



Brio "Easy Serving Espresso"

BASIC TECHNICAL MANUAL

THE CONTENTS OF THIS DOCUMENT ARE INTENDED FOR NECTA'S AFTER SALES PERSONNEL

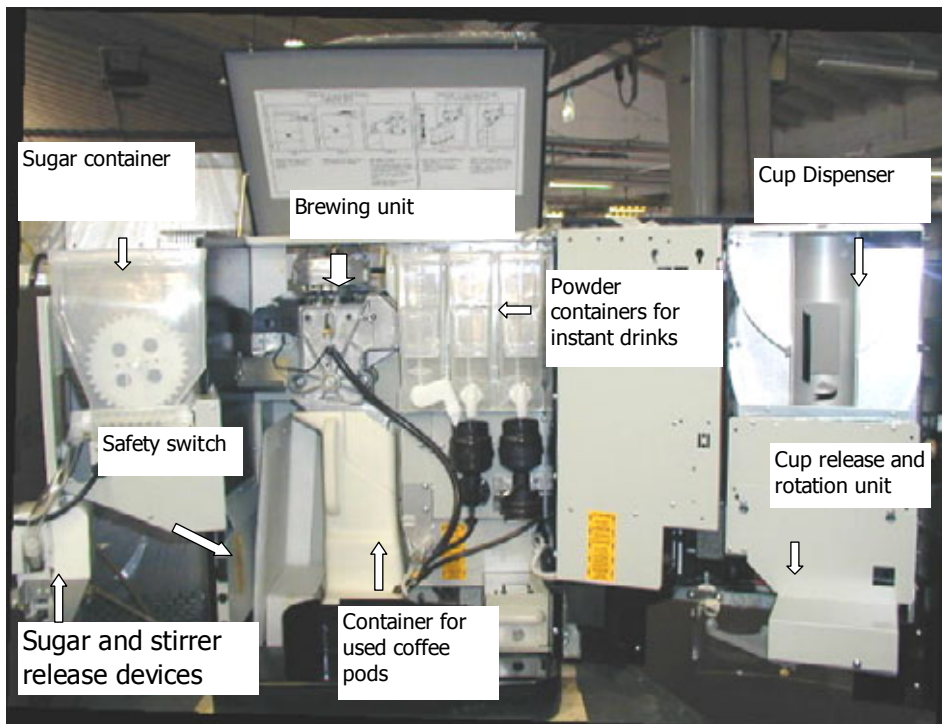
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NOTE

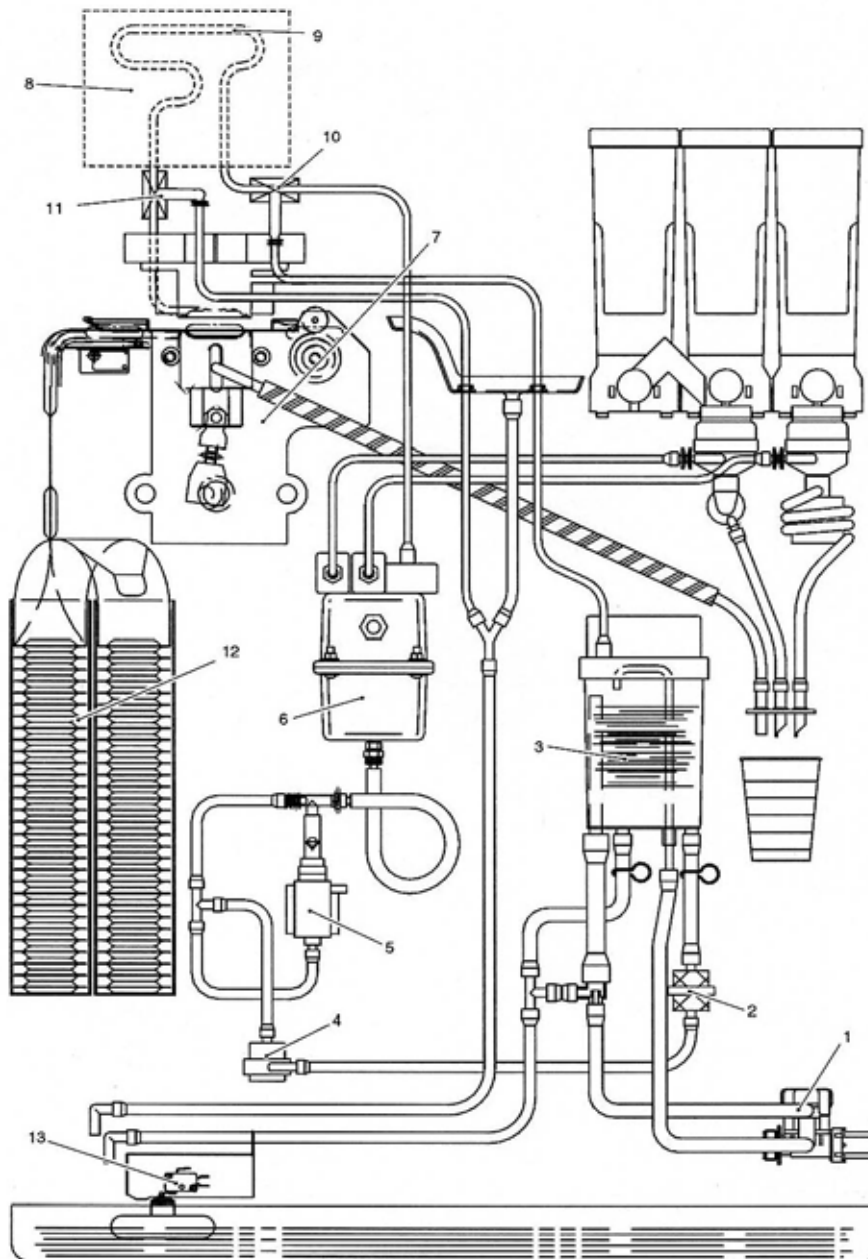
The above units are specific to this machine.

All functional units not mentioned are used also in other machines and are described as such in a separate manual specific to the relevant range of machines.



View of Brio "ESE" with door open

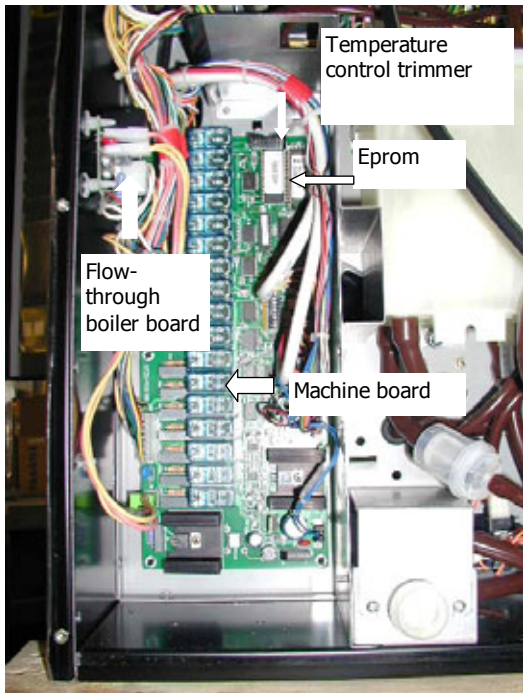
1 – HYDRAULIC LAYOUT



1	Water inlet solenoid valve	8	"Flow-through" Espresso boiler
2	Mechanical filter for impurities	9	"Flow-through" coil
3	Air-break	10	Three-way solenoid valve 1
4	Volumetric counter	11	Three-way solenoid valve 2
5	Vibration pump	12	ESE coffee pods
6	Pressure boiler for instant drinks	13	Liquid waste float
7	Brewer unit for coffee pods		

2 - ELECTRICAL WIRING AND BOARD CONNECTIONS

View_rear side without casing



The **Brio ESE** vending machine is fitted with the same actuation board used on the base model (with a specific Eprom); this board processes the information from the push-button board, the payment systems and from the sensors installed throughout the machine; it also controls the actuations and the display board. It is built on SMT technology.

An additional board was also added for the specific "ESE" version, located in the same compartment and controlling the "flow-through" espresso boiler

(see photo).

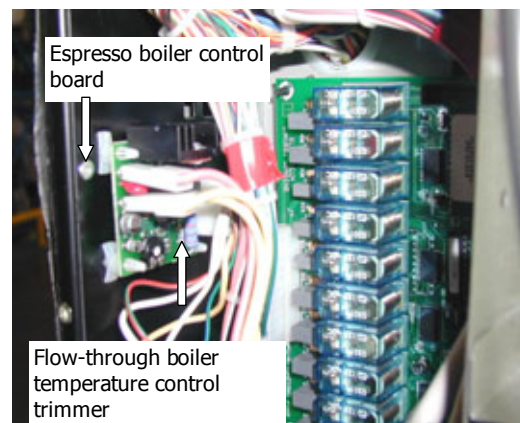
Two other boards are installed:

- 1) The display board, which processes the information from the CPU board and converts it into readable signals, and the push-button board.
- 2) The push-button board that controls the display, the push-button actuations; it supports the connectors for the payment systems.

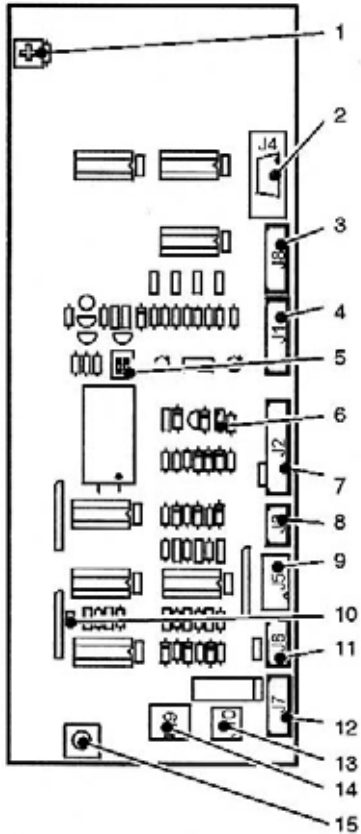
The CPU/actuation board is set by default to achieve a temperature of 78-82° C in the Instant boiler.

The espresso boiler control board is set to achieve a dispensing temperature of 78-85° C.

See brewer unit paragraph for any corrections.



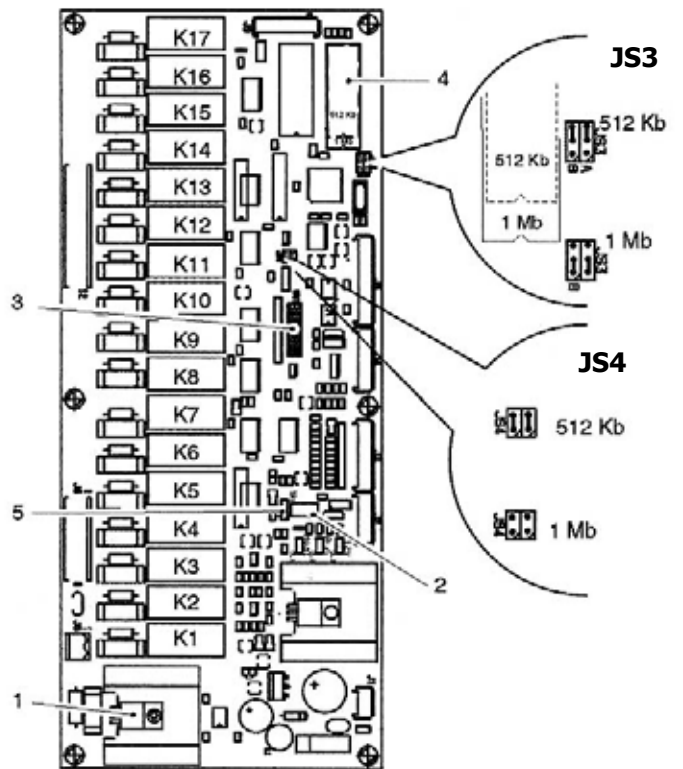
Push-button board component layout



Push-button board components legend

Ref. N°	Description
1	LCD brightness adjustment trimmer
2	Printer connector
3	Programmer device connector
4	Machine board connector
5	Payment system configuration minidip
6	Jp2
7	Control board connector 2
8	Executive serial interface
9	Front validator connector
10	Jp1
11	Coin return lamp
12	NOT USED
13	MDB board power supply
14	MDB coin mechanism connector
15	Programming mode button

Machine board component layout



CPU board component legend

Ref. N.	Description
1	Pressure boiler heating element TRIAC
2	Pressure boiler temperature control trimmer
3	Machine configuration minidips
4	EPROM
5	Jumper 1-2 Instant versions 2-3 Espresso versions
6	JS3 - JS4 EPROM version configuration jumpers

RELAY CODE TABLE AND ACTUATIONS

RELAY CODE	ACTUATION DESCRIPTION
K1	Three-way relief solenoid valve
K2	Three-way relief solenoid valve 2
K3	Instant drink solenoid valve 2
K4	Pump
K5	Coffee brewer motor
K6	Instant drink solenoid valve 2
K7	Pod strip (Serving) drive motor
K8	Mixer motor 1
K9	Doser device 3
K10	Doser device 2
K11	Doser device 1
K12	Sugar doser device
K13	Cup release motor
K14	Stirrer release motor
K15	Cup stacker shift motor
K16	Water inlet solenoid valve
K17	Mixer motor 2

MACHINE CONTROL BOARD CONFIGURATION

The machine board is designed with integrated the control system (CPU) and the actuations. It was also conceived to be used in different machine models.

In the event of replacement it will be necessary to check that the new board configuration is suitable for the required use.

Proceed as follows:

A series of 8 minidips (**3**) is located at the centre of the board permitting its configuration for use in the different versions and countries. A jumper (**5**) is used to configure the board for Instant or Espresso versions. The board has also provisions for supporting **512 Kb** and **1 Mb** EPROMs by setting Jumpers **JS3** and **JS4**.

For the different configurations see the following tables:

LANGUAGE CONFIGURATION

LANGUAGE			
Minidip	Italian	French	Spanish
6	OFF	ON	OFF
7	OFF	OFF	ON

MODEL CONFIGURATION

Model	Espresso
MINIDIP 5	OFF
Jumper	2 - 3

STIRRER CONFIGURATION

STIRRER	Dispensed also with unsweetened selections	Not dispensed with unsweetened selections
MINIDIP 2	ON	OFF

PAYMENT SYSTEM CONFIGURATION (FRONT COIN MECHANISM)

MINIDIP	ON	OFF
1	-	Fixed to OFF
3 (validator only)	Credit control	No credit control
4	-	Validator
8	-	Fixed to OFF

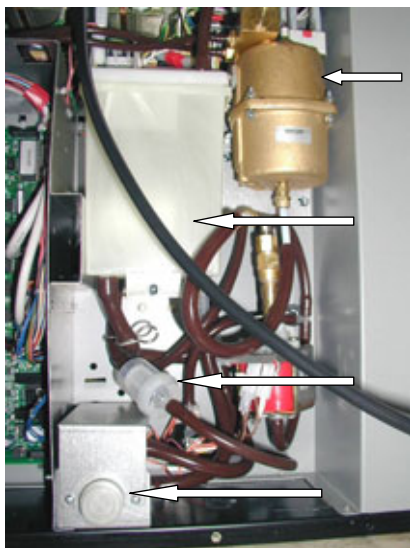
PAYMENT SYSTEM CONFIGURATION (SERIAL COIN MECHANISM)

SERIAL SYSTEM	DIP 3	DIP 4	DIP 5
Executive std. U-Key URW 2	OFF	OFF	OFF
Executive Price Holding Parameter 36 = 2)	OFF	ON	OFF
System ECS	ON	OFF	OFF
U-Key URW 3	OFF	OFF	ON

IMPORTANT NOTICE

Minidips that are not mentioned must be set to OFF.

3 - AIR BREAK / BOILERS

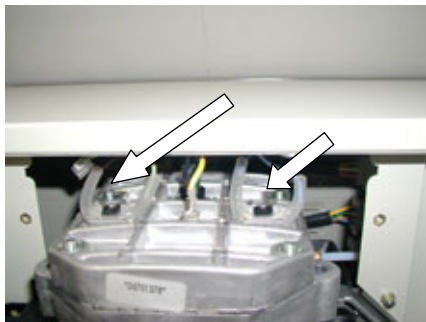


Pressure boiler
for instant
drinks

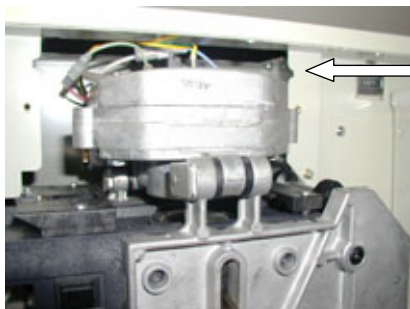
Air -break "C"

filter for
impurities "B"

Elettrovalvola ingresso
acqua "A"



Overheating protection
thermo-fuses



"Flow-through"
Espresso boiler

NOTE: The pressure boiler is fitted with manual reset overheating protection.
The flow-through Espresso boiler is fitted with overheating protection provided by two accurate thermo-fuses calibrated at 120° C; these fuses must be replaced after they are triggered.
Before resetting or replacing the above protections, the problem that caused the trigger must be identified and corrected.

The **Brio ESE** vending machine is fitted with two boilers, each for a specific function. A classic pressure boiler is used for Instant selections, normally fitted on the Base Brio as an all-purpose boiler, but it is kept at an internal pressure of 10 bar by means of specific setting of the by-pass valve.

A "flow-through" boiler is used for Espresso selections; this boiler receives water from the base pressure boiler preheated at a temperature of approximately 80° C and then heats it up to 95-100° C.

This solution ensures a long operating life without premature scaling problems.

It is well known that in flow-through boilers, where water is heated from ambient temperature to brewing temperature in a very short time, very shortly there are problems with excessive scaling.

The hydraulic circuit is conceived as follows: When the water in the air-break falls below the minimum level, a float triggers a microswitch that sends a signal to the board, which activates the water inlet solenoid valve "A", then the water flows through the filter "B" and reaches the air-break "C" until it is full to the max level, controlled by the float and microswitch.

When a coffee selection is made, after positioning the pod in the brewing chamber, the pressure boiler two-way solenoid valves is opened and the vibration pump is started for a length of time determined by the volumetric counter, that by computing the number of rotations of an impeller wheel sets the exact amount of water necessary for the selection.

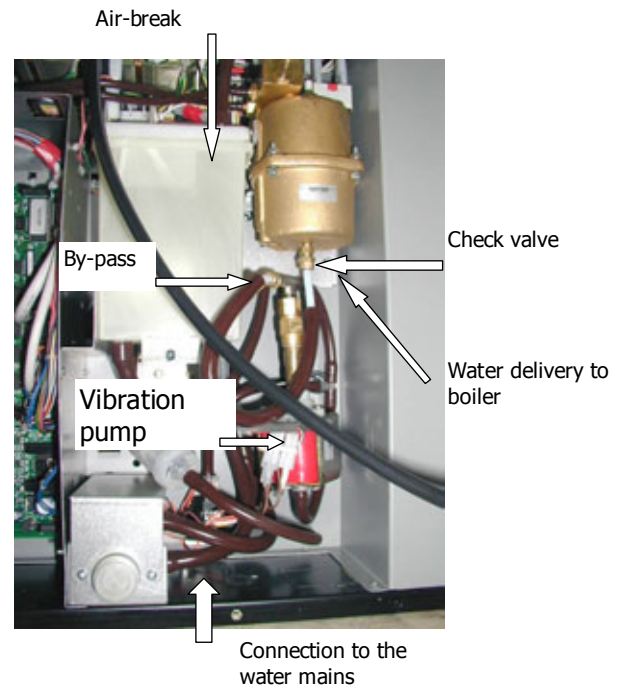
The necessary amount of water is drawn from the air-break and sent to the pressure boiler, thus pushing out the same amount of hot water (85° C) which is then delivered to the glow-through boiler, and heated up to 95° C by means of forced flow through a coil heated by the Espresso boiler heating element. This water is controlled by a pair of three-way solenoid valves, allowing the flow of water for brewing and for relieving the excess water in the pod, thus leaving a perfectly dry pod

4 – PUMPS AND BY – PASS

A standard vibration pump is used, also adopted on the base Brio, and fitted with overheating protection; however a by-pass pre-set at 10 bar is installed, to avoid an uneven use of the coffee pod and thus ensuring better dispensed product quality.

To ensure greater pump reliability and better tightness against the pressure, a check valve was added at the boiler inlet, this way no anomalous leads are exerted on the pump when idle.

Also the pump is fitted with a check valve, thus ensuring optimum tightness against the boiler internal pressure.



5 - BREWER UNIT FOR COFFEE PODS

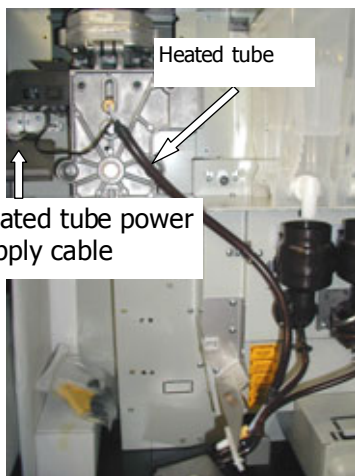
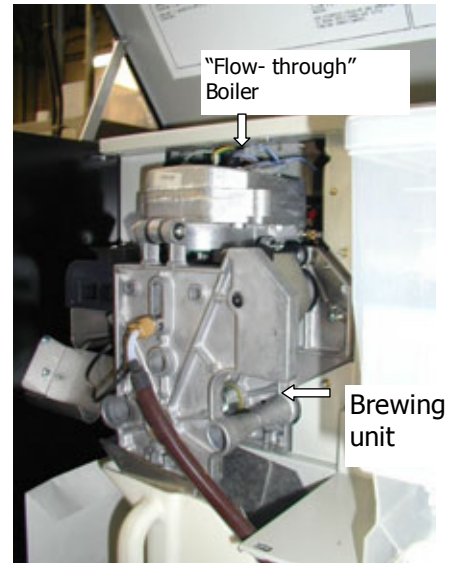
The adopted brewer unit is used to brew coffee exclusively by means of continuous strip "ESE" pods (servings) with 100/200 doses. The pods are made up with an optimum coffee dose.

The unit works as follows:

When a selection is made the serving drive motor positions the pod in the brewing zone under the flow-through boiler. The unit motor lifts the piston until hermetically closing the brewing chamber.

The three-way solenoid valve is opened so that the pressure boiler is connected to the flow-through boiler located above the brewer unit.

The pressure boiler maintains the water at a temperature of approximately 80° C (ideal for instant products) and the flow-through boiler heats it up to 95-100° C (ideal for espresso coffee).



The brewing chamber is kept hot at the same temperature of the flow-through boiler.

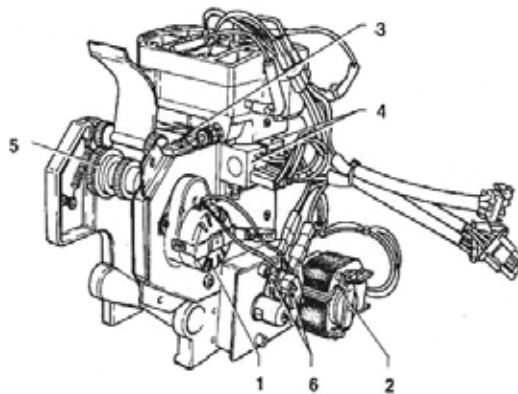
The pump delivers the programmed amount of water that is accurately computed by the volumetric counter. At the end the three-way solenoid valves are closed and the water still in the flow-through boiler is expelled through the third way of the valve. Then the unit motor is activated, lowering the piston until opening the brewing chamber.

The "serving" drive motor is started, dragging the serving out of the brewing chamber.

At this point the unit is ready for a new selection.

In order to maintain the correct temperature up to the dispensing point, a special tube heated by a special permanent low-consumption heating element is used.

- Pod strip drive motor
- Unit drive motor
- Inner piston
- Three-way solenoid valve
- Pod strip (Serving) drive roller
- Microswitches



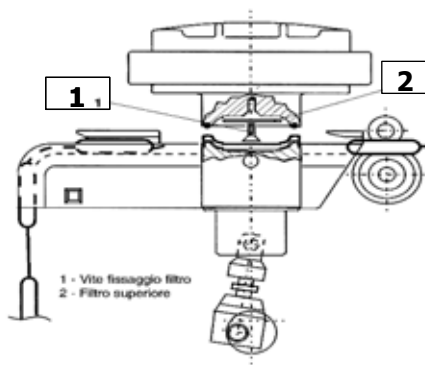
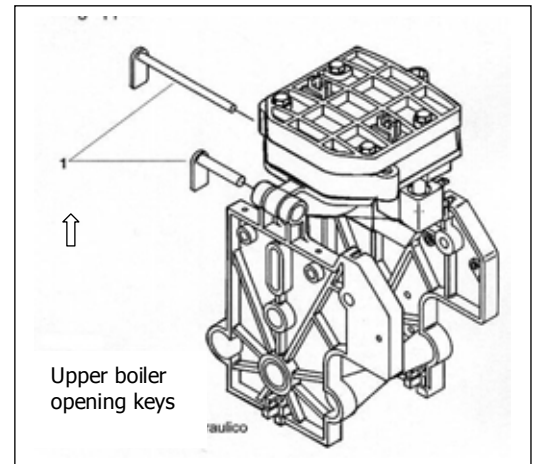
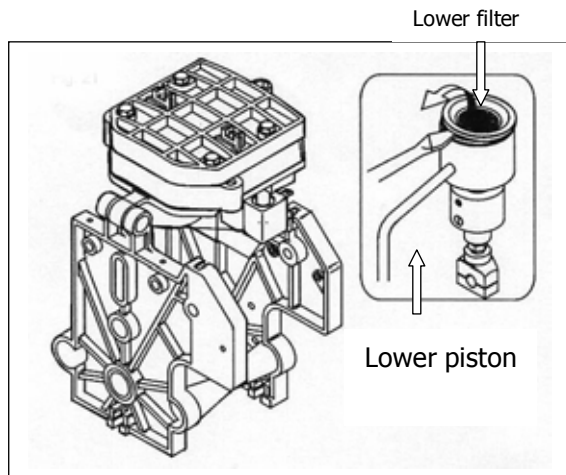
Rear view of brewer unit

BREWER UNIT MAINTENANCE

Before any maintenance operations and adjustments it is necessary to wait for the unit to cool down completely.

Cleaning / replacing the coffee filters

The coffee filters must be cleaned and descaled at least every 2500 selections. To remove the lower filter, the flow-through boiler must be lifted (hinged to the brewer) after removing the keys **1** (front and if necessary back), this way access is gained to the lower filter; using a screwdriver lift the edge until removed completely. Clean and descale using suitable products. To replace the filter, press on the edges until reinserted completely.



Upper filter

To remove the upper filter **2**, undo the stainless steel screw **1**.

1.

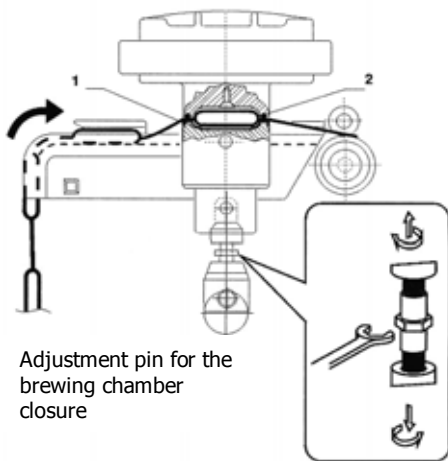
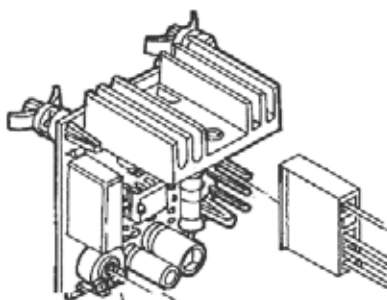
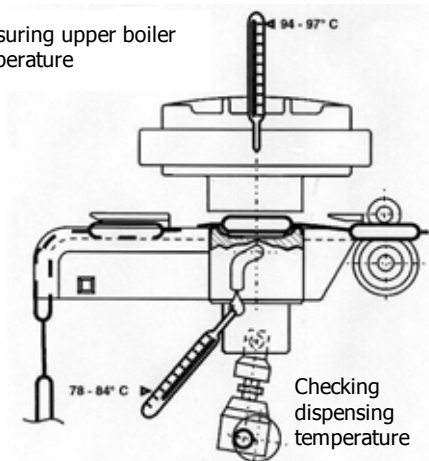
This operation is possible after removing the upper boiler (see above).

Filters and gaskets must be replaced not later than 25000 selections.

Boiler and brewing chamber section

Setting the coffee water temperature (flow-through boiler)

Measuring upper boiler temperature



The optimum temperature is set at the factory; should any adjustments and small changes be necessary, proceed as follows: Check the upper flow-through boiler temperature, which must be between 94° and 97° C. This way the dispensing temperature will be 78° to 84° C.

Such temperature must be considered as optimum.

If that is not the case, adjust the temperature using the trimmer **1** on the electronic board located at the back of the cabinet next to the machine board.

It must be taken into account that:

Tightening will decrease the temperature

Loosening will increase the temperature

Make very small adjustments and check the dispensing temperature. The instant boiler inlet water temperature is determined by the instant boiler temperature, as pre-heated water is sent to the flow-through boiler to reduce to a minimum the scaling problem typical of such boilers. For adjustments to the instant boiler see paragraph **Boilers**.

ADJUSTING THE POD HOLDER CLOSURE

In order to dispense a perfect coffee with the pod brewer it is very important to have a perfect setting on the closing position. The system is adjusted to the optimum setting at the factory, however in the event of disassembly for cleaning and/or replacing filters and gaskets it may be necessary to readjust the settings; in this case proceed as follows:

To increase tightness between gasket **1** and filter **2** rotate the pin clockwise using an 11 mm spanner.

To decrease tightness in the case of excessive interference the pin must be rotated anticlockwise.

After the adjustment, the system is self-locking.

PERIODIC CLEANING OF THE FLOW-THROUGH BOILER

At least once a year, or not later than 10000 selections, the flow-through boiler must be cleaned and if necessary descaled; at the same time the sealing gasket must be replaced.

In order to remove the boiler it is advisable to extract the brewer unit from the machine.

Before any operations the vending machine must be disconnected from the power supply, and the unit must cool down completely. Disconnect the hydraulic circuits, disconnect the electrical connectors, completely undo the fastening screws and remove the unit from the machine. Remove the two securing keys from the upper boiler.

Proceed to cleaning, descaling and any replacement of worn components; thoroughly rinse and reassemble in the reverse order of disassembly.

BREWER UNIT CLEANING CYCLE

As well as manual cleaning through setting in the "Maintenance" menu, anyway performed without "Serving", an automatic cleaning cycle can be set.

After a selection, if a new "Serving" is not detected within 20 seconds, a cleaning cycle is carried out and the vending machine will be out of service for approximately 60 seconds.

Manual cleaning must be carried out every time new "Servings" are loaded; it is however advisable to leave the automatic cycle control set at all times.

CHECKING AND ADJUSTING THE COFFEE DISPENSING PARAMETER SETTINGS

In order to get the best possible quality for the dispensed products, the vending machine was adjusted to the optimum setting at the factory; however in relation to the products used it is advisable to check the following points:

The water dose, which must be between 35 and 40 cc.

The coffee dispensing temperature, which must be between 78° e 85° C.

The pump by-pass valve setting, adjusted to 10 bar by default.

The dispensing time, which must be between 18 and 20 seconds, considering that a longer time (with the same water dose) could clog filters, and a shorter time could alter the by-pass setting towards a higher pressure, and lead to poorer dispensing quality.

STANDARD SETTINGS

By default the vending machine is adjusted at the factory as follows:

Coffee temperature at the spout, 78-85° C

Instant boiler temperature, 78-82° C

Dispensing time, 18 to 20 seconds

Coffee water dose, 35 to 40 cc

ADJUSTING THE INSTANT BOILER WATER TEMPERATURE

The instant boiler has a dual function: it provides hot water for all instant products by means of its two-way solenoid valve.

It pre-heats water for the flow-through boiler to avoid the scaling problem typical of such type of boiler.

It is therefore important to have an optimum setting, as a temperature change affects also the final temperature of the coffee.

To change such temperature the special trimmer on the machine board must be used.

Considering that:

Tightening (clockwise) will increase the temperature

Loosening (anticlockwise) will decrease the temperature

Each complete turn correspond to +/- 0.5° C change

BOILER OVERHEATING PROTECTIONS

The boilers are fitted with safety overheating protections.

The espresso boiler is fitted with two thermo-fuses located above it and sheathed in a special silicone tube.

In the event of failure that could cause boiler overheating, the two thermo-fuses melt, thus disconnecting the power from the heating element.

After the occurrence of such melting, the problem that caused the malfunction must be identified, corrected and BOTH THERMO-FUSES MUST BE REPLACED with identical ones or having the same characteristics.

Fuses must never be replaced with others that are not approved by the manufacturer, otherwise hazard conditions could be created and the manufacturer declines all responsibility.

The instant boiler is fitted with manual reset overheating protection; therefore after having identified and corrected the cause it is sufficient to press the upper red button to restore the initial conditions.

6 – MIXER UNIT



The mixer units are the same used on the Base Brio vending machine.
 Motors powered with 230 V AC 50 HZ
 Loadless velocity 20000 RPM
 Removable powder exhaust drawer and conveyors.
 Conforming with HACCP directive.
 Bush seal made of self-positioning material, ensuring excellent and long lasting seal in all conditions.

7 - POWDER AND LIQUID DOSE TABLES

Selection	Notes	coffee	Coffee Instant	Water cc	Powder gr.	Sugar gr.	Notes
Short coffee	Time Quantity	Pre-set dose in a pod	-	35" 60 cdv 40 c.c.		7,5 gr	CDV = Wheel counts
Long coffee	Time Quantity	Pre-set dose in a pod	-	38" 95 cdv 60 c.c.		7,5 gr	
Coffee with milk	Time Quantity	Pre-set dose in a pod	-	38" 60+35 cdv 42+25 cc	2,0 gr latte	7,5 gr	
Cappuccino	Time Quantity	Pre-set dose in a pod	-	45" 60+72 cdv 40+55 cc	6,0 gr latte	7,5 gr	
Instant Coffee (Optional)	Time Quantity		1,3 gr.	22" 55 cdv 40c.c.	-	7,5 gr	
Chocolate	Time Quantity			32" 116 cdv 90 c.c.	23-28 gr.	-	
Instant tea	Time Quantity			32" 116 cdv 90 c.c.	12-14 gr.	-	
Milk	Time Quantity			32" 116 cdv 90 c.c.	8 gr.	7,5 gr	

Note 1

The water flow in the mixers is approximately 10 cc per second and it is given as an indication, as there are many variables that can affect the accuracy.

The dose of liquids is determined by pulse setting of the volumetric counter (cdv).

For both selections (coffee and instant) a vibration pump is used.

The number of pulses does not vary in a linear manner, i.e. double the amount of water does not correspond to double the number of pulses.

For espresso coffee the volumetric counter is reduced because of the coffee compress reaction that slows down the water flow, while it is accelerated in the instant drinks selections, since there are no obstructions to the water flow. Therefore, in the event of changing the default dose setting, some measurements must be made to check the accuracy of the doses.

8 – TROUBLE-SHOOTING

Problem (and/or indication on the display)	Possible cause	Solution
The machine does not go into the heating phase, remaining in the installation phase	No water flow from the mains or insufficient pressure (it must be 5-85 N/cm ²) The air-break microswitch is faulty Water inlet solenoid valve blocked by the overflow drain of the air-break. Water inlet solenoid valve not activated because of faulty RELAY K16	Check the presence of one or more of situations indicated and once identified the cause do as follows: Short-circuit the air-break microswitch to check its functioning In the event of failure, replace with a new that MUST HAVE the same characteristics Unlock the water inlet valve, undoing the threaded ring and emptying the overflow tube Check for 230 V AC voltage at the power supply terminals Check the activation of relay K16
The display indicates the message "No coffee"	Coffee pod spent or faulty pod detection microswitch Faulty "SERVING" drive motor Pod drive locked Faulty RELAY K7	When a coffee selection is made, the "SERVING" drive ratiomotor is activated, and the movement activates a microswitch. If such microswitch is not activated within 5 seconds, the SW disables all coffee based functions. Check for one or more of the situations indicated
The display indicates the message "Boiler failure"	The boiler does not reach the operating temperature Faulty temperature probe Overheating protection triggered For the espresso boiler, melted thermo-fuse	The vending machine is locked if the set temperature is not reached within 10 minutes. Check the correct operation of the heating element, the probe and of the actuation triac. NOTE: 1) at 25° C the probe must have a resistance of 12 k ohm 2) at 100° C the probe must have a resistance of 963 ohm (± 4 ohm tolerance) 3) In the event of faulty flow-through boiler, the problem is not signaled by the SW, therefore it must be checked whether the thermo-fuse was triggered or the failure is in the power supply board (specific)
The display indicates the message "No cups"	No cups in the dispenser Faulty cup detection microswitch Faulty RELAYS K13-15	If no cups were present when starting the machine, the column rotation ratiomotor is activated to search for a full column and if no cups are found within a 60 sec (indicated by the specific cup detection microswitch) the machine is locked. Excluding the fact of a real lack of cups, the correct microswitch functioning must be checked and in the event of failure it MUST BE replaced with an identical one. In the event of locked release motor or column motor, check for the correct actuation of relays K13-15.
The display indicates the message "Brewer unit"	The unit failed to reposition. Faulty unit positioning microswitch (upper dead centre) Faulty unit positioning microswitch (lower dead centre) Faulty RELAY K5	Check the correct functioning of the upper and lower position microswitch using a multimeter In the event of correct functioning, check the correct setting. In the end, check the correct setting of the adjustable rod that closes the brewing chamber.

<p>The display indicates the message "Volumetric counter" (Wheel)</p>	<p>The expected liquid dose is not reached (computed) within 60 seconds from starting the selection.</p>	<p>The water amount for both espresso coffee and instant drink selections is ensured by a volumetric counter; with the water flow (drawn by the pump) a wheel rotates and through an electronic sensor sends a number of pulses, and when the number of pulses corresponding to the water dose set during programming is reached, the pump is stopped.</p> <p>If such value is not reached within 60 sec it means that there is a problem: Then, check for the correct functioning of the volumetric counter; there must be 5 V AC on the terminals during the counter operation. Check that the filters are not clogged. Check that the by-pass is not locked open.</p>
<p>The display indicates the message "Air-break failure"</p>	<p>No water from the mains. Faulty air-break microswitch Failure to the level detection system (float)</p>	<p>If in the period taken to make any 6 selection the microswitch controlled by the float is not triggered, the vending machine is locked for air-break failure.</p> <p>The malfunction could occur for lack of water from the mains, or because of a failure to the float/microswitch system.</p> <p>Replace the microswitch with one that MUST HAVE the same characteristics. Otherwise various malfunctions could occur.</p>
<p>The display indicates the message "RAM data"</p>	<p>System lock Wrong RAM data, which must be retrieved by initialising the EPROM.</p>	<p>Access the installation procedure and initialise the Software. If the problem persists, replace the entire CPU board.</p>
<p>The display indicates the message "Coin mech failure"</p>	<p>If there is no communication between coin mechanism and CPU board for 30 seconds (for serial coin mechanisms only)</p>	<p>Check for correct connection and configuration of the minidips, if all correct replace the coin mechanism.</p>
<p>The display indicates the message "Water failure"</p>	<p>Models with water supply from the mains: If the air-break microswitch is activated for more than a minute Models with water supply from an internal tank: If the water level is less than 300 cc</p>	<p>Check the water inlet solenoid valve. Check the correct actuation of relay K 16 Check the air-break microswitch functioning. Check the float/microswitch system functioning.</p>
<p>Coffee is dispensed too slowly and it tastes burnt</p>	<p>Faulty pump by-pass (open) Clogged coffee filters. Excessive temperature in the flow-through boiler Flow-through coffee boiler clogged</p>	<p>Replace the by-pass valve with one set at 10 bars. Consider that coffee must be dispensed in a maximum time of 15 to 20 seconds; longer times can clog the filters.</p>
<p>The coffee is dispensed too quickly and lacks body and cream</p>	<p>Faulty pump by-pass (closed) Insufficient temperature in the flow-through boiler Faulty heating element in the heating pipe</p>	<p>Replace the by-pass with one set at 10 bars. Check for the correct temperature, which must be between 95° and 97° C. Check that there is flow in the dispensing tube and that the temperature is at least 60° C. Check the functioning of the specific power supply board. Check that the thermo-fuse was not triggered; if triggered replace with one having the same characteristics.</p>
<p>The mixers clog up</p>	<p>The whipper failed to rotate Powder removal drawer full Insufficient water to powder ratio.</p>	<p>Check for the mixer motor overheat protection trigger, if that is the case check the cause of such trigger. Empty the powder collection drawers and check the functioning of steam suction fan. Check the powder/liquid setting</p>

9 - WIRING DIAGRAMS

