



The 'IEC' MASH BATH

This manual covers all models for 2024



BENCH MODELS:
6, 9, 12 and 16 head.

Image shows 9 Head,
with colour 'touch
panel' control system
and distilled water
beakers.

FLOOR MODELS:
16, 20, 25 and 30 head.

Image shows 20 Head,
with colour 'touch panel'
control system with
distilled water storage
and dispensing to side.



Designed and Manufactured by :

Industrial Equipment & Control Pty. Ltd

Melbourne, Australia

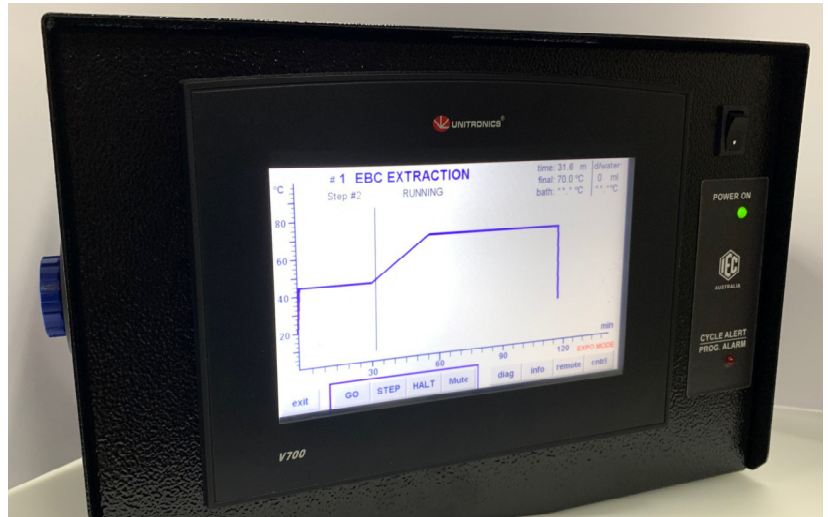
Bench models do not have distilled water storage or dispensing, but the special bath lids carry distilled water beakers that heat with the bath and are used to add volume to the sample as required.

Floor standing models have temperature controlled distilled water storage and a quick action dispensing system.

All models are controlled by a colour 'touch panel' system. The program is visible to the user as a graph with a 'time line' progressing to indicate the status.

All the required information is displayed and all programs can be fully edited to suit the requirements of the laboratory.

Most 'touch panel' functions can be monitored and controlled remotely.



Floor models are complete with a rugged dispensing gun which is used to initially fill the pots and to add the distilled water during the mash, if required.

The gun is fitted with a press switch which initiates the discharge of the correct volume of distilled water at the correct temperature as set in the program.

The gun is neatly parked in a receptacle in the removable cover of the storage tank.



GENERAL DESCRIPTION:

A high quality, electronically controlled Mash Bath containing up to 8 selectable programs that relate bath temperatures with times. The IEC Bath is carefully designed to automatically perform the standard mash sequences as required by the various brewing, barley, malt and cereal industries, however its versatility permits it to be easily programmed for variations to these standard tests.

Some of the features of the 'IEC' Mash Bath are:

ALL MODELS:

- Adjustable colour touch screen controller is mounted above the rear cover to provide a narrow machine with small footprint. Screen can be angled to suit any user. If desired, the controller can be removed from the machine and mounted remotely.
- Fully sealed 'wipe clean' touch screen for control and monitoring.
- Outer panels are easy to remove and tools are not required. All the front and side panels are powder coated for excellent resistance to corrosion.
- Machine can be supplied for either single or three phase power.
- Stainless Steel construction and the whole design has been developed for easy access and quick and simple maintenance.
- Very strong but quiet magnetic stirrers stir the mash samples from below the tank and 30 to 40mm long laboratory 'spinbars' can be used in each sample pot.
- Each stirrer magnet is driven directly by a speed controlled motor. If one drive should fail, it will automatically shut down without disturbing any other drives. Drives are easily replaced in minutes.
- The temperature/time ramping of the bath is held to close accuracy. The bath and D/W temperature can easily be calibrated by a lab technician.
- The bath automatically preheats the water to the programmed temperature and provides an audible alert to advise when preheat is achieved.
- All audible alerts can be silenced or reinstated by the momentary press of a button and can be altered in loudness to suit the environment.
- Different programs are easily created and any program can be selected by the touch panel controller. The names of the programs can be edited to suit your lab.
- The special IEC designed bath lid accepts 'Industry Standard' 500ml stainless steel beakers (pots). The lid seals grip gently to the pots to hold them firmly against floating when empty and to prevent bath water evaporation. The lid is easily removable without tools for cleaning, but cannot be dislodged when fitted for operation.
- The bath and distilled water tank are lagged to conserve energy.
- At the end of the selected program, a selectable cooling option is provided for either a hot bath finish or to cool the samples slowly, or to cool them quickly.
- The samples are stirred by magnetic stirrers below the tank. Automatic ON / OFF / INTERMITTENT control over the magnetic stirrers is part of each program but manual override is also provided.
- The 'IEC' Mash Baths have our specially designed quiet circulation pumps that run fully immersed inside the main bath and the distilled water tank to ensure accurate temperature through the whole bath.

FLOOR MODELS:

- Floor models are fitted with small castors for ease of moving for cleaning.
- The cabinet provided below the bath is for storage of beakers (pots), lab equipment and spare parts.
- The distilled water is either gravity or pressure filled automatically from the laboratory's supply, which is sometimes mounted on the wall. Water level and circulation in this tank is automatically controlled and the distilled water is temperature held to within +/- 0.3 degrees. The tank is fitted with a cold water heat exchanger coil for quick cooling of the distilled water between mashes. This cooling can be instigated within the program to have the distilled water cold at the end of the program. This avoids delays between mashing cycles.
- A special hand held gun with press switch accurately dispenses the correct volumes of distilled water into the pots as required both prior to mashing and at the 'top-up' time during the cycle. An alert sounds at exactly the correct moment to remind the operator to dispense the water. By using the touch screen in EDIT mode, the d/w volumes are edited into each program to relate to the correct step.
- The dispensed distilled water volumes in millilitres are normally set inside each program, however pressing the manual dispense button permits a manual setting to temporarily override the programmed volumes without changing the program.
- All the larger sized floor mounted machines fit through standard width doorways.

FITTING THE CONTROLLER:

The machine is supplied with the control housing separate. It is complete with a 'U' shaped support bracket that can be fixed to the top surface of the cover. The controller can be mounted remotely if desired.

To shift the position of the control unit, unclamp the blue locking knobs on the sides of the controller and slide the controller from the 'U' bracket.

Take the controller and re-position it into the slots in the bracket and tighten the clamp knobs firmly. Adjust the controller's twist and tilt to suit the operator's viewing.

Take the cable at the back of the machine and engage the multi-pin plug to the larger socket at the rear of the controller. The smaller multi-pin plug is only used on floor models and must also be engaged and secured with the security screws.

NOTE: Floor models use 2 cables, Bench models use only one cable.



GENERAL INSTALLATION INFORMATION:

Bench mounting units are placed on the bench with sink to the side of the machine. Floor machines are fitted with small castors so that they can easily be moved into and out of the laboratory location for cleaning or maintenance.

Electrical Services Required:

Standard voltages listed below. Machines frequency can be either 50 or 60 Hz. Please contact IEC for other voltages if required.

BENCH MOUNTING MODELS:

SIZE	SINGLE PHASE	AMP	THREE PHASE	AMPS /phase	HEATER (bath)	SIZE WxDxH cm
6 head	240V 1 ph	14	N/A	-	1x 3.1 kW	45x61x46
	208V 1 ph	16	N/A	-		
9 head	240V 1 ph	14	N/A	-	1x 3.1 kW	56x61x46
	208V 1 ph	16	N/A	-		
12 head	240V 1 ph	18	415V 3 ph	9	2x 2.0 kW	56x72x46
	208V 1 ph	21	208V 3 ph	17		
16 head	240V 1 ph	22	415V 3 ph	11	2x 2.5 kW	74x72x46
	208V 1 ph	25	208V 3 ph	22		

FLOOR MOUNTING MODELS:

SIZE	SINGLE PHASE	AMP	THREE PHASE	AMPS /phase	HEATER (bath)	HEATER (d/w)	SIZE WxDxH cm
16 head	240V 1 ph	29	415V 3 ph	12	2x 2.0 kW	2.8 kW	76x72x116
	208V 1 ph	34	208V 3 ph	24			
20 head	240V 1 ph	33	415V 3 ph	12	2x 2.5 kW	2.8 kW	76x83x116
	208V 1 ph	39	208V 3 ph	24			
25 head	240V 1 ph	36	415V 3 ph	12	2x 2.8 kW	2.8 kW	87x83x116
	208V 1 ph	42	208V 3 ph	24			
30 head	240V 1 ph	39	415V 3 ph	13	2x 3.1 kW	2.8 kW	98x83x116
	208V 1 ph	45	208V 3 ph	27			



WIRE COLOURS:

Australian Standards: 415V 3 phase / 240V single phase & earth. 50 Hz,

Mains 3 Phase: RED, WHITE, BLUE ACTIVES with BLACK NEUTRAL

OR RED, WHITE, BROWN ACTIVES WITH BLUE NEUTRAL.

Mains single phase: BROWN ACTIVE with BLUE NEUTRAL.

EARTH: GREEN / YELLOW STRIPE

Low Voltage: 24V.AC. GREY DC pos: GREY +red stripe DC neg: GREY +black stripe

For USA and Canada: 208V 3 phase colours are: Red, Black, Blue. 60 Hz.

120V single phase neutral is: White

MAINS WATER:

Connection from mains water is by a 10 or 12mm diameter reinforced pressure hose similar to that used on a domestic washing machine or dish washer. This hose is supplied with the machine and the lab water supply must have a $\frac{3}{4}$ BSP male thread for this hose to connect. A fine mesh water strainer is fitted to the mains inlet of floor models and is supplied with bench models to be fitted to the laboratory mains water line on installation to prevent foreign matter lodging inside the various solenoid valves.

DISTILLED WATER: (Floor models only)

In some labs, distilled water is gravity fed from the laboratory water still on the wall, so the supply pressure is very low. For gravity feed, the still should be mounted at least 1 metre higher than the Mash Bath so the head pressure is sufficient. Because of the low source pressure, the hose and the connection from the distilled water source should be large in diameter. The distilled water may be supplied by a 12mm bore rubber hose and hose clip to the hose tail provided on the machine.

In some labs, the distilled water will be supplied to the machine under pressure. A smaller hose or pipe can be used and the solenoid valve used in the machine is suitable for both low and high pressure sources.

DRAIN:

The machine has a bath drain hose and a bath overflow hose. They require a waste drain facility, about 50mm diameter, close to floor level so the large diameter drain hoses can be inserted directly into the floor drain. **NOTE:** For fast, efficient bath draining, the water falling under gravity must completely FILL the hose. If possible, the two drain hoses should be inserted into the drain say 300mm or more so that the 'falling' of the water down the long straight hose will draw the water quickly from the bath. If the drain hose is too large or too small or simply passes into a sink, the bath will drain much more slowly.

The bath overflow hose is not so important to drain fast. On floor mount machines, this hose also carries the water coming from the heat exchanger (cooling coil) in the distilled water tank. The drain hoses must not be kinked, flattened or restricted.

FOR MAINTENANCE AND TRADES: PREPARATION FOR CONNECTING:

- Remove all packing and ties that may be present for security during transport. Check the machine generally for damage.
- Lift off the long rear s/s cover (with controller disconnected) to expose the mains wiring section of the machine. Observe the circuit breakers. They are for the following circuits:
 - Mains power. Heater #1 (and usually Heater #2) for the bath.
 - (Floor Machines) Mains power. Heater for the distilled water tank
 - Mains power: To transformer via ON/OFF switch.
 - Low Voltage power. 24V.AC. for the Controller Unit and sensors etc.

The earth connection is a large brass screw mounted to the tray near the power entry point.

ELECTRICAL CONNECTIONS: The original test wiring is usually left connected to the machine to assist only in the identification in electrical connections.

For 415V.AC. 3 phase connection, connect the 3 phases to the three circuit breakers. Each heater connects between a phase and Neutral and all heaters are 240V rated. Incoming Neutral and Earth must be connected to terminal blocks.

For 240V or 110V.AC. single phase connect the 1 phase to the circuit breaker. For 240V machines, the heaters are 240V. For 110V machines, the heaters are 110V rated. Neutral and Earth must be connected to terminal blocks.

For connections for 208V.AC. 1 & 3 phase (USA & Canada), the connections are different because they connect between phases. For all systems, the machines are the same and only the connections of wiring are different. If assistance is required, please contact the manufacturer for details. Drawings provided show the various electrical connections.

Mains power should always be supplied from a mains isolation switch on the wall.

WATER and DRAIN CONNECTION:

Mains water should be from an isolation valve on the wall and depending on water quality, through a fine gauze strainer or water filter. Connect mains water using the reinforced pressure hose with the ¾ BSP threaded fittings. The drain hoses must not be kinked or restricted and, for fastest draining, the water must FILL the hose so that it draws out the water as if passes down the drain. The drain hoses should be slipped into a drain pipe near the floor, because keeping the drain hoses long and vertical helps to reduce the drain time.

ON FLOOR MODELS:

Distilled water supply, either gravity or pressurised, should be through a hand isolation valve on the wall and then to the hose tail provided on the rear of the machine. To ensure the distilled water tank fills quickly enough, the gravity head height for the distilled water source should be at least 1 metre. If the water is pressurised, the tank will always fill quickly.

The distilled water control solenoid valve is designed to control both low and high pressure distilled water supplies.

OUTER PANELS:

The outer panels of the machine have no screws. For removal, lift panel slightly and swing the bottom edge outwards. The front panel is fitted with a lifting rail for easy removal.

While the first cycles are being run, always leave the front panel removed to observe any signs of wetness or leaks in hoses and pipework.

IDENTIFICATION OF COMPONENTS:

Maintenance personnel should spend a few minutes to identify the electrical components and it will make things easier if you need to maintain or service the equipment at a later time

From the left end of the electrical section (under the cover), identify the following components:

- Insulated Neutral connection(s) for bath heating element(s).
- Mains transformer 240/24V.AC. 50Hz/60Hz. Note that, depending on mains power, it may be 208//24V.AC. or 110/24V.AC. 60Hz transformer. Approx: 4 amps. In some cases it may provide for 24 or 26 or 28V.AC output.
- One circuit breaker. Low voltage 24V.AC. for touch screen and control circuits.
- Set of several circuit breakers (mains power for transformer and heaters)
- Mains contactor to isolate mains from heaters
- Temperature probe for bath. RTD probe with in-line connector.
- High and low level switches for bath with inline connectors
- Circulation Pump for bath. Can disconnect wires from motor.
- Insulated Mains connection(s) for bath heating element(s).

ON FLOOR MODELS ONLY:

- Insulated Neutral connection for d/w tank heating element.
- Temperature probe for distilled water tank. RTD probe with in-line connectors.
- Circulation and dispensing pump motor for distilled water tank. Motor can disconnect from cable.
- High and low level switches for distilled water tank with in-line connectors.
- Insulated Mains connection for D/W tank heating element.

NOTE: THE LARGE FLOOR MOUNTED MODELS NORMALLY HAVE 2x HEATING ELEMENTS IN THE BATH AND ONE IN THE D/W TANK. EACH HEATER HAS A SEPARATE CIRCUIT BREAKER.

CONTINUE INSPECTION:

Inspect the machine further: Remove front, sides and rear cover by lifting panels and allowing bottom edges to come forward.

At the rear.....Observe the solenoid valves and hoses. These control mains water in for bath fill and distilled water cool, distilled water in, and bath drain. The third hose is for the important overflow inside the bath that must be drained through a separate hose.

STIRRER BANKS:

At the front, see the racks of magnetic stirrers with electronic control. The small green LED indicates that 24V.DC is applied to the stirrer PCB. The 4 connections to each socket are: top: signal voltage controlling speed. Next: signal negative. Next: 24V.DC..positive. bottom 24V.negative.

All stirrers on all banks run at the same speed. This speed is controlled by a DC voltage provided to all the banks by the controller and it is adjustable on the touch panel. To be sure that each bank is running at the same speed, the speed of each bank is adjusted by a small control mounted above the connection blocks. Finally, the overall speed of all the stirrers is then controlled by the touch screen controller. The speed of each individual motor is individually monitored to maintain the set speed.

REMOVE A STIRRER BANK OR A MOTOR:

To remove a stirrer bank, remove the green electrical plugs from the end of the circuit board. Use an Allen key to remove the cap screw passing vertically through at the front of the aluminium rail. Support the weight while pulling the rail forward to extract the rail from its support hole at the far end. To change a motor and magnet assembly, undo the 2x wing nuts that hold the motor bracket to the PCB. Unplug the 2x motor wires from the small socket and unplug the 3x speed control wires from the socket. To fit a new motor, simply reverse the procedure and tighten the wing nuts firmly.

ON FLOOR MODELS:

On floor models, at the rear there are 2 additional solenoid valves for the filling of the d/w tank and for the control of cooling water through the coiled heat exchanger in the d/w tank.

At the front, the stirrer arrangement is the same as the bench models but there could be several more stirrer banks and there could be up to 5x stirrers on the one bank.

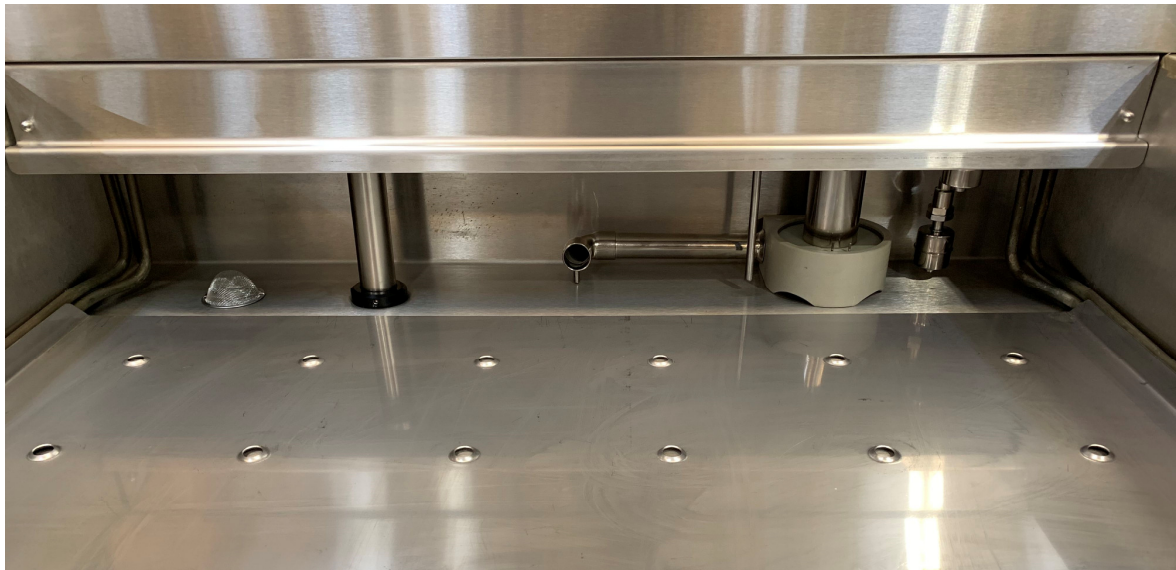
There is another solenoid valve and flow meter on the front of the distilled water tank and This valve is for feeding the dispensing gun.

The flow meter measures the dispensed volume and can easily be disconnected for removal. For water tight construction, 'O'rings are used to seal all joints. The signals from the flowmeter can be monitored on the touch screen and the gun switch can be either monitored or simulated from the touch screen.

An interface housing in front of the d/w tank provides LEDs for visual indication of 24V.DC. power present, the dispensing gun's trigger switch operation, the pulses from the flow meter and the power supply to the flow meter. All solenoid valves have an illuminated cap to monitor the power to the valve and the valves can be heard to 'click' loudly when opening.

STARTUP:

- At this time, the machine can be placed in position and connected to power and mains water. Be sure the large drain hoses are down the drain facility pipe for a distance of about 30 cm. Be sure there are no loops, kinks or obstructions in these large hoses. As mentioned previously, the drain water should “fall” down the hoses directly into the drain. NOTE: for the bench style machine, the drain hoses can be placed into a sink close by, but if the hoses can be passed into a drain pipe that is lower than a sink, the bath will drain much faster.
- **To remove the bath lid**, push the lid horizontally towards the rear and lift the front edge past the retainer pins. Be sure there are no loose parts or packing materials in the bath and be sure the mesh strainer is inserted into the drain hole in the bath and is lying flat on the bath bottom. A tray sits on the floor of the bath to support the beakers and allow water to flow under the beakers to give uniform temperature around the beaker. This tray can be easily removed for cleaning.
- In the bath, observe from the left the drain cover, the overflow tube, the temperature sensor, the circulation pump and the 2x level switches. The overflow tube is adjustable up and down, normally set to be about 3mm higher than the water level when the upper level switch is tripped. A lockable collar is fitted to the tube to ensure the tube cannot be inserted lower than the correct level.



- For floor mounting units, lift the cover from the d/w tank and remove it to permit visual access. Observe the temperature sensor, upper and lower level switches, the pump plus the heat exchanger cooling coil mounted towards the front.
- If the ‘U’ shaped bracket is not yet fitted to the cover, with fingers, place the bracket over the hole and insert the blue headed screw provided to fix the bracket to the cover. Tighten firmly.
- Be sure mains power is off at the isolation switch on the wall. Lift and remove the long cover and turn ON all circuit breakers that control the heater and control circuit(s). Refer to the hardware layout drawing if necessary. Replace the cover.
- Position the control unit into the ‘U’ shaped mounting bracket and gently tighten the blue knobs to clamp it into position. Twist and tilt it the screen to a suitable viewing angle. At the rear, connect the multi pin plug and tighten the 2x security screws. The floor models use two cables to connect to the control unit.



- Be sure mains water supply to the bath is turned OFF. For floor models be sure the distilled water isolation valve on the wall is turned OFF.
- With the bath lid fitted, insert a stainless steel pot into each large hole in the lid. Drop a 30 to 40mm long spin bar into each empty pot but there is no need to load a mash sample for this trial.
- On the left SIDE of the rear S/S cover, see the red mains power rocker switch. Turn ON mains power and turn ON the switch on the front of the electronic controller. The cooling fan will softly sound and the screen should light up. Press the START button on the screen.
- The display will change to present the list of pre-installed programs. The water inlet valve(s) should be heard to 'click'. Now open the mains water valve on the wall and water should begin to fill the bath. For floor mounting units, open the d/w isolation valve and the d/w tank should also begin to fill. When both the bath and d/w tank (floor model only) are full, the upper level switches will stop the filling automatically. Check below the bath to be sure there are no leaks at the hose fittings.
- Use the arrow buttons to select the desired program. When the tanks are full, a message appears and the button can be pressed to access the program screen and the temp/time graph **of the selected program** will appear on the screen.
- Press EXIT and return to the selection display. At this time we can say the machine is operational.

NOW READ THE 'OVERVIEW' SECTION DESCRIBING THE DIFFERENT DISPLAYS AND THE OPTIONS AVAILABLE.

OVERVIEW

A TYPICAL MASH:

The Mash Bath is designed to accept a certain number of stainless steel pots through a special lid so they rest into the water bath. On the bench models, the smaller pots are manually filled with the correct volume of d/w that needs to be added to the mash part way through the program. These small pots are located through the smaller holes in the lid so they heat to exactly the same temperature as the mash sample. The floor models do not have these smaller pots because the d/w will be stored, heated and dispensed by the d/w gun directly into the sample pots.

THE SAMPLE: After ENTERING the selected program, an exact amount of ground sample of barley, hops, or similar, is placed into each pot together with a 30 to 40mm long polypropylene or PTFE coated 'spin bar with pivot ring' for stirring the sample.

NOTE: Sometimes the triangular style of spin bar is preferred where the bar runs slightly raised on small pips and the mash cannot become 'ground' into finer particles between the bar and the base of the pot.

PRE-HEAT: The GO button is pressed and Step 0 begins. The display shows 'pre-heat'. The water is heated to the starting temperature of the selected mashing program and, to avoid loss of dry sample, the dry sample is not stirred at this time. When the preset temperature is reached, the alert #1 sounds and the program automatically HALTS.

ADD D/WATER: This first alert (#1) sounds to advise the operator to fill each pot with the correct volume of distilled water at the same temperature as the bath so that the test can

begin. The required initial volume of distilled water is displayed on the screen and, with a momentary press of the gun switch, this programmed volume at the correct temperature is added to each pot. When all are filled this way, the mashing can begin.

NOTE:: *In bench models, this d/w volume is held in the small pots that are placed in the same bath as the sample. This ensures the d/w temperature is always correct. In the larger floor mounted machines, d/w is stored, separately controlled for temperature, circulated, metered and is quickly dispensed into each pot by pressing a switch on the top of the special d/w dispensing gun. The dispensed volume depends on the volumes set in each program on step #1.*

START THE TEST: The program has HALTED awaiting the filling of all the pots. Press the GO button to release the HALT and stirring begins and the program time progresses. The temperature of the bath will follow the programmed course relative to time. The stirring will operate as programmed step by step, but normally, stirring continues throughout. When EDITING, the stir option can be changed on any step.

SOMETIMES ADD WATER: At a certain point, some programs require an additional amount of distilled water to be added to the mash. On the bench models, the additional d/w volume is placed in the smaller pots after the initial fill and they are re-inserted into the bath lid. The next alert (#2) sounds at the correct point in the program but the program does not HALT. The operator, one by one, lifts the small pots from the bath and adds the contents to the corresponding sample pot (see note above relating to floor models).

THE MASHING CONTINUES: At the end of the program, the slower END alert (#3) sounds and the pots may be allowed to remain in a warm bath or they may be cooled slowly or quickly. This 'end cycle' action is selected by the operator when editing the program. Various programs require different end cycles. The program remains in cycle while the bath draining and filling actions take place.

When the samples are removed from the bath, the RESET button cancels all program function and the system resets back prior to step zero. The cooler in the distilled water tank is fed with cold water and the d/w tank refills and cools quickly to prepare for the next mashing cycle.

THE CONTROL OF THE BATH:

The control of the mashing process is performed by a touch screen PLC. This controller permits programming of up to 8 steps of all 8 programs. It controls the functions of all the filling, draining, temperatures, alerts, circulation pumps, dispensing valves and tank levels and so on as well as providing numerous on-screen operator assistance signals. In each program, it performs GO, STEP, HOLD, RESET functions throughout the program pattern selected.

The stirrers are adjustable for speed, the alerts are adjustable for volume and temperatures of the bath and distilled water (floor models only) can be trimmed for best accuracy.... See later in this manual.

In the floor mounted machines, the distilled water volumes are set inside each program and the operator is not required to measure volumes. However, if a special volume needs to be used or trialed, it can be set without altering a program and used during any program. See later in this manual.

In EDIT mode, a GRAPH of the program is created and is visible to the operator as the information is entered into each step of the program. In running mode, the GRAPH of the

selected program appears on the screen and progress along the graph is indicated by a visible 'time-line'.

In the floor models, the distilled water temperature follows the bath so that the distilled water is the same temperature as the mash at the time it is dispensed. At the end of a program, the distilled water tank is cooled by a heat exchanger to prepare the tank for the next mash.

NOTE:: The cooling of the d/w can be an extra step programmed to begin d/w cooling prior to the end of the mash to create a longer d/w cooling time.

THE AUDIBLE ALERTS:

The audible alert is controlled by the PLC and is automatically triggered at the start of certain steps through the program. Each audible alert is programmed to run for only 5 minutes and then stop unless it has been stopped manually by the MUTE button. Alerts are used for several purposes:

- To make sounds of different patterns to alert the operator that the preheat is finished, or the top-up is required now or that the cycle is finished.
- To alert the operator that the machine is in distress because of low water level in either tank or faulty temperature probe.

To STOP the audible alert at any time, a MUTE button is provided on the touch screen. The alert will sound again only when another event occurs.

To MUTE the audible alert from sounding completely (silent machine), the alert volume can be adjusted down to zero however, alarms due to faults always remain at full volume and cannot be muted.

THE PROGRAMS:

To EDIT any program, it is first selected from the list on the selection screen and the EDIT button is pressed. A password is required to enter the editing mode and a keypad will appear. When the machine is first supplied, the default **password is '1111'** and, if desired, the password can be changed to improve security ...**see later in this manual..**

When EDIT mode is entered the graph of the selected program appears and the program steps can be selected back and forth by on-screen arrow buttons. A HELP button provides 2 displays of brief information on editing. When on the program edit screen, the EDIT button takes you to the 'edit program names' screen. If a name is pressed, a keyboard appears to allow editing of the name or creating a completely new name. Buttons on the right hand side of this screen allow settings to be adjusted. BACK takes you to the previous screen.

MORE INFORMATION ON ALL DISPLAYS IS LATER IN THIS MANUAL.



STIRRING OPTIONS: Normally the dry sample is not stirred during the preheat period and, after the distilled water has been added to the sample and GO has been pressed to cancel the HALT, the stirring begins and continues. The choices for stirring at any step are: YES. NO, INT, loB.

- YES means constantly stirring at the speed set in the 'stirring screen', usually 400 RPM.
- NO means no stirring at all.
- INT means intermittent stir and the timing of the ON / OFF can be set in the "stirring screen".
- loB means the correct special stirring required to run the loB program. 30 seconds stir and 10 minutes no stir.

“COOL DISTILLED WATER” feature:

For floor models with distilled water tanks, during high production times, sometimes it is useful to cool down the distilled water quickly, to be ready for the next mash. The COOL D/W permits the starting of the cooling process before the mash program is completely finished. An extra step is created with COOL D/W set to YES.

PROGRAMS ALREADY INSTALLED: When supplied, several selectable programs are already installed in the machine. When in the SELECTION display, one program must be selected by the arrow buttons and, if the bath and d/w are full of water, the selected program can be ENTERED. If the bath and d/w are not full, a program cannot be entered to run. A message appears to advise this condition.

The selected program is always shown on any display together with the program's step number controlling the temperature and time relationships. When the program is running, the GRAPH of the program and the moving time line can be seen as the program steps proceed.

As supplied, the following programs are present in the controller but at any time program names can be changed and any step in any program can be altered to suit requirements:

Program #1: EBC extraction

Program #2: Hartong index extraction

Program #3: EBC Diastase Power.

Program #4: AAL test, cold water added intermittently to keep bath cool.

Program #5: loB extraction, intermittent stir on/off.

Program #6: Fermentability extraction

Program #7: Spare

Program #8: Spare

The following pages take you through each display and provide information about each one.

'OPENING' display



This is the opening display when the machine is first powered.

Press START will proceed to the PROGRAM SELECTION screen prior to doing a mash cycle.

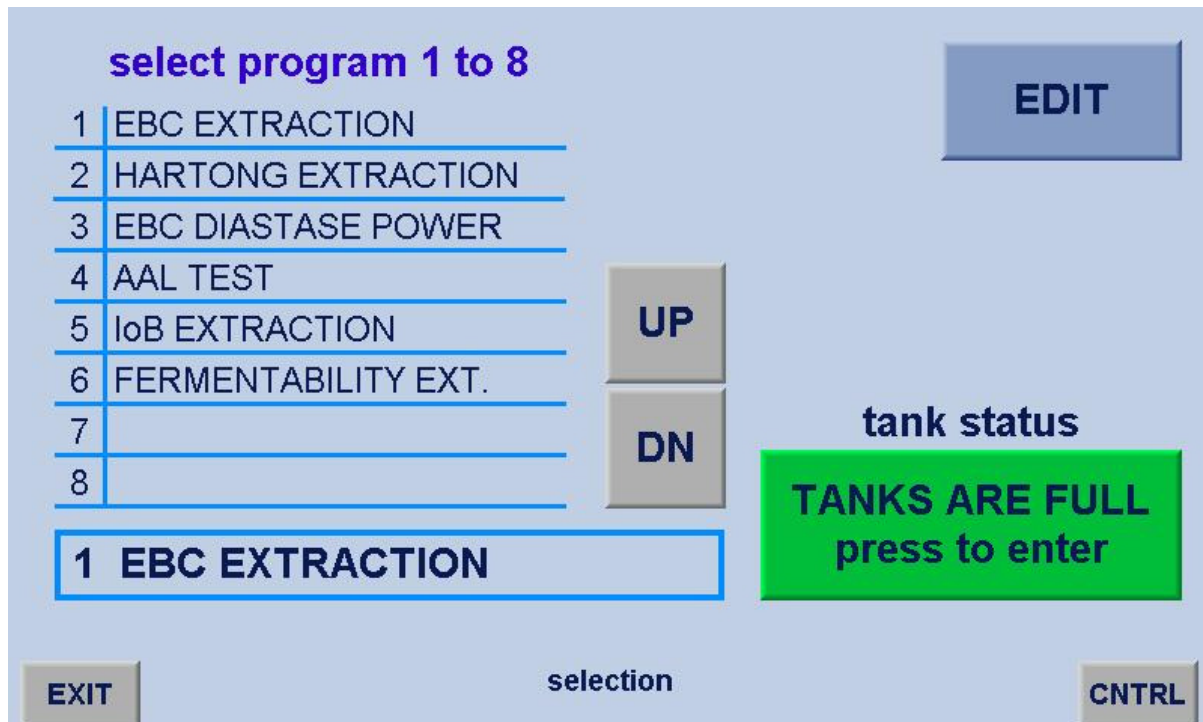
The STORE DRY BATH button permits the optional complete draining of the mash bath before shutting down. When pressed the bath drains empty. Normally the power would then be turned OFF. If START is pressed, the bath will refill to prepare for the next mash.

This display also shows the model type, program version number and the condition of the system RAM and the system BATTERY.

Pressing the top left hand corner of this display allows the operator to change the model type if the controller is moved from one model bath to another. See page 41 for further details.

Press START button

'SELECTION' display



The screen will change to the program SELECTION screen. The system provides 8 different programs and 8 steps inside each program. If either the bath or the distilled water tank is low level is low, they will both fill at this time.

The list of programs are shown and the up/down buttons permit program selection. Select the program to be edited from the SELECTION screen prior to entering the Run Program or Editing section.

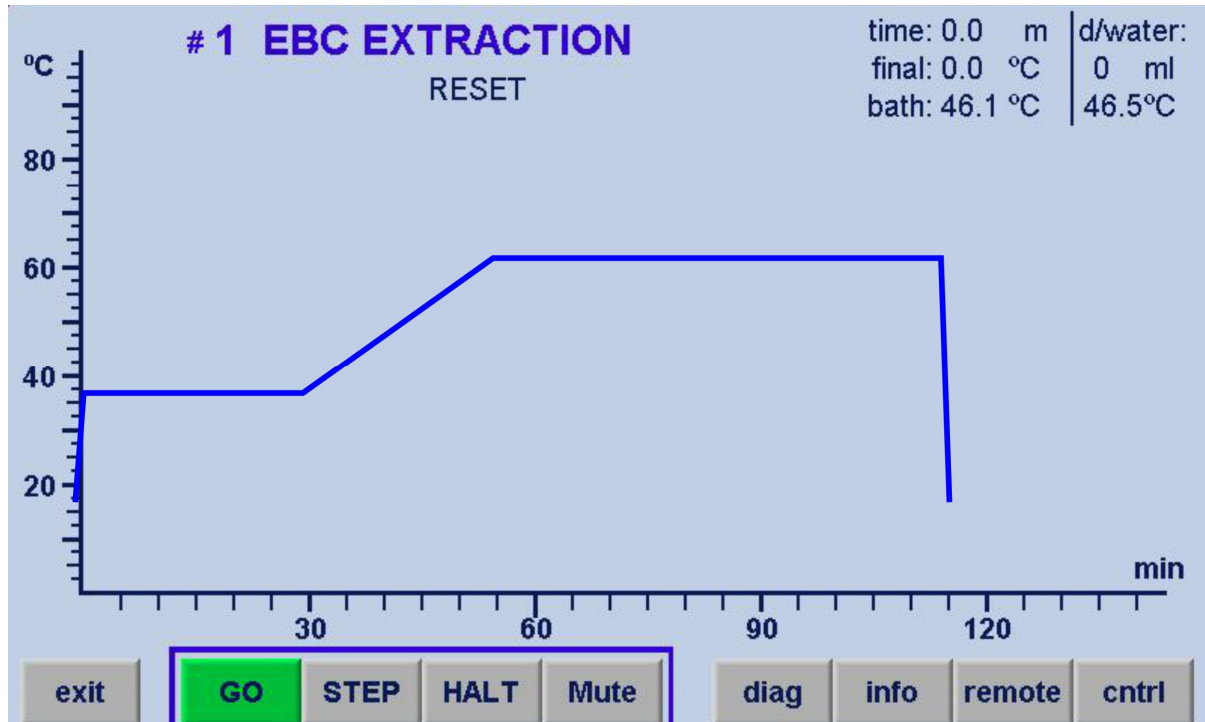
The tank status button advises if the bath and d/water tank (floor models) are full or filling. Once the TANKS ARE FULL the button may be pressed to begin a mash program.

The EDIT button permits entry into the editing areas where program steps and program names can be created or edited. A four digit password is required. The initial password is '1111' but can be changed by the operator in the Alter Password page if desired.

EXIT returns to the OPENING display and CNTRL allows access to manual control of the bath functions.

Press TANKS ARE FULL button

'PROGRAM RUN' display



If the bath and d/w tank are both full, the selected program can be run. As the program progresses, a vertical cursor or 'time-line' is seen to move from left to right so that the current point on the graph can be seen. The program name, its number and the step number are all displayed. The progressing time, the final temperature of that step and the current bath temperature are all displayed on the screen. For floor models, the distilled water temp. is displayed.

Press GO to begin. The program status is shown and this can be 'RUNNING' or 'HALTED' or 'RESET' or 'FINISHED'. Heaters come on and 'H' appears as heating monitor. If bath is cooling, 'C' appears. Small square flashes to monitor program running.

If an alarm occurs, this also is shown on the screen. An alarm can be bath 'LEVEL LOW' or 'BATH TEMP o/c' (temp.sensor open circuit). See later in manual for explanations.

Step #0 is the 'pre-heat' to 45°C. Stirrers are normally off during pre-heat to avoid fluffing the dry sample. When the short time (1 minute) has expired AND bath initial temperature is achieved, the program jumps to Step #1 and HALTS. Stirrers remain OFF and display shows the volume of d/w to add to the sample. At this time, Alert#1 sounds for loading the pots with distilled water. When pots are loaded, the mash is about to start. Press GO to release the HALT.

NOTE: When HALTED, the button changes to RESET. If pressed, the program resets and GO must be pressed again. If a program needs to be RESET, press HALT then press again to RESET – otherwise press GO to cancel the HALT and to continue.



For this particular program:

Step #1 starts at 45°C and remains 45°C for 30 min.

Step #2 climbs a temperature ramp from 45°C to 70°C over 25 min. At the top of the ramp, Step #3 is triggered.

Step #3. At the start of Step #3, Alert #2 sounds to call the operator to add d/w to each mash pot. The volume to add (100 ml) displays on the screen (see screen above at step #3). The program does NOT automatically HALT at this point. Step #3 runs for 60 minutes and holds 70°C.

'CYCLE' Display cont....

USEFUL OPTION: Pre-cool distilled water: If it is required to cool the distilled water earlier than the END of the mash cycle, to be ready for the next cycle, an extra step (step #4) can be created at say 50 minutes to maintain the 70°C and also COOL D/W while the bath is holding the mash at 70°C (step#5) for the extra 10 minutes. Then create step #6 to drop to 25°C for 1 minute so that heaters turn off immediately and the END of cycle is reached and the slow "END alert" sounds during bath draining.

At the end of the 70°C period the next step (step#4) forces the bath heaters off as the bath tries to cool from 70° to 25° in just one minute..

When step #5 is reached, the word END appears and the beaker cooling cycle begins. This beaker cooling cycle can be chosen during programming. In this case, the bath automatically drains empty then re-fills again with cold water to cool the samples quickly. The distilled water cooling coil has water passing to cool down the D/W before the next mash.

The samples are then removed and RESET is pressed to cancel the program.

EXIT returns to SELECTION display when not in cycle. If in cycle, RESET must be pressed before EXIT. GO starts program and will always cancel HALT.

When program is RUNNING, the STEP button moves line forward to the start of the next step of the program.

HALT will stop a program at any point. The stirrers stop and the timers stop but the bath maintains current temperature. To cancel HALT, press GO. When HALTED, the HALT button changes to RESET. If pressed, the program cancels. If cancelled accidentally, the program can be continued by pressing GO, then STEP, then GO (to cancel the HALT), then STEP to the closest place to resume cycle progress.

The Shhh button cancels the BEEPER at any time. If Shhh not pressed, the BEEPER self cancels after 5 minutes running.

The INFO button provides 2 displays of brief information and CNTRL moves to the same CNTRL and DIAG displays as described in previous pages.

Press diag button

'DIAGNOSTICS 1' display

PLC digital inputs		analog inputs	
OFF 0: flow meter (fast)	OFF 6: d/w gun sw.	386	BATH RTD OK
OFF 1: not used	OFF 7: spare	423	D/W RTD OK
UP 2: bath upper lev.sw.	OFF 8: spare		
UP 3: bath low lev.sw.	OFF 9: spare		
UP 4: d/w upper lev.sw.	OFF 10: spare		
UP 5: d/w low lev.sw.	OFF 11: spare		
d/w flowmeter counts: 0		volume: 0	
d/w ml/sec flowrate: 0		f/m p/litre: 1000	
hardware info.		system	
unitronics: V700-T20BJ		controller: 31.4 °C	
hw rev: A ver: 5.30		scan time: 6 ms.	
snap-in I/O module:		unit ID: 1	
V200-18-E3XB			
		SYS. RAM OK	
		SYS. BATT. OK	
		RESTORE DEFAULTS	
		TEST MODE	
back		diagnostics 1	
		diag2	

The diagnostic displays are for maintenance and fault finding.

On DIAGNOSTICS 1 screen the status of the PLC digital and analog inputs are displayed and flow meter information (floor models). Values of the controller's internal temperature, scan time and ID info.is also shown. Battery and RAM status is monitored.

TEST MODE can be entered to perform tests quietly without fault alarm.

RESTORE DEFAULTS can be pressed for 5 seconds until the red LED comes ON then goes OFF, this will re-load the memory with current data in the event of data corruption. This avoids keying in all the program data again.

Press back to return to 'cycle progress' screen.

Press diag2 button

'DIAGNOSTICS 2' display

PLC digital outputs		analog outputs
OFF 0: d/w heat signal DC	OFF 9: stirrer bank 2	d/w pump speed: 1000
OFF 1: bath heat signal DC	OFF 10: stirrer bank 3	stirrer speed: 3544
OFF 2: heater contactor	OFF 11: stirrer bank 4	alert volume: 0
OFF 3: s/v d/w cool	OFF 12: stirrer bank 5	analog max. = 4000
OFF 4: s/v d/w fill tank	OFF 13: stirrer bank 6	
OFF 5: s/v bath drain	OFF 14: alarm LED	
OFF 6: s/v bath fill	ON 15: bath circ.pump	
OFF 7: s/v d/w dispense	ON 16: d/w circ.pump	
OFF 8: stirrer bank 1		

back **diagnostics 2** **diag3**

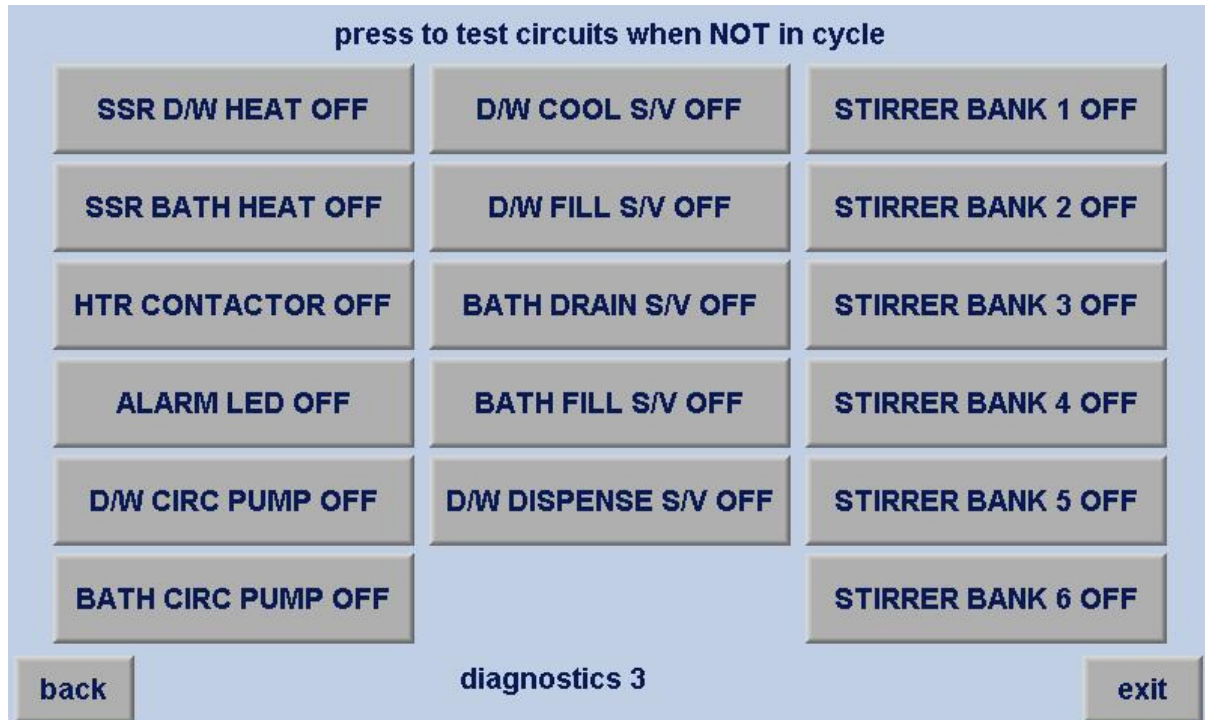
As above, this display is for maintenance and fault finding. On DIAGNOSTICS 2 screen the status of the PLC digital and analog outputs is displayed.

The PLC drives analog outputs controlling the d/water pump speed, stirrer speed and alert beeper volume. The value applied to each device is monitored on this display. 4000 is the maximum value possible.

Pressing the back button on DIAGNOSTICS 2 screen will return to DIAGNOSTICS 1 screen.

Press diag3 button

'DIAGNOSTICS 3' display



As above, this display is for maintenance and fault finding and it is used when the bath is not in cycle.

DIAGNOSTICS 3 has press buttons to force on each output device. If there is suspicion that a particular device is not operating, it can easily be proven on this screen. During manufacture it is used as a check that each device is wired correctly.

Press 'back' to return to DIAGNOSTICS 2 screen.

Press 'exit' to return to PROGRAM RUN screen.

Press exit button to return to Program Run screen, then press info button

'PROGRAM STATUS' display

settings of current step: 0		total progress: 0.0 of 112 min.	
initial temp: 15.0 °C		alert: 0	0: alert off
final temp: 45.0 °C			1: D/W: initial dispense (step 1)
step time: 0 of 1 min.			2: D/W: dispense addition
add d/water: 0 ml			3: END of program (last step)
stirring: INT yes / no / intermittent / loB			4: spare alert sound
d/water cool: YES begin cooling of distilled water tank			
warm bath	warm bath: bath remains full and warm slow cool: adds cold water for slow cool drain only: drains bath empty drain/refill x1: drains bath then refills with cold drain/refill x2, x3, x4: for cooler samples		
bath: 39.6 *C	target: 15.0 *C	d/w: 22.5 *C	
back	program status	next	

The PROGRAM STATUS screen shows the following information:

Current step number.

Total time through the whole program and overall program time.

Initial Temperature of the current step.

Time progress of the current step and overall step time.

Final temperature of the current step.

Distilled water volume to add.

Stirring status of this step.

Distilled water cooling.

Alert number

Selected cooling cycle at program end

Bath temperature

Target temperature

Distilled water temperature

Press next button

'CYCLE NOTES' display

explanation of cycle

Bath preheats (Step 0). When temp.is achieved, program moves to Step1, alert sounds, pot fill volume displays and program HALTS

In HALT mode, the button changes from HALT to RESET.
Press GO to cancel HALT or press RESET to cancel program.

When not in HALT or RESET mode, press STEP to jump forward through program. NOTE: cannot step backwards.

Press Mute to stop alert. Press CNTRL to alter or monitor.
Press EXIT (only when reset) to exit run mode display.

 cycle notes

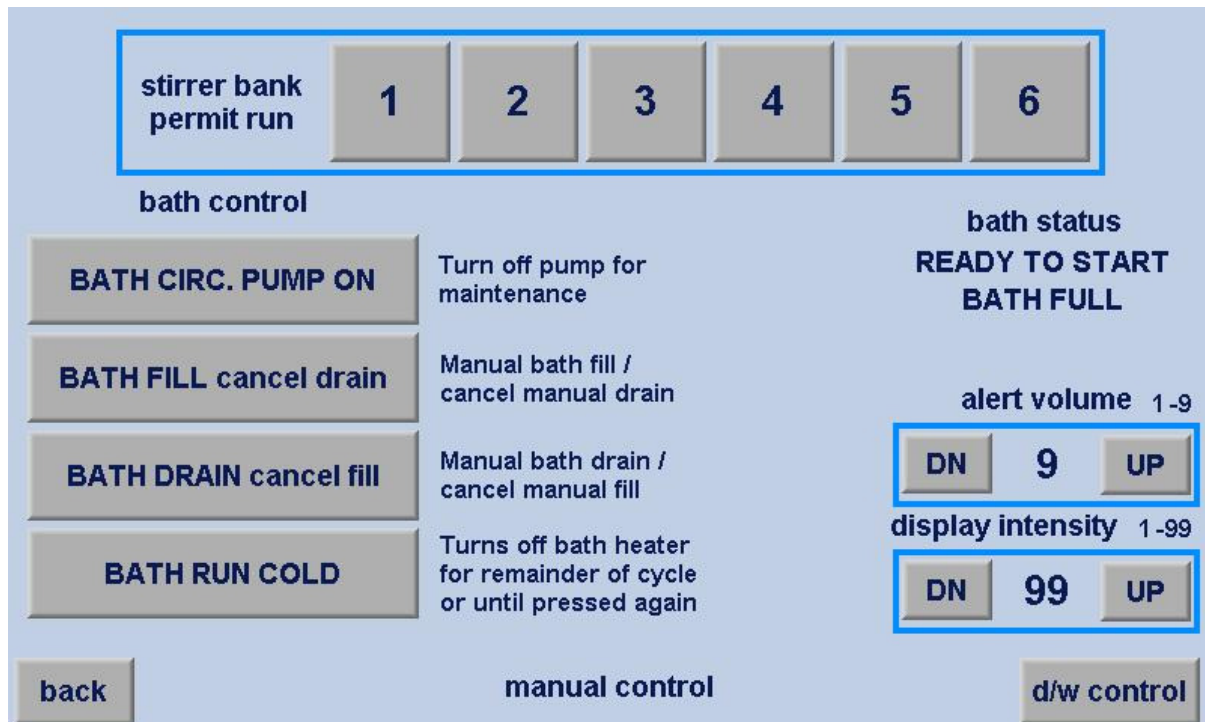
The cycle explanation screen gives the operator an overview of the cycle and the press button functions on the Run Program screen.

Press the back button to return to the PROGRAM STATUS screen.

Press the exit button to return to the Run Program screen.

Press exit button to return to Program Run screen, then press cntrl button

'MANUAL CONTROL' display



The MANUAL CONTROL screen allows manual control of some of the bath functions.

The magnetic stirrer banks may be individually turned off if not all are required, or if there is a malfunction.

Bath circulation pump can be turned ON/OFF but is normally free to run.

Bath filling and draining can be controlled. Momentary press on FILL cancels DRAIN and momentary press on DRAIN cancels FILL. Second press executes command. By pushing the press button, bath can be forced to fill beyond 'full' and will overflow to waste.

For testing equipment, the mash cycle can be run with the heaters OFF.

The machine STATUS is shown.

The audible volume of the various ALERTS can be altered to suit lab noise conditions. Fault Alarms are always fixed at full volume.

The display brightness can also be changed to the lab conditions.

Press d/w control button

'D/WATER CONTROL' display

D/WATER CIRC. PUMP ON Turn off pump for maintenance

D/WATER TANK FILL Turn off filling of D/W tank when filling

D/WATER GUN SWITCH D/W Gun switch is simulated. Use if faulty gun switch

QUIT D/W DISPENSE Stops dispense if faulty flow meter

D/WATER COOL 10min Cools D/W tank for 10 mins in or out of cycle

D/WATER RUN COLD Turns off D/Water heater for remainder of cycle or until pressed again

MANUAL DISPENSE OFF

manual volume - ml

DN 100 UP

If MANUAL D/W is selected ON, all volumes will be dispensed as set above

d/w status

D/W TANK FULL
D/W CIRC. ON

back distilled water tank control diag

The DISTILLED WATER CONTROL screen (Floor models only) allows manual control of some of the distilled water functions.

Circulation / dispensing pump can be turned ON/OFF.

D/W tank cannot be filled beyond 'full'.

Dispense switch on gun can be simulated by pressing button.

Cooler (heat exchanger) is automatic when out of cycle, but can be turned ON or OFF. If forced ON, will turn OFF after 10 min to conserve water. Can be set as a step inside a program to begin cooling the tank prior to the next mash cycle.

Programs carry d/w volumes, but a fixed volume can be entered and, if turned ON, this volume will always be the dispensed volume. Normally remains OFF.

Distilled Water tank status and several important explanations are displayed

Return to selection screen and then press edit button

'EDIT PROGRAM' display, Step 0



The EDIT PROGRAM screen allows the operator to edit and create new programs. Select the program to be edited from the SELECTION screen prior to entering the editing section.

Press HELP for useful information relating to the editing of the program.

The program is to be built from Step 0 to the final step or END.

On Step 0, start °C is 15, 'min' (minute) is 1, and 'd/w ml' is 0. For Step 0, these values are fixed and cannot be altered.

Press "end°C" for keypad and key in desired end temperature for Step 0 (pre-heat is usually to 45°).

Press "alert" for keypad and key in the alert options (0-4). Press HELP to see the alert options.

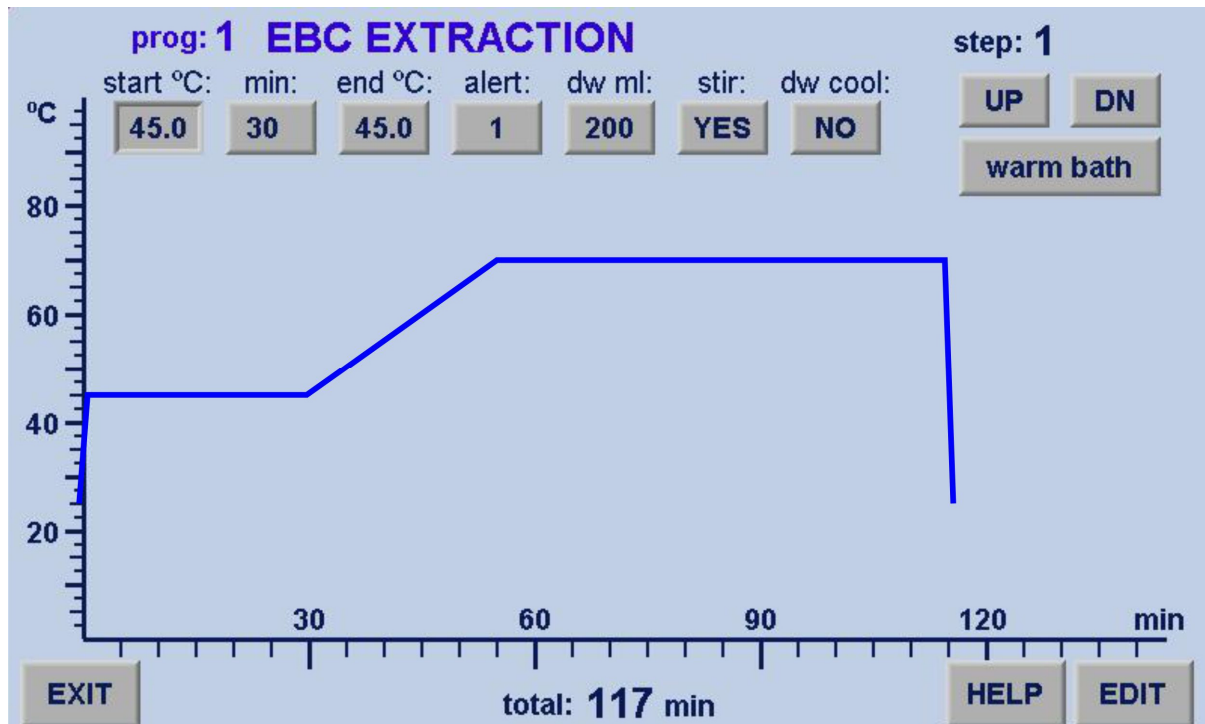
Press "stir" to cycle through the options (NO/YES/INT/loB). For Step 0, stir is normally NO so the sample is not fluffed.

Press "d/w cool" to cycle through the options (NO/YES)

Press EDIT for other program items that can be edited. Press EXIT to revert to the SELECTION display.

Press UP button to Step 1

'EDIT PROGRAM' display, Step 1



The start °C (45) is copied from the end °C of the previous step. It cannot be altered.

Press min and set to 30. Press end °C and set to 45. This means the temperature will remain steady at 45 °C for 30minutes.

Set alert at the start of Step 1 to 1. When pre-heat is finished, Step 1 is entered and the alert sounds. Program HALTS to load distilled water into pots.

Press d/w ml to set the initial distilled water volume dispense to desired amount, in this case 200ml.

Press stir and set to YES so the stirring occurs when HALT is cancelled by GO.

Press UP button to Step 2

'EDIT PROGRAM' display, Step 2



The start °C (45) is copied from the end °C of the previous step. It cannot be altered.

Press min and set to 25. Press end °C and set to 70. This means the temperature will rise steadily from 45 to 70 °C over 25 minutes.

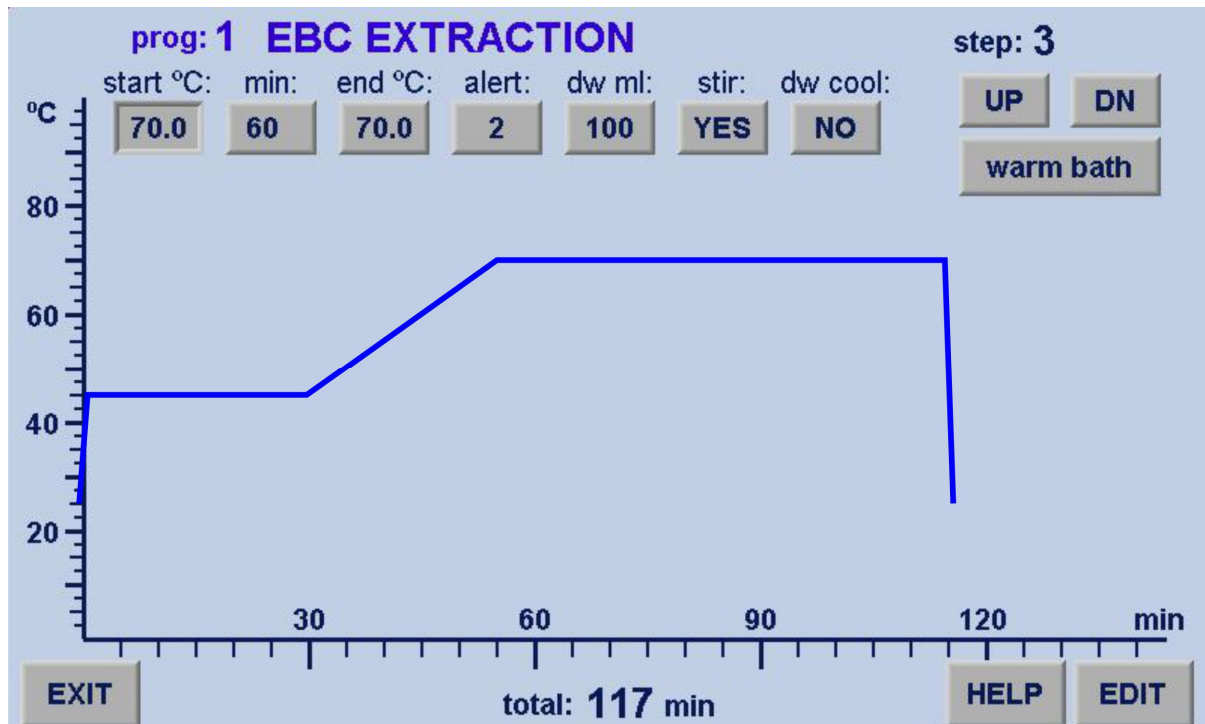
Set alert to 0 (no alert).

Press d/w ml to 0 volume.

Press stir and set to YES.

Press UP button to Step 3

'EDIT PROGRAM' display, Step 3



The start °C (70) is copied from the end °C of the previous step. It cannot be altered.

Press min and set to 60. Press end °C and set to 70. This means the temperature will remain steady at 70 °C for 60 minutes.

Set alert to 2 (add d/w). When program reaches Step 3 the alert will sound to remind the operator to add the distilled water into the pots.

Press d/w ml to set the added distilled water volume to 100ml.

Press stir and set to YES.

Press UP button to Step 4

'EDIT PROGRAM' display, Step 4



The start °C (70) is copied from the end °C of the previous step. It cannot be altered.

Press min and set to 1. Press end °C and set to 25. This means the temperature will fall to 25 °C in 1 minute. Heater is OFF, cooling is ON.

Set alert to 0 (no alert). When program reaches Step 3 the alert will sound to remind the operator to add the distilled water into the pots.

Press d/w ml to set the distilled water volume to 0ml.

Press stir and set to YES.

Press UP button to Step 5

'EDIT PROGRAM' display, Step 5



The start °C (25) is copied from the end °C of the previous step. It cannot be altered.

Press min and set to 0. Press end °C and set to 0. This means the END of PROGRAM. The word end END will appear in display.

Set alert to 3 (end alert). When program reaches Step 3 the alert will sound to remind the operator to add the distilled water into the pots.

Press d/w ml to set the distilled water volume to 0ml.

Press stir and set to YES so that stirring continues through the cooling cycle.

Press to set the bath state at End Of Cycle. There options are Warm Bath, Slow Cool, Drain Only, Drain/Refill x1, 2, 3 & 4.

Press HELP button

'EDIT HELP 1' display

program notes

After preheat, step1 is entered only when initial bath & d/w temperatures have been achieved. Program enters HALT mode.
Load d/w and press GO to continue.
All programmed alerts sound and d/water volumes appear as a step is entered.

alert options

0 = no alert
1 = d/w fill
2 = d/w add
3 = cycle end
4 = spare alert

program: end options

warm bath: program finishes with warm bath. No draining.
slow cool: adds cold water to warm bath to overflow
drain only: drain bath empty at finish of program
drain/refill x1: drain then refill bath with cold water for fast cooling
drain/refill x2, 3, 4: drains then refills bath two, three or four times

back

editing info

next

This display assists operators with program editing notes.

The alert options are listed together with their meanings.

The program end options are listed together with their meanings.

Press NEXT to move to EDIT HELP 2 display

Press NEXT button

'EDIT HELP 2' display

notes on program progress

Alerts sound as a step is entered. The END alert is automatic and does not require placing into the last step.

Alert1 is end of pre-heat and start of step1. Pots are loaded. Press GO to continue. If d/w is to be added (often at step3) alert2 sounds. Program does not HALT. D/W volumes display in ml. If desired, any alert can be set for any step. Each step requires the stir OFF/ON/INT/loB setting. Usually OFF for pre-heat.

At the end of program there is a choice of cooling methods. These are explained in other displays. If RESET is pressed at any time, all functions cancel but a step can be repeated by pressing STEP to move to the desired step for continuing.

back

notes & explanations

exit

This display assists operators by explaining aspects of the steps and functions.

Press EXIT to return to Program Edit display

Press EXIT button to return to EDIT PROGRAM page and then press EDIT

'EDIT PROGRAM NAMES & SETTINGS' display

edit program names		settings
1	EBC EXTRACTION	bath
2	HARTONG EXTRACTION	d/water
3	EBC DIASTASE POWER	stirring
4	AAL TEST	p/word
5	loB EXTRACTION	comms
6	FERMENTABILITY EXT.	
7		
8		

BACK edit program names & other

This display permits editing, adding or removal of any program name and other settings.

Press on the name you would like to edit. A full keyboard will appear with 3 alternative screens to choose characters.

Key in the new name and press enter to save.

BACK returns to the Program Edit display.

Press on the buttons to change settings of the bath, distilled water, stirring, password or remote communications.

Press BATH button

'BATH SETTINGS' display

bath temperature offset

The bath temperature probe can be adjusted to compensate for small temperature errors.

If 'offset' is altered, bath water will increase or decrease in temperature by the offset amount.

DECREASE BATH TEMP. **DN** **0.0 *C** **UP** INCREASE BATH TEMP. **BATH TEMP.** **46.2**

bath cooling adjustment

For bath cooling (if overshoot 2°C), cold water ON and OFF times can be adjusted for best results: 3 to 30 seconds.

ON OFF

DN **5** **UP** **DN** **10** **UP**

back temperatures

This display permits the adjustment of bath temperature and cooling.

Temperature: The bath temperature offset allows the operator to have the offset applied to achieve maximum accuracy. Use accurate thermometer in the bath and adjust the OFFSET so the bath temperature control matches the thermometer.

Cooling: If the bath temperature exceeds the set temperature by 2 °C or more, the COOLING function adds cold water to cool the bath. This display permits adjustment of cold water time ON and time OFF for the best cooling function. Typically 5s ON, 10s OFF.

BACK returns to previous screen.

Press BACK then D/WATER button

'D/WATER SETTINGS' display

d/water temperature offset

The d/water temperature probe can be adjusted to compensate for small temperature errors.

D/WATER TEMPERATURE OFFSET

DECREASE TANK TEMP. **DN** **0.0 *C** **UP** INCREASE TANK TEMP. **D/W TEMP.** **24.8**

flow meter: 1000 / 1200 pulses per litre

1000p/L **1000 p/L** **1200p/L**

distilled water dispense adjustment

Dispensed volume can be trimmed in %. Also by fixed 'offset'.

% CHANGE OFFSET (ml)

DN **4 %** **UP** **DN** **-2 ml** **UP**

back **d/w temperature**

This display permits the adjustment of distilled water temperature and flowmeter pulse and distilled water temperature.

Temperature: The distilled temperature offset allows the operator to have a small offset applied to achieve maximum accuracy. Use an accurate thermometer in the bath as a reference to adjust the OFFSET so the bath temperature control matches the thermometer.

Flow meter pulses: IEC have used two different types of flow meters on the Mash Baths over the years. The current hall effect flow meter used is more accurate and reliable than its predecessor and gives 1000 pulses per litre, as opposed to the earlier flow meter which gave 1200 pulses per litre.

Dispense: The dispense volume can be adjusted by either a percentage change in volume up or down, OR by a fixed ml 'offset', OR a combination of the two to give the most accurate dispensing volume.

BACK returns to previous screen.

Press BACK then STIRRING button

'STIRRING SETTINGS' display

stirrer speed adjustment

For spin bars, the normal stir speed is about 400 RPM.
This speed can be adjusted above or below this figure.

STIRRER SPEED 250 - 440

DN 400 UP

intermittent stir adjustment

Some programs may require intermittent stirring. The ON
and the OFF times can be adjusted 3 to 30 seconds.

ON OFF

DN 3 UP DN 3 UP

back alter stirring

This display permits the adjustment of stirrer speed and the intermittent stirring time, when programmed.

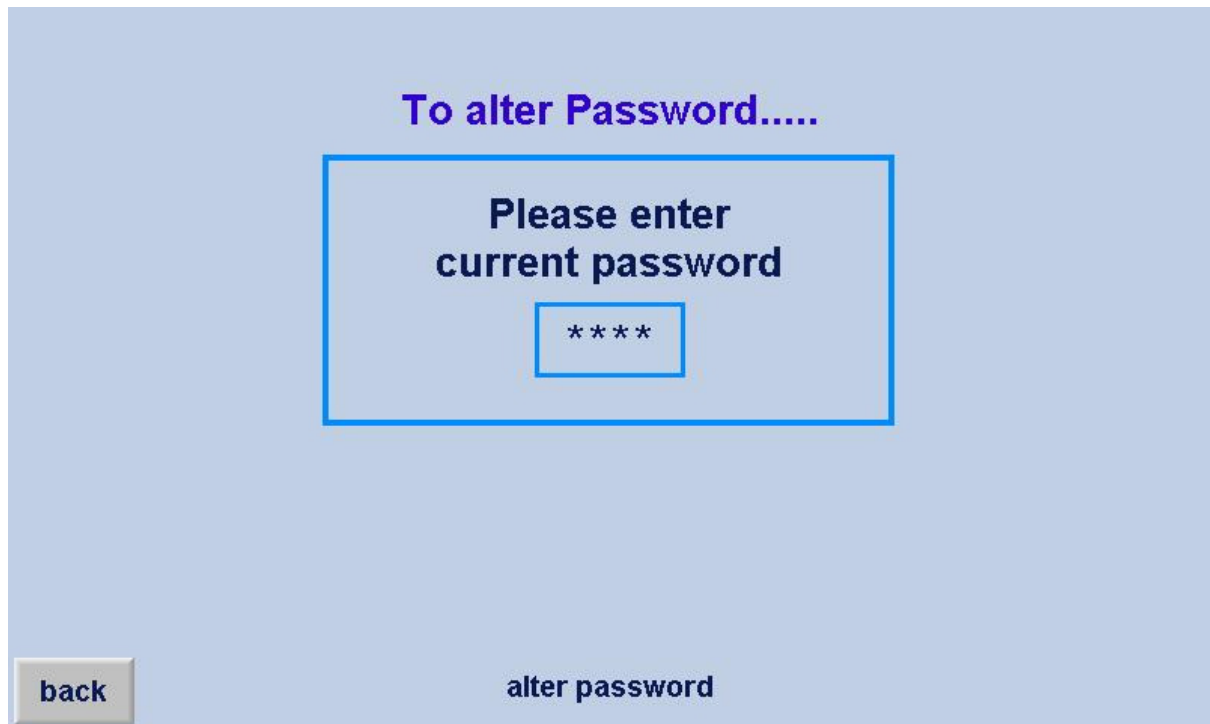
Speed: This display adjusts the speed of all the magnetic stirrers. The speed for a 40mm long spinbar is set normally to about 400 RPM. To ensure all stirrers run at the same speed, each bank of stirrers under the bath has its own speed adjustment control.

Intermittent Stirring: Some programs require intermittent stirring. This display permits changing both the stir ON and the stir OFF times. These are typically set at 5s ON and 10s OFF.

BACK returns to previous screen.

Press BACK then P/WORD button

'ALTER PASSWORD 1' display



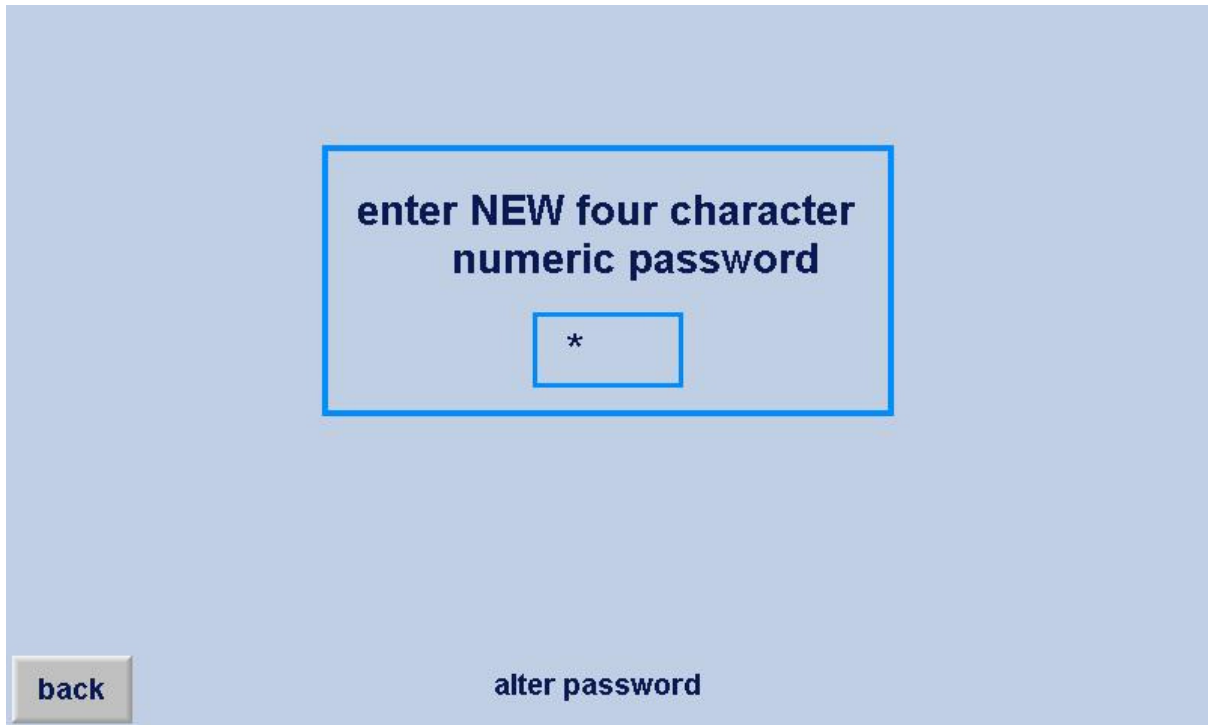
This display permits the password to be changed from the supplied password '1111'.

To alter the password, press the centre area. A keyboard will appear asking for the current password to be entered.

Key in the 4 numeric digits and press the enter symbol.

If valid another display will appear asking for the new password to be entered.

'ALTER PASSWORD 2' display



To enter the new password, press the centre area. A keyboard will appear asking for the NEW password to be entered.

Key in the 4 numeric digits and press the enter symbol.

If valid, the display will revert back to this display.

Press BACK twice to PROG NAMES screen, then COMMS button

'COMMS' display

ethernet settings

PLC Name	IECMASHBATH
IP Address	192 . 168 . 1 . 50
Subnet Mask	255 . 255 . 255 . 0
Gateway	0 . 0 . 0 . 0
PCOM	PASS6165

ETHERNET CARD INITIALISED **TCP CONNECTION NOT ESTABLISHED**

 communication

This display permits the communication settings to be changed from the supplied settings and to monitor the Ethernet connection.

NOTE: The PLC Name must match the connecting program such as "Remote Operator" to allow Ethernet communication.

To alter the PLC Name, press on the current name. A full keyboard will appear with 3 alternative screens to choose characters. NOTE: The PLC Name is case sensitive and must match a connecting program such as Unitronics "Remote Operator" to allow Ethernet communication. See page 42 for more details.

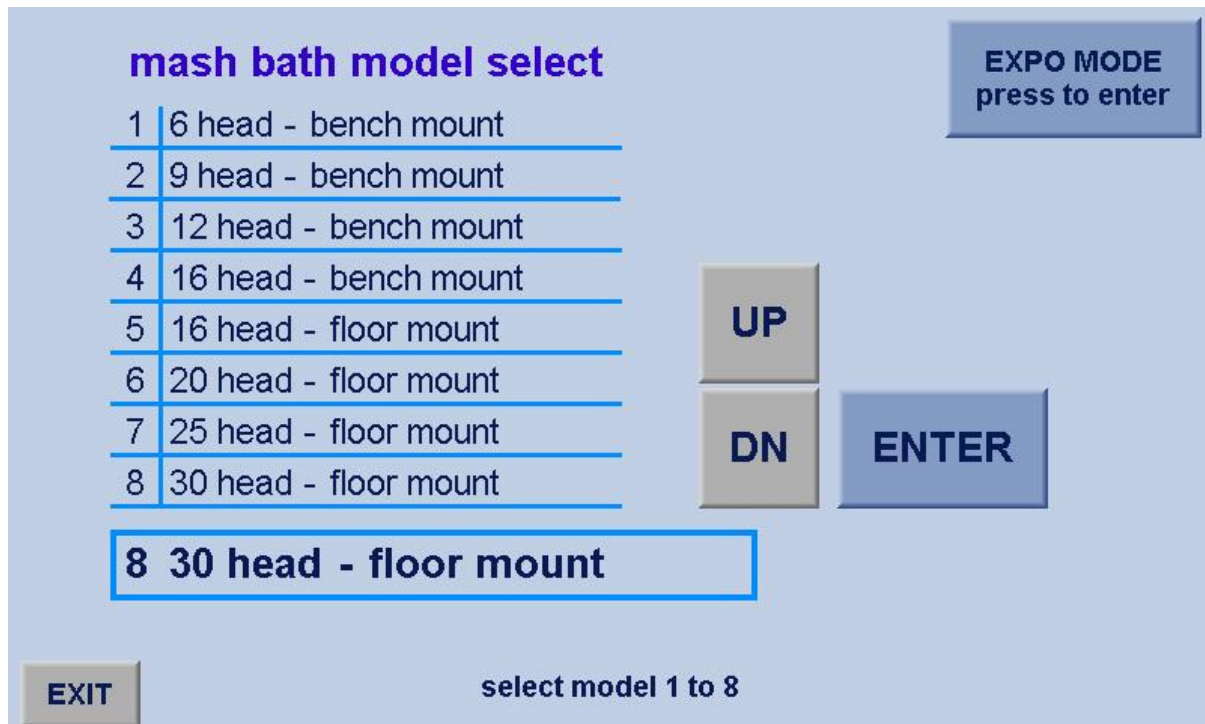
To alter the IP Address, press each octet button and a numeric keyboard will appear. Key in each octet of the desired IP address. The first three octets must match the network being connected to.

The Subnet Mask and Gateway IP address can also be changed if required.

To alter the PCOM (Ethernet) Password, press on the field and enter your desired password. The password is case sensitive and a connecting program such as Unitronics "Remote Operator" will ask for this password to allow Ethernet communication. This is a recent addition to the Unitronics software to help protect against cyber attacks.

Press BACK twice and then EXIT to leave the editing section

'Model Types' display



This display allows the operator to change the model type if the controller is moved from one model bath to another.

Press the top left-hand corner of the opening display, WHEN THE MACHINE IS STOPPED, and a numeric keypad will appear. Key in password 807 and press ENTER to access this screen.

Use arrow buttons to select and enter the correct model type. This will automatically modify the displays to give the relevant information for the model selected.

“Remote Operator”

“The Mash Bath controller can be connected to the laboratory LAN network so the Controller can be viewed and controlled remotely by PC. If connected to the LAN wifi network it can also be connected to a IOS or android device.

Connect an ethernet cable to the ethernet port on the rear of the controller.

For PC or Laptop:

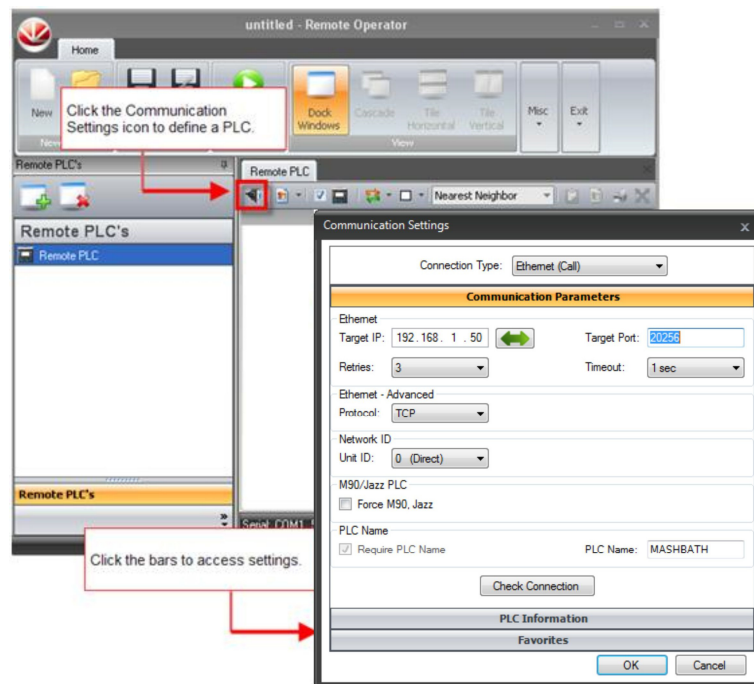
Go to: <https://unitronicsplc.com/software-visilogic-for-programmable-controllers/>

Click on “Download Software Utilities” section and you will see the download tab for Remote Operator

Download and install the Remote Operator software on your PC.

Define the PLC

By default, Remote Operator opens with a single PLC named “Remote PLC”, defined by default as directly connected to your PC



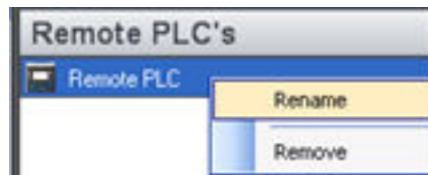
Under Connection Type, use the drop-down arrow to select Ethernet (Call) option.

Enter the Target IP address. This is the IP address of the Mash Bath Controller. In this case, 192.168.1.50. If unknown, check the IP address on the Mash Bath controller, by going to the Comms page in the editing section of the Mash Bath controller. See page 40 for more details.

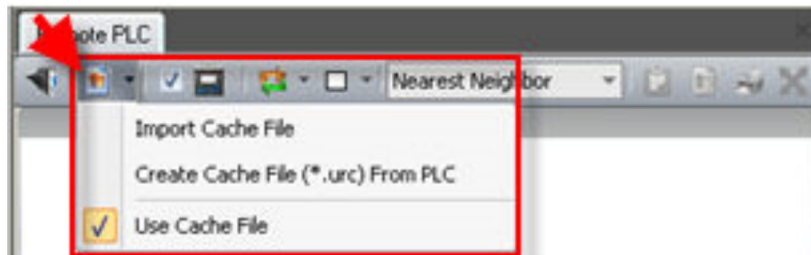
Enter the PLC Name, in this case, MASHBATH.

Test the connection by clicking “Check Connection” button.

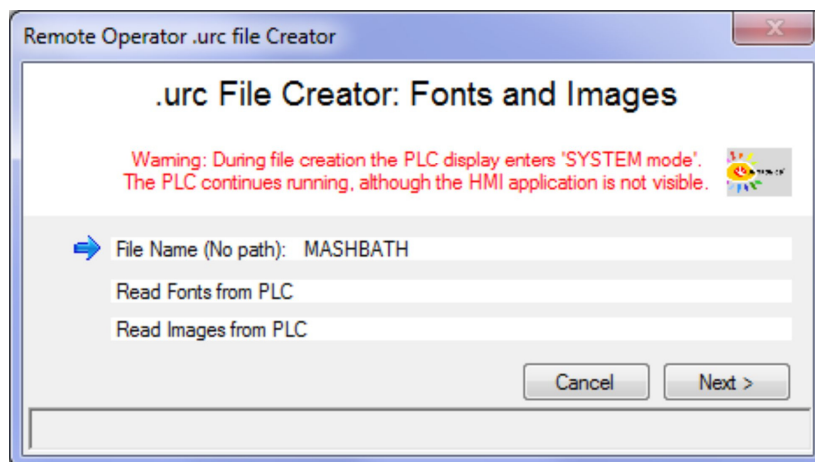
Rename Remote PLC: You can rename and remove the PLC by right-clicking it.



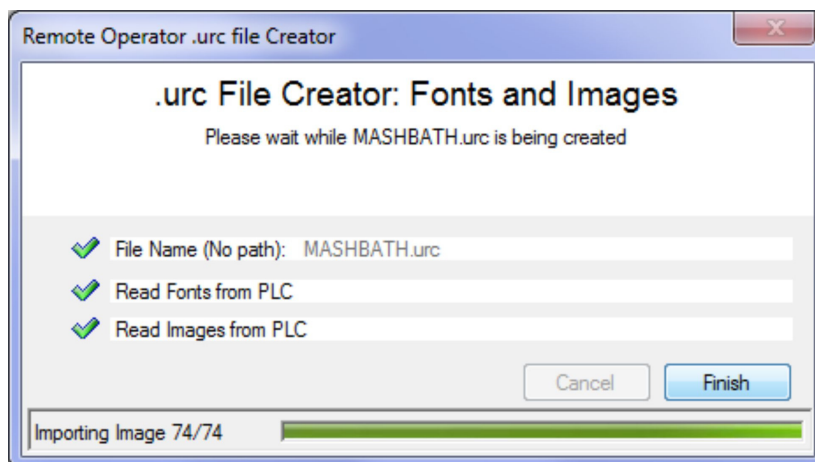
Cache Files: In order to see the PLC's images, you must create a .urc file from the PLC that contains the images. Click "Create Cache File (.urc) From PLC"



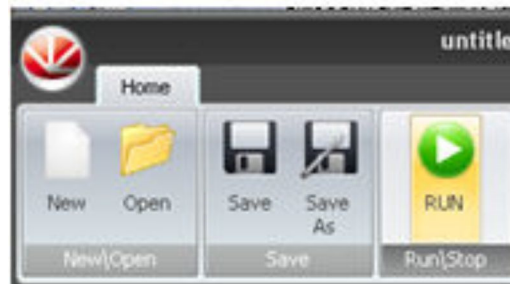
Enter File Name in field and click "Next" button.



Reading images from the PLC may take a few minutes, then click Finish button.



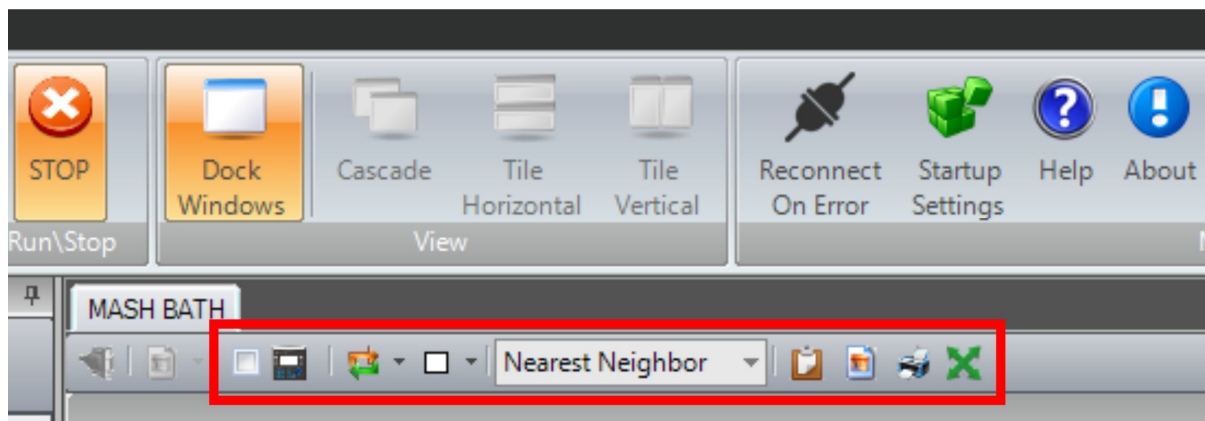
Save Session: It is advised to now save the Remote Operator session with the image cache file and all settings.



Click Save on the toolbar. Enter the name of the session and the location you would like it saved, and then click Save. If saved to the desktop it will automatically create a shortcut for Remote Operator, with the name and settings for use in the future.

Once you have configured Remote Operator, enter Online mode by clicking Run.

Other options:



Show Case: Select this to hide or display the PLC enclosure around the Display screen.

Refresh: Select to assign a display refresh rate or opt for Manual refresh.

Background Color: This will provide the background colour in the window displaying this PLC

Interpolation Mode: Different modes may display differently on your PC screen

Copy Picture to Clipboard: To paste screen into a document for instructions, etc.

Copy Picture to Disk: For saving image on computer, etc.

Print Picture: To print image on computer screen

Full Screen Mode: Press to have PLC screen image the full PC screen. Press Esc to exit full screen mode.

NOTE: ONLY ONE DEVICE CAN BE CONNECTED TO THE PLC AT ANY ONE TIME

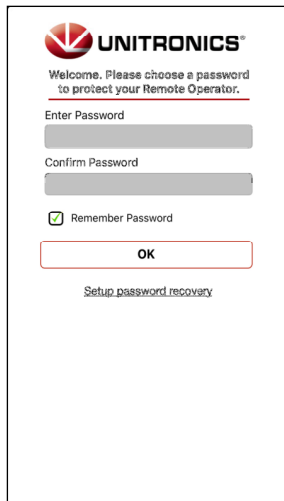
“Remote Operator”

For IOS or Android devices:

Go to your app store and download the Unitronics Remote Operator app for your device.



Open the app by tapping on the icon on your device home screen.

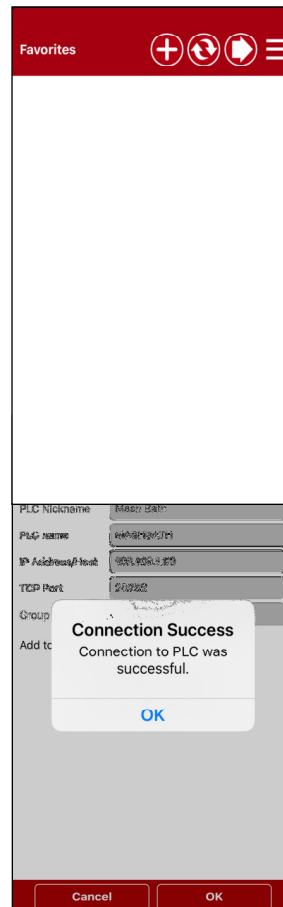


Account:

Create a password to prevent unauthorized entry to the app. Tap OK, the app opens an empty Favorites screen

Favorites:

Tap (+) to add a new Mash Bath Controller PLC



New PLC:

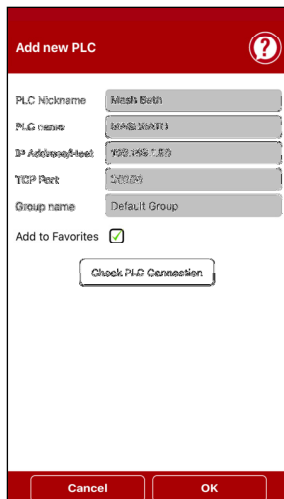
PLC Nickname is optional.

PLC Name must exactly match, including capital letters.

IP Address/Host must match the IP Address of the Controller PLC.

TCP Port must be 20256

These define the communication channel

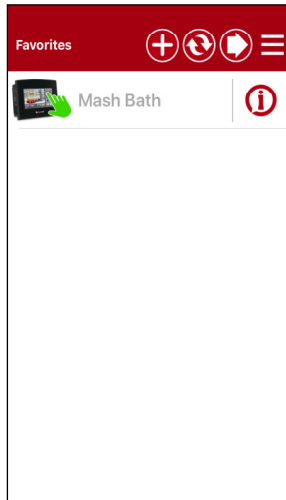


Check PLC Connection:

Please note: Only one device may be connected to the PLC at any one time.

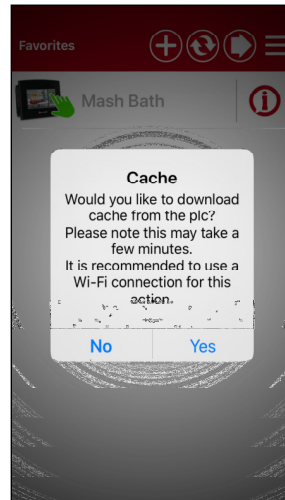
If connection failed, turn off device mobile data and check the device wifi is connected..

If it still fails, check the PLC Name, IP Address and TCP Port with the Controller PLC.



The PLC marked with a green hand is active. You can access it remotely by tapping it.

To view/edit PLC details tap (i) beside the PLC.



Download the cache file so the app has access to the PLC images.

This may take a few minutes.

The Mash Bath screen is now connected to the device for control and monitoring.



SPARE PARTS, SERVICE & MAINTENANCE:

The spare parts box supplied with the Mash bath should contain:

Assorted fuses, including: 5 x 500 mA fuses, 5 x 1 Amp fuses, 10 x 2 Amp fuses, 10 x 3 Amp fuses, 2 x 4 Amp fuses, 2 x 7.5 Amp fuses

1 x Stirrer motor complete assembly (tested)

1 x Stirrer Motor only

1 x Pump motor only

Stirring System

How the stirring system works:

Each bank of stirrers is fed with 24V.DC.to power all the motors on that stirrer bank. A control voltage is provided from the Control Unit to set the stirring speed of the motors. This control voltage is supplied to all banks and is adjustable on the Control Unit's "Stirrers Page" in the editing section. The normal setting is 400 RPM which is classed as the best stir speed for Mashing.

Each motor has its own optical feedback system to ensure the speed is accurate and constant and a micro controller synchronises all the motors on each bank. The speed of all motors is controlled by the voltage signal from the controller.

The Stirrer Motors:

If a stirrer motor stops, first be sure that the stirrer bank is not manually switched off in the CNTRL display of the control unit. Remove the front cover and first check the fuse to the stirrer bank. The fuse is on the front lowest corner of the stirrer bank PCB. The green LED on the stirrer bank PCB indicates that power is present at the stirrer bank. The red LED indicates that the 3 amp fuse is blown. The cause is probably a motor problem.

For removal of the stirrer bank, Unplug the connections from the 2x sockets at the front end of the PCB. Undo the one vertical screw directly above the PCB by using an Allen key. The set of stirrers will now extract from the bath

Each motor drive assembly is easily removed from the bank by removing 2x wing nuts and removing 2 small electrical plug.

To reinstall, look under the bath and slide the pin at the far end of the PCB into the hole provided and reinstall the large vertical screw at the front. Tighten firmly with Allen key. Replace the 2x plugs into the sockets.

Protection:

If any motor loses speed control for any reason, or if a motor jams and stops, it will be automatically isolated without affecting any other stirrer on the bank. When the problem is resolved, a small press "Reset Button" on the end of the stirrer bank PCB will reset the isolated motor (or motors) to bring them back into operation again.

Circulation Pumps:

Bench Models have bath circulation only

Floor Models have both bath circulation and Distilled Water tank circulation with dispensing of Distilled Water.

If a circulation pump motor stops, first be sure it is not manually switched off in the Control Unit display. If not switched OFF, first check the fuse to the motor. The bath circulation fuse is one of the vertical fuses inside the control unit. It is marked "BATH PUMP". It is a 3 amp fuse. The distilled water circulation and dispensing motor fuse is also a 3 amp fuse beside the bath pump fuse and is marked "D/W PUMP".

To replace a circulation pump motor: Open the spare parts package, remove the spare pump DC motor. Turn off the power to the machine. Isolate the power to the machine at the isolation switch on the lab wall, as high voltages are present under the rear electrical cover.

Remove the beakers and lid of the mash bath for access and also remove the long rear cover over the electrics. NOTE: If the cable is disconnected from the Control Unit, it can remain mounted on the cover as the cover is lifted from the machine.

Take note of the polarity of the RED and BLACK connections to the circulation pump motor. Reach inside the bath and hold the barrel of the circulation pump motor firmly in one hand while twisting and pulling the motor from the top. Tools are not required. The motor, complete with the location boss assembly should extract from the pump barrel. Unscrew the insulating adaptor from the metal location boss, then unscrew the motor from the insulating adaptor.

Remove the insulated coupling from the motor shaft and fit it to the new motor making sure it is in the same position on the motor shaft.. Tighten firmly. Re-fix the insulating adaptor to the new motor and re-fix insulating adaptor to the metal boss.

Look down the barrel of the pump and see the cross pin at the top of the shaft. This cross pin must engage in the slot of the coupling. Line up the slot as the motor assembly is re-inserted into the barrel. 'Feel' the end of the shaft enter the coupling, "feel" the cross pin enter the slot, then push the motor assembly all the way into the barrel.

Check that the pump is resting squarely on the bottom of the bath.

Reconnect the wiring to the tabs of the new motor, making sure the polarity to the motor is as originally connected. The motor must rotate anti-clockwise as viewed from the top or the circulation will be very poor. **NOTE:** The direction of rotation can be felt by placing a finger on the motor shaft protruding from the top end of the motor.

The cable can be re-connected to the control unit with the long cover removed for a test. Allow the display to come on and press the START button. Water should automatically fill the bath. With water in the bath higher than the low level switch, the circulation pump will turn on and the water circulation should be seen and felt coming from the pump into the bath.

If all is OK, turn off the power and re-fit the rear cover to the machine. Turn on the power and allow the bath to fill.

FAULT FINDING ASSISTANCE:

Power will not go on.

- No power to machine. Check mains isolation switch is ON.
- Master switch on side of cover not turned ON.
- Switch on the control unit not switched ON.
- Circuit breakers under main cover off or tripped.

Bath will not fill OR will not finish filling:

- Check water supply isolation valve not closed.
- Enter the DIAG2 display (see previous pages) and check if the output for Bath Fill solenoid valve is on. If ON but solenoid valve is not open at the rear of the machine, check the 'Bath Fill' 2 amp output fuse inside the control unit.
- If output is OFF, the program is holding the solenoid valve OFF.
- Upper level switch in main tank possibly stuck in high level position thus advising the program that the bath is full. Be sure there are no foreign bodies jamming floats.
- Level switch faulty. Check DIAG1 display to check input status. For bath to be filling, upper level switch status should be DN. Move upper float and see input status change. When float is in UP position, input should show UP. When DOWN input should show DN.
- If the output is ON, remove the front panel from the machine. Looking to the rear of the machine, beside the Distilled Water tank, you will see a manifold with 3 valves mounted. The Bath Fill solenoid valve is the left hand valve. Check the electrical cap is illuminated. This shows power is present to the solenoid valve coil. If the Output is ON, but this electrical cap is OFF, check the horizontal fuse marked "Bath Fill" is most likely blown. Check and replace.
- If the overflow pipe in the bath is set too low, or if the upper switch is set too high, incoming water will flow over the overflow pipe and bath can never fill. Check that overflow pipe is approx. 5mm higher than the upper float switch switching point.
- Check incoming water strainer is not clogged and mains water supply pressure is present at the machine.

Bath not draining, or draining slowly or will not drain completely empty:

- Remember that some programs do not drain the tank at end of the program cycle. Check program status in INFO1 display.
- Tank will not drain in standby unless Drain button pressed in the Manual Control display.
- Large drain solenoid valve not operating or fuse blown. See section above for checking inputs and outputs in the DIAG displays.
- Level switch faulty. Check inputs in DIAG1 display to check input status. When float UP, input should show 'I'. When down input should show 'O'. This is the opposite to the upper switch.
- Drain hose from machine kinked or blocked.

- Drain hole strainer mesh clogged inside tank

Bath floods OR will not drain down its overflow.

- Overflow drain hose from the machine kinked or blocked.
- Overflow pipe set too high so that level is too high before overflowing down the overflow pipe.
- During overflow or filling at the end of some program cycles, mains water pressure may be so high that tank is filling faster than it can drain over the overflow pipe. Restrict water flow to the machine or reduce water pressure to the machine with a pressure regulator.

Bath or Distilled Water tank is the wrong temperature.

- Faulty temperature sensor or disconnected. Check Cycle Progress display to see the water temperature in degrees. If sensor is open circuit, bath temperature will appear very high or as a series of asterisks ("***"). Alarm will sound (several short beeps with 1 minute time between beeps). The red LED on the control unit will be ON steady. Any alarm fault will display in the SELECTION display and in the PROGRAM RUN display.
- If the temperature is reading close to the correct temperature, but incorrect, the temperature sensor can be calibrated in the editing section. See pages 35 & 36 for further details.
- Wrong program selected.
- Faulty heater or a heater circuit breaker tripped.

Will not DRAIN at the end of a cycle:

- Cycle not at the END step. The word END should appear on the display as the end cooling cycle begins.
- Program not set for that type of cooling end cycle sequence.
- Drain hose kinked or blocked
- Drain solenoid valve not opening. Blown fuse. (see earlier notes)

Will not REFILL after draining at end of cycle.

- Cycle not at the END step (see previous note).
- Program not set for that type of end cycle sequence.
- Level switch in the tank faulty or stuck in high level position.
- Tank fill solenoid valve not opening. Blown fuse. (see earlier notes).

Cycle will not START (cannot ENTER program run display):

- Bath not full..
- Distilled water tank not full (floor models only).

Program will not STEP:

- Already on last step of the selected program.
- Program in HALT mode. Program must be RUNNING for STEP to occur.
- Program not IN CYCLE (small square symbol not flashing in display).

Program will not HALT.

- Program not IN CYCLE (small square symbol not flashing in display).
- Program must be RUNNING for HALT to occur.

Program will not RESET.

- Program status must be HALTED before RESET is possible.

□

FLOOR MOUNTED MODELS ONLY:**Distilled water tank will not fill:**

- Distilled Water isolation hand valve closed from water still.
- No distilled water supply to machine.
- Distilled water fill solenoid valve not operating. See previous notes for checking outputs and finding fuses. While observing DIAG1 display, move float switch up and down. Input status is the same as for the upper level switch for the bath.
- Level switch stuck in high level position.
- Distilled water pressure too high for solenoid valve rating. If distilled water pressure too high, solenoid valve cannot open. **CAUTION:** S/Valve coil can burn out.

□

Will not dispense distilled water OR slow dispensing.

- Manual D/W volume set to ON but d/w volume set to small volume. See D/W CONTROL display. **Caution: If the manual distilled water value is set to a value and is ON, this volume will override any volume set in the programs. All dispense will be this Manual Volume.**
- Dispensing solenoid valve not operating. Blown output fuse. See previous notes for checking outputs and finding fuses.
- If dispensing very low pressure, motor not running fast enough or the pump has separated. Remove the distilled water tank lid and check the pump is intact. Occasionally the pump housing may separate from the body, particularly during shipment. Slide housing into pump body and re-fit the wire clip. When dispensing switch is pressed, drive to motor should be at #4000. See DIAG2 display for the drive speed value.
- Faulty press switch on dispensing gun or open circuit wiring from gun to PLC. See DIAG1 display to check inputs. To prove faulty gun switch or wiring, press simulated gun switch in D/W CONTROL display.
- Jammed dispensing pump motor or pump rubbing internally.
- Nozzle on front of dispensing gun jammed shut.
- Faulty distilled water circulating and dispensing pump motor.
- Strainer inside distilled water tank requiring cleaning. This is a Y shaped device with a sealed removable cap to examine the strainer gauze.

Distilled water tank wrong temperature.

- * Distilled water tank should follow the same temperature as the bath so the distilled water is always matching the temperature of the sample pots. After the top-up volumes are dispensed (part way through the program), the d/w tank cools down for the next program start and the temperature will not be the same as the bath.
- * Faulty or open circuit temperature sensor. This will show as an alarm – similar to the bath sensor fault.
- * Faulty heater or heater circuit breaker tripped.

Wrong initial fill volume or no initial volume dispensed.

- * Initial dispense volume set into the wrong program step. **The initial fill volume MUST always be set in step #1.**
- * Manual dispensing set as ON. See D/W CONTROL display. If set ON, this volume overrides the programmed volumes and is always dispensed. This setting can be changed while the program is running.
- * Program not in the correct step (segment) for dispensing the desired volume. Look at the screen to see volume to be dispensed in that program step.

Wrong top-up volume dispensed.

- * Wrong ADD volume set in the PLC program.
- * The ADD volume set in the wrong step. The d/w additional volume in mls and the alert#2 must be programmed into the step that is just entered when the additional volume is required (normally step#3).
- * Program not in the correct step (segment) for dispensing this volume.

COMPONENT PARTS AND INFORMATION:

All parts supplied by Industrial Equipment & Control Pty.Ltd. Melbourne Australia.

RTD temperature probes:

1x **MB 0300-101** 1/4" x 180mm long, S/S RTD probe PT100 single, compensated.

1x **MB 0300-111** 1/4" x 430mm long, S/S RTD probe PT100 dual, compensated.

Heaters:

See table inside manual for sizes of the various heaters for the different models.

Electric motors: for stirrers.

MB 0300-111 12V.DC., 3800 RPM. 3mm diameter shaft.

Electric motors: for pumps.

MB 0300-065 12V.DC., 9700 RPM. 5mm diameter shaft.

Solid State Relays:

Low voltage DC turn-on

Main tank heaters: 2x **MB 0300-072** (240V.AC. at 40 amps)

Distilled Water tank heater: 1x **MB 0300-072** (240V.AC. at 40 amps)

Flow meter:

1x **MB 0042-005** Hall Effect 1000 pulses/litre. Flow rate: 1.0 - 25 L/min.

Series: "Vision 2000" Cat No: 2008 4F 22

Stirrer magnets: **MB 0300-050** Type PW40 Alnico grade #5. 'U' shaped power magnet.

Lid seals for pots: **MB 0100-030** Special IEC lid seals for 500ml pots

Solenoid valves: all 24V.AC. coils.

Bath Fill: **MB 0301-010** Poppet, Asco SCE262C208 1/4" BSP 0-7Bar

D/W Cool: **MB 0301-010** Poppet, Asco SCE262C208 1/4" BSP 0-7Bar

Bath Drain: Diaphragm. **MB 0301-030** Asco SCE210C94 1/2" 0-10Bar

D/W Fill: Diaphragm, **MB 0301-030** Asco SCE210C94 1/2" BSP 0-10Bar

NOTE: This valve is for both low and higher pressure distilled water supplies.

D/Water Dispensing: **MB 0301-020** Poppet, Asco SCE030A17 1/4" BSP 0-2Bar

Controller:

Touch screen HMI: **MB 0300-031** Unitronics, V700-T20B

PLC Snap On I/O module: **MB 0300-032** Unitronics V200-18-E3XB

Float Switches in bath and d/w tank:

Stainless Steel, 'RIKA' type RFS2-2 reed switch type.

Electrical hardware:

All fuses use only 20x5mm glass cartridge type fuse.

Proudly designed and manufactured by:
Industrial Equipment & Control Pty. Ltd.
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email: iec@iecpl.com.au web: www.iecpl.com.au