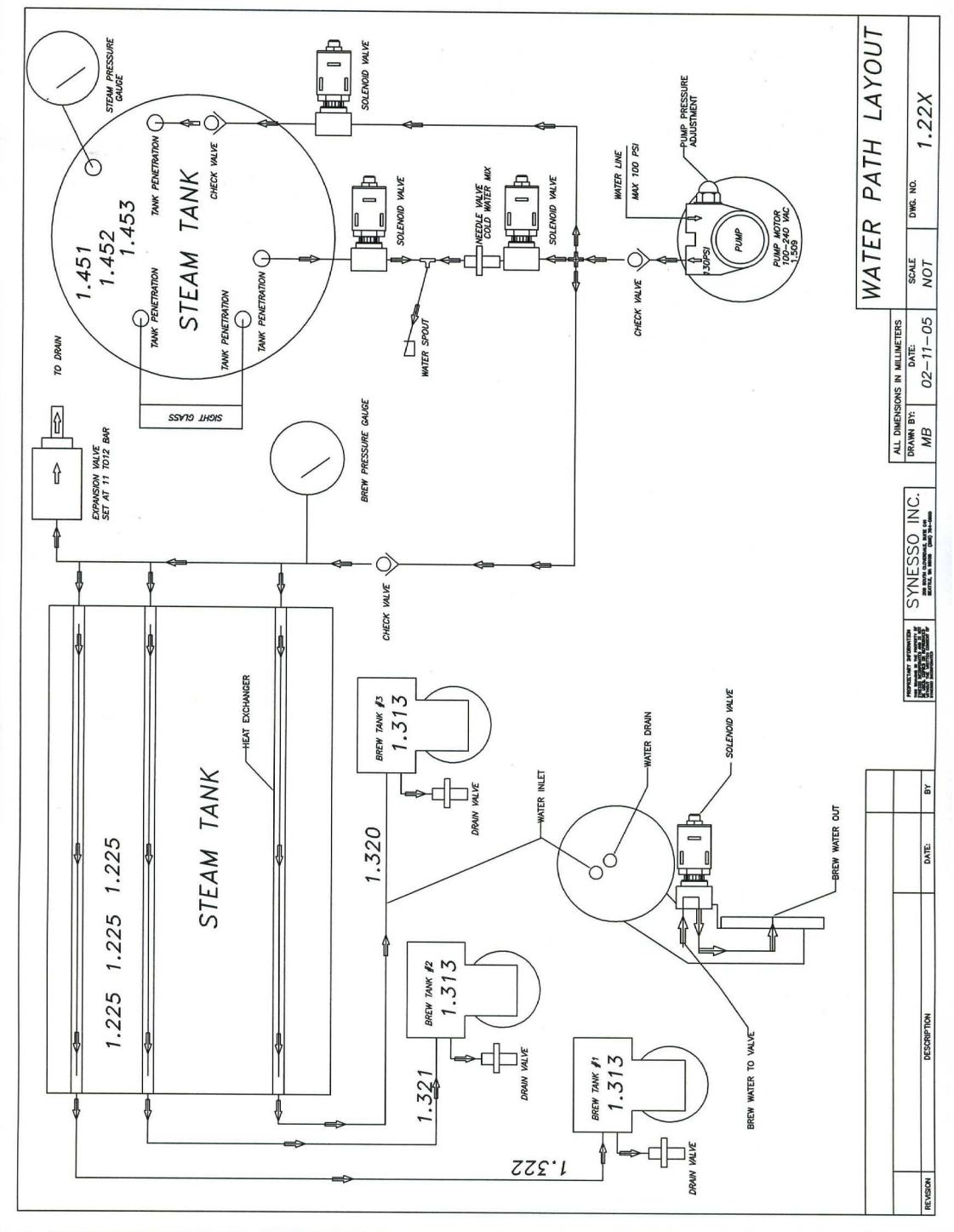
On dual inlet machines, the water splits off at the pump: the water for the coffee boiler goes through the pump and the water for the steam boiler splits off and goes through a separate line to fill the steam boiler. The next 3 pages show the dual, single, and Hydra inlet water paths.

HYDRAULIC SCHEMATIC--DUAL INLET

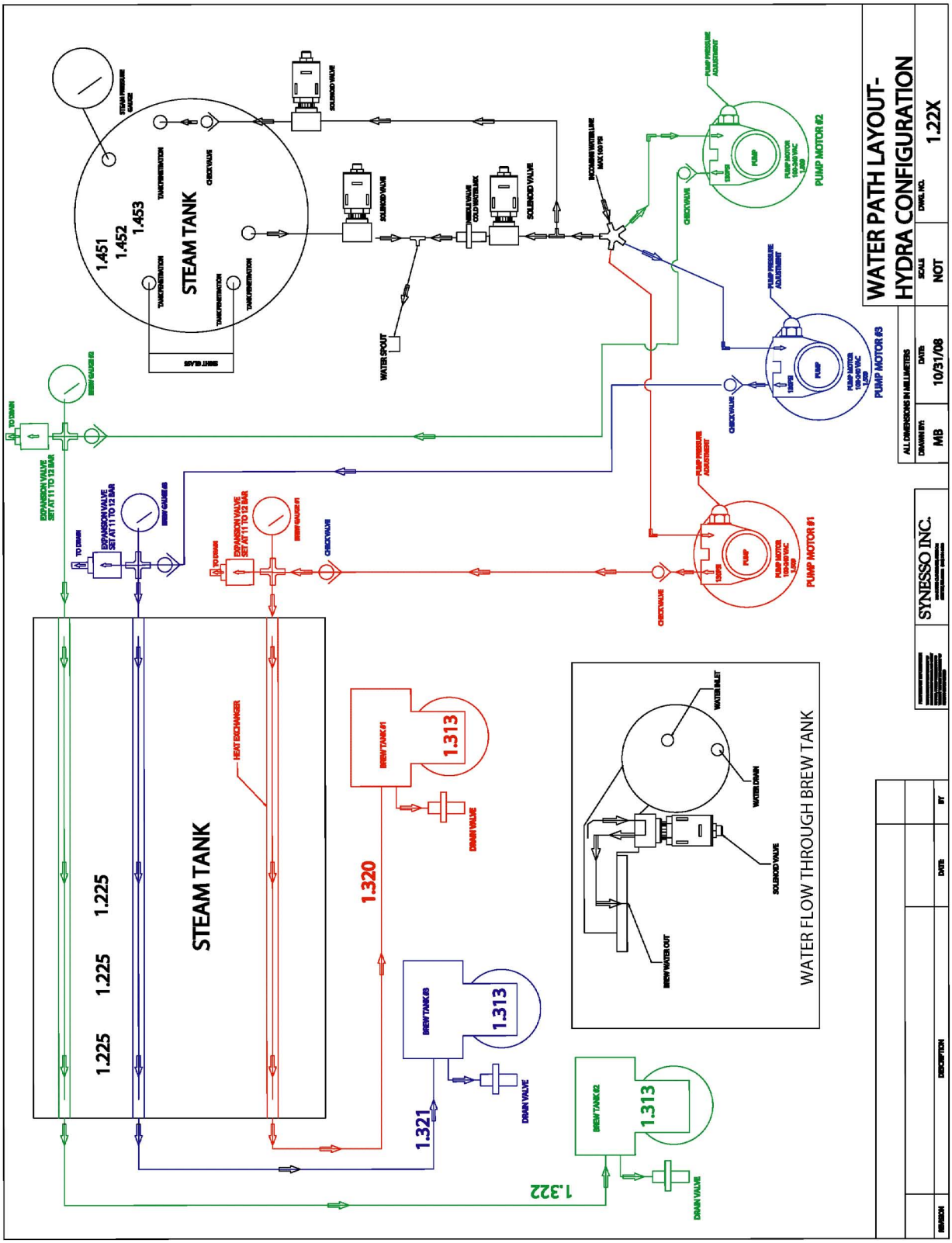


HYDRAULIC SYSTEM

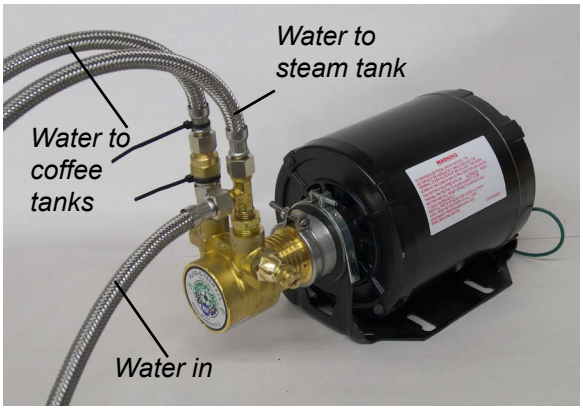
HYDRAULIC SCHEMATIC--SINGLE INLET



HYDRAULIC SCHEMATIC--HYDRA



HYDRAULIC SYSTEM

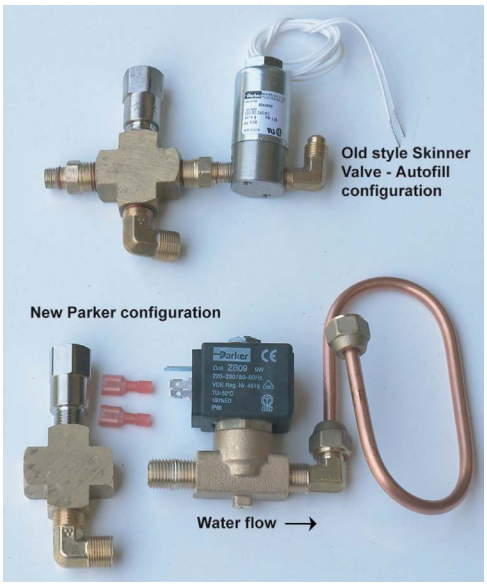


Pump and Motor:

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™s 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.



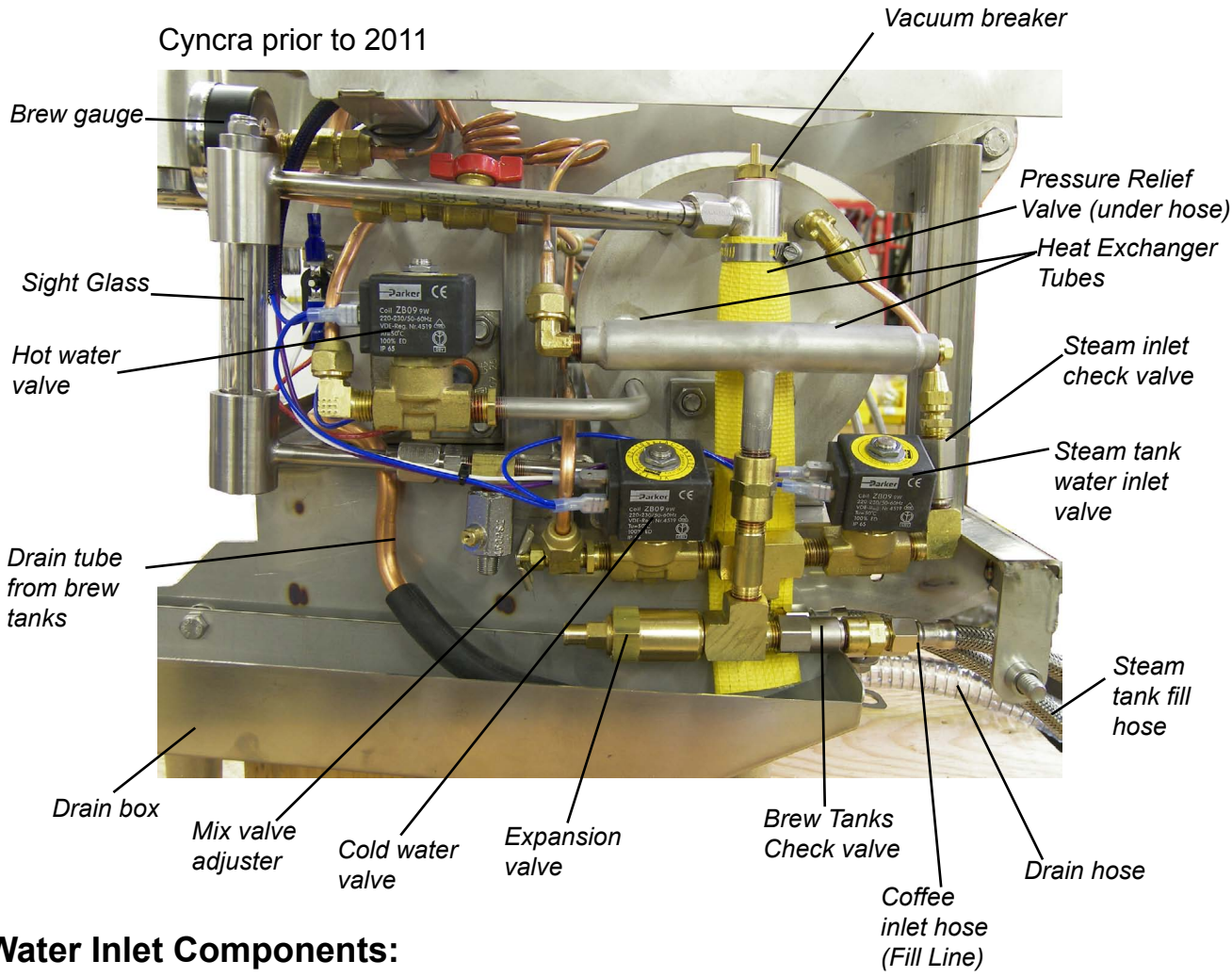
Water Inlet control valves:

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 Synes-

Major Components of the Water Inlet System



Water Inlet Components:

Brew Gauge:

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

Brew Tank Check Valve:

Check valves prevent water from going the wrong way in the hydraulic system. Water flow should only go one direction and the check valve ensures that pressuized water from inside the tanks cannot overwhelm the incoming water pressure and go backwards.

Coffee Inlet Fill Line:(Single inlet and Hydra machines would have this line only)

Supplies the brew tanks with water, passing first through the heat exchangers.

Water Inlet Components (cont.):

Drain box:

Water flows into this box prior to going through the drain hose to the floor drain. It is important to periodically pour small quantities of hot water down this drain box to clear any build up of coffee oils inside the box.

Drain Hose:

Waste water and some grounds go down this tube to the drain. It's important to keep this free of clogs and maintain a steeply 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. It also is directly connected to the drain system on the left hand group, allowing the user to drain the left tank easily after depressurizing the system.

Expansion valve:

The brew tanks are completely saturated with water. As the tanks heat, the pressure increases within the tank.The expansion valve allows this pressurizing 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 counter clockwise to decrease.

Heat Exchanger tubes:

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

Cold Water Valve:

Synesso™ has 2 valves which provide water to the Americano (tea) spout: the hot water valve and the cold water valve. The cold water input allows the user to moderate the temperature at the spout to make drinks appropriate temperatures for their customers.

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 butterfly valve allows the user to increase or decrease the amount of cold water (from the cw valve above) going to the Americano (tea) spout. Turning this valve completely clockwise shuts the cold water off, while turning it counter-clockwise allows more cold water in. Synesso™ sets machines to have a steady flow of water, at approximately 203° F in bench test.

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 would direct any releases to the drain box, minimizing spray on the electronic valves.

Water Inlet Components (cont.):

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 about 1/2 to 2/3 full during normal operation. This is a safety feature which enables the user to ensure that they have sufficient water levels in their steam system.

Steam Inlet Check Valve:

See Brew tanks check valve description. (Page 17).

Steam Inlet Water Control Valve:

When the *upper level probe* detects an absence of water, it sends a signal to the CPU to open this valve and allow water into the steam tank. The water then fills the tank until the probe grounds out on the water, and the valve is then closed.

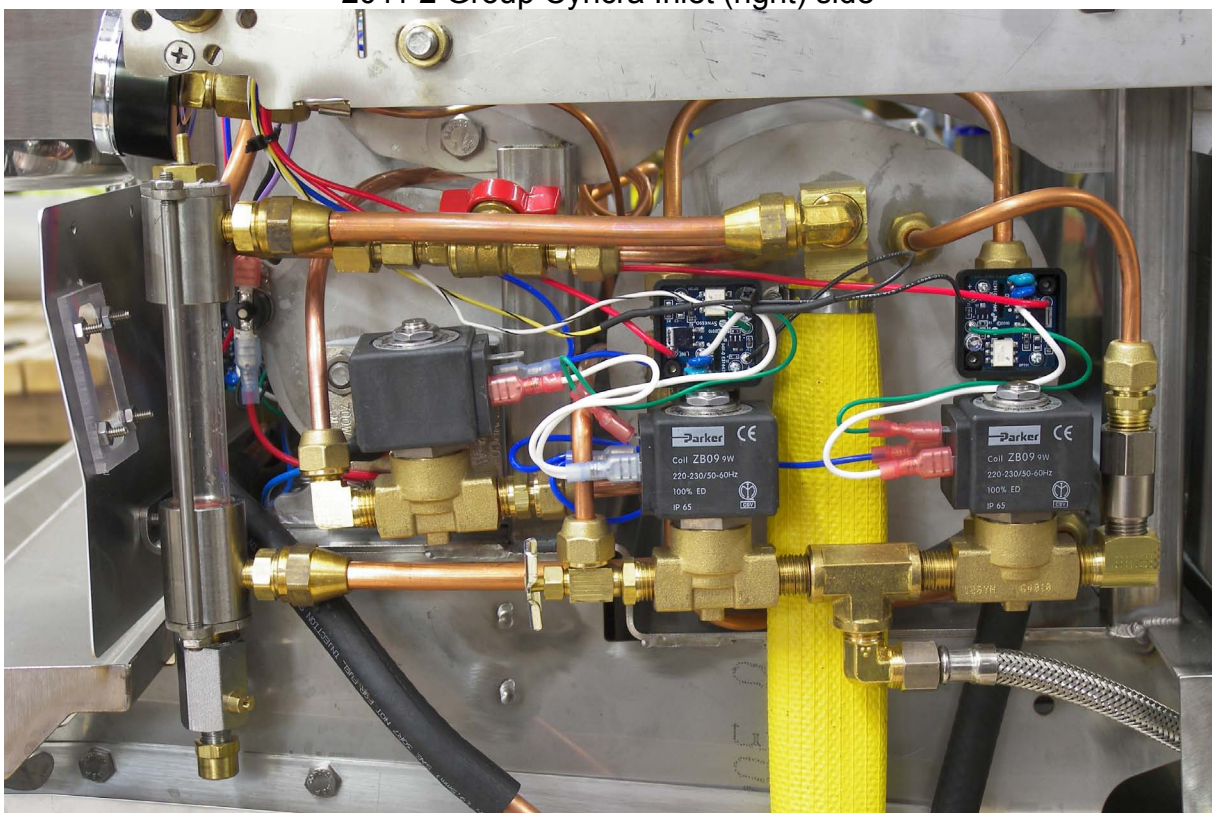
Steam Tank Inlet Fill Line: (*Dual inlet machines only*)

This is the incoming 3/8” steel braided line which supplies the steam tank with water.

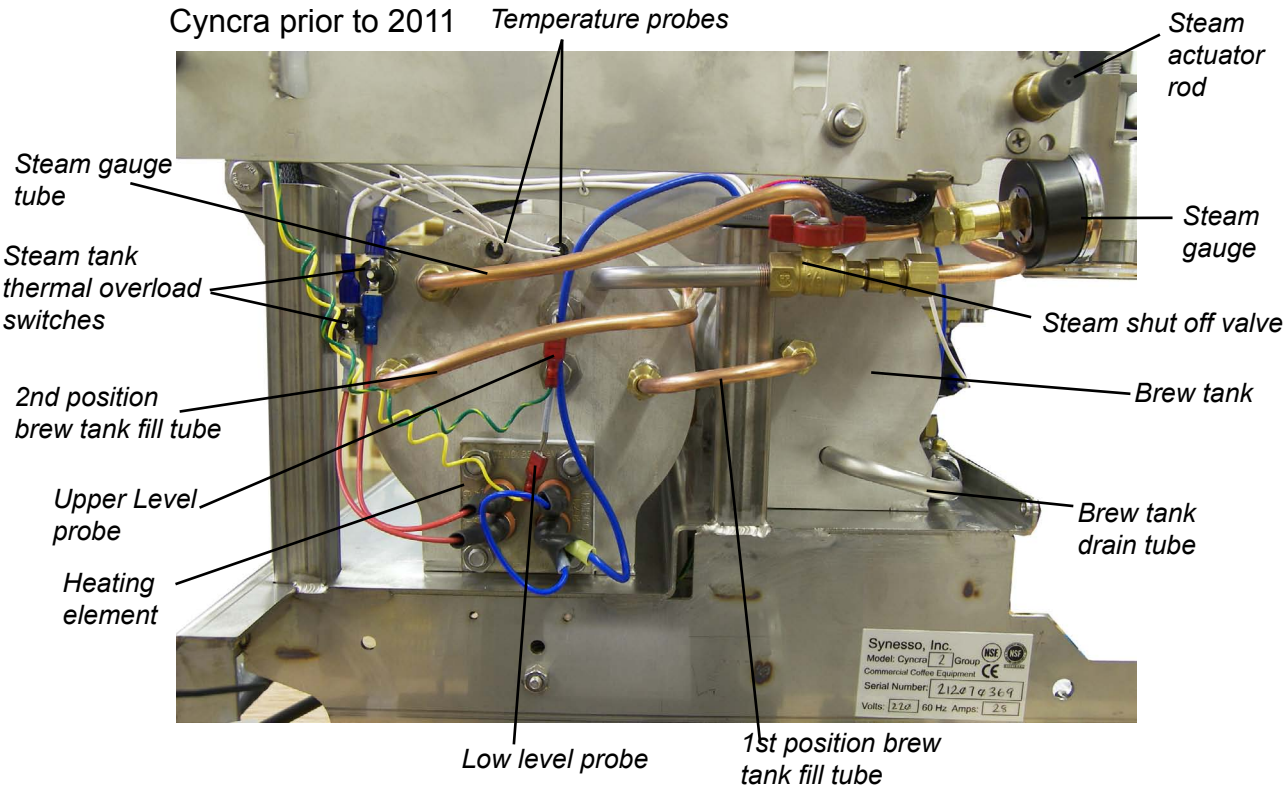
Vacuum breaker:

Allows steam pressure to build above atmospheric pressure. As the element heats the water in the steam tank, the pressure from the steam pushes an internal rod and o-ring up, sealing the steam inside the tank. Pressure continues to build until the temperature probes sense the temperatures are to the set points, then keeps this pressure inside for use in heating milk, maintaining a hot water supply, and pre-heating the brew water in the *heat exchanger tubes*.

2011 2 Group Cyncra Inlet (right) side



Major Components of the Water Outlet (Left) Side



1st and 2nd position brew tank fill tubes:

After travelling through the steam boiler, the heat exchangers exit on the left side of the machine and copper tube (these were stainless steel until serial number 352) deliver the pre-heated water to the brew tanks.

Brew tank:

Synesso™'s brew tanks are solid stainless steel, welded internally and externally in order to be leak-proof and thermally stable. Each brew tank has its own isolated system from the water inlet. This allows the user to set different temperatures on each group, as well as function without a group in the system if something has gone wrong with a group. There is a 3-way brew valve which controls the flow of water to the group head.

Brew tank drain tube:

Each group head is fitted with a drain tube to easily drain the tank. In order to drain a brew group, remove the pressure from the brew groups by turning off the water, cycling through the control panel to the Temperature Display screen on menu level 2. Turn the Brew Valve setting to ON which will allow a small amount of water to run out of the groups. Once the water stops, select NORMAL on the Brew Valve control line. Remove the 1/2" plug fitting on the end of the drain and attach a 3/8" rubber line to drain the water into the drain pan. Set the Brew valve control back to ON to completely drain the tank.

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.

Water Outlet Components (cont.):

Low level probe:

This probe detects when the water has dropped below the level of the probe in the tank. It sends a signal to the CPU which immediately cuts power to the heating element, registers an “STLW00” error on the display and begins an audible alarm to alert the operator to the problem.

Steam actuator rod:

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

Steam gauge:

Displays the amount of steam pressure in the steam tank. The gauge reads between 0 and 4 bar (0-60psi) and normal operating pressure is 1.5 bar. The pressure is set to 1.3 in test.

Steam shut-off valve:

Safety device for service agents: turning this ball valve shuts off steam to the valve for protection during repairs.

Steam tube:

Delivers steam from the upper part of 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.

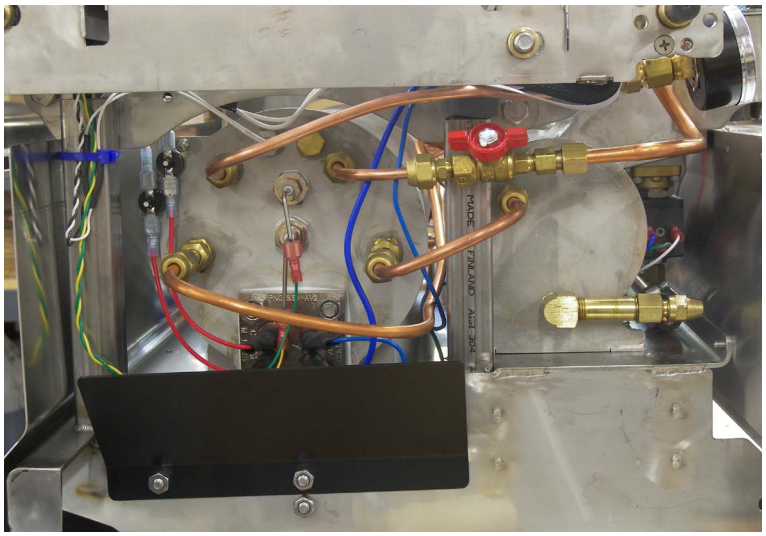
Thermal probes:

2K ohm probes have been part of the Synesso™ machines since serial number 229 (prior to this, 100 ohm probes were standard). These probes are highly sensitive and send thermal data to the PID controller to control the temperature within the steam tank.

High level probe:

Detects whether the desired water level has been reached. A small amount of Voltage in Alternating Currents (VAC) travels through this probe in an open circuit. When water touches the probe, the circuit is closed (grounded) and the *steam inlet water control valve* closes. Both probes are adjustable by turning the entire probe clockwise to increase or counter-clockwise to decrease the water level. The bend in the probe is identical inside the tank, so the level of the water inside is where the probe connects to the wire on the outside.

2011 3 Group Cyncra outlet (left) side



Electrical System

The electrical system in a Synesso™ is relatively straighforward. 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.

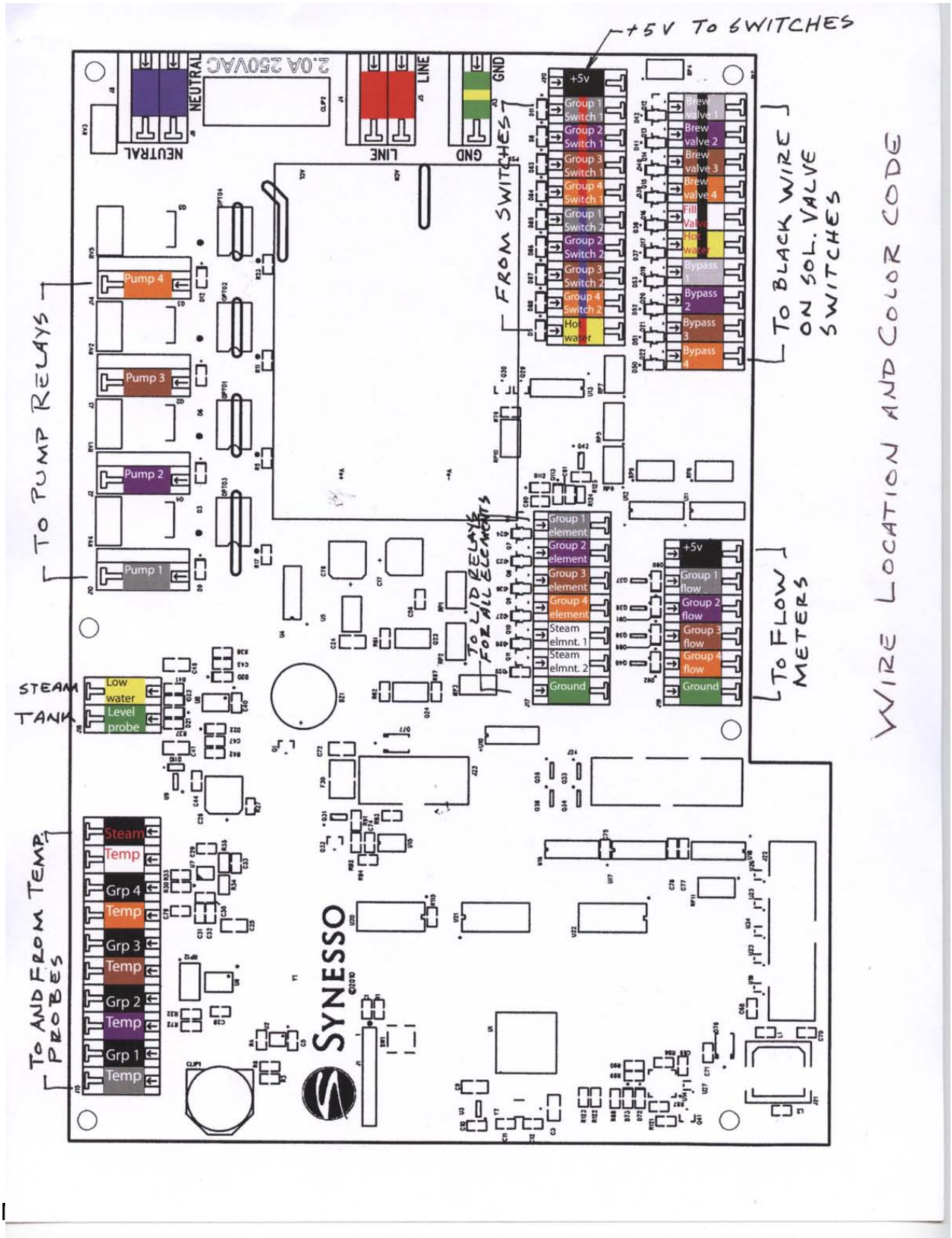
The major components of the electrical system can be broken down into the following functional categories:

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 an various parts of the CPU, rocker and brew/preinfusion switches, pump and motor)
3. Operator feedback (visual display)

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

Electrical System

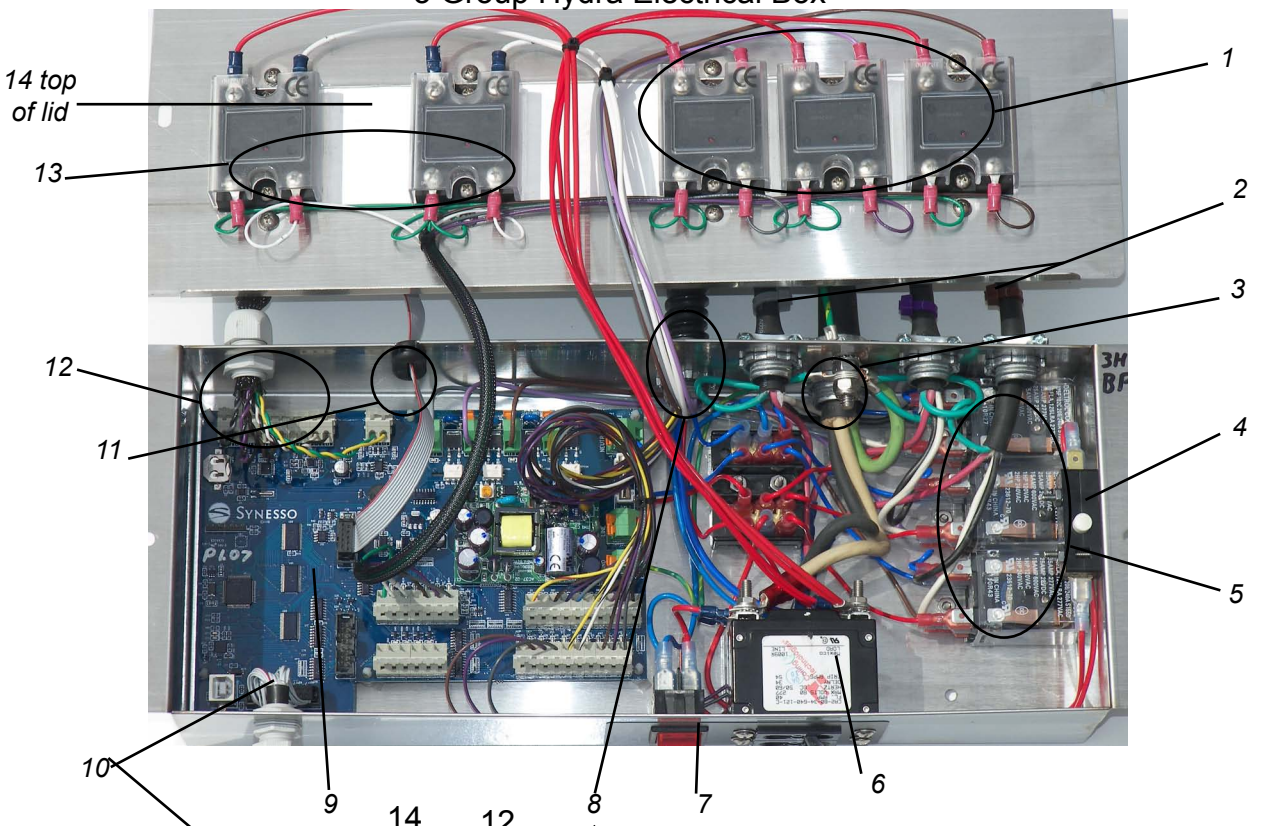
Wiring schematic

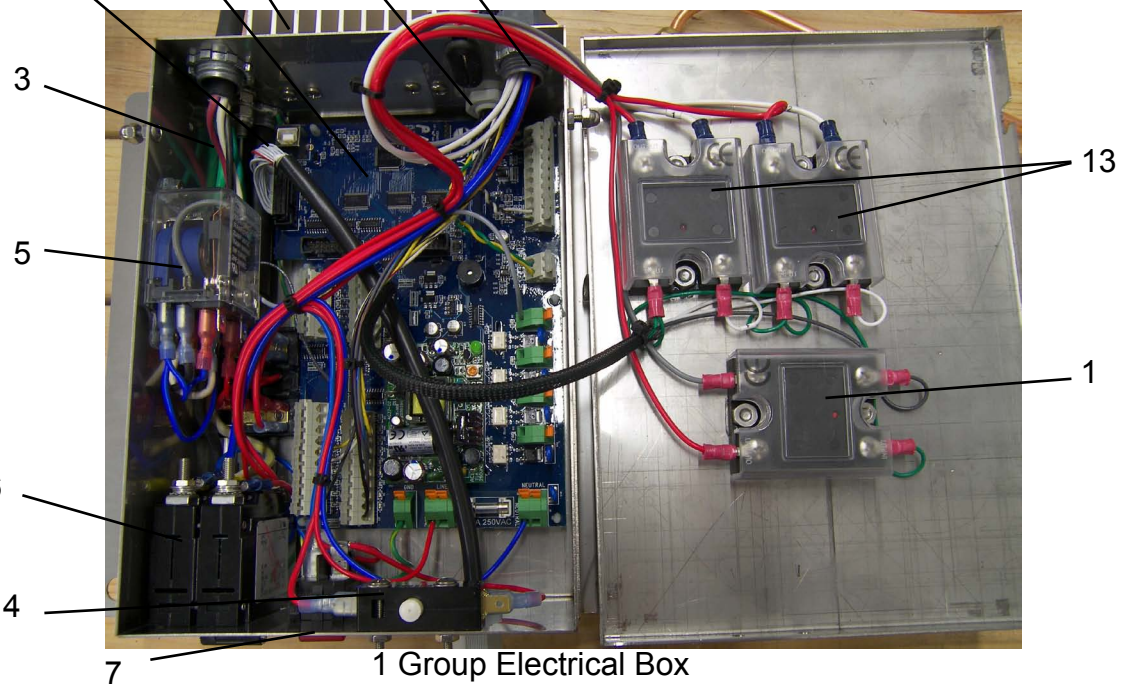


ELECTRICAL BOX:

The electronics box, located underneath the machine, contains all the incoming and outgoing power to the Synesso™. Since the 2 boxes represented below (top: 3 group box, bottom 1 group) 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

1. Brew relays:
Control voltage to the brew tank heating elements.

2. Pump wires:
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:
Safety device which cuts power to the control board when the lid is removed.

5. Pump relays:
Controls voltage to the pump motors.

6. Element breaker:
Controls voltage to all heating elements in the machine.

7. Electronics power switch:
Turns the machine off and on. If the machine is plugged into an electrical source, the light will be lit red in the “On” position.

8. Conduit Tube:
Tube containing power and signal lines to elements, switches and valves.

9. *Power board:*
Controls heating elements, valves and level/fill system.

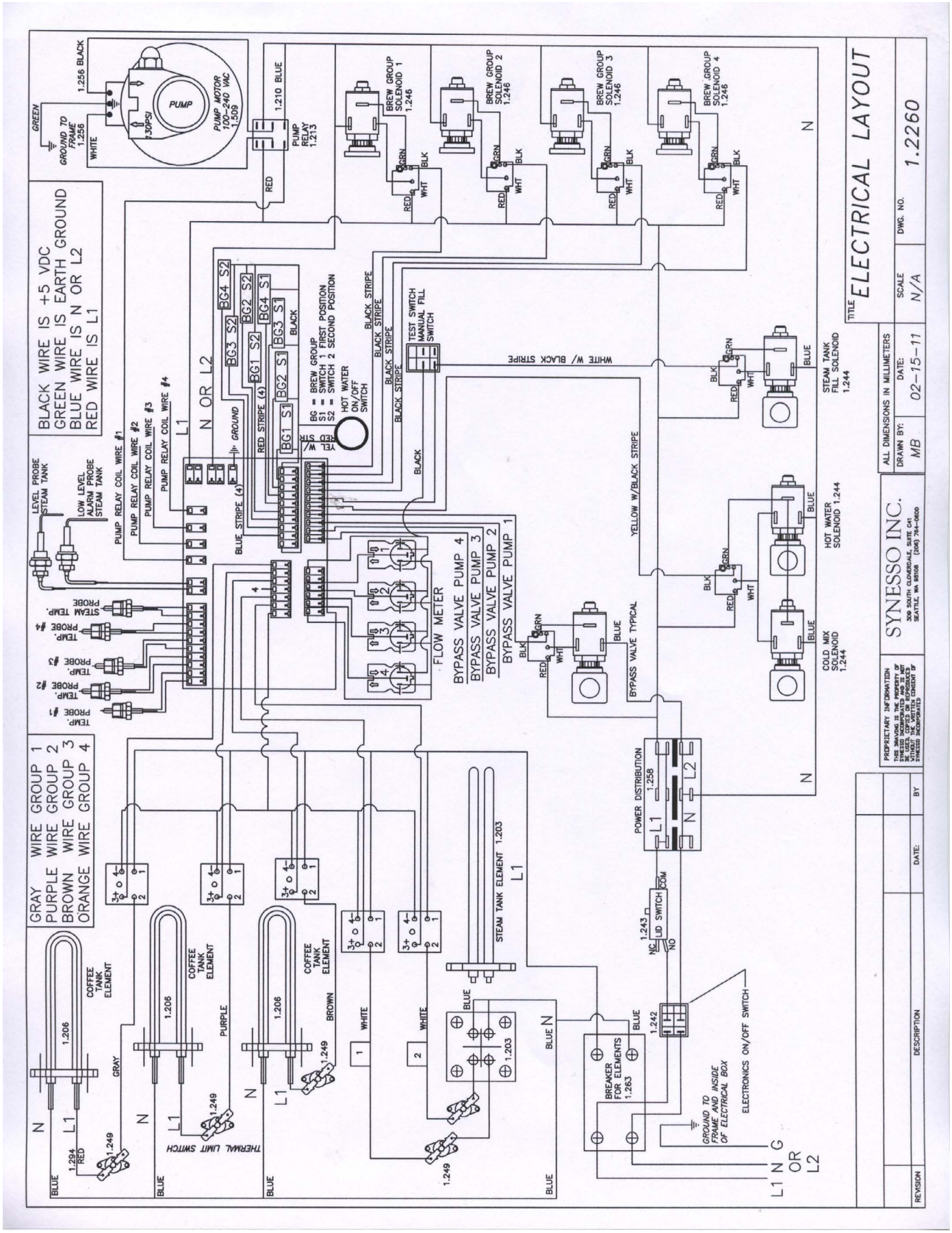
10. Ribbon cable:
Transfers signals from display board to power board. Volumetrics and shot timers use additional ribbon cables.

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:
Controls voltage to steam tank heating elements. Located on lid.

14. *Heat sink:*
Dissipates heat produced by the element relays. Located on lid.


ELECTRICAL LAYOUT
SYNESSO INC.
1.2260
BLACK WIRE IS +5 VDC
GREEN WIRE IS EARTH GROUND
BLUE WIRE IS N OR L2
RED WIRE IS L1
GRAY WIRE GROUP 1
PURPLE WIRE GROUP 2
BROWN WIRE GROUP 3
ORANGE WIRE GROUP 4
PUMP
PUMP MOTOR 100-240 VAC 1.309
PUMP RELAY 1.213
BREW GROUP SOLENOID 1 1.246
BREW GROUP SOLENOID 2 1.246
BREW GROUP SOLENOID 3 1.246
BREW GROUP SOLENOID 4 1.246
HOT WATER ON/OFF SWITCH
TEST SWITCH MANUAL FILL SWITCH
FLOW METER
BYPASS VALVE PUMP 1
BYPASS VALVE PUMP 2
BYPASS VALVE PUMP 3
BYPASS VALVE PUMP 4
BYPASS VALVE TYPICAL
STEAM TANK FILL SOLENOID 1.244
HOT WATER SOLENOID 1.244
COLD MIX SOLENOID 1.244
STEAM TANK ELEMENT 1.203
COFFEE TANK ELEMENT 1.206
THERMAL LIMIT SWITCH 1.249
POWER DISTRIBUTION 1.258
LID SWITCH 1.243
BREAKER FOR ELEMENTS 1.263
ELECTRONICS ON/OFF SWITCH 1.242
GROUND TO FRAME 1.256
LEVEL PROBE STEAM TANK
LOW LEVEL ALARM PROBE STEAM TANK
TEMP. PROBE #1
TEMP. PROBE #2
TEMP. PROBE #3
TEMP. PROBE #4
STEAM TEMP. PROBE
PUMP RELAY COIL WIRE #1
PUMP RELAY COIL WIRE #2
PUMP RELAY COIL WIRE #3
PUMP RELAY COIL WIRE #4
BG = BREW GROUP
S1 = SWITCH 1 FIRST POSITION
S2 = SWITCH 2 SECOND POSITION
BLACK STRIPE
WHITE W/ BLACK STRIPE
YELLOW W/BLACK STRIPE
RED STRIPE (4)
BLUE STRIPE (4)
GROUND TO FRAME AND INSIDE OF ELECTRICAL BOX
L1 N G OR L2
PROPRIETARY INFORMATION
ALL DIMENSIONS IN MILLIMETERS
DRAWN BY: MB
DATE: 02-15-11
SCALE N/A
DWG. NO. 1.2260
REVISION
DESCRIPTION
DATE:
BY

Troubleshooting

General Notes:

Many problems can be prevented or minimized by installing the proper water filtration system, changing your filters often and regularly cleaning the dust and debris away from the pump motor and inside the electrical box.

Synesso™ recommends changing your portafilter gaskets every 3 to 4 months.
See the changing portafilter gaskets procedure on page 33.

Every nut, bolt, screw and connection is assembled using: Red Loctite, Blue Loctite or Food Grade Grease.

- Red Loctite: Seals very quickly and the seal is permanent until heated to at least 500° F. To release this sealant, the safest heat source is a Heat Shrink Gun.

- Blue Loctite: Seals quickly and holds firm but can be broken without the use of heat.

Red sealant is used on: pipe threads – all brass that is not connected to a copper tube and 6/32" threads
Blue sealant is used on: nuts, screws, and brass flow jets
Food Grade Grease is used on: all tube fittings (flared) stainless steel and brass, any moving parts (steam valves, steam wand, steam actuators, brew and pump switch rollers) and all stainless steel nuts and bolts 5/16" or larger – this will keep them from galling. Re-apply when disassembly and reassembly is needed.

****SPECIAL NOTE: VARIOUS TECH BULLETINS ARE REFERRED TO IN THE FOLLOWING TROUBLESHOOTING SECTION, I.E. "SEE TEST LEVEL PROBE," etc. PLEASE CONTACT Synesso™ TECH SUPPORT TO OBTAIN THESE AND ANY OTHER TECH BULLETINS YOU REQUIRE.****

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 is 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
	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.
	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.
	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 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. 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	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 stablility.
		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	Display temperature will climb during brewing as high temp 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.
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	● 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 has 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	● On machines built prior to 01-01-2011, Test zone 5 functionality: ■ Turn down the set point for zone 4 a few degrees below zone 5 ■ Turn up zone 5 by a few degrees and confirm that the temperature rises to the new set point. ■ If the temperature has risen, then zone 5 is functioning properly.
		● Test zone 4 functionality. See Test zone 5 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:
		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
		● 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.
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
	Vacuum breaker	● See Vacuum Breaker Explanation
	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.

Periodic Maintenance

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

Back-Flushing

On the current generation of Synesso™ machines, back-flushing can be programmed for Auto-Flush activation. For Auto-Flush activation, please refer to the programming section of the Owners Manual, page 21.

1.Replace the filter basket with the provided blind filter basket (a single solid basket without holes) in one of the portafilters.

2.Engage the portafilter in one of the brew groups, turn the head to the BREW position and leave it there for 10 seconds. Repeat several times (in Auto-Flush, the machine will turn the group head on and off automatically; for manual back-flushing, the operator must manually turn the group on for 10 seconds, then off for 10 seconds). This procedure should be performed on EACH brew group daily. This process forces water through the inlet tube and drain system.

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.

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.

2.Make sure the steam wands and tips are free of milk built-up. It is always best to clean the steam wand and tip after each use. Approved espresso industry cleaners can be used to help dissolve milk built-up.

3.The drip tray, drip tray grates, cup 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 insert springs before placing all items in the dishwasher.

Changing Portafilter Gaskets

Synesso™ uses an 8 mm gasket with grooves in the outside edge to help with ease of installation and to allow trapped air and water to escape without contacting the coffee.

1.Remove the diffuser screen and screw

2.Use a small Awl or a screw driver to pry the old gasket out, then clean the area thoroughly to remove any leftover gasket material

3.Install the new gasket, with bevel side up, using a small amount of food grade grease or vegetable oil

4.Work your way around the gasket pushing it up into place with the rounded end of a wrench.

5.Take the basket out of your portafilter and engage it to make the final "seat" of the gasket. Pull hard to make sure there is no air trapped above the gasket.

6.Install the diffuser screen and screw.

Periodic Maintenance

Maintenance Schedule

Daily

1.Back-flush each brew group a few times, without detergent.
2.Wipe down the entire machine.
3.Remove portafilters, baskets and springs, drip tray and grates, cup tray grates and clean thoroughly. These items are all dishwasher safe.
4.Slowly pour a pitcher of hot water down the drain.

Weekly

1.Back-flush each brew group using an espresso industry approved detergent.
2.Soak portafilters and the removed filter baskets in an approved espresso industry detergent and water solution overnight.
3.Rinse thoroughly before reassembling and using your portafilters.
4.Carefully remove screens from each brew group using a short handled screwdriver and soak in a similar solution as the portafilters.
5.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. Do NOT over-tighten the screws. Gently turn them until they are snug, but not past that point.

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, closely inspect diffuser screens and filter baskets – change if showing wear. Call an authorized repair representative to perform routine maintenance.
2.Check legal policies that may prohibit you from completing the next step before continuing further. (Australain operators most not open the electronics box).
Please disconnect machine from the power supply; Check inside the electronics box and gently remove any build up of dust or debris by using a soft brush and vacuum. It is also important to keep dust and debris out of the vented ends of your pump motor. Lack of airflow will shorten the life of the motor.

Important: Machine service and repair procedures must be performed by authorized service personnel.

Periodic Maintenance

**This is the form that Synesso™ uses when performing Preventative Maintenance visits.

Preventative Maintenance Visit Checklist

Customer: _____ Phone:_____ Date:_____
Serial Number: _____

Basic Service--Operational Inspection

- ❑ Inspect or rebuild steam valves
- ❑ Inspect or rebuild water control valves
- ❑ Clean, adjust, lube steam valve acutators
- ❑ Inspect all tube connections
- ❑ Retorque element flange
- ❑ Inspect drain system for leaks, clogs
- ❑ Lube & adjust roller switches
- ❑ Grease brass on brew switch threads
- ❑ Inspect and clean autofill probe
- ❑ Assess water hardness ___gpg
- ❑ Inspect for scale buildup
- ❑ Test brew pressure gauge
- ❑ Clean steam wand tips
- ❑ Check drain manifold hose connections

Electrical inspection

- ❑ Ensure electrical box is clean and dry
- ❑ Inspect & clean temp probe connections
- ❑ Check amp draw on all zones:
  Z1___ Z2___ Z3___ Z4___ Z5___

- ❑ <u>Replace the following parts:</u>
- ❑ Portafilter Gaskets 8.0 8.6 9.0
- ❑ Vacuum breaker ❑ VB o-ring
- ❑ Sight glass o-rings
- ❑ Hot water switch
- ❑ Diffuser screens
- ❑ Pump relay

<u>Inspect and replace if necessary:</u>

- ❑ Pump and motor
- ❑ Expansion valve ❑ EV rebuild
- ❑ Hot water tap aerator
- ❑ Braided steel hoses
- ❑ Steam tube ball valves

*A checkmark in a box indicates that this item was inspected, but not replaced. If a number is present in the box, that indicates the quantity of this part that was replaced.

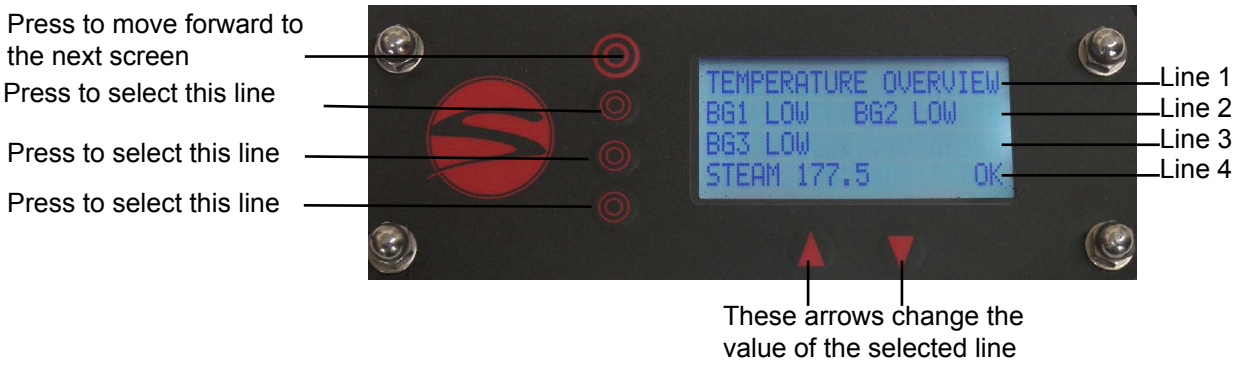
Other parts used:_____
Technician comments / Suggested maintenance: _____
_____
_____

PROGRAMMING

This programming manual applies to all Synesso machines after serial number 203111051. These machines have a hand held (wired) keypad, pictured below, to allow the user to comfortably view and change the machine settings. The machine must be on and at operating temperature to adjust the settings. 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.

In order to access menu level 2 - start on 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.

To reach menu level 3, On the 'Return to Operation Mode' screen of menu level 2, 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.



Line 1 indicates the screen title, in this case **Temperature Overview**.
Line 2 indicates the operable brew group(s) and the associated temperature(s).
Line 3 indicates the operations of brew groups 3 and 4, 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 ***set range*** of measurement (170F-270F / 76.6C-132.2C). If the BG1 heating element is on (element breaker in the left position) for longer than 15 minutes, and the indicator continues to read 'LOW', refer to the error indicator on line 4. Check Error Log Codes on page 26 if needed.

The lowest ***programmable*** temperature is 180F (82.2C) and the highest ***programmable*** temperature is 220F (104.4C). The factory set temperature is 203F (95C). To change brew groups' factory set temperatures, refer to page 21.

The steam tank reading on line 4 will normally read the factory default setting of 250F(121.1C). To change this temperature, see page 23.

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: AABB##), refer to the Error Log codes on page 26.

To cycle to the next display screen in the menu level, the 'BG 1 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 preinfusion) 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. See page 22 for more information.

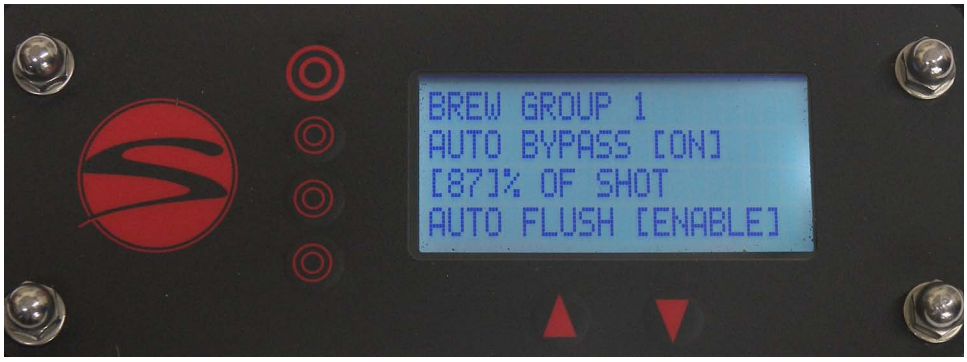
To change the temperature set point, press the button for **line 2**. The current temperature setting (203.0F) will begin to flash. To alter the temperature, press the '▲' or '▼' buttons until the desired temperature is reached. Press the button to the left of line 2 to confirm the temperature point. 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. Note, setting the Stage 1 timer to 00 will automatically set the Stage 2 timer, if present, to 00). Once the desired time is reached, press the line 3 button to save the 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 designated number of seconds for Stage 1 time have 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. Operating the bypass while the pump is running, as occurs in Stage 2, allows a settable, reduced pressure point between line pressure and pump pressure. To change the Stage 2 time, press the button for line 3. 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 next to 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 select the desired percentage, followed by the line 3 button once again to confirm the selection. The bypass will now turn on after the selected percentage of the shot is completed.

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 groups 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, 3, and 4, 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 tanks 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 point.

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.

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 next to line 1.

PROGRAMMING

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

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

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

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 next to line 1.

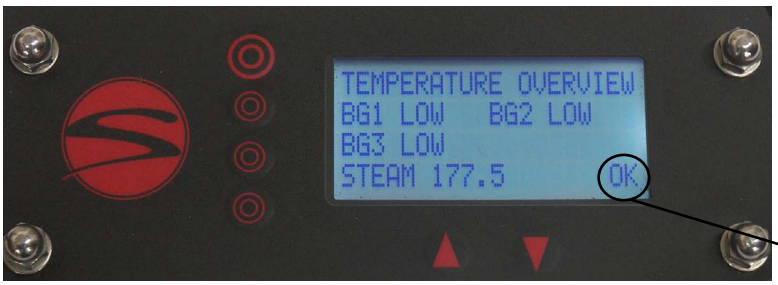
PROGRAMMING

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

Error codes are in this format: AABB##
AA = system code
BB = subsystem code
= group or section experiencing the issue

BR – Brew System Codes
BV – Brew Valve open time-out (valve has been held open for 5 minutes)
01 through 04 – groups 1-4
OT – Over-temperature (over 220F)
UT – Under-temperature (under 180F for 1 minute while group is trying to heat)
PR – Pump relay is on and timed out (relay coil has been on for 5 minutes)
BP – Bypass valve open time-out (valve has been held open for 5 minutes)

ST – Steam system Codes
LW – Low water probe is dry, meaning it is not in contact with water (an audible alarm will also sound)
FP – Fill probe is dry (water is not touching it) for 1 min (an audible alarm will also sound)
FV – Fill valve open time-out (valve has been held open for 5 minutes)
OT – Over temperature (over 270F)

VM – Volumetric system
UF – Unexpected flow while group is off (leaking or filling)

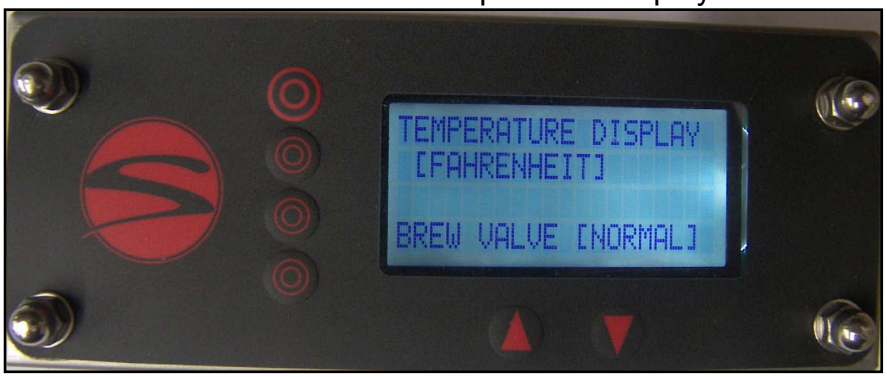
Example:
After manual back flush, group 2 was not returned to the Off position. After 5 minutes, the machine will register a **BRBV02** and a **BRPR02** error; which translate to “Brew System, Brew Valve Group 2” and “Brew System, Pump Relay is timed out, Group 2” errors. At this time the machine will 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

The machine must be on and at operating temperature to adjust the settings. There are 3 levels of programming: Level 1 programs, as discussed on the previous pages are also found in the Owners Manual. Level 2 and 3 will be discussed in the following pages.

Menu Level 2: Temperature Display

Line 1 O
Line 2 O
Line 3 O
Line 4 O



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 Valve(s) can be set to the [ON] or [NORMAL] position in order to help with draining the brew group(s) on volumetric machines. Setting the Brew Valve function to the [ON] indicator will activate the brew valve(s), 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 group(s) 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 group(s) 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 valve(s) 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 in order to operate fully.

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

PROGRAMMING

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.
Press the line 1 button to cycle to the next display screen.

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.

Press the line 1 button to cycle to the next display screen.

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.
Error log key
Logs are in format: AABB##
AA = system code
BB = subsystem code
= group or section effected

BR – Brew system
BV – Brew Valve open timeout (valve has been held open for 5 minutes)
01 through 04 – groups 1-4
OT – Over temp (over 220F (104.4C))
UT – Under temp (under 180F (82.2C) for 1 min while group is trying to heat)
PR – Pump relay on timeout (relay has been held open for 5 minutes)
BP – Bypass valve open timeout (valve has been held open for 5 minutes)

ST – Steam system
LW – Low water probe is dry (an audible alarm will also sound)
FP – Fill probe is dry for 1 min (an audible alarm will also sound)
FV – Fill valve open timeout (valve has been held open for 5 minutes)
OT – Over temp (over 270F (132.2C))

VM – Volumetric system
UF – Unexpected flow while group is off (leaking or filling)

Example:
After backflushing, group 2 was not returned to the off position. After 5 minutes, the machine registered a BRBV02 and a BRPR02 error. At that time the machine shut off both the brew valve and the pump relay to ensure they would 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

Menu Level 2: Return To Level 1

Line 1 and 2 indicate that you are on the Return To Operation Mode screen.
Pressing the line1 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.

In order to enter menu level 3, press and hold both the line 4 button and the ‘▲’ button at the same time, for approximately 4 seconds. Access to level 3 is only available from this screen.

PROGRAMMING

Menu Level 3: Volumetrics

The functioning of Volumetrics is only applicable on machines with volumetric hardware.
If the machine does have volumetric hardware, this indicator should always be left in the [ON] position.

PROGRAMMING

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 without first contacting Synesso™.

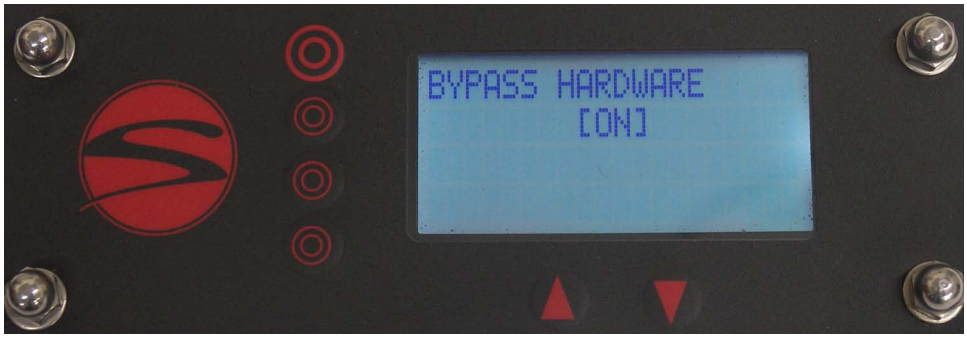
PROGRAMMING

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.

PROGRAMMING

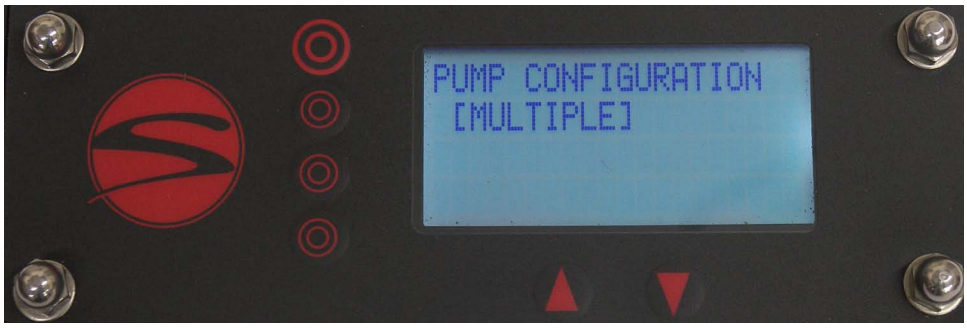
Menu Level 3: Bypass



The Bypass Hardware on the pump can be activated and deactivated from this screen. If your machine has the bypass capability, this program will be set to [ON], as indicated above.

PROGRAMMING

Menu Level 3: Hydra



The Pump Configuration screen gives the option of selecting between [SINGLE] pump use, or [MULTIPLE] pump use.

In the case of a Hydra, the pump configuration will be set to [MULTIPLE]. Otherwise it will be set to [SINGLE]. These selections will be set at the Synesso™ factory and should not need to be altered.

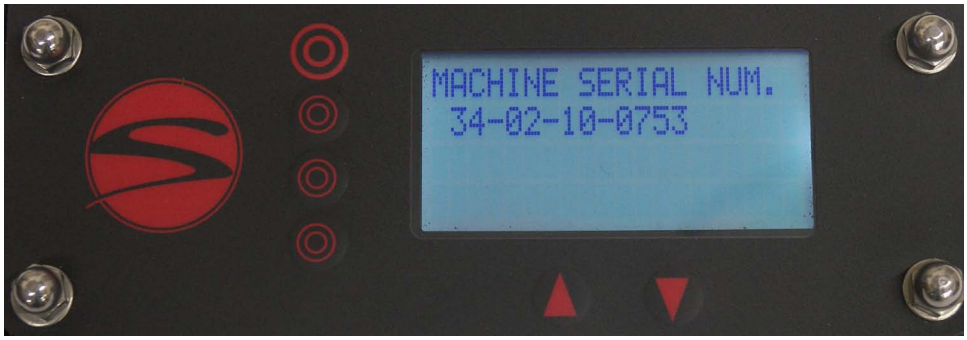
PROGRAMMING

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 level at which the P Gain (Proportional Gain) is set.
Line 3 indicates the level at which the I Gain (Integral Gain) is set.
Line 4 indicates the level at which the D Gain (Derivative Gain) is set.

PROGRAMMING

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 indicates the option to return to menu level 1's operation mode.
Line 3 indicates the option to return to menu level 2's settings mode.