OPERATING & MAINTENANCE MANUAL

DOC. NO. 438.9030-16/04 EDITION 42.2005

EXSM 230 S and 350 S

OPERATING & MAINTENANCE MANUAL

EXSM 230 S and 350 S

WARNING: ALL OPERATING AND MAINTENANCE PROCEDURES SHOWN ON THE NEXT PAGE OF THIS MANUAL MUST BE FOLLOWED DAILY FOR PROPER OPERATION OF YOUR WASCOMAT MACHINE.

PLEASE ENTER THE FOLLOWING INFORMATION AS IT APPEARS ON THE MACHINE(S) DATA PLATE(S).

MACHINE TYPE OR MODEL	
MACHINE SERIAL NUMBER(S)	
ELECTRICAL CHARACTERISTICS: _____ VOLTS, _____ PHASE, _____ HZ.	

MAKE CERTAIN TO KEEP THIS MANUAL IN A SECURE PLACE FOR FUTURE REFERENCE.

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SAFETY AND WARNINGS SIGNS

Replace If Missing Or Illegible

One or more of these signs must be affixed on each machine as indicated, when not included as part of the front instruction panel.

LOCATED ON THE OPERATING INSTRUCTION SIGN OF THE MACHINE:

CAUTION

1. Do not open washer door until cycle is completed and wash cylinder has stopped rotating.
2. Do not tamper with the door safety switch or door lock.
3. Do not attempt to open door or place hands into washer to remove or add clothes during operation. This can cause serious injury.

MACHINE SHOULD NOT BE USED BY CHILDREN

PRECAUCION

1. No abra la puerta de la máquina lavadora sino hasta que la máquina haya terminado su ciclo, la luz operativa esté apaga da y el cilindro de lavado haya completamento terminado de girar.
2. No interferia o manipule el switch o la cerradura de la puerta.
3. No trate de abrir la puerta o meta las manos dentro de la máquina para meter o sacar ropa mientras la máquina está en operación, pues puede resultar seriamento herido.

LAS MÁQUINAS NO DEBEN SER USADAS POR NIÑOS

LOCATED AT THE REAR OF THE MACHINE:

INSTALLATION AND MAINTENANCE WARNINGS – *AVERTISSEMENT*

1. **This machine MUST be securely bolted according to the installation instructions, to reduce the risk of fire and to prevent serious injury, or damage to the machine.**
   Pour reduire les risques d'incendie, fixer cet appareil sur un plancher beton sans revetement.
2. **If installed on a floor of combustible material, the floor area below this machine must be covered by a metal sheet extending to the outer edges of the machine.**
3. **This machine MUST be connected to a dedicated electrical circuit to which no other lightning unit or general purpose receptacle is connected. Use copper conductor only.**
   Utiliser seulement des conducteurs en cuivre.
4. **This machine MUST be serviced and operated in compliance with manufacturer's instructions. CHECK DOOR LOCKS EVERY DAY FOR PROPER OPERATION TO PREVENT INJURY OR DAMAGE. IF THE DOOR LOCK FAILS TO OPERATE PROPERLY, PLACE THE MACHINE OUT OF ORDER UNTIL THE PROBLEM IS CORRECTED.**
5. **Disconnect power prior to servicing of machine.**
   Deconnecter cet appareil del'alimentation avant de proceder a l'entretien.
6. **To remove top panel, first remove eventual screws at the rear. When remounting the top, reinstall them. To remove the top panel on models on which it is secured by one or two keylocks, use the keys originally shipped in the drum package. Be certain to relock after remounting the top panel.**

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DISTRIBUTED BY WASCOMAT, INWOOD, NEW YORK, USA

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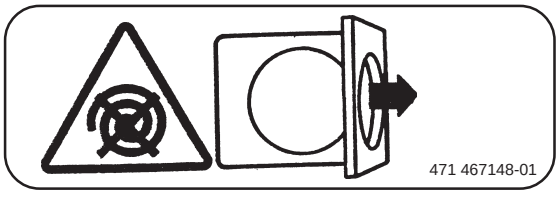
LOCATED ON THE DOOR:

If you need to order more safety or warning signs, call Wascomat's parts department at 516-371-2000, or call your local dealer.



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NOTICE TO: OWNERS, OPERATORS AND DEALERS OF WASCOMAT MACHINES

IMPROPER INSTALLATION AND INADEQUATE MAINTENANCE, POOR HOUSEKEEPING AND WILLFUL NEGLECT OR BYPASSING OF SAFETY DEVICES MAY RESULT IN SERIOUS ACCIDENTS OR INJURY. TO ASSURE THE SAFETY OF CUSTOMERS AND/OR OPERATORS OF YOUR MACHINE, THE FOLLOWING MAINTENANCE CHECKS MUST BE PERFORMED ON A DAILY BASIS.

1. Prior to operation of the machine, check to make certain that all operating instructions and warning signs are affixed to the machine and legible. (See the following page of this manual for description and location of the signs.) Missing or illegible ones must be replaced immediately. Be sure you have spare signs and labels available at all times. These can be obtained from your dealer or Wascomat.

2. Check the door safety interlock, as follows:

   (a) OPEN THE DOOR of the machine and attempt to start in the normal manner:

   For CLARUS microprocessor models, choose a program and press the START button.

THE MACHINE(S) SHOULD NOT START !

   (b) CLOSE THE DOOR to start machine operation and, while it is operating, attempt to open the door without exerting extreme force on the door handle. The door should remain locked!

   If the machine can start with the door open, or can continue to operate with the door unlocked, the door interlock is no longer operating properly. The machine must be placed out of order and the interlock immediately repaired or replaced. (See the door interlock section of the manual.)

3. DO NOT UNDER ANY CIRCUMSTANCES ATTEMPT TO BYPASS OR REWIRE ANY OF THE MACHINE SAFETY DEVICES, AS THIS CAN RESULT IN SERIOUS ACCIDENTS.

4. **Be sure to keep the machine(s) in proper working order**: Follow **all** maintenance and safety procedures. Further information regarding machine safety, service and parts can be obtained from your dealer or from Wascomat through its Teletech Service Line - 516/371-0700.

All requests for assistance must include the model, serial number and electrical characteristics as they appear on the machine identification plate. Insert this information in the space provided on the previous page of this manual.

5. **WARNING**: DO NOT OPERATE MACHINE(S) WITH SAFETY DEVICES BYPASSED, REWIRED OR INOPERATIVE! DO NOT OPEN MACHINE DOOR UNTIL DRUM HAS STOPPED ROTATING!

NOTICE TO INSTALLER

Improper installation of this machine:

- May cause serious damage to the machine.
- May result in other property damage.
- May cause personal injury.
- Will void the manufacturer's warranty.

Improper fastening of this machine to its foundation, inferior foundation materials, an undersized foundation, the use of fabricated steel bases not provided by Wascomat or its approved supplier(s), the use of an improper type, number, or size of mounting bolts, or failure to use proper hardware on mounting bolts may result in damage to the machine that will not be covered by the manufacturer's warranty.

Use of a steel base beneath this machine DRAMATICALLY INCREASES the mechanical stress placed on the underlying concrete floor or foundation. This must be taken into consideration when employing a steel base to raise the height of the machine.

Increase the manufacturer's recommended floor or foundation thickness requirements by at least three inches (see installation manual) when using six-inch-high Wascomat steel bases to raise the machine's height.

The use of steel bases more than six inches in height is NOT recommended. If installation requires a base higher than six inches, contact Wascomat Technical Support at 516-371-0700 for advice.

Connection to line Voltage or over-current protection devices other than those specified on the data plate may result in severe damage to machine components, and will void the manufacturer's warranty.

Refer to complete installation instructions provided in manuals accompanying the machine.

Contact Wascomat Technical Support at 516-371-0700 with any questions BEFORE installing this machine. Damage resulting from inadequate installation materials or improper installation techniques will void the manufacturer's warranty.

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Encl. Hospitality wash programs

The manufacturer reservs the right to make changes to design and material specification without notice.

Safety instructions

- **The machine is designed for water washing only.**
- **The machine must not be used by children.**
- **All installation operations are to be carried out by qualified, licensed personnel.**
- **The door interlock must be checked daily for proper operation and must not be bypased.**
- **All seepage in the system, due to faulty gaskets etc., must be repaired immediately.**
- **All service personnel must be fully familiar with the operating manual before attempting any repair or maintenance of the machine.**
- **The machine must not be sprayed with water, otherwise short circuiting may occur.**
- **Volatile or inflammable fluids are not to be used in the machine.**

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Introduction

Fig. 1 The EXSM-S model solid mounted washer/extractor has been developed to cover the heavy duty requirements of hotels, motels, nursing homes, hospitals, professional laundries, restaurants, airlines, ships, schools, colleges and all on-premises laundries where flexibility and quick formula variation, coupled with high quality automatic washing, are required.

The Selecta offers 28 pre-set wash programs which can be selected by means of push buttons. These programs are designed to suit a variety of fabrics and offer different water temperatures, water levels, wash levels, wash periods and supply injection. The machine is designed for connection to hot and cold water supplies, and may be used with free-standing powder or liquid supply injectors which can be activated by signals from the machine.

All parts of the machine which come into contact with the items being washed are made of heavy gauge surgical stainless steel, ensuring long life and lasting beauty, as well as full protection for no-iron fabrics. All electrical components are made accessible for servicing by simply removing the top panel.

This manual contains a technical description of the machine and instructions for its installation, operation and maintenance. Together with the wiring diagram which accompanies each individual machine it should be kept in a safe place for easy reference.

When ordering spare parts or contacting the manufacturer for any purpose always give the machine serial number, model, voltage and other electrical characteristics appearing on the nameplate at the rear of the machine.

The S-machine is equipped with a frequency controlled motor, which gives:

- better distribution of the wash load prior to extraction.
- a low of start current.
- a choice of extraction speeds up to 690 rpm (220 G-force).

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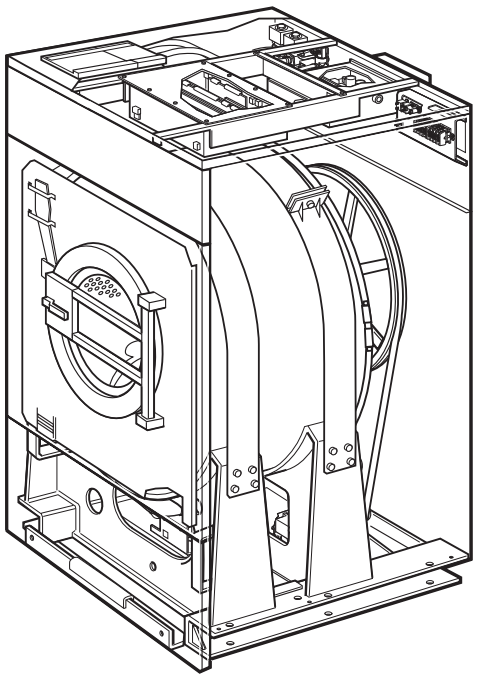

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Technical data

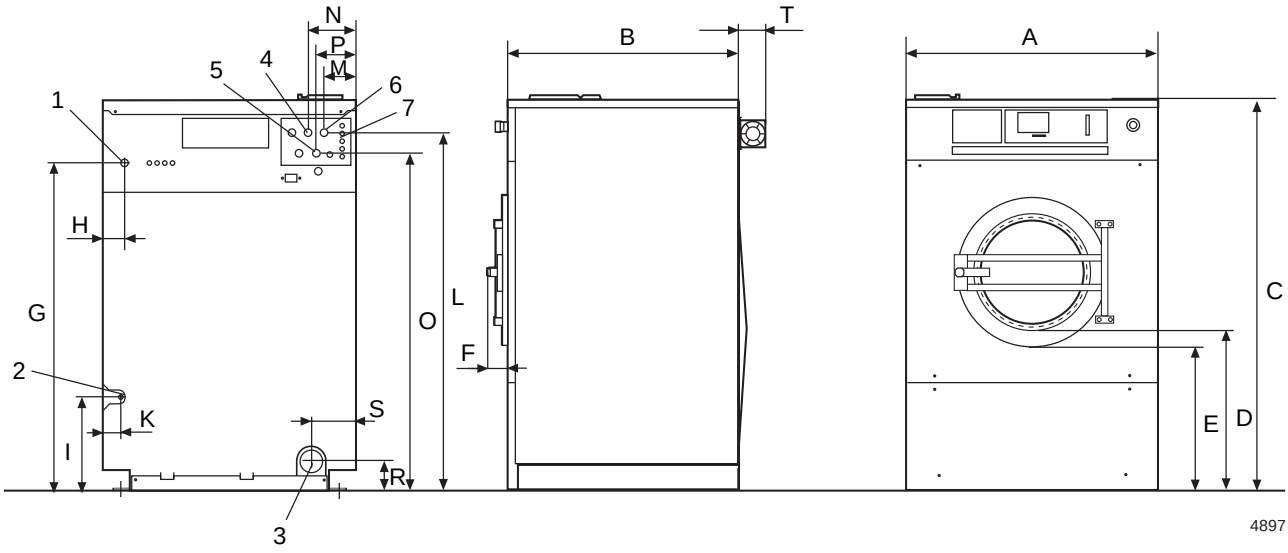
EXSM 230 S

Dry load capacity	up to		65 lbs
Overall dimensions	Width	935 mm	36 7/8''
	Depth	1100 mm	43 3/8''
	Height	1430 mm	56 1/4''
	Net weight	365 kg	805 lbs
Max. floor load at extraction		5,0±11.5 kN	1200±2760 lbs.force
Frequency (dynamic force)		12 Hz	
Crated Dimensions	Volume	1.85 m^3	65 cu.ft
	Weight	361 kg	795 lbs
Inner drum	Diameter	830 mm	32 11/16''
	Depth	425 mm	16 3/4''
	Volume	230 litre	8.12 cu.ft
Speed of rotation	Wash		41 rpm
	Distribution		72 rpm
	Extraction, max		690 rpm
G-factor	During wash		0.8
	During extrac., max		220
Motor speed	During wash		450 rpm
	During distrib.		770 rpm
	During extrac., max		7390 rpm
Rated power	Motor, wash		0.85 kW
	Motor, distrib.		0.25 kW
	Motor, extrac.		1.0 kW
Voltage requirements			208-240 V 1-Phase 60 Hz
Full load amps			15A
Overcurrent protection			20A
Water connections			
Recommended water pressure	2-6 kp/cm^2		25-85 psi
Hose connection, water	DN 20		3/4''
Hose connection, steam	DN 15		1/2''
Hose connection, drain	75 mm		3''

EXSM 350 S

Dry load capacity	up to		80 lbs
Overall dimensions	Width	1085 mm	42 3/4"
	Depth	1325 mm	52 1/8"
	Height	1540 mm	60 5/8"
	Net weight	545 kg	1200 lbs
Max. floor load at extraction		6.5±14 kN	1560±3147 lbs.force
Frequency (dynamic force)		10,8 Hz	
Crated Dimensions	Volume	2.4 m^3	85 cu.ft
	Weight	545 kg	1199 lbs
Inner drum	Diameter	920 mm	36 1/4"
	Depth	520 mm	20 1/2"
	Volume	350 litre	12.6 cu.ft
Speed of rotation	Wash		40 rpm
	Distribution		70 rpm
	Extraction, max		650 rpm
G-factor	During wash		0.8
	During extrac., max		220
Motor speed	During wash		500 rpm
	During distrib.		870 rpm
	During extrac., max		8200 rpm
Rated power	Motor, wash		1.2 kW
	Motor, distrib.		0.3 kW
	Motor, extrac.		1.5 kW
Voltage requirements			208-240 V 1-Phase 60 Hz
Full load amps			15A
Overcurrent protection			20A
Water connections			
Recommended water pressure	2-6 kp/cm^2		25-85 psi
Hose connection, water	DN 20		3/4"
Hose connection, steam	DN 15		1/2"
Hose connection, drain	75 mm		3"

Outline and dimensions



1. Electrical cable connection
2. Steam connection (option)
3. Drain connection
4. Hot water connection
5. Hot water connection
6. Cold water connection
7. Liquid supply connection

	EXSM 230 S		EXSM 350 S	
	mm	inches	mm	inches
A	935	36 13/16	1085	42 11/16
B	870	34 1/4	1095	43 1/8
C	1430	56 5/16	1540	60 5/8
D	595	23 7/16	595	23 7/16
E	525	20 11/16	530	20 7/8
F	135	5 5/16	135	5 5/16
G	1210	47 5/8	1325	52 3/16
H	75	3	90	3 9/16
I	355	14	525	20 11/16
K	55	2 3/16	60	2 3/8
L	1315	51 3/4	1430	56 5/16
M	115	4 1/2	120	4 3/4
N	175	6 7/8	180	7 1/16
O	1240	48 13/16	1355	53 3/8
P	145	5 11/16	150	5 7/8
R	115	4 1/2	120	4 3/4
S	170	6 11/16	190	7 1/2

Installation

Machine foundation

The machines are designed to be bolted in position to a concrete floor or specially prepared concrete foundation. A template showing the size of the foundation and positioning of the foundation bolts is available.

For installation on an existing concrete floor, the floor must be at least 8" thick and of good quality. If the floor does not meet these requirements, then a high concrete foundation should be made.

Refer to "Technical data" for static and dynamic floor loading.

Follow the instructions below when making a concrete foundation:

Fig. (2) 1. Decide where to place the machine and consider maintenance requirements, i.e. determine a suitable distance from the rear of the foundation to the wall, and the distance from the foundation to the nearest side wall. The distance should be at least 16 and 2 inches, respectively.

Fig. (3) 2. Break up the floor to a depth of at least 3 inches, making sure that the sides of the hole slope inwards - the bottom of the hole should be 5 inches longer than the upper length.

3. Wet the hole well. Brush the bottom and sides with cement grout.

4. Prepare a casing and fill with concrete to form foundation. Make sure the foundation is level.

Fig. (4) 5. Use the template to position the foundation bolts correctly - bolts are to extend 1 1/2" above concrete.

Reinforcing ironrods (A) shall be used around the base. The ironrods shall be placed between the bolts and the edge of the foundation.

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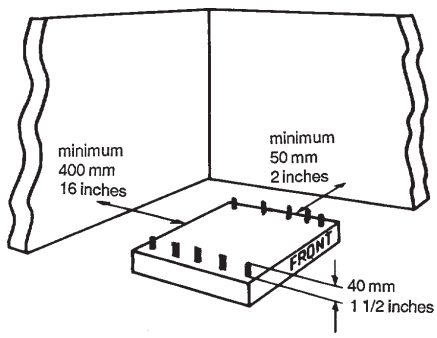

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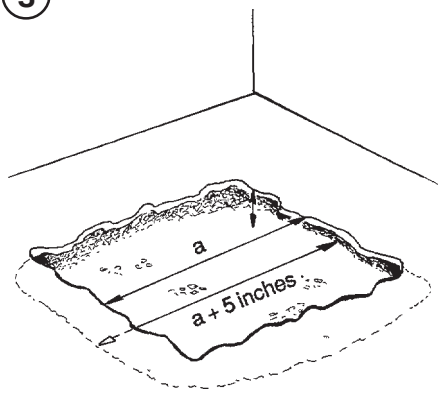

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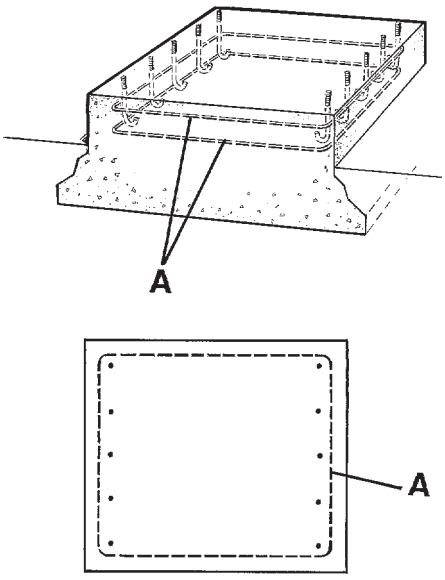

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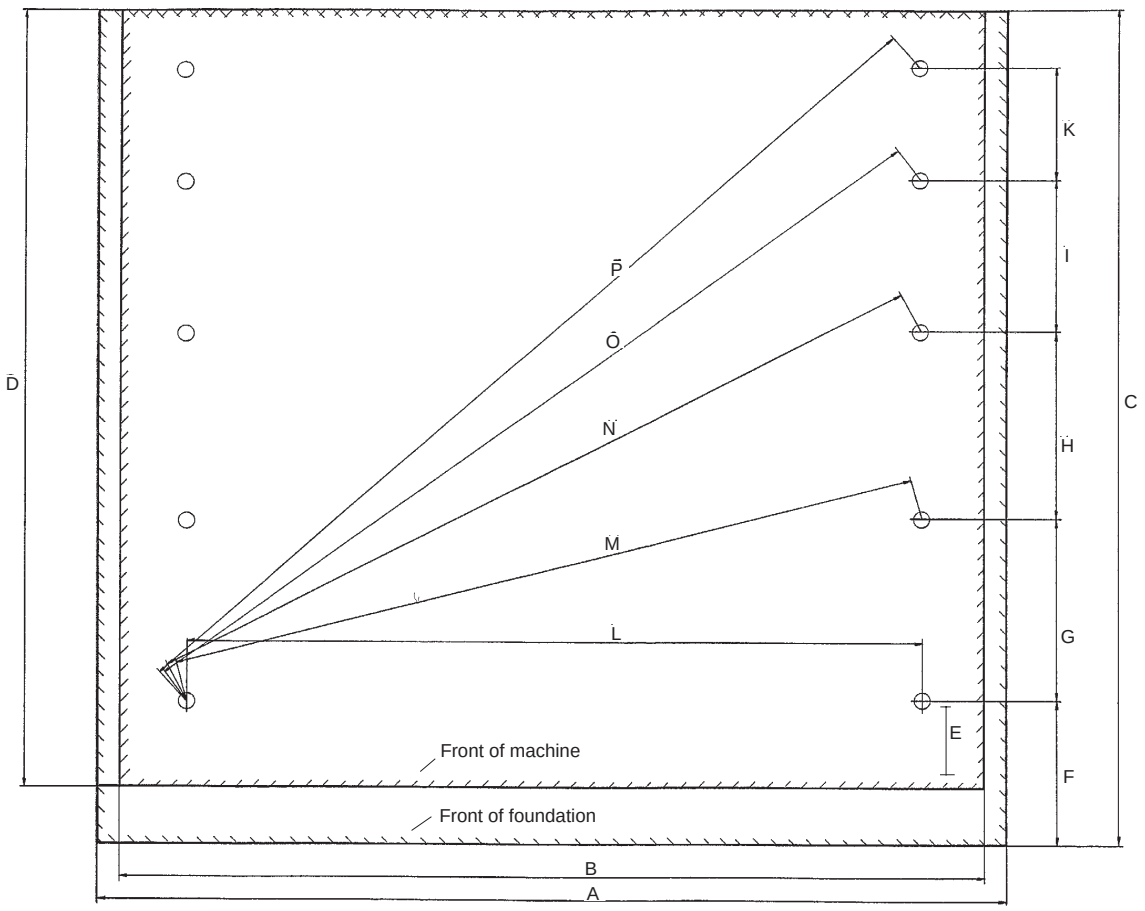
EXSM 230 S

Fig. 5 Measurements for foundation in inches and (mm).

A 39 (990)	I 6 5/8 (168)
B 37 (940)	K 4 29/32 (125)
C 36 3/8 (925)	L 31 1/2 (800)
D 33 7/8 (860)	M 32 1/2 (825)
E 3 3/4 (95)	N 35 11/32 (898)
F 6 5/16 (160)	O 38 3/4 (985)
G 7 7/8 (200)	P 41 27/32 (1063)
H 8 5/32 (207)	

5



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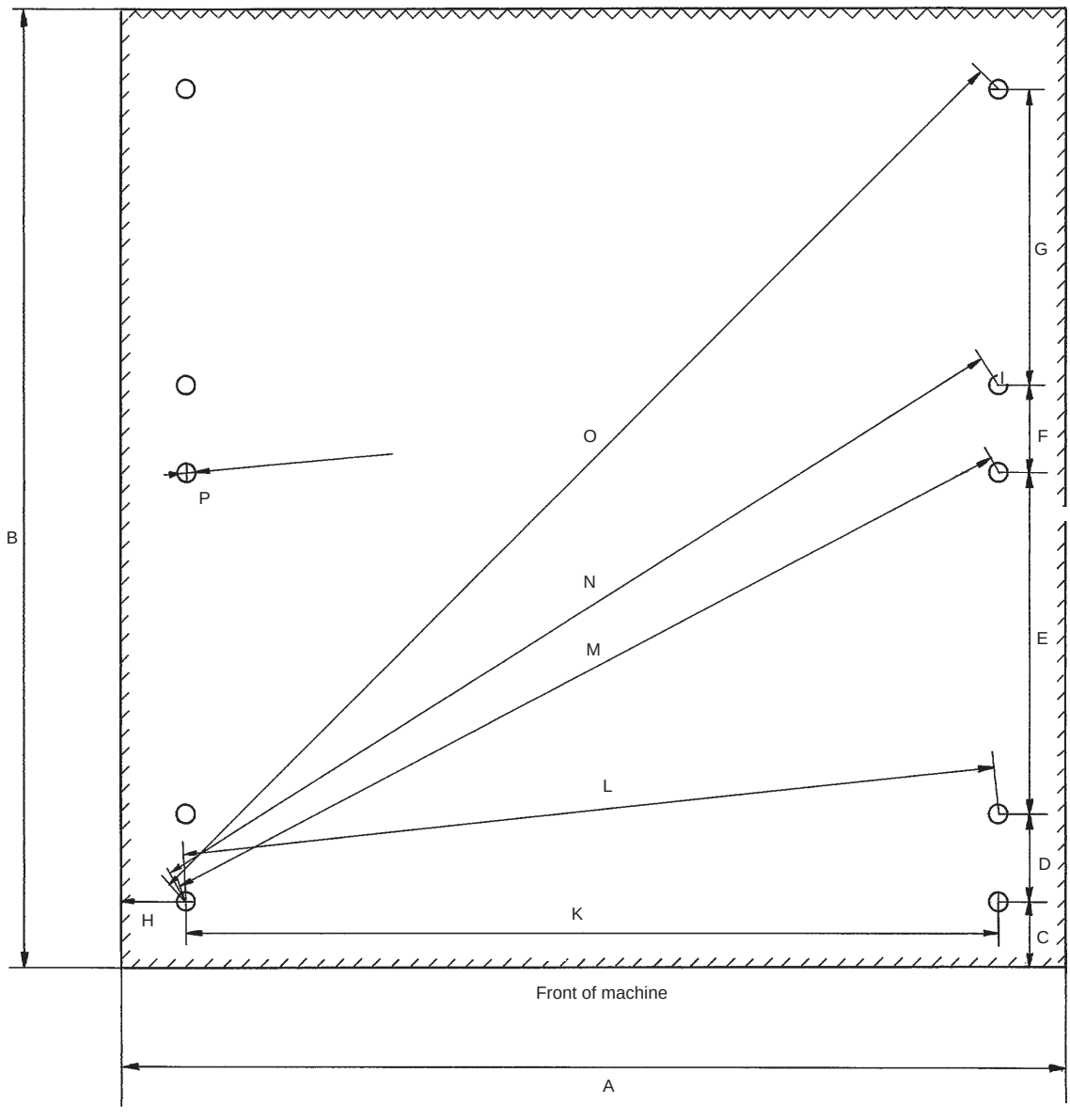
EXSM 350 S

Fig. Measurements for foundation in inches and (mm).
6

A 42 29/32" (1090)
B 43 15/64" (1100)
C 3" (75)
D 3 15/16" (100)
E 15 23/64" (390)
F 3 15/16" (100)
G 13 25/64" (340)
H 3" (77)
K 36 13/16" (935)
L 37 1/64" (940)
M 41 9/16" (1056)
N 43 17/32" (1106)
O 51 59/64" (1319)
P 7/8" (22)

6



Mechanical installation

Fig. 7
- Place wide steel shims on the concrete foundation over the bolts.
- Lift the machine and lower it in position. Never use the door or the door handle to lift or lower the machine.

Fig. 8
- Check that the machine is level front-to-rear and side-to-side and standing firmly on the ten supporting points. Spacing washers must be mounted if one or more of these points is not resting against the floor/foundation.

Fig. 9
- Place flat washers over the foundation bolts and secure the machine in position by tightening the self-locking nuts. See illustration below.

Fig. 10
- Tighten the nuts in sequence as shown.
- Check and tighten the nuts every week for the first month.

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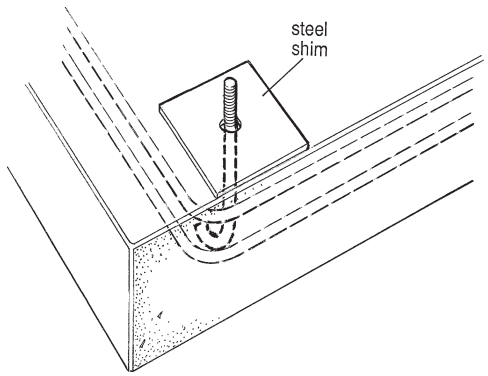

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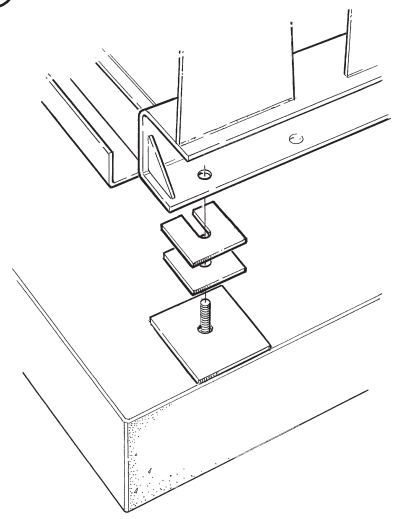

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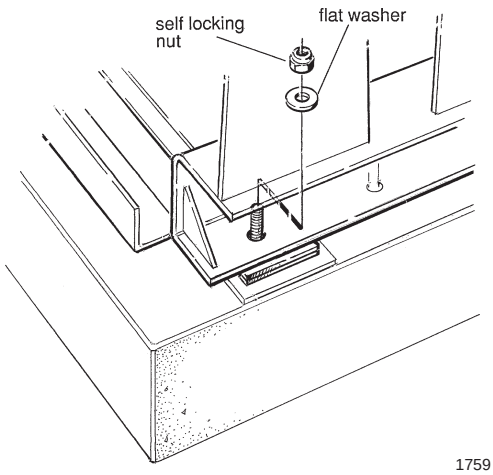

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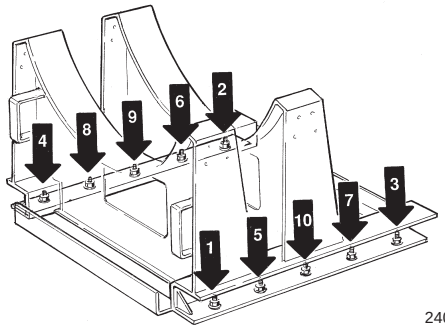

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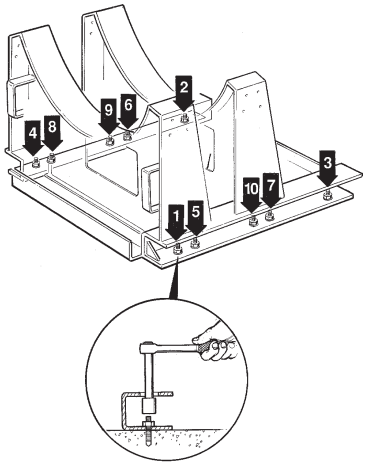

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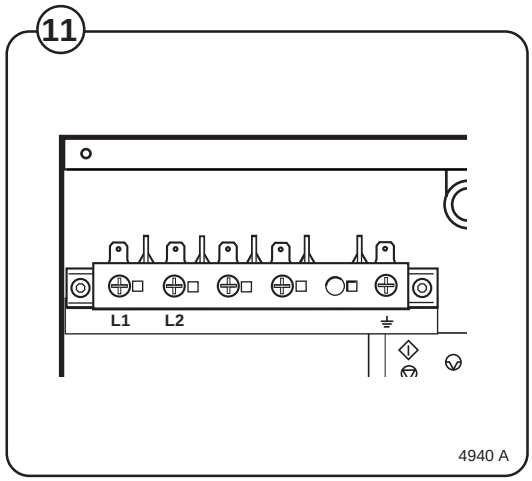
Electrical installation

Although the machines are fitted with a thermal overload in the motor windings and fuses for the control circuit, a separate circuit breaker must be installed for each machine.

For proper overcurrent protection, check the data plate at the rear of the machine. Also consult local electrical code for special requirements.

The machine is equipped with a control circuit transformer, mounted on the control unit and connected for 220 volt operation.
If your incoming voltage is below 210 volts move the wire connection to the 208 volt tab on the transformer. If it is above 230 volts move the wire to the 240 volt tab on the transformer.

Fig. (11) Connect L1, L2 and ground wires according to the markings of the terminal block. The cable is to hang in a large loose loop, supported by the clamp below the terminal block.



Connection of external units (optional equipment)

Electrical installation must be carried out by an authorized personnel!

All optional equipment connected must be EMC-approved to EN 50081-1 or EN 50082-2.

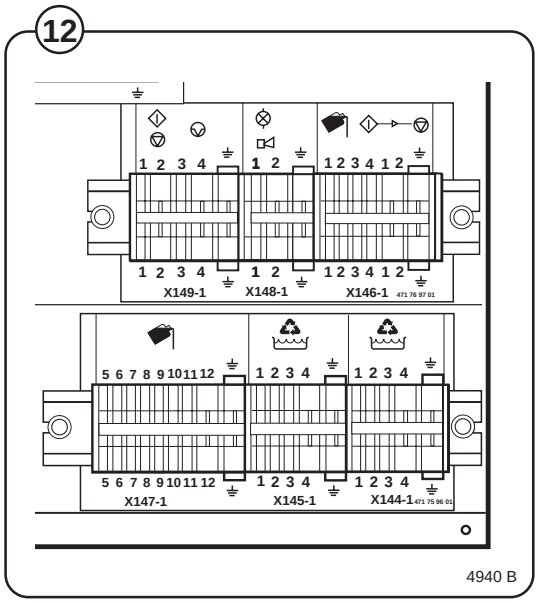


Fig. (12)

Connector X149-1.

Connector for external START/STOP/PAUSE function for machine.

Connector X148-1 (only on machines with at least two I/O boards).

Connector for external buzzer or signal.

Connector X146-1.

Connector for external liquid supply pumps. Control signals on 1-4 on left and Neutral to be connected to 1 and Phase to 2 on right-hand side.

Connector X147-1 (only on machines with at least two I/O boards).

Connector for additional external liquid supply pumps.

Connector X145-1 (only on machines with three I/O boards).

Connections for recycling system 2.

Connector X144-1 (only on machines with at least two I/O boards).

Connections for recycling system 1.

Water connections

All plumbing must conform to national and local plumbing codes.

All intake connections to the machine are to be fitted with manual shut-off valves and filters, to facilitate installation and servicing. The machine is equipped with an integral air gap (siphon braker) which complies with backflow preventions requirements in most locations. In certain cases non-return valves will need to be fitted before the machine to comply with local plumbing regulations.

Water pipes and hoses should be flushed clean before installation. After installation hoses should hang in gentle arcs.

The machine may have between two and four DN 20 (R 3/4") water connectors. All connectors present on the machine must be connected up.

All water connectors must be connected up, otherwise the wash program will not function correctly.

Hoses are to be of an approved type and grade, to comply with national regulations.

The water pressure data is as follows:

- min: 40 kPa (0,4 kp/cm^2)
- max: 1 MPa (10 kp/cm^2)
- recommended: 200-600 kPa (2-6 kp/cm^2)

Water type	Water connection		
	1	2	3
cold and hot	cold	hot	cold or hot

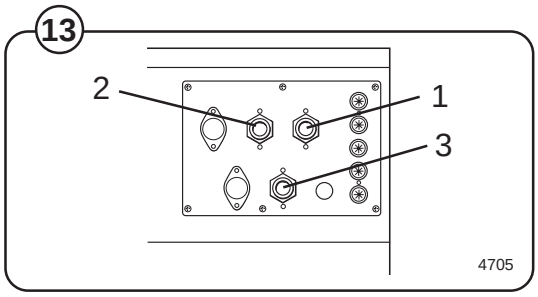


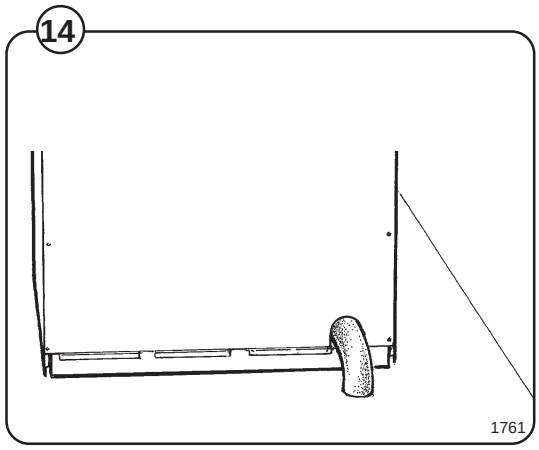
Fig. 13

Drain connection

Fig. (14) Connect a 3'' (75 mm) flexible hose to the drain outlet of the machine.

The drain hose must not have any sharp bends and must slope from the machine to assure proper drainage. The outlet must open freely to the main drain.

Do not reduce the size of the drain connection from the machine to the waste line.



Steam connection (optional steam heating)

Fig. 15

The steam inlet pipe must be fitted with a manual cut-off valve in order to facilitate installation and service operations.

Attach the filter supplied with the machine to the manual cut-off valve.

Conncection hoses should be of the quality required according to regulations in the country of use.

Connections size at filter: DN 15 (1/2").

Steam pressure required:

- minimum: 50 kPa (0.5 kp/cm^2) (7 psi)
- maximum: 800 kPa (8 kp/cm^2) (113 psi)

Check there are no sharp angles or bends in the connection hose.

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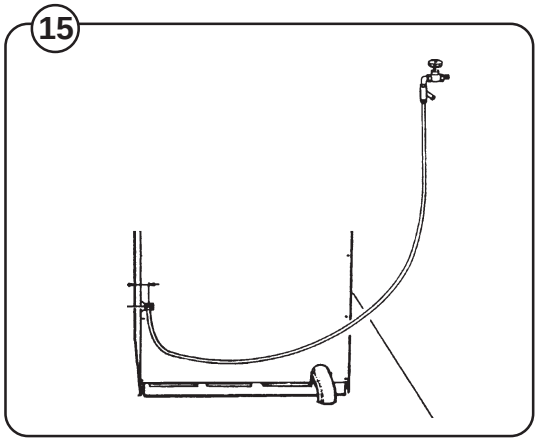


Installing top-mount manifold for connection of liquid supplies

Remove the cover and cover support over the soap box.

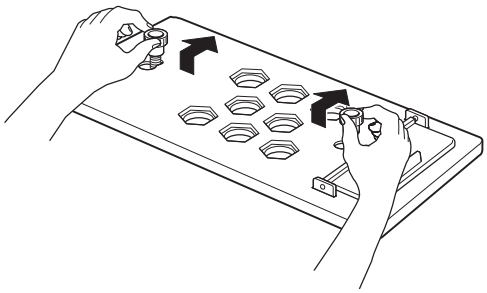
If comp 3 has a metal plate at the rear, bend it all the way as shown.

Fig. 16 Pull the manifold knobs up and forward.

1. Loosen both knobs so that one side of the metal fingers underneath can slide under the top lid of the machine, within the supply box. Fig. 17
2. Fit the supply manifold into the supply box so that both sides are held securely in place by the metal fingers.

If the supply manifold does not fit turn it around. You have it in backwards.

16



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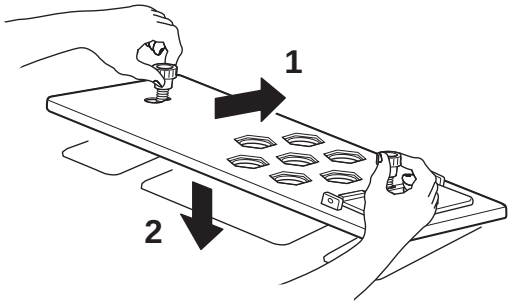

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Fig. 18

1. Drop the knob into the larger opening in the supply manifold lid.
2. Tighten securely. Do not overtighten! Do not use pliers or other tools to tighten the knobs!

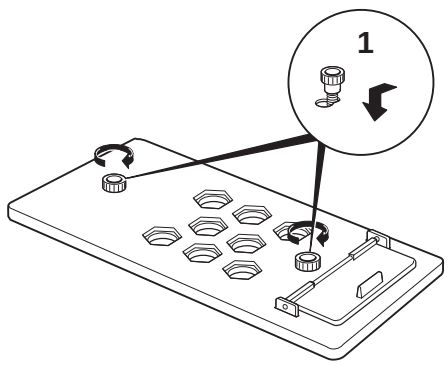
Fig. 20

1. Select the correct size rubber ring which will fit snugly on the chemical tube you are using. Ring A is used for tubes with Ø5/16''.
2. Use scissors or a razor to carefully cut out the proper size rubber ring. Wrap the rubber ring around each tube after threading each tube through the strain relief. Run the tube through the compression nut to the bottom of the soap box compartment. Cut the end of the tube at an angle. Hand tighten the strain relief on to the compression nut.

Fig. 19

Separate lid which gives possibilities to add powder detergent in compartment 1.

18



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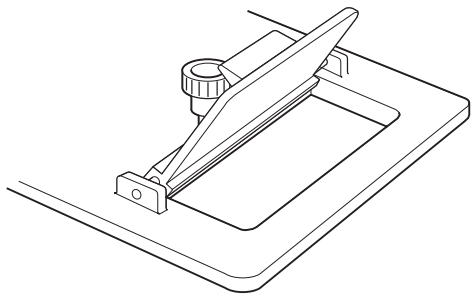

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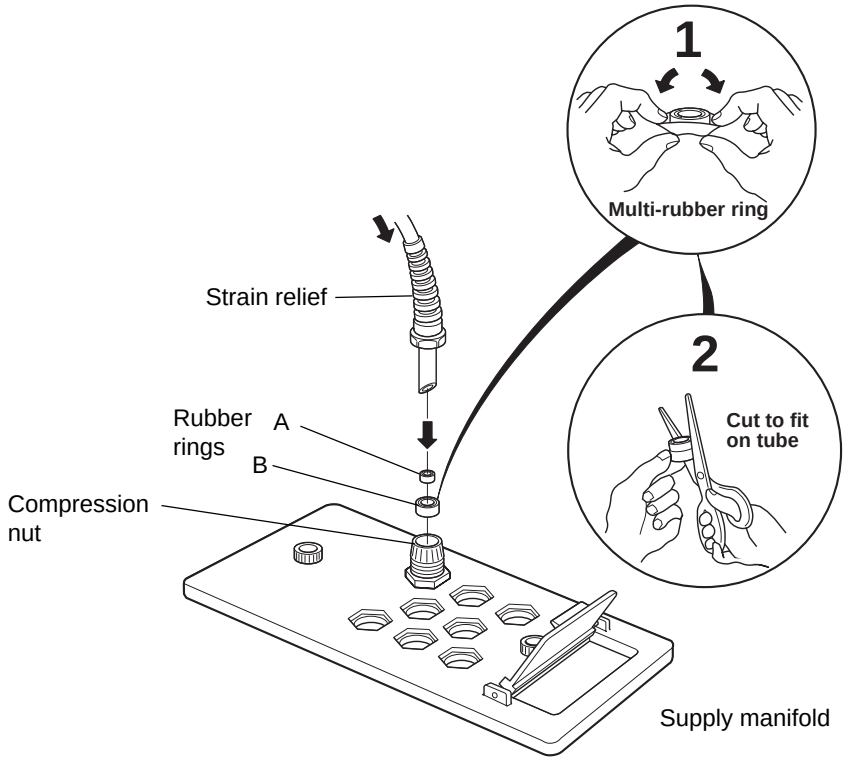


Function control and safety check list

In the machine cylinder, you will find the warranty registration card, a copy of the warranty policy and other pertinent material.

The warranty card should be completed and sent to Wascomat. All other items should be placed in a safe place for future reference.

The machine should be cleaned when the installation is completed, and checked out as detailed below without loading the machine with fabrics:

Fig. 21
- Make sure the machine is properly bolted to the floor..

Fig. 22
- Make sure that all electrical and plumbing connections have been made in accordance with applicable local codes.

1. Check the incoming power for proper voltage, phase and cycles.

- Make sure the machine is properly grounded electrically.
- Make sure that only flexible water fill and drain hoses of the proper length to avoid sags and kinks have been used.

2. Open the maunal water and steam valves.
3. Turn on electric power.

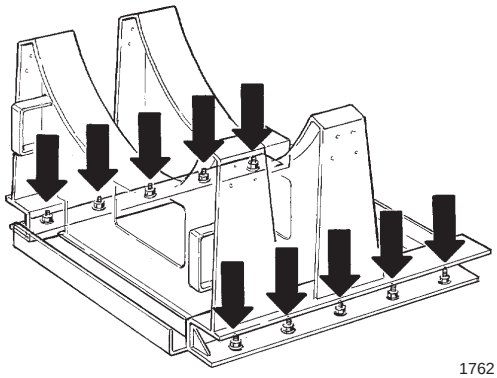
Before the machine is operated, the door safety interlock must be checked for proper operation as follows:

Fig. 23
- When washer loading door is open, the machine must not start. Verify this by attempting to start washer with door open.

Fig. 24
- When washer is in operation, the loading door is locked and cannot be opened. Verify this by attempting to open the loading door when the machine is operating. If necessary, consult this manual for proper operation of the door lock and door safety interlock or call a qualified serviceman.

Door safety interlock must be checked daily in accordance with above procedure.

21



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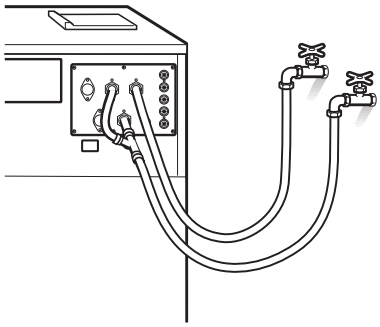

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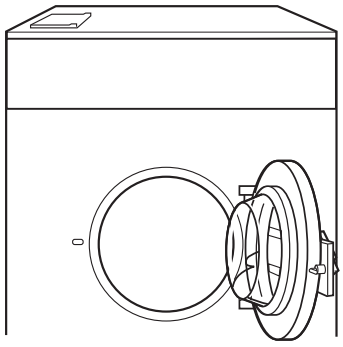

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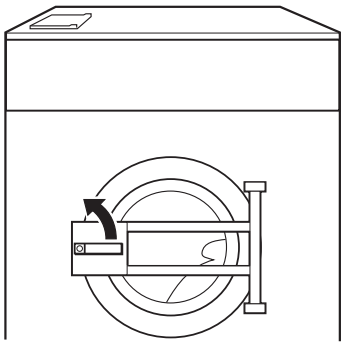


4945

Add detergent and softner.

Choose a program.

Press **START** to begin test cycle The machine will start up and the display window will show cycle information.

Check that:

- the drum is rotating normally at all program steps and that there are no unusual noises.
- there are no leaks from the water/steam connections and the drain valve.
- the detergent/conditioner compartments are flushed down.
- the door cannot be opened during the program and not until after the program has finished.

Fit the panels and covers removed during installation. Wipe the machine clean with a damp cloth.

If no problems were encountered, the machine is ready for use.


All machines are factory tested prior to shipment. Occasionally, some residual water may be found when the machine is installed.


Before servicing Wascomat equipment, disconnect electrical power.

Safety rules

- **This machine is designed for water washing only.**
- **All installation operations are to be carried out by qualified personnel. Licensed personnel are necessary for all electric power wiring.**
- **The interlock of the door must be checked daily for proper operation and must not be bypassed.**
- **All seepage in the system, due to faulty gaskets etc., must be repaired immediately.**
- **All service personnel must be fully familiar with the operating manual before attempting any repair or maintenance of the machine.**
- **This machine must not be sprayed with water, otherwise short circuiting may occur.**
- **This machine must not be used by children.**
- **Fabric softeners with volatile or inflammable fluids are not to be used in the machine.**

Consignes de sécurité

- **La machine est conçue pour le lavage à l'eau exclusivement.**
- **Tous les travaux d'installation doivent être effectués par une personne qualifiée. Tous les câblages électriques doivent être réalisés par un électricien diplômé.**
- **Le verrouillage du hublot doit être vérifié chaque jour et ne peut être neutralisé.**
- **Toute fuite du système, due à des joints défectueux etc., doit être réparée sans délai.**
- **Tous les membres du personnel d'entretien doivent être parfaitement familiarisés avec le manuel d'entretien avant d'entreprendre une réparation ou un entretien de la machine.**
- **Ne jamais asperger d'eau la machine sous peine de risquer un court-circuit.**
- **La machine ne peut être utilisée par des enfants.**
- **Ne pas utiliser dans la machine des adoucissants textiles contenant des liquides volatils ou inflammables.**

General

The door and the electronic timer with display and keyboard are fitted at the front of the machine.

All control and indicating components, i.e. relays, delay unit, etc are assembled under the top cover, easily accessible from the top of the machine for simplified servicing.

Main units

Fig. 25

1 Electronic timer.

2 Door -with automatic locking device which remains locked throughout the wash processe.

3 Detergent supply box - three compartments for automatic injection of powered detergents and fabric softener.

4 Inner cylinder - of stainless steel supported at the rear by two bearings.

5 Outer drum - of stainless teel (18/8) securely attached to the frame.

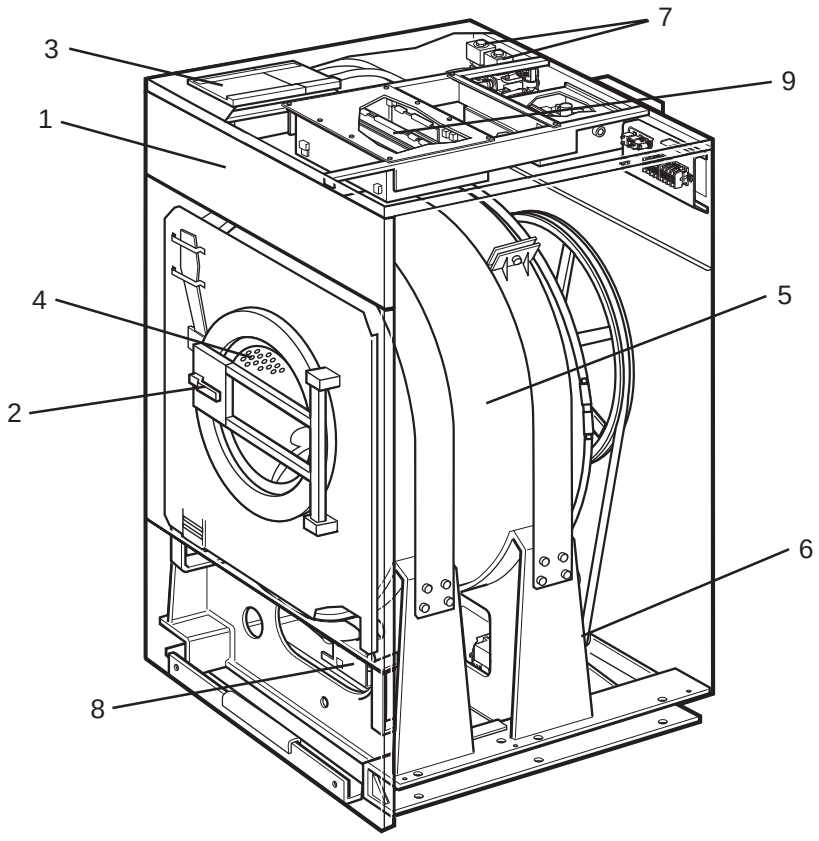
6 Motor - for reversing wash action, distribution and for high speed spin action.

7 Hot and cold water valves - program and level controlled solenoid valves for filling with water, and for flushdown of automatic detergent dispenser.

8 Drain valve - timer controlled valve for draining the machine of water.

9 Control circuit - of plug in type, for time and temperature control of the different wash cycles.

25



4941

Machine construction

Panels

The machines are equipped with a top panel and front panel made of stainless steel. Colored panels are made of phosphatized steel.
For servicing purposes, the panels can be easily removed.

Outer shell

Fig. 26 The outer shell is made of heavy gauge surgical steel and is attached to a heavy duty, rigid head casting (back gable).

The whole assembly is mounted on a heavy gauge fabricated steel base, hot-dip galvanized for long life and corrosion resistance.

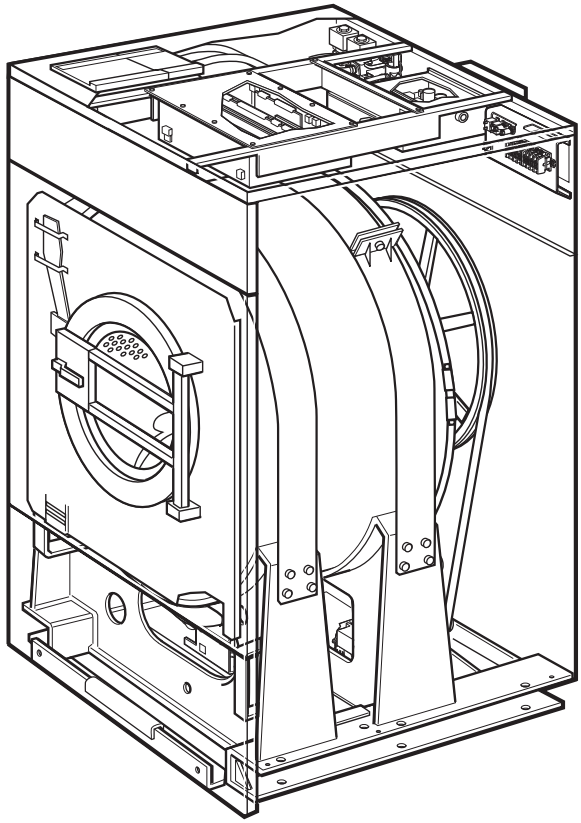
Inner cylinder

The inner cylinder is made of perforated surgical stainless steel. It is equipped with three lifting ribs and has highly-polished side sheets and back with maximum embossed perforated area to assure high flow of water and supplies through fabrics.

Scientifically correct ratio of cylinder diameter and depth assures maximum washing action.

The shaft is electrically welded to the reinforced back of the cylinder. A specially designed chrome plated sleeve bushing protects the seals from wear.

26



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Back gable and bearing

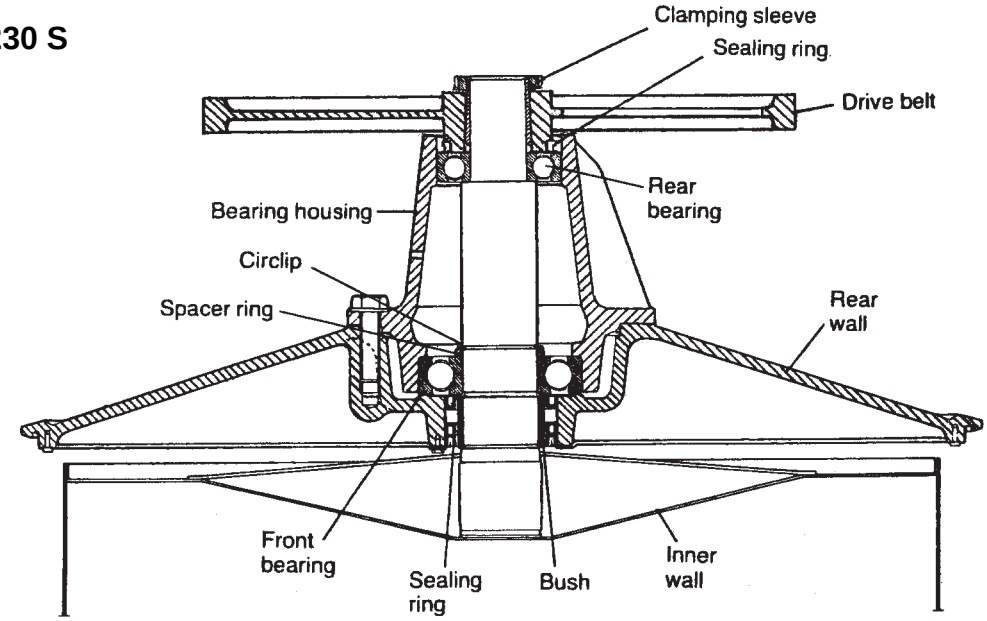
Fig. 27 The back gable and the bearing trunnion housing are constructed of a webbed heavy casting for extra rigidity. The bearings are protected against infiltration of water by three neoprene seals. An intermediate safety outlet provides an escape for any possible condensation.

The seals are mounted on a chrome-plated, noncorrosive, specially hardened sleeve bushing that is mounted on the drive shaft to prevent wear of the seals and shaft. The main bearing is fitted tight into the bearing trunnion housing. A nut is tightened on the shaft to prevent the cylinder from moving in and out.

The extension of the bearing trunnion housing supports the rear bearing holding the shaft. A grease seal is mounted to prevent escape of grease. The bearings are permanently lubricated and need no maintenance.

27

EXSM 230 S



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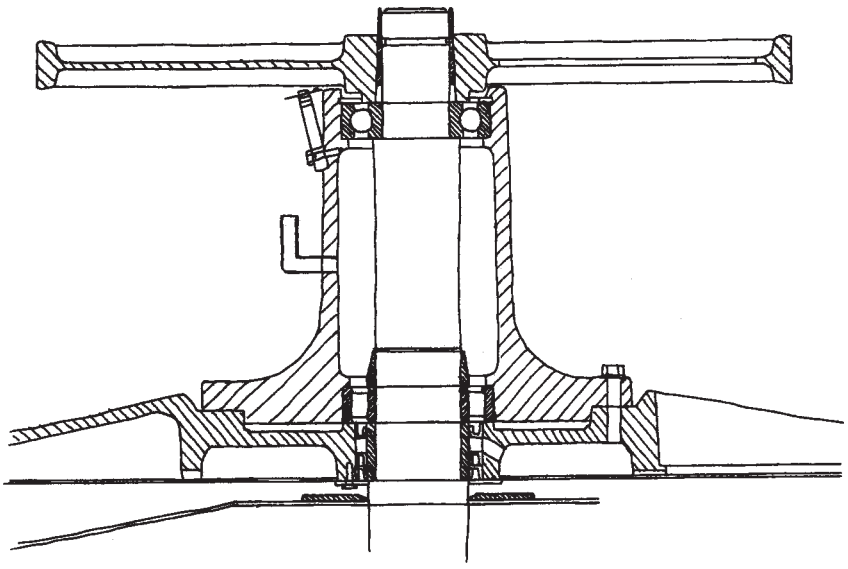

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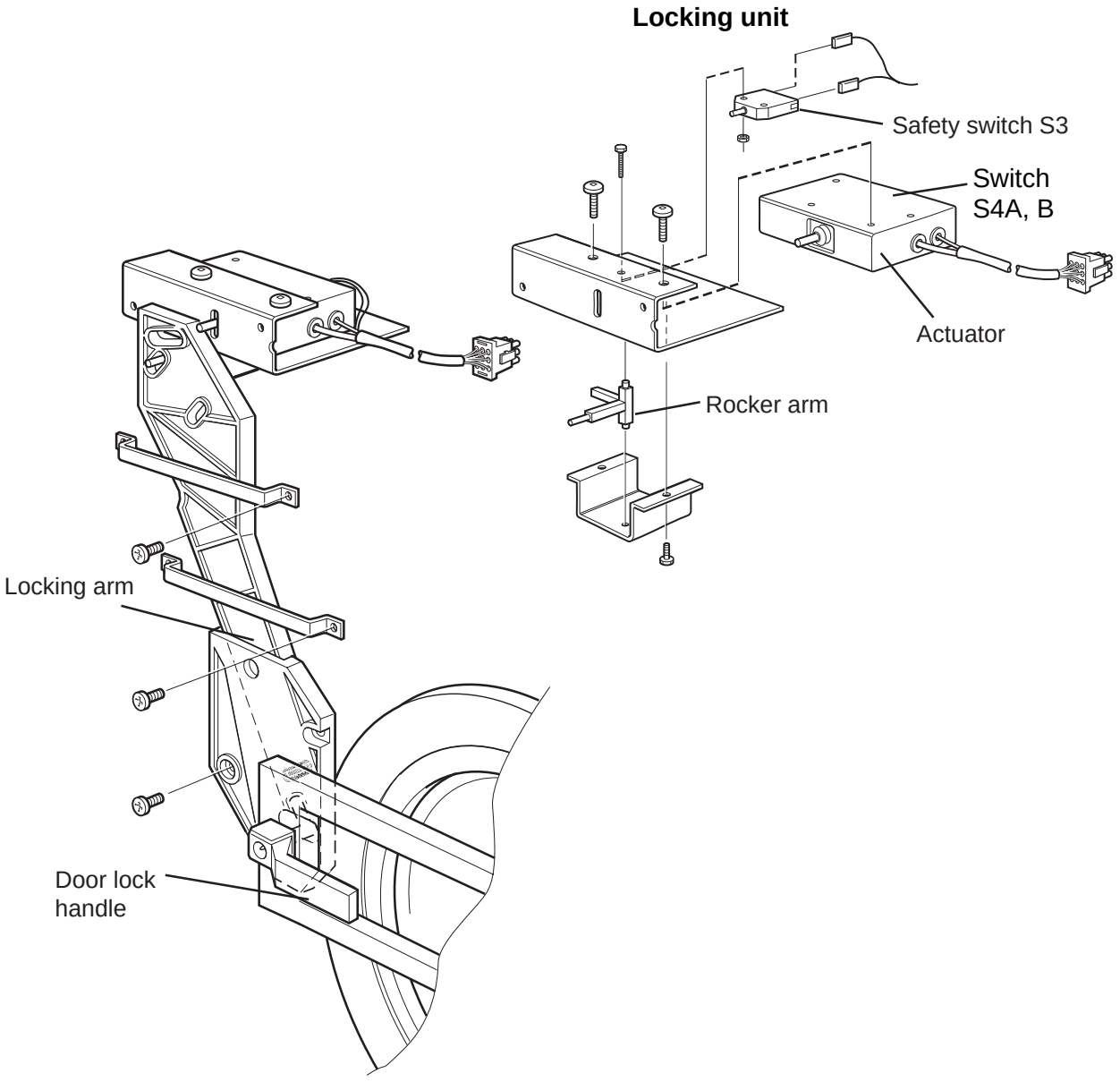
Description

Fig. 28 The machine door lock consists of the following:

- The locking unit, located behind the front panel below the detergent dispenser. The unit consists of a solenoid which locks the door, and two microswitches. Switch S4A indicates that the door is locked and switch S3 indicates that the door is closed.
- The door lock control unit, located in the automatic control unit. This unit consists of a circuit board for monitoring door lock functioning.
- The locking arm, located between the door lock handle and the locking unit. This arm provides the mechanical link between door lock handle and locking unit.

28



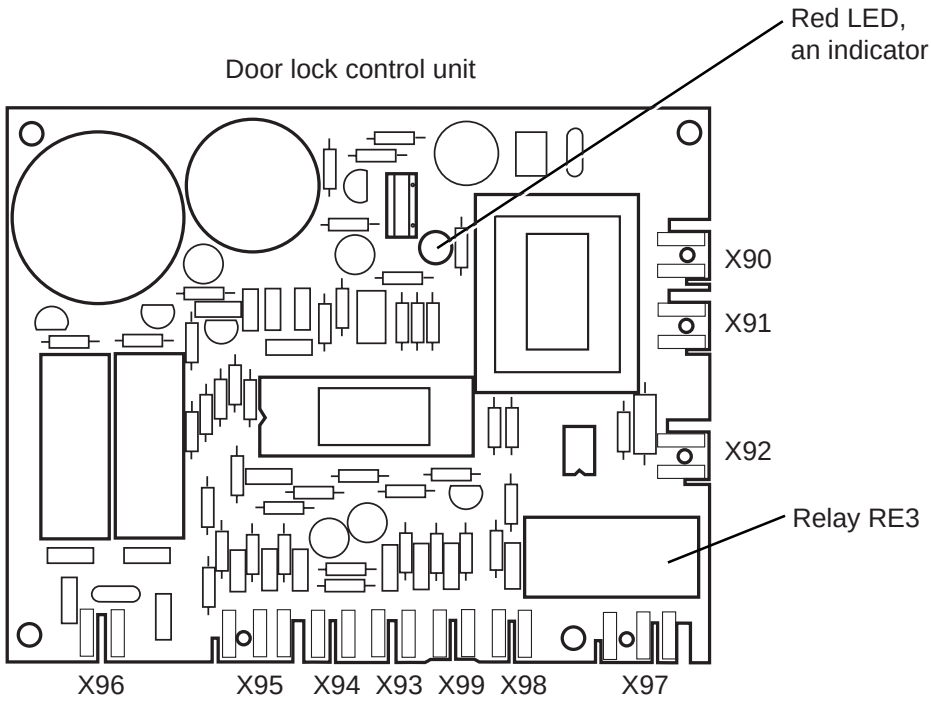
Door lock control unit

Fig. 29 The sole function of this control unit is to oversee the correct functioning of the door lock. The CPU board receives information from the motor control unit about motor rotation, and has its own level-monitoring device. The control unit also detects water level and motor speed through separate level measurement devices and the rotation guard (speed-monitoring device). Through this double monitoring, a very high level of safety can be achieved.

When the CPU board commands door locking, the control unit checks that there is no water in the drum and that the drum is not rotating. Only after that is a signal sent to the door lock. Level and rotation are checked in the same way before the door is allowed to open.

For even greater safety, the voltage feed to the I/O boards' outputs goes via both the emergency stop and the door lock switch. This means that no functions can proceed unless the emergency stop is in its normal position (not actuated) and the door is locked.

29

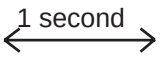


Error indication patterns

Fig. 30 If the door lock is working correctly, this is indicated by the red LED, by a pattern of flashes which indicates “OK”. The error indication patterns revealed by the LED flash at various frequencies for the various errors or faults. All error indication patterns have a frequency cycle of 50%, i.e. the LED will be on half the time, off half the time.

30

LED pattern of flashes during normal functioning



Pattern of flashes indicating “OK”, drum at standstill

Pattern of flashes indicating “OK”, drum rotating, 5 Hz

Error indication pattern	Meaning/cause
	Level-sensing device indicates water in drum when door lock is open. 2.19 Hz
	Auxiliary relay for motor indicates that the motor contactor is activated when the door lock is open (this error indication pattern does not occur when the excess-speed-monitoring device is selected). 1.88 Hz
	Signals from rotation sensor and auxiliary relay do not correspond. 1.56 Hz
	The control unit sensor circuits indicate fault/ error in drive circuits for door lock including its wiring. 0.85 Hz
	Armament circuits for RE1/RE2 activated (capacitor C8 charged when it should be discharged). 0.37 Hz

4686

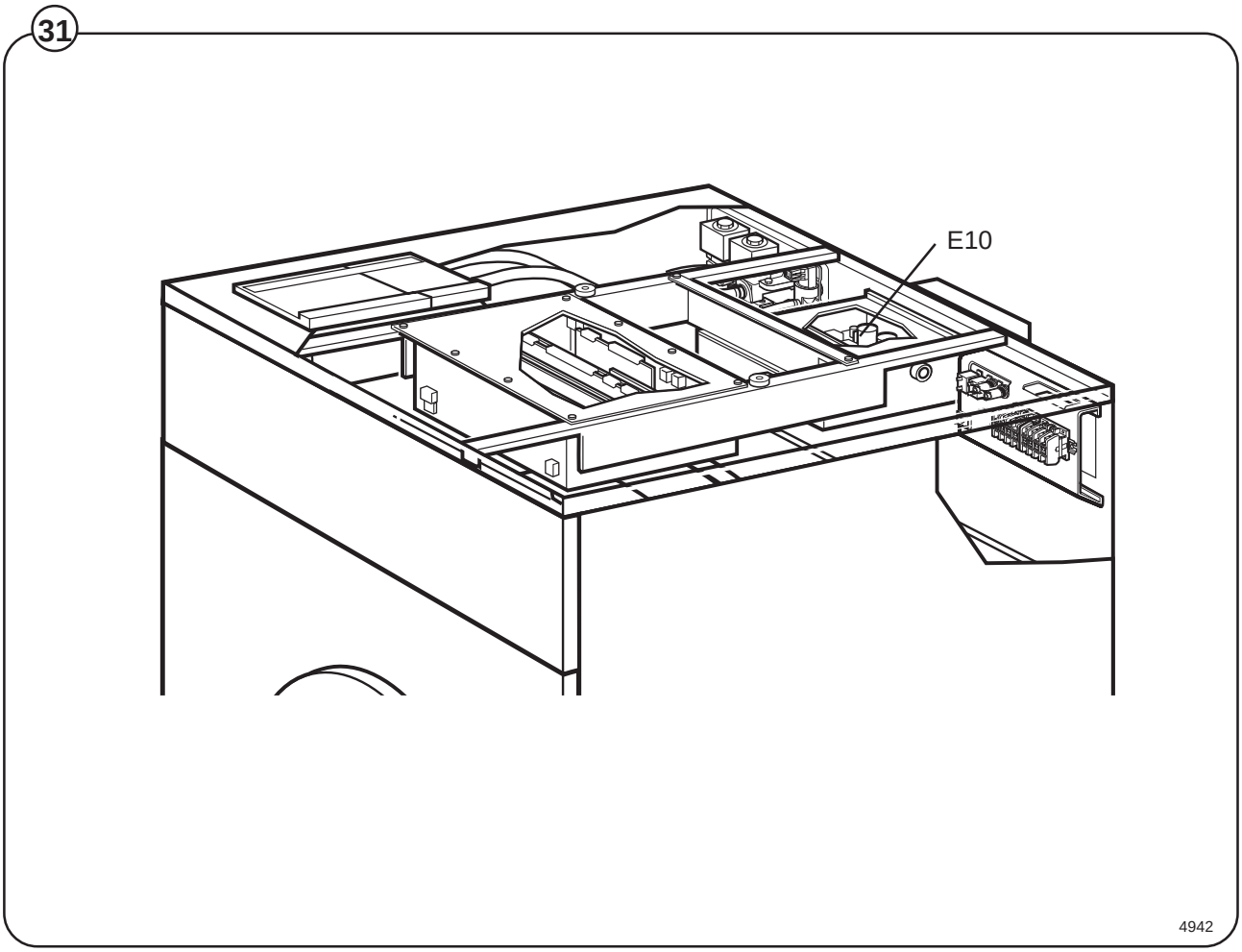
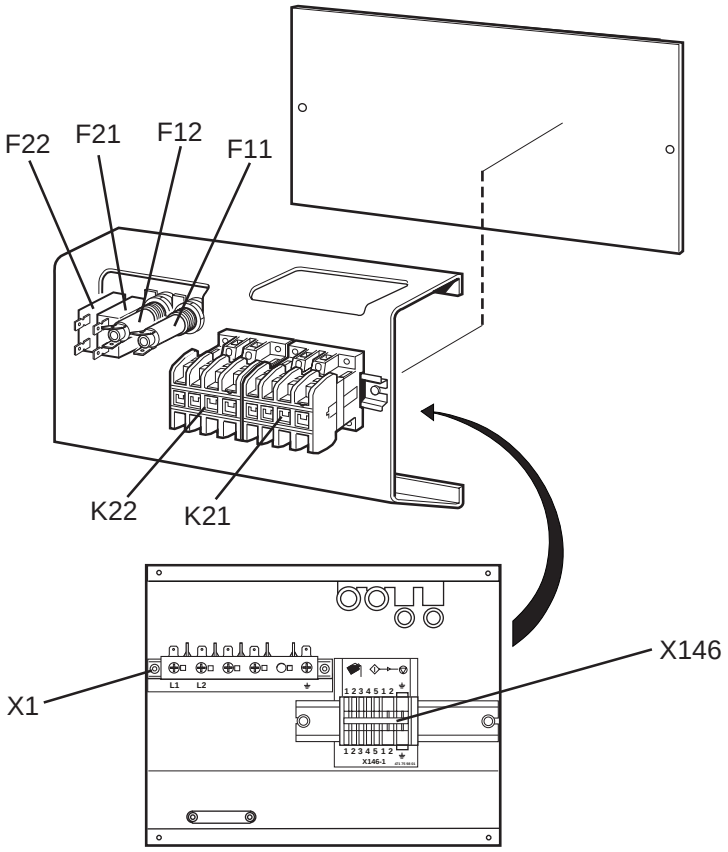


Fig. 31 E10 Motor control unit, microprocessor-controlled. Controls direction of rotation and speed of motor. The MCU is also used for imbalance detection and calculating weight of wash load.

Control unit

Supply unit

33



4989

Fig. 33

F11, F12	Fuses, incoming power supply
F21, F22	Fuses, motor control unit
X1	Main input
K21, 22	Heating relays (only if heated)

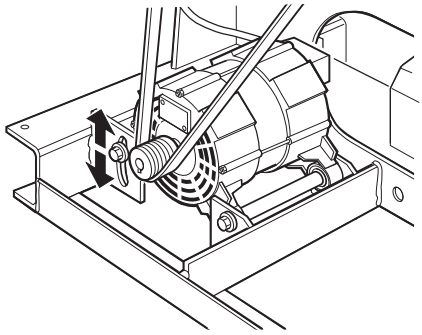
Motor

Fig. (34) In machines with a frequency control the same motor is used for wash speed, distribution speed and extraction. The motor is located on a motor mounting plate, and drives the drum via a belt.

The tension of this drive belt can be adjusted by moving the entire motor in the mounting slots on one side. The motor has a thermal cut-out located in its windings. The status of this thermal cut-out is deffected by the motor control unit causing it to shut itself off, in the event of the motor overheating, i.e. if the temperature exceeds 130°C.

The various motor speeds for normal action, distribution and extraction are controlled by a microprocessor-based motor control unit (MCU). The control signal for the motor control unit goes via a speed selector, which the operator can also use to select specific extraction speeds for low and high extraction.

34



4939

Repair instructions

Overheated motor, motor not running

- Wait until motor has cooled down. Motor guards are automatically reset after 30 minutes. Restart, machine.
- Possible cause of motor guards releasing repeatedly: Low voltage, faulty windings, faulty bearings.

Very noisy motor

- Breakdown of bearings – replace motor.

Motor locks

Breakdown of bearings – replace motor

Motor does not turn

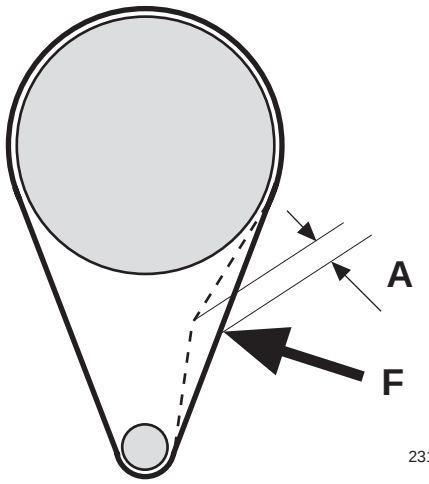
Fig. 35

- Check belt tension.

When checking the belt tension or when changing belt, use the adjustment data provided.

Checking the belt tension should always be a part of the regular maintenance.

35



A_{max}	15 mm	9/16 in
A_{min}	15 mm	9/16 in
F	25 N	60 lbs

Motor control unit E10

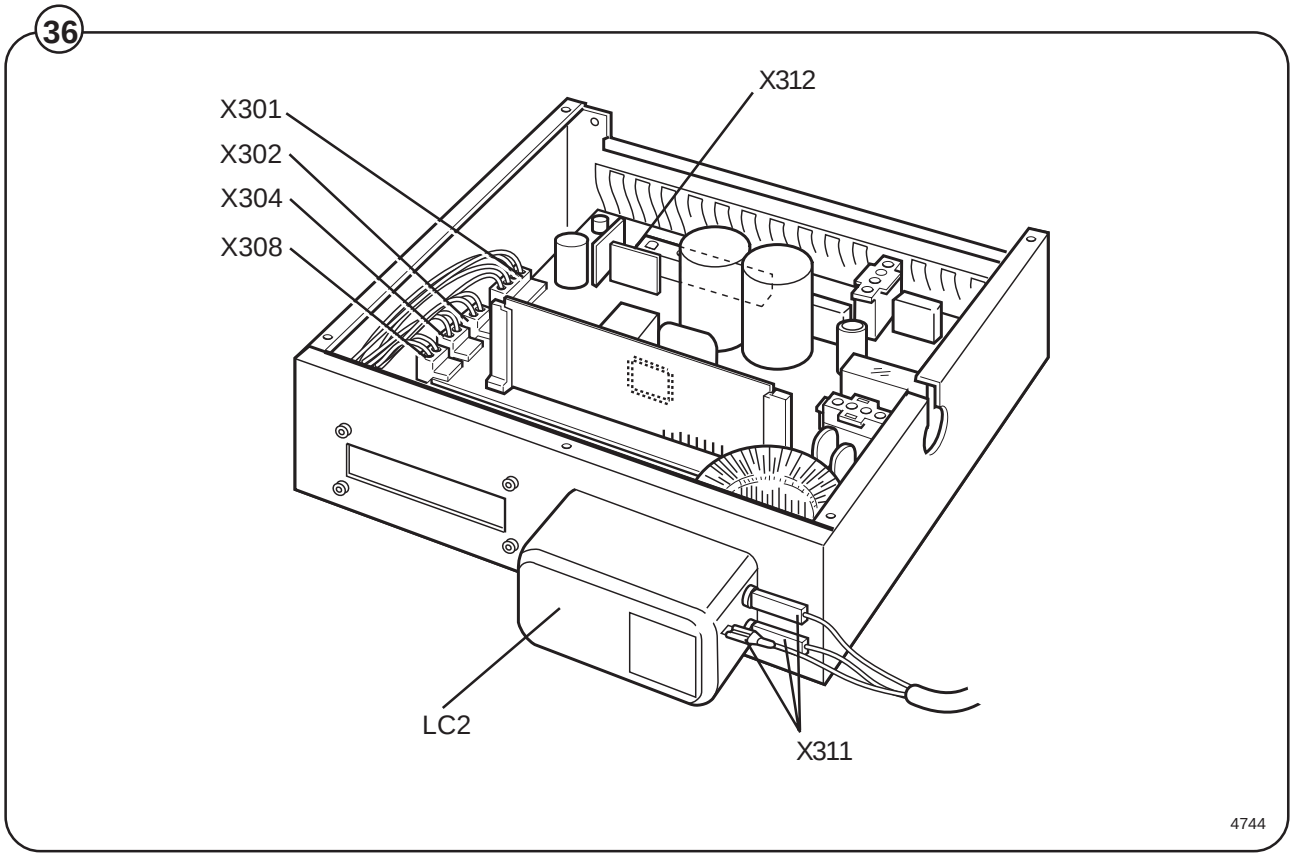


Fig. 36

LC2	Suppression filter
Connectors	
X301	Serial communication with PCU
X302	Input, lock confirmation
X304	Relay output
X308	Imbalance input
X311	Main power input
X312	Connection, motor and thermal protection device (Klixon)

Motor control unit

Fig. 37

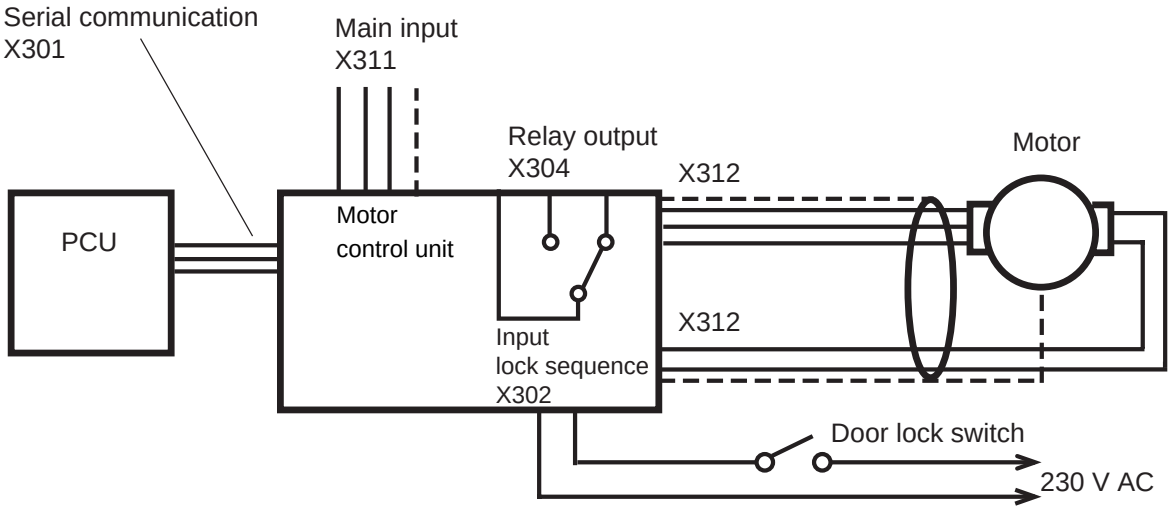
Fig. 39

The motor control unit communicates with the PCU board via a serial duplex interface. With the aid of the MCU, the PCU can not only control the speed the motor is to have at any given moment, but also control the acceleration and deceleration rates the motor will use to reach the speed commanded. The MCU constantly relays information back to the PCU board on current operating status, e.g. whether everything is proceeding without problems or if a fault or error has arisen.

The MCU can also supply data on the torque of the motor at constant speed and when accelerating and decelerating. This data is used both for calculating the weight of the wash load and for detecting any imbalance present.

Take great care when using measuring instruments on the MCU, since all components have a potential difference of approx. 300 V in relation to earth and neutral.
The MCU will not be de-energised until 10-30 seconds after the machine is isolated from the power supply and the motor has stopped.
The green LED on the MCU board will remain lit for as long as there are hazardous voltages present in components.

37



There is a cooling fan on the MCU. The fan starts up automatically when the heat sink reaches a temperature of approx. 65°C, which can arise during extraction if the load is unfavourable or if the ambient temperature is high. When the machine power supply is first switched on the fan operates for a short time.

The MCU has an interlock signal input connected to a switch in the door, which supplies the input with main voltage when the door is locked.

PCB connector/Function

X301: Serial communication

Communications between MCU and CPU. With an interface it is possible to connect a PC for testing machine operation/functions.

X 301:2 Gnd
X 301:3 Txd
X 301:4 Rxd

X302: Input lock confirmation

An input voltage of 96-276 VAC is required to start the motor.
The function of this input is to stop/not start the motor when the door lock is open.

Input voltage: 120 V-20 % (=96 V) - 240 V+15 % (=276 V), 50/60 Hz
Current: Max. 0.01 A

X304: Relay output

The relay is controlled via commands from the PCU (X301). The relay is not to be activated if communication with the PCU is lost.

Isolation voltage: 3750 V
Voltage: 250 VAC
Current: max. 2 A
Relay connections: 1-pole, 2-way (three connections)

Connector:	X304:1	Normally open
	X304:2	Normally closed
	X304:3	Common

X307: Internal

This contact is used for connection of a fan for cooling the MCU.

X311: Main power input

Input voltage: Single-phase or DC three-phase: 200 V-15%(=170 V) - 240 V+10% (264 V)

X312: Output to motor and input thermal protection device (Klixon)

The output is connected to a thermal protection device, located on the motor windings, with a connection back to the input. If the motor becomes overheated, the thermal protection device switch opens. The yellow LED reveals an error code through its pattern of flashes, see the section “Error indication patterns”.

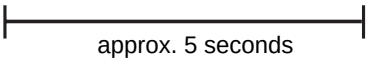
Current, max. 0.01 A

Error indication patterns

Fig. 38 Fig. 39 If a fault or error occurs in the motor or motor control unit, the MCU sends an error signal to the CPU board. In addition to an error code showing on the display, errors/faults are revealed by the flashing of a yellow LED on the MCU board. The table below shows how to identify the error/fault on the basis of the flashing pattern of this LED.

38

	LED pattern of flashes	Error code/message on display	Cause
1		HEAT SINK TOO HOT	Heat sink on MCU too hot.
2		MOTOR TOO HOT	Motor thermal protection device activated
3		NO INTERLOCK	MCU has received start command, but not received interlock signal.
4		NO MOTOR COMM	Communication error MCU – PCU
5		–	Short in motor windings, wiring or internally in MCU. MCU will restart automatically.
6		MOTOR SHORT	Once again short in motor windings, wiring or internally in MCU.
7		INTERL HARDWARE	Fault in interlock circuits in MCU.
8		LOW DC VOLTAGE	MCU DC voltage too low.
9		HIGH DC VOLTAGE	MCU DC voltage too high
10		RIPPLE DC BUS	Ripple DC-bus (EWD 4000 only).
11		KLIXON CIRCUIT	Fault/error in MCU overheating circuits.

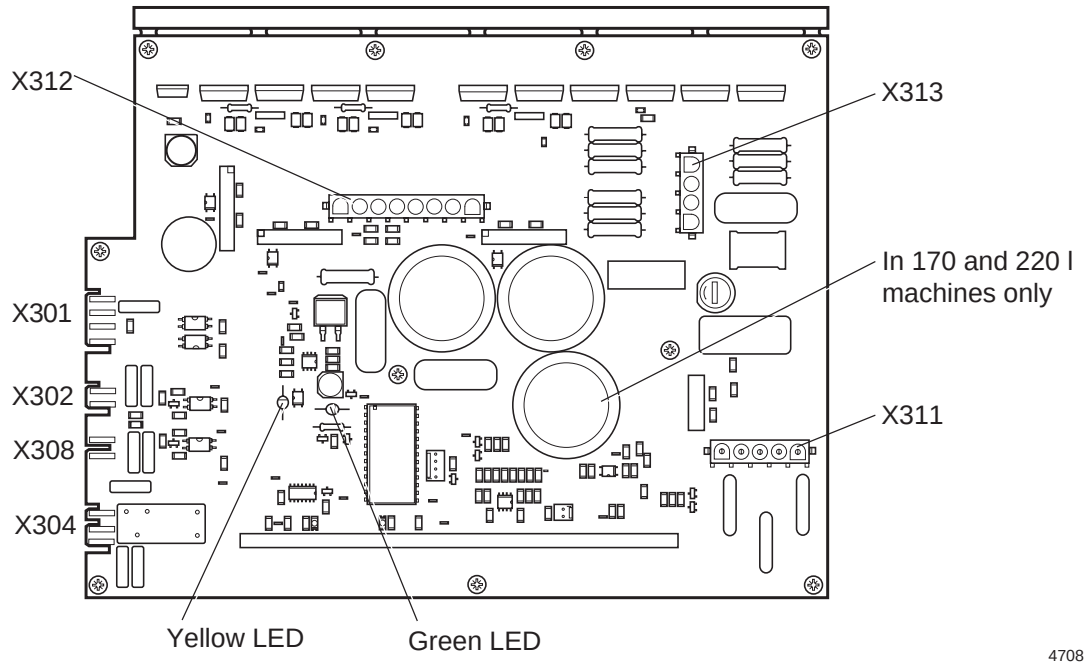


4710

Fault-finding

There are fault-finding charts for all error codes in Chapter 12, “Fault-finding”.

39



Error indication patterns, green LED

Fig. 40

The green LED on the MCU board is normally lit except for a brief pause approx. once every five seconds (pattern which indicates “OK”).

When the microprocessor for the PCU is removed from the machine or has reset status, the LED will be lit without flashing.

When the MCU current-limiting function is activated, the LED will instead flicker, and the flashing pattern which indicates “OK” will be suspended for as long as the current-limiting function is activated. When the MCU current-limiting function ceases, the pattern of flashes indicating “OK” will return after 10 seconds.

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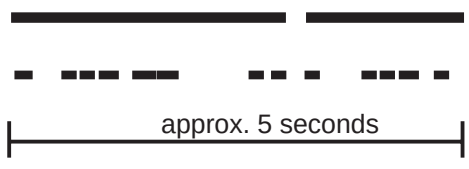


Pattern indicating “OK”

Flickering when MCU current-limiting function is activated.

Extraction

Fig. 41 During extraction, the motor speeds follow an extraction sequence which is always the same. This extraction sequence is used for all standard programs 991-999 for CLARUS machines.

The table shows the extraction speeds during the various phases of the sequence, for various drum volumes.

The extraction sequence is as follows:

Phase 1. Distribution period of 40 seconds, with imbalance sensing. Imbalance sensing takes place during the last 5 seconds.

Phase 2. Extraction for 30 seconds.

Phase 3. Extraction for 30 seconds.

Phase 4. Extraction for 30 seconds.

Phase 5. Extraction for remainder of the program’s total extraction time.

41

Imbalance measurement

At the start of every extraction sequence the system monitors variations in the motor torque while the drum is operating at distribution speed. If these variations are too great, it indicates that the load is unevenly distributed in the drum. At this point extraction is halted, the motor speed is reduced to wash speed and a fresh attempt to begin extraction starts. This procedure will be repeated up to three times per extraction. After the third time the system will decide whether the imbalance is “great” or “small”.

- If the imbalance is “great”, the extraction stage of the program will end without extraction having taken place.
- If the imbalance is “small”, extraction will take place, but at a reduced speed.

Supply injection valve

Construction

Fig. (42) The valve has a single-inlet with either one, two or three outlets, each with its own solenoid coil.

The body is made of heat-resistant polyamid plastic and the solenoids encased in water-tight plastic. The electrical connector terminals are spade lugs.

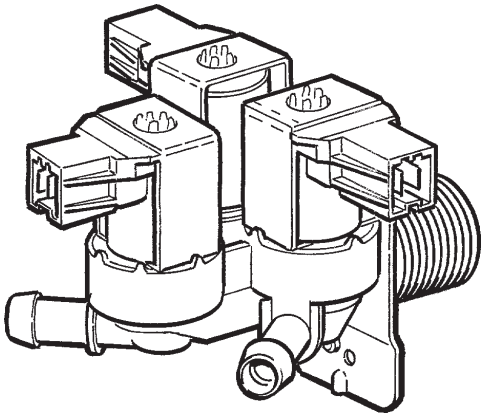
A filter screen on the inlet side prevents dirt from entering the valve. Flow restrictors can be placed at either the inlet or any of the outlets.

Operation

Fig. (43) When the solenoid is energized, the spring-loaded plunger is drawn up and the pilot valve in the centre of the diaphragm open. Because of the difference in diameter between the pilot valve opening and the ventilating hole in the diaphragm, the pressure above the diaphragm drops to a point where the admission pressure below the diaphragm can lift the diaphragm, thus opening the valve.

When the current to the solenoid is cut off, the plunger spring will press the plunger against the pilot opening of the diaphragm. The pressure above the diaphragm then rises to correspond to the water inlet pressure and the pressure of the spring will close the valve.

42



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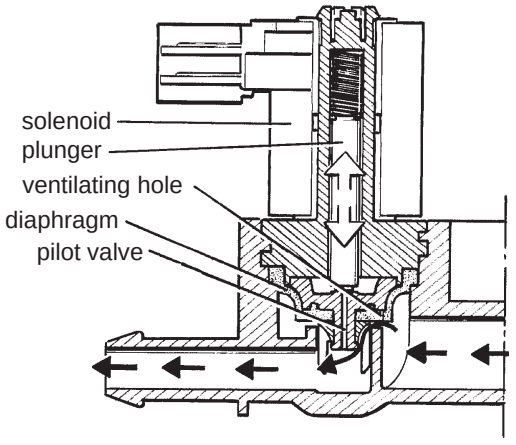


1185

Repair instructions

Limescale can block the hole in the valve diaphragm and interfere with the function of the valve.

Fig. (44) It is therefore advisable to dismantle and clean the valve at certain regular intervals. The frequency depends on operating conditions and the level of contamination in the water.

If the valve does not open

- Check that power is supplied to the coil.
- Check the coil with an instrument to determine whether there is a break or a short circuit.
- Dismantle the valve (see below) and check the openings in the valve diaphragm.
- Check the inlet strainer and clean as required.
- Undo the coil and clean the surfaces of the magnetic core.

If the valve does not close

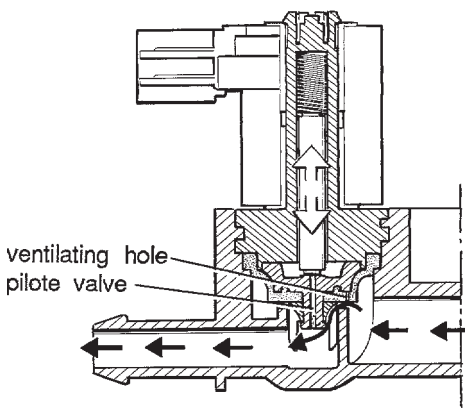
- Check that the coil is not live. The valve is normally closed when the magnet is not energised.
- Check the return spring.
- Check the diaphragm (pilot pressure opening).

Dismantling the valve.

Fig. (45)
- Pull the coil straight upwards. Use a screwdriver if necessary to carefully undo the coil.

Fig. (46)
- Use the tool supplied (attached to one of the hoses when the machine is delivered) to open the valve housing. Slide the tool over the protruding plastic sleeve to that the pegs on the tool engage the corresponding sockets in the valve housing.
- Use a spanner or a pair of pliers and unscrew the upper part of the valve housing.

44



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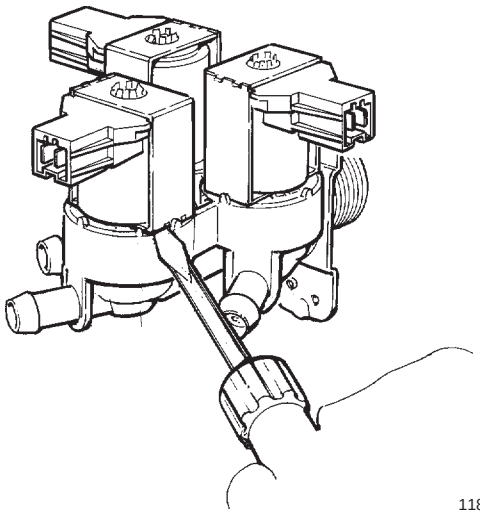

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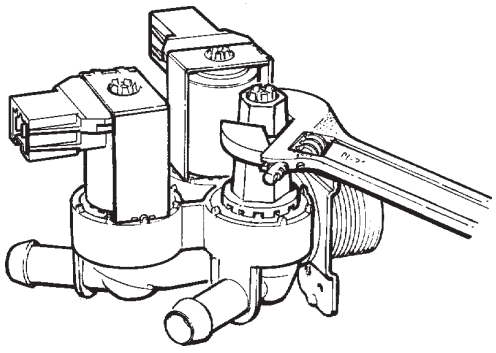


1181

Inlet valve

Fig. 47 The water inlets have brass bodies with larger cross section of the outlet in order to achieve a shorter filling time for the machine.

Construction

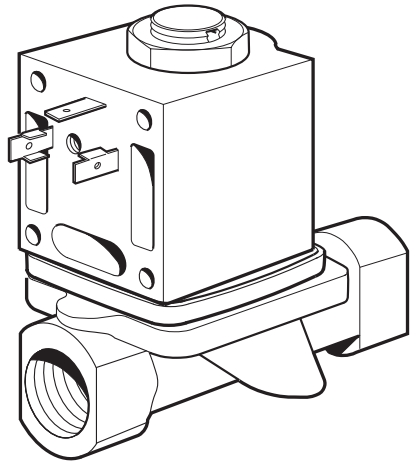
Fig. 48 The valve housing is made of pressed brass. The spring-loaded plunger is made of stainless steel and located at its lower end.

Operation

The valve is automatically operated by means of a rubber diaphragm and a pilot valve in exactly the same way as the supply injector valve.

To strip, clean, re-assemble and troubleshoot the inlet valve, follow the instructions outlined for the supply injector valve.

47



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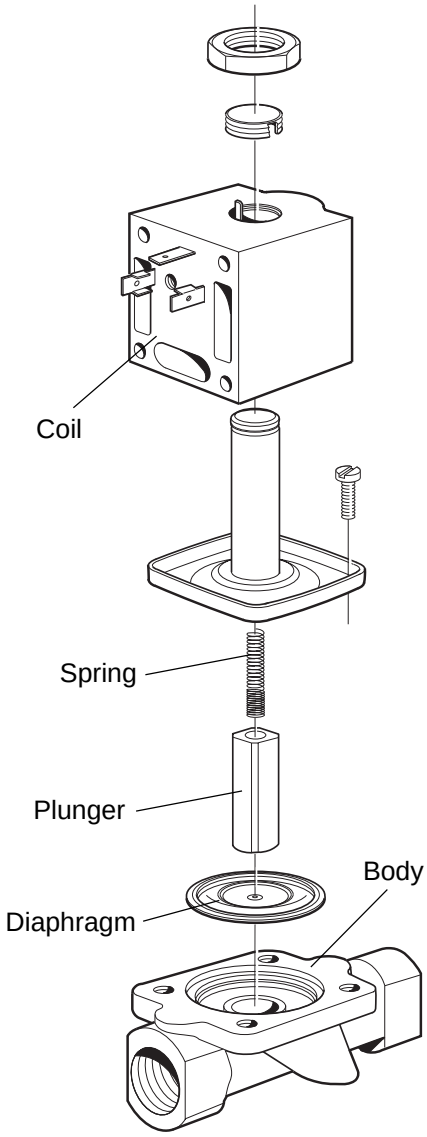


3961

Description

Fig. 49 Fig. 50

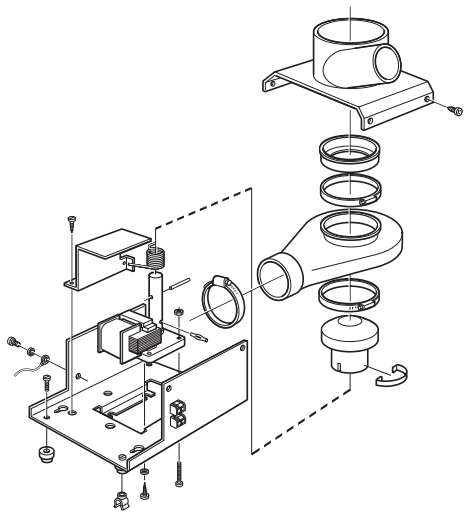
The drain valve is a motor-operated diaphragm valve which allows rapid emptying thanks to its large cross-section. This is a self-clearing design, so there is no need for a lint filter.

Main parts of the valve:

- motor plus gear
- piston rod with trapezoidal thread, plus piston and return spring
- rubber diaphragm
- connections for water filling, overfilling, drain

In its open state, the valve is not energised. In this state the piston rod is screwed down to its lowest position by the return spring. The diaphragm is pressed downwards with the piston and the valve is open.

49



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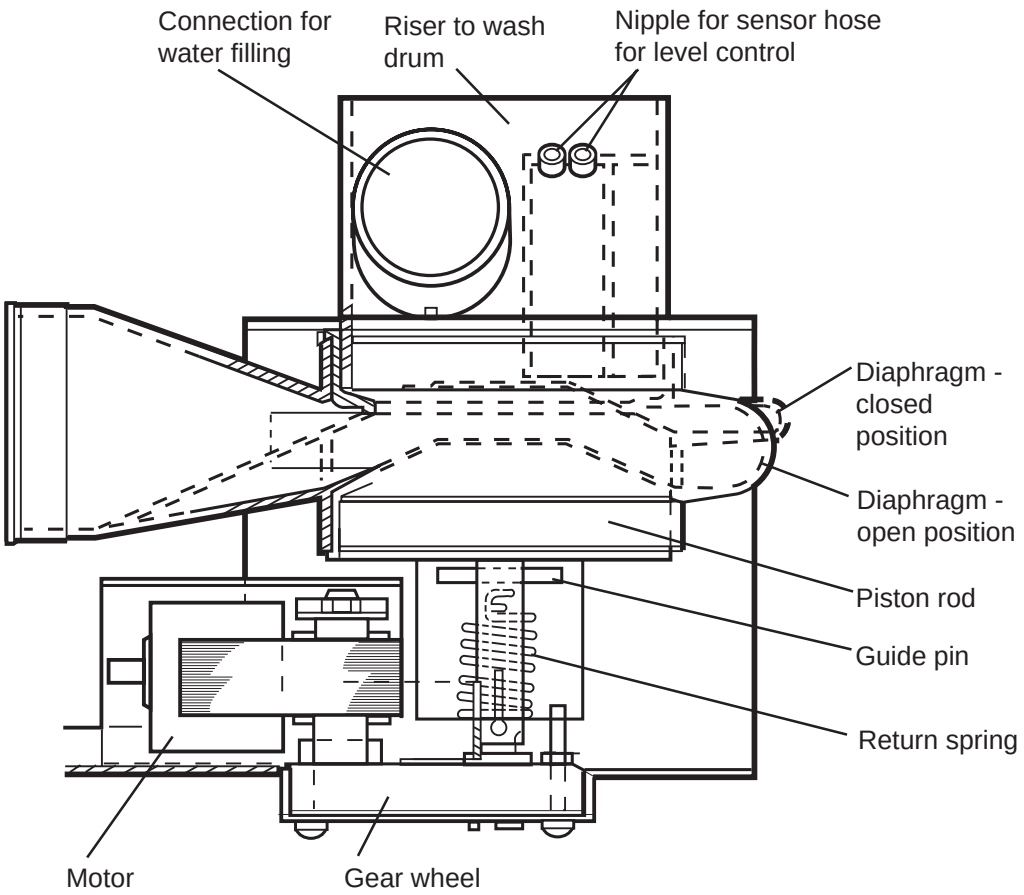


4748

When the motor is activated and begins to rotate, the piston rod is turned upwards via the gear, the diaphragm is pressed upwards with the piston and presses against the valve seat: the valve closes.

The connection for overfilling is connected to the upper part of the wash drum, water and foam are diverted straight to the drain if the intake valves or level control should malfunction.

On the riser for the wash drum are the connection for water filling and a nipple for connecting the sensor line for the level control.

Instructions for repair

Deposits on the diaphragm can prevent the valve from opening or closing properly. The valve should therefore be cleaned at certain intervals, depending on operating conditions and water quality.

If the valve is not opening or closing properly:

Fig. 51

- Check that the motor has the right input voltage.
- Check that the piston rod can move freely.
- Check whether the diaphragm is clogged with deposits.

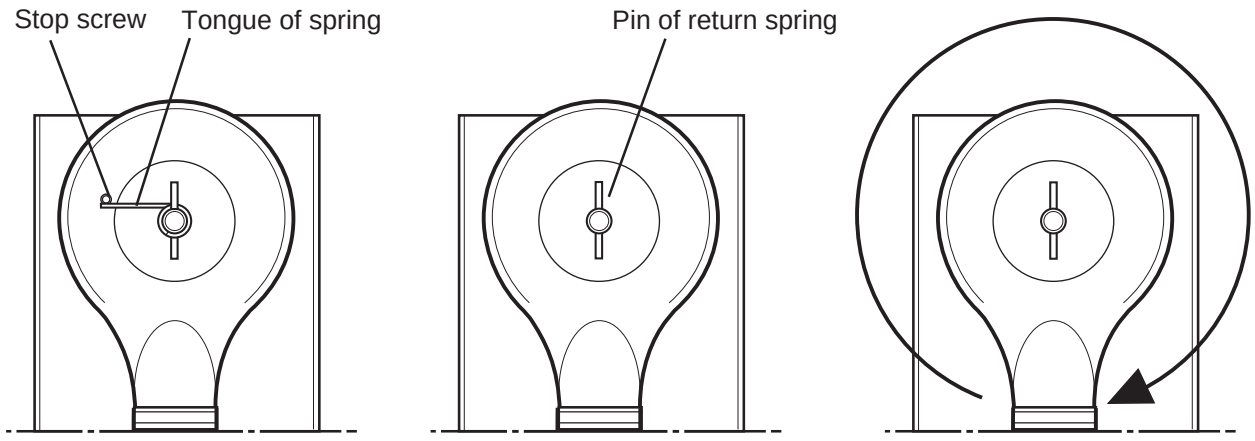
To note if replacing the motor:
Brown cable: 60 Hz
Blue cable: common
Black cable: 50 Hz

Tensioning of return spring

With the valve housing removed:

- Turn the return spring so that the “tongue” of the spring is resting against the stop screw.
- Position the valve housing over the return spring so that the pin on the spring will fit into the recess on the piston rod. (Note: the piston rod should be installed so its recess is aligned along the housing.)
- Then turn the housing one turn clockwise. (This will screw the pin of the spring into the piston rod. The spring will be now tensioned approx. 1/4 of a turn on account of the lead in the piston rod.)

51



4749

Soap supply box

Fig. (52) The three-compartment soap supply box is located at the top of the machine. Viewed from the front, the compartments marked with figures 1, 2 and 3 are used as follows:

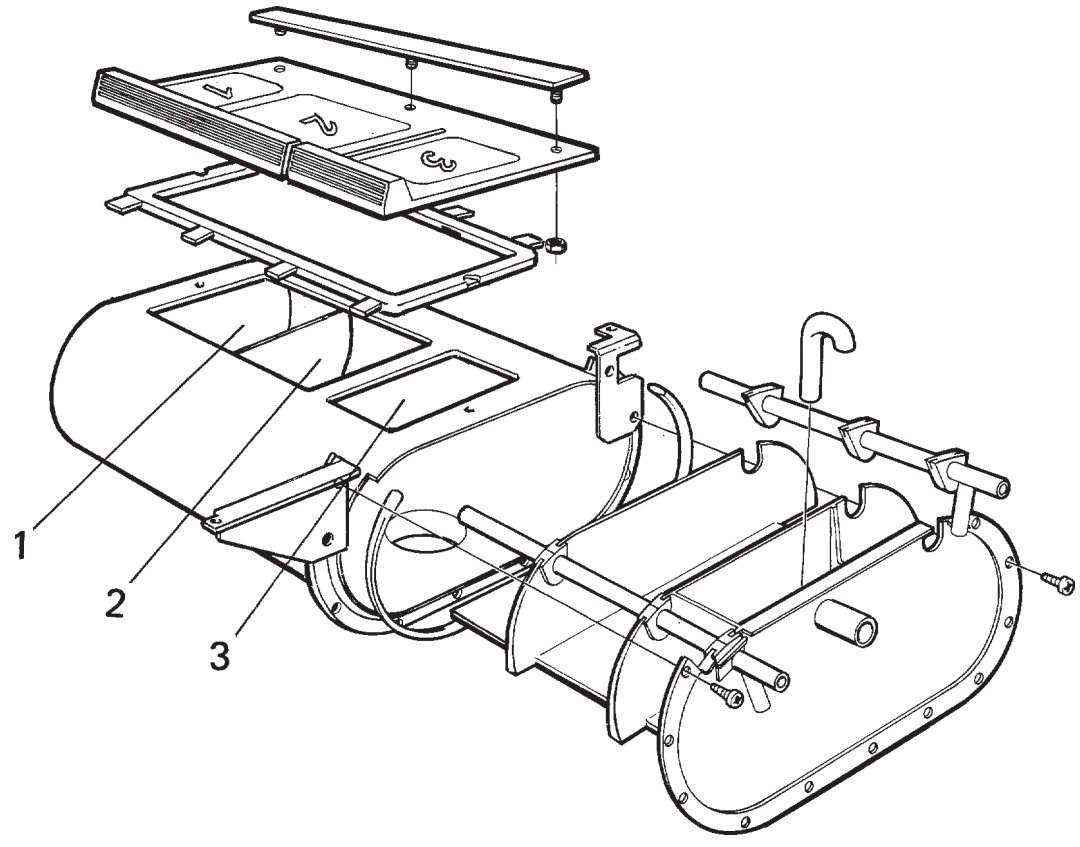
Compartment 1
This compartment is used for adding detergent directly to the wash at the beginning of a cycle or at any time during the cycle when extra supplies are required.

Compartment 2
This compartment is the main compartment for adding detergent to the wash .

Compartment 3
The small compartment is used for adding fabric softener. The fabric softener is flushed down with water by overflowing when the injection of fabric softener is called for.

When using a top mount supply injector connection only compartment 2 will be utilized.

52



1182

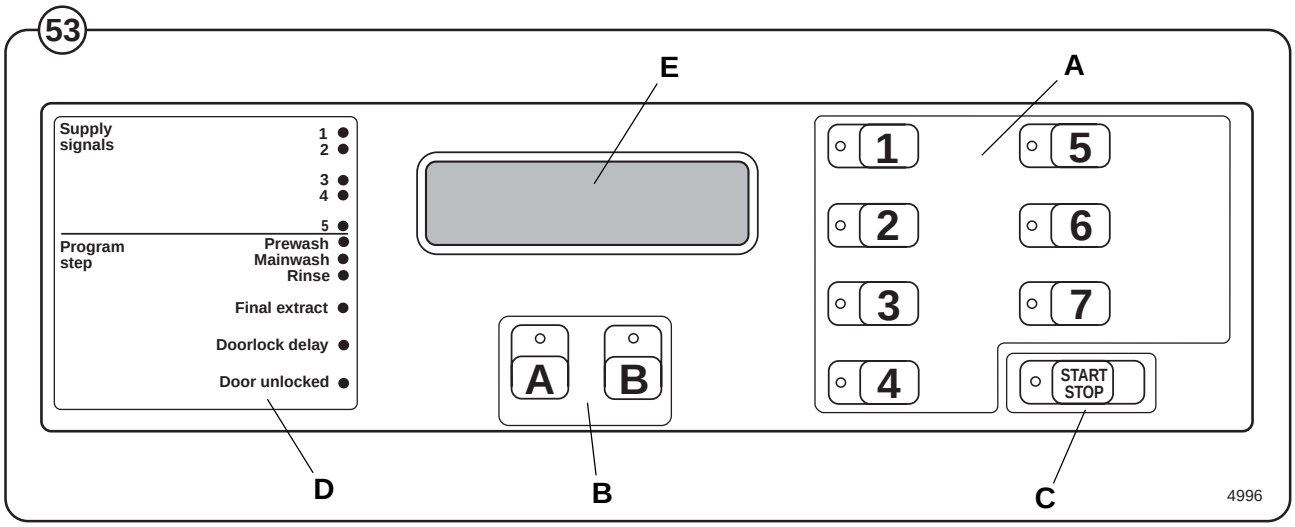
Operating instructions

The Emerald Series program unit controls the various functions of the machine in a certain time sequence with the aid of seven built-in standard programs. The standard programs can also be modified by selecting various options. By selecting options, the user has access to programs for all types of wash loads and degrees of soiling.

Fig. 53 The control panel consists of program selection buttons (A) and (B), a combined start, pause and rapid advance button (C), symbols with LEDs (D) which show the program selected and the program sequence, plus an alphanumeric display (E).

The alphanumeric display shows illuminated green characters.

In the event of faults, error codes will be displayed on this window. See Fault codes.



Explanation of control panel

A Program selection buttons

B Option buttons

C Start/pause and rapid advance button

D Symbols with LEDs to indicate program sequence

E Information display

Washing

Fig. 54
- Press the button for the desired program.

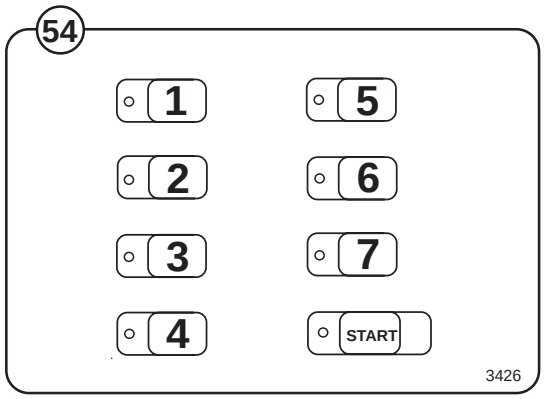
Fig. 55
- Now the LEDs alongside the program symbols will show what the selected program consists of.

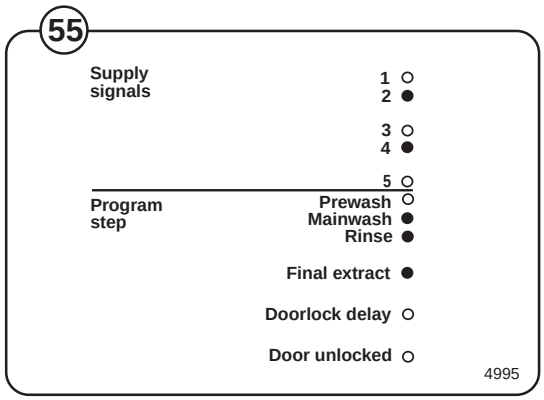
Fig. 56
- Press the button(s) for any options required.

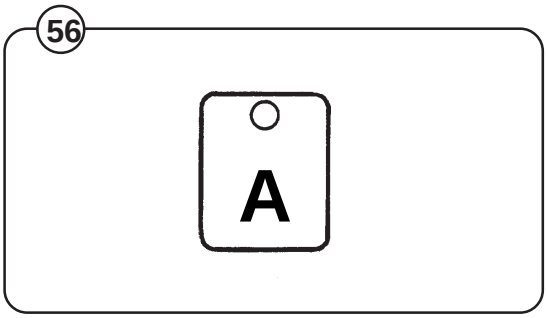
Fig. 57

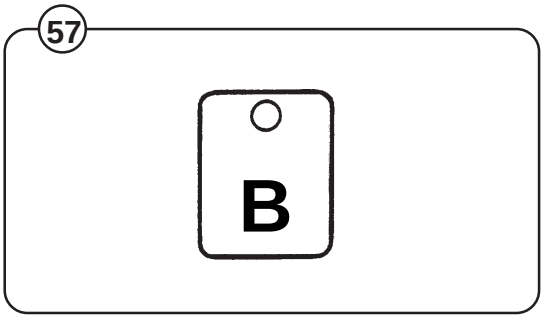
Gentle actions consists of 6 seconds rotation, as opposed to 18 seconds pause and 6 seconds pause and 14 seconds rotation for Normal action.

Fig. 58
- Press the **START** button.









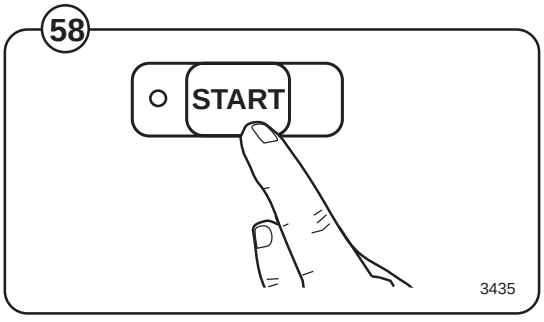
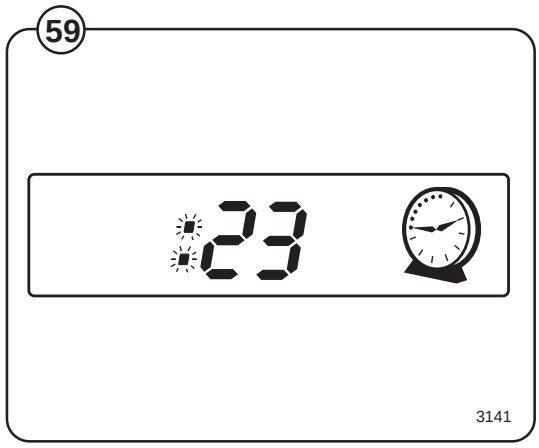


Fig. 59

- Now the display will show the clock symbol and two digits. The two digits are the time left before the wash will be finished.

The two digits indicating time left will not appear when the machine is first installed. Each program needs to have been used at least once before the time left will be displayed.



- For 5 minutes immediately after START is pressed the colon character (**:**) will flash on the display. As long as this character is still flashing a new program can be selected (without the drain opening). This means you still have the chance to change the setting if the wrong program has been selected. Do as follows:

Fig. 60

- Press **START**.
- Select a new program.
- Press **START** again after making any change in the program selected.

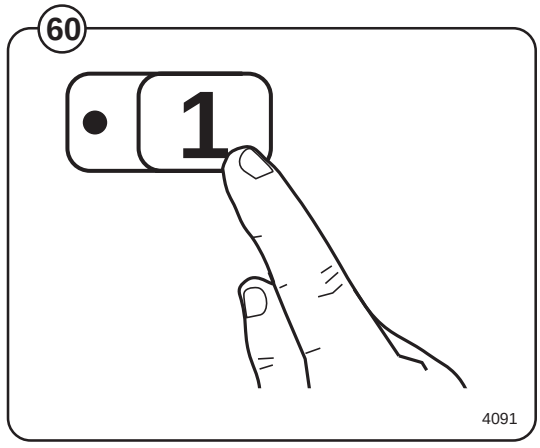
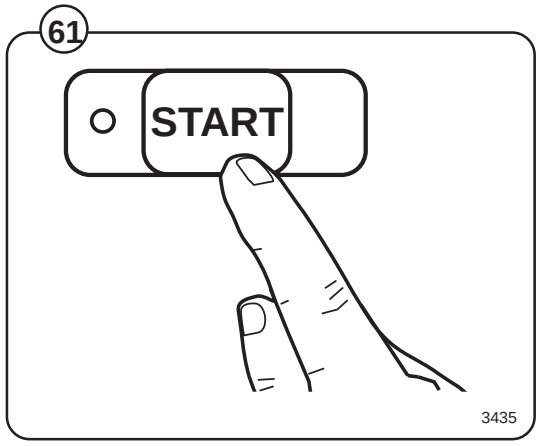


Fig. 61

If for any reason you wish to halt the wash cycle for a time, press the **START** button for a moment or two. The program will be suspended and the drain will remain closed.

To restart the program, press the **START** button again briefly.



For coin-operated machines

Fig. 62

Select a wash program, then insert the number of coins corresponding to the figure shown on the display.

As each coin is added the machine counts backwards towards 00 on the display. The machine will not start until the display shows 00.

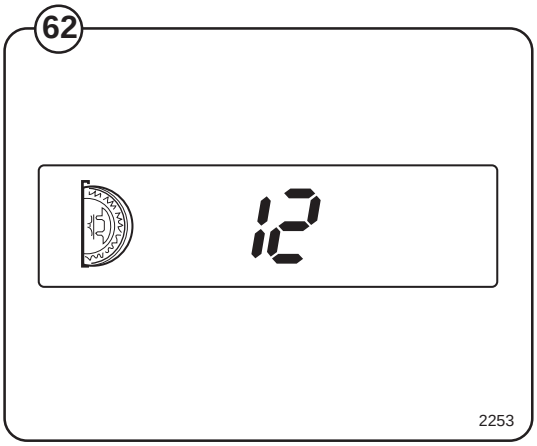
Fig. 63

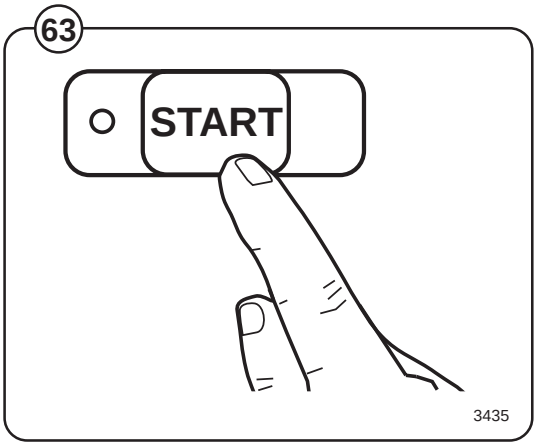
- Press the START button.
- Now the display will show the clock symbol and two digits. The two digits are the time left before the wash will be finished.

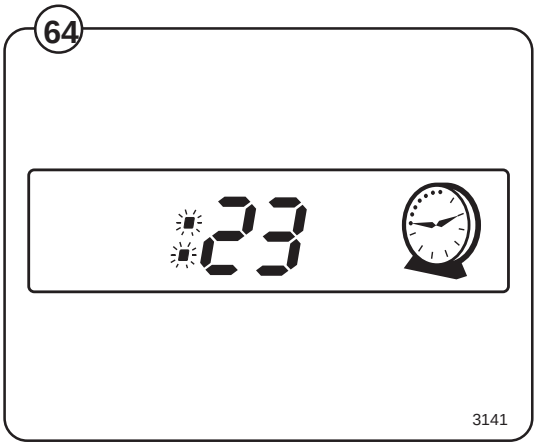
The two digits indicating time left will not appear when the machine is first installed. Each program needs to have been used at least once before the time left will be displayed.

Fig. 64

- For a time immediately after START is pressed the colon character (:) will flash on the display. As long as this character is still flashing a new program can be selected (without losing anything). This means you still have the chance to change the setting if the wrong program has been selected.
- Press **PAUSE/START**.
- Select a new program.
- If the new program costs more to run than the amount already paid, the difference will be shown on the display. Insert enough coins to make the display show 00 again.
- Press **START** again after making any change in the program selected.







Rapid advance

Whole steps in programs can be skipped using rapid advance.

Fig. 65

- Press and hold the **START** button until the program indicator LEDs have moved past the program steps you wish to skip.

Program end

Fig. 66 After final extraction, the LED by the "doorlock delay" comes on. This shows that the door lock will shortly be unlocked.

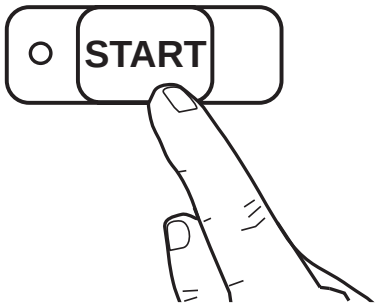
Fig. 67 The door will not actually be unlocked until the green LED by the "door unlocked" comes on, accompanied by an audible signal. This takes about 1 minute.

Troubleshooting

If the machine won't start, check that:

- the circuit breaker is on.
- the manual shut-off valves for water are open.
- a program has been selected.
- the door is properly locked.

65



3435

66

Doorlock delay ●

Door unlocked ○

3424

67

Doorlock delay ●

Door unlocked ●

3425

Coin-operated machines

In coin-operated machines the prices for the various programs have to be programmed in.

Values from the coin mechanism (the accumulated value) can be read out with the aid of the service program.

If a machine is fitted with a coin mechanism after its original installation the relevant electronic circuitry will have to be activated before the prices can be programmed in.

Only trained service personnel may use the service program and program in prices for coin operation.

Activation of electronic circuitry in machines fitted with coin operation after original installation.

Fig. 68

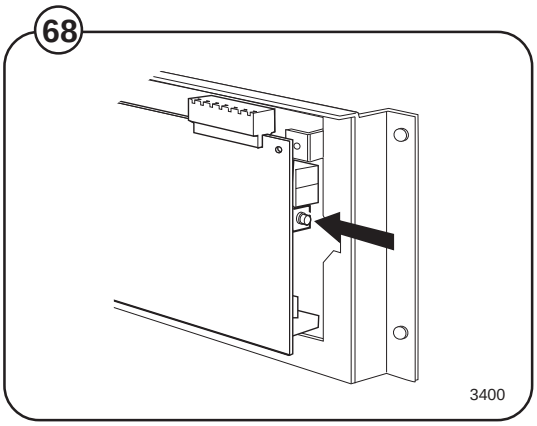
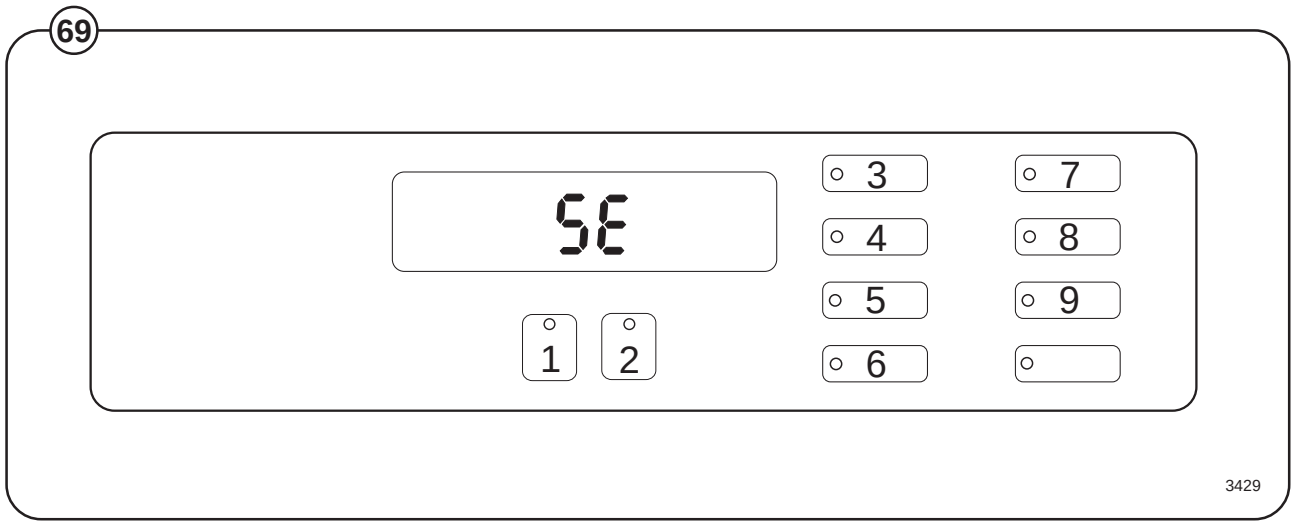


Fig. 69

- Press the service button.

  Now certain of the buttons switch to being number keys (1 to 9), with the START button being 0.



Codes 91 and 92 are used to store the values for coin slots 1 and 2. For mechanisms with only one slot, only code 91 is used.

The values to be stored are the ratio of one coin to the other.

For example: if the coin slots are for a 10 cent coin and a 50 cent coin. The value 10 should be stored under code 91, and the value 50 should be stored under code 92.

Fig. 70
- Enter code 91 using the buttons which have become number keys 9 and 1.

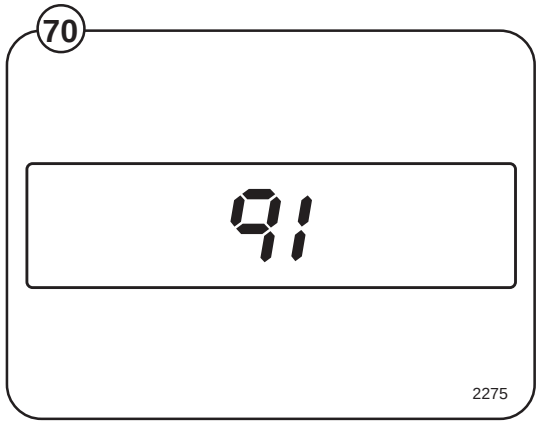
  The display will now show 91.

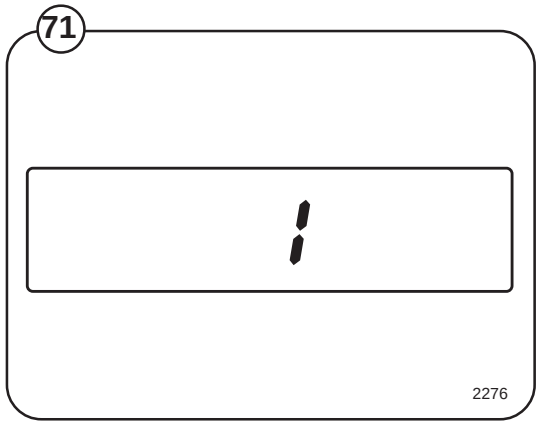
Fig. 71
- When entering the actual value: keep the price-programming button activated (the switch is located under the top cover at the right front edge). Enter the value 1 and then release the button.

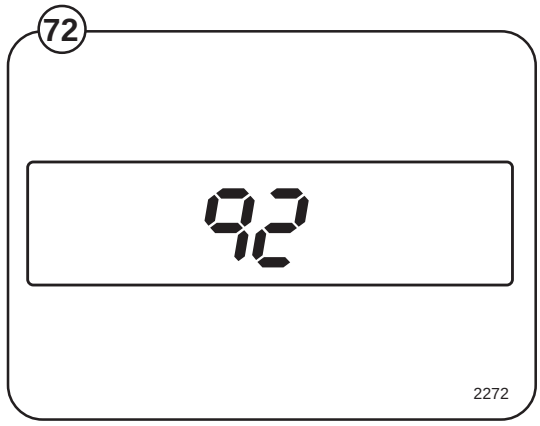
Fig. 72
- Enter code 92. The display will now show 92.

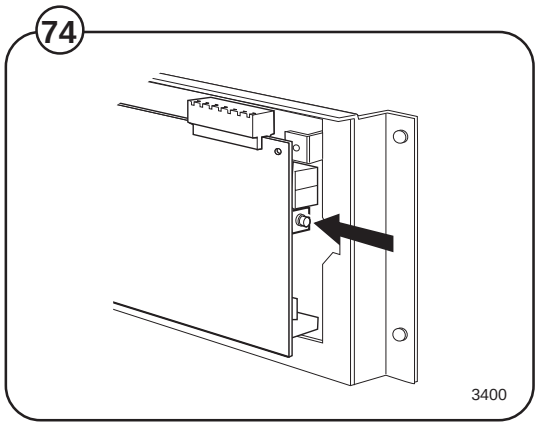
Fig. 73
- Enter the value 5.

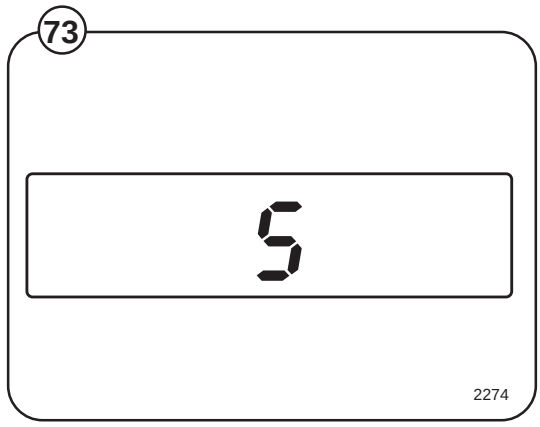
Fig. 74
- Exit the service program by pressing the service button again.











Price programming:

- Press the relevant wash program selector button.

Fig. 75

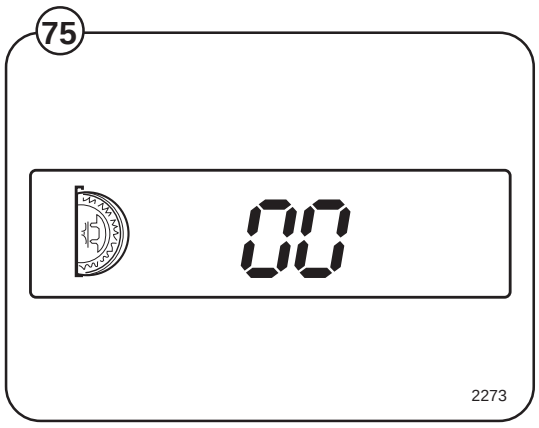
When programming the price of a wash program plus options, press both the relevant program selector button and the option button.

- Keep the price-programming button activated.

  Now the display shows 00 plus the coin symbol.

- Enter the price via the numerical key functions. The START button can be used to enter 0.
- Release the price-programming button.

This procedure should be repeated for all wash programs.



Hospitality wash formulas

For hotels/motels, restaurants, retirement communities, schools and universities, commercial and institutional laundries.

1	White uniforms sheets & pillow-cases (light soil)	1A	White towels (medium soil short program)	1B	White table linen (bleach, no starch)	1AB	White table linen (bleach and starch)
2	White uniforms sheets & pillow-cases (light/ medium soil)	2A	Colored towels	2B	Colored table linen (bleach, no starch)	2AB	Colored table linen (bleach and starch)
3	White uniforms, sheets, pillow-cases (medium soil)	3A	White towels (heavy soil)	3B	White or colored table linen (no bleach, no starch)	3AB	White or colored table linen (starch, no bleach)
4	Colored uni-forms, sheets, pillowcases (light soil)	4A	Bedspreads/ delicates (cold water)	4B	White 100% polyester (VISA) table linen	4AB	Bedspreads/ delicates (warm water)
5	Color uniforms, sheets, pillow-cases (medium soil)	5A	Kitchen & housekeeping rags	5B	Colored 100% polyester (VISA) table linen	5AB	Light soil general wash formula
6	White towels (light soil)	6A	Mops	6B	Chef coats	6AB	Extra rinsing with extract
7	White towels (medium soil)	7A	Stain treat-ment (short formula)	7B	Stain treat-ment (long formula)	7AB	Test program

Healthcare wash formulas

For nursing homes, hospitales and medical center.

1	White uniforms sheets & pillow-cases (very light soil)	1A	Diapers/pads medium soil	1B	Colored uni-forms, sheets & pillowcases (light soil)	1AB	White cotton or blend table linen
2	White uniforms sheets & pillow-cases (medium/ heavy soil)	2A	Diapers/pads heavy soil	2B	Colored towels	2AB	Colored cotton or blend table linen
3	White uniforms, sheets, pillow-cases (medium/ heavy soil)	3A	Diapers/pads extra heavy soil	3B	Dietary and kitchen rags	3AB	100% polyester (VISA) table linen
4	White uniforms sheets, pillow-cases (heavy soil)	4A	100% polyester pads	4B	Housekeeping rags	4AB	AIDS/ infectious disease iso-lation in water soluble bags
5	Color uniforms sheets, pillow-cases (medium soil)	5A	Delicates/ bedspreads	5B	Mops	5AB	Rinse and extract (cotton/terry)
6	White towels (light/medium soil)	6A	Sheepskins/ cubicle curtains	6B	Stain treatment (short formula)	6AB	Rinse and extract (polyester)
7	White towels (heavy soil)	7A	Personals/ general ldry.	7B	Stain treatment (long formula)	7AB	Test program

Shirt laundry formulas

1	Shirts (starch, cold rinses)	1A	Short formula shirts (no starch) (may use with 5 or 6)	1B	Delicates	1AB	White or colored blend table linen (with bleach, no starch)
2	Shirts (starch, warm rinses)	2A	Heavy soil shirts (one starch injection)	2B	Mops	2AB	White or colored blend table linen (with bleach and starch)
3	Shirts (no starch) (may use with formula 5 or 6)	3A	Shirts (pause for starch)	3B	Extra heavy soil – no – iron fabrics	3AB	White or colored 100% polyester (VISA) table linen (white bleach, no starch)
4	Shirts (no starch, no bleach) (may use with formula 5 or 6)	4A	Light soil general wash no-iron fabrics	4B	Extra heavy soil – cotton fabrics	4AB	White or colored 100% polyester (VISA) table linen (with bleach and starch)
5	One starch injection with extract	5A	Light soil general wash (cotton)	5B	Wool blankets	5AB	White cotton blankets
6	Two starch injections with extract	6A	Shirts (no starch, short extract) (may use with formula 5 or 6)	6B	Stain treat-ment	6AB	Uniforms
7	Short rinse and extract	7A	Shirts (starch, short extract)	7B	Stain soak (supplies added manually)	7AB	Test program

Electronic program control unit

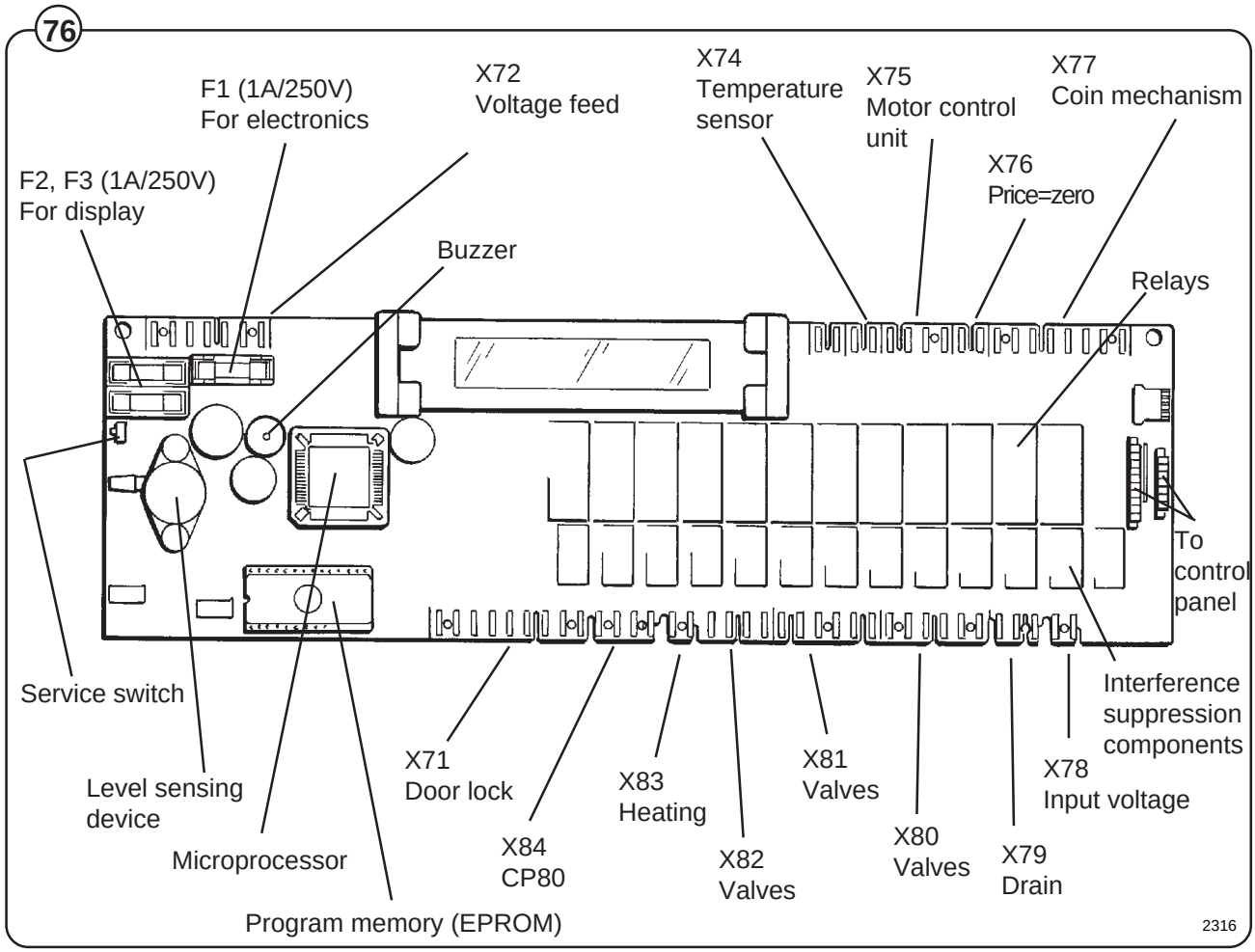
Description

Fig. 76

The program control unit is electronic and consists of a circuit board with components. On one half are the microprocessor, program memory (EPROM), power supply circuits, temperature and level control devices and so on. On the other half are the relays and interference suppression components. The program control unit has the following inputs and outputs:

- Inputs reacting to push-buttons on the control panel.
- Inputs which provide information on the machine's door lock status, level control, temperature sensors and coin mechanism if installed.
- Outputs which via relays directly control the various functions of the machine, e.g. motor control, water valves and door lock.
- Outputs to the display.
- Serial communication with the motor control unit.

The program control unit is controlled by the microprocessor, which fetches its instructions from the program memory (EPROM). The EPROM contains instructions for operation, the service program, control of relays, sensing of inputs etc. The EPROM also contains the standard programs supplied with the machine.



Operating time, accumulated coin value, EPROM no.

The machine's built-in service program can be used to check the machine's accumulated operating time, the accumulated coin value (for coin-operated machines), and the program EPROM part number.

Accumulated operating time

To check during normal operation

Fig. 77 The machine needs to be actually operating (program selected and started).

The buttons identified as A and B in the illustration may be "concealed" on some machines, in other words, have no symbols or other markings. They will still be usable for this function, however.

Press button A. The first two digits of a four-digit number will now be displayed, e.g. 13.

Press button B. The last two digits of a four-digit number will now be displayed, e.g. 47.

This means that the machine's accumulated operating time is 1,347 hours.

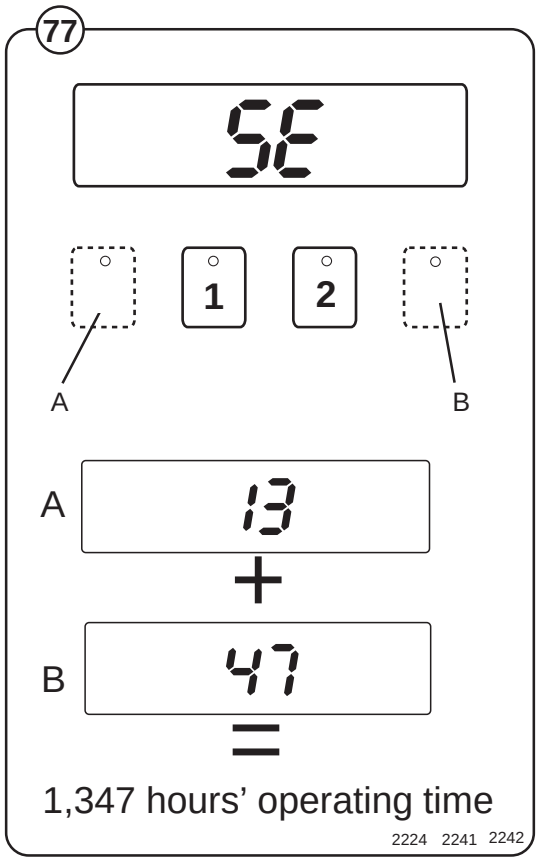
To switch on service mode

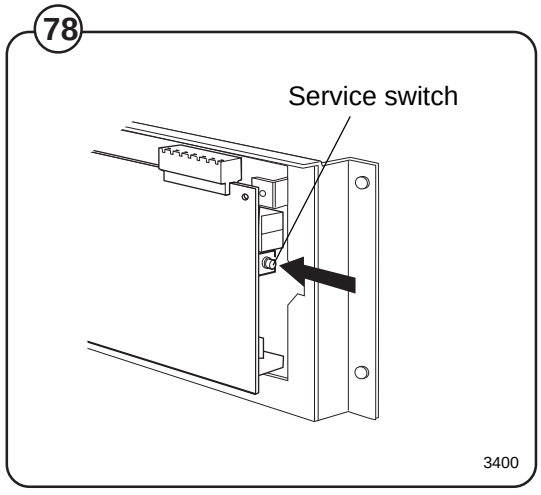
- Remove the machine top and the cover for the program unit circuit board.
- Fig. 78 Press the service switch. This switch is on the left-hand edge of the circuit board when viewed from the machine front. The display will now show SE, which means that the service program is activated.

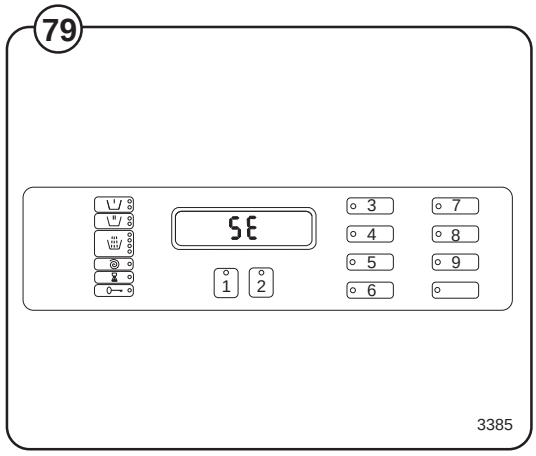
Fig. 79 Now some of the buttons switch to being number keys (1 to 9). The start button becomes an **ON/OFF** key.

To switch off service mode

Press the service switch again, or switch off the machine power supply.





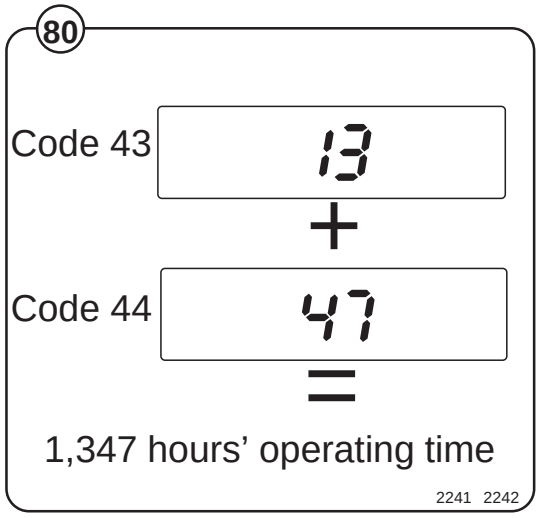


To check in service mode

Fig. 80 Enter code 43. The first two digits of a four-digit number will now be displayed, e.g. 13.

Enter code 44. The last two digits of a four-digit number will now be displayed, e.g. 47.

This means that the machine's accumulated operating time is 1,347 hours.



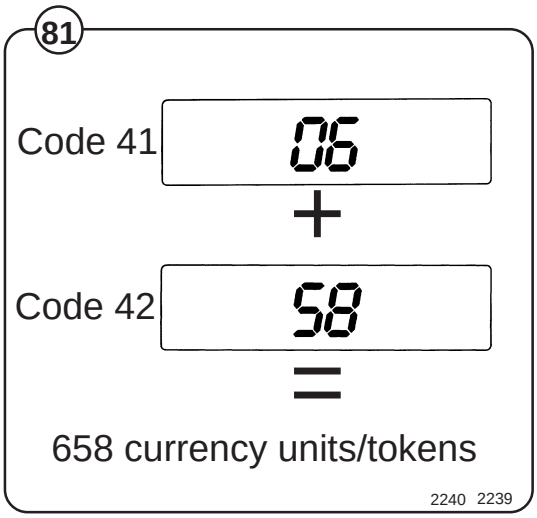
To check in service mode

Fig. 81

Enter code 41. The first two digits of a four-digit number will now be displayed, e.g. 06.

Enter code 42. The last two digits of a four-digit number will now be displayed, e.g. 58.

This means an accumulated coin value of 658 currency units or 658 tokens. In other words, it shows that 658 currency units or tokens have been inserted into the coin mechanism up until the time of the check.



Program EPROM part no. (check in service mode)

Fig. 82 Enter code 51. The letter A and two digits will be displayed, e.g. A47. ”A” denotes part no. (article no.).

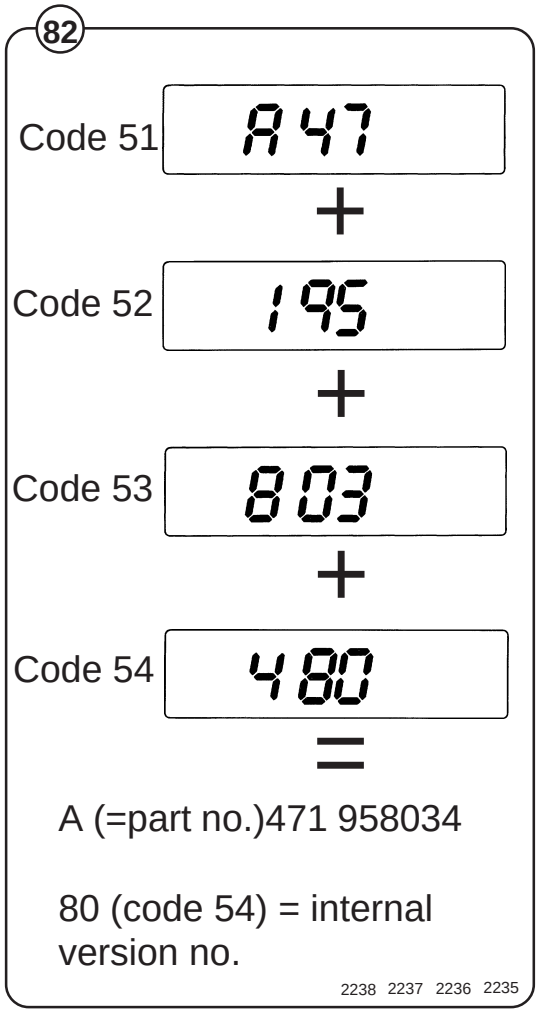
Enter code 52. The display will show (e.g.) 195.

Enter code 53. The display will show (e.g.) 803.

Enter code 54. The display will show (e.g.) 480.

When these digits are put together they make up the full part number:

A471 958034. The two digits at the end are an internal version number.

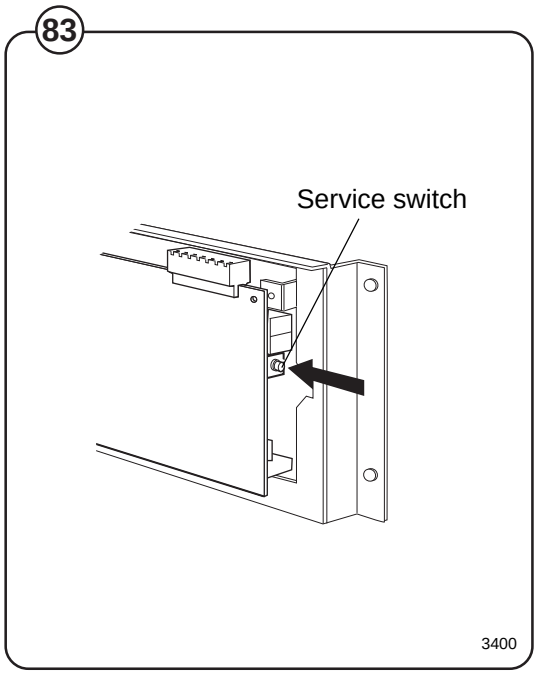


Level control

Description

The "level control", which is located on the circuit board, is a pressure switch which monitors the different water levels in the drum by sensing the air pressure in a tube which is connected to the bottom of the drum. As the water rises in the drum, the air inside the tube is compressed and at a set pressure ("cut-out-level") the micro-processor cuts out water filing.

When the water is emptied from the drum the microprocessor switches back to the starting position again, but now at lower water levels than were needed to switch when the drum was filling. These levels are called "on-levels". If during a wash the water should sink below on-level, the machine will be filled with water again, to cut-out-level.



Checking functioning and fault location

⚠ **To be carried out by authorized personnel only.** ⚠

A faulty level control cannot be repaired. Instead the whole circuit board must be replaced.

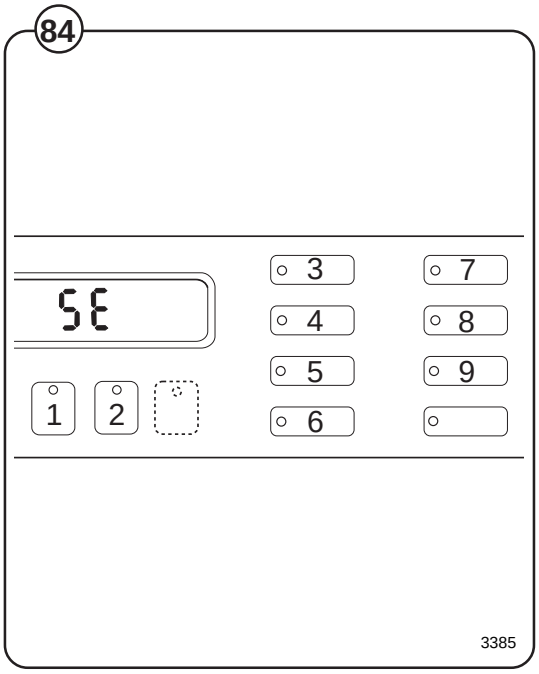
To check functioning of the level control

Fig. 83

- Start the service program by pressing the service button. Now certain of the buttons switch to being number keys (1 to 9).

Fig. 84

- Enter code 24. Now the display will show the current level in the machine on a scale of 1 to 200. An empty machine should show a value between 0 and 4.
- Press the START button. The machine will start to fill.
- Check that the figure shown on the display is counting upwards as the water level rises.
- After completing your check, stop filling by pressing the START button.
- Enter code 21 and open the drain valve to empty the machine.
- Quit the service program by pressing the service button.



If machine is filling to a level which is too high:

- Check that the tube between the level control and drum is not blocked. If necessary clean it by disconnecting it at the level control end with no water in the machine and blowing it clean.
- Check that the tube is undamaged.
- Test the machine by running a program.

Built-in service program

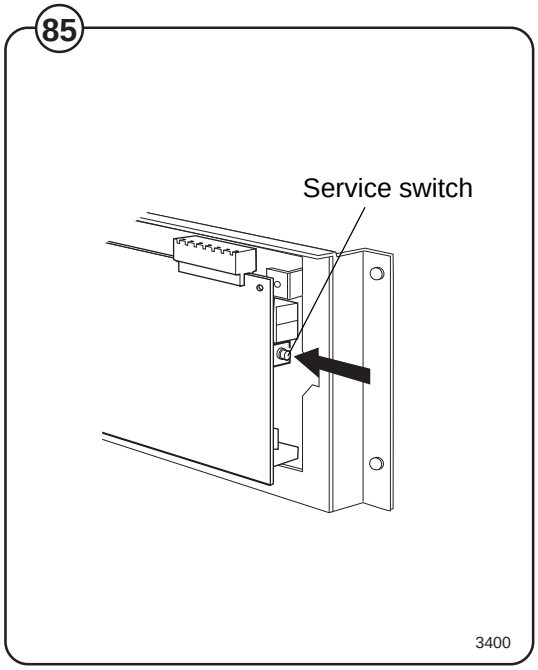
The machine has a built-in service program to facilitate function checking and fault-finding.

This program may only be used by trained and authorized service personnel.

To switch on service mode

- Remove the machine top and the cover for the program unit circuit board.
- Press the service switch. This switch is on the left-hand edge of the circuit board when viewed from the machine front. The display will now show SE, which means that the service program is activated.

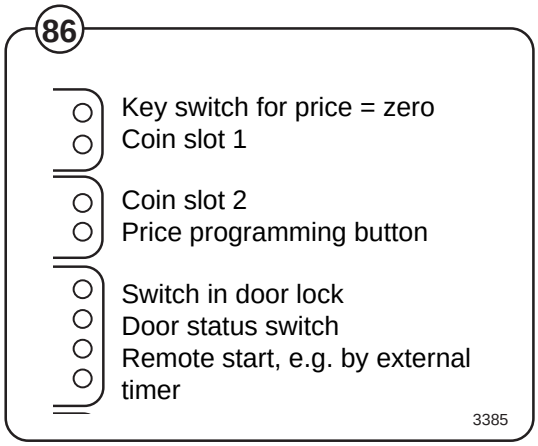
Fig 85



Controls in service mode

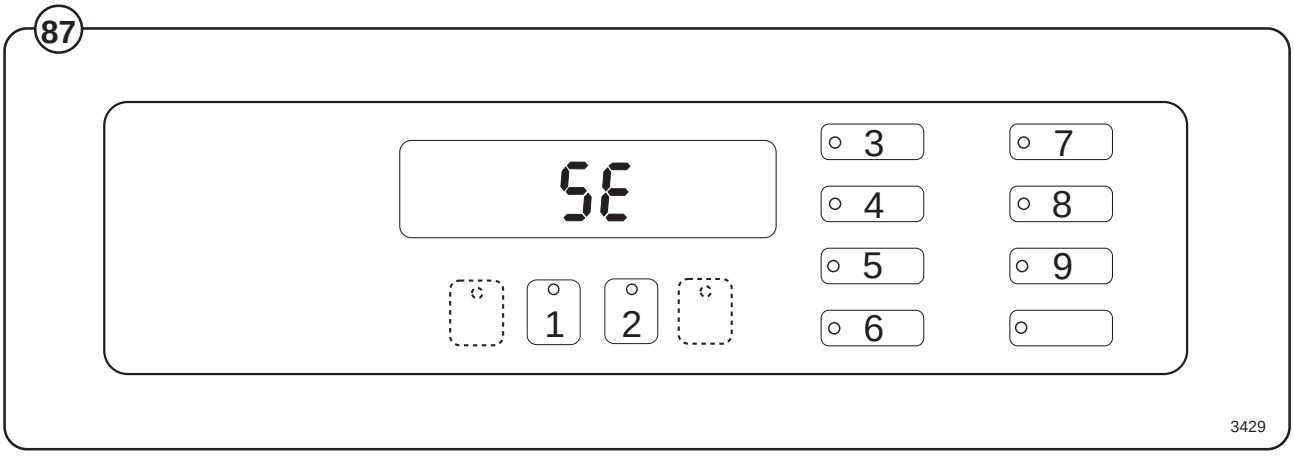
Fig 86 Now some of the buttons switch to being number keys (1 to 9). The start button becomes an **ON/OFF** key. The various machine functions can be tested using numerical codes (see table on next page).

Fig 87 The LEDs to the left of the display show which input signals to the program control unit are active.



To switch off service mode

Fig 85 Press the service switch again, or switch off the machine power supply.



Error codes

Given below is a brief summary of all the error codes and their causes.

Error Code	Cause
11	Detergent signal 1, liquid detergent.
12	Detergent compartment 2, cold water /Detergent signal 2, liquid detergent.
13	Detergent compartment 3, cold water /Detergent signal 3, liquid detergent.
14	Detergent compartment 2, hot water /Detergent signal 4, liquid detergent.
15	Detergent signal 5, liquid detergent.
16	Hot water in drum.
17	Detergent compartment 1, cold water.
18	Hard water in drum.
19	Heat: display shows actual temperature in drum, not code 19. When ”START” is pressed, the heating relay reacts if the water level is above 64 scale units. (Safety level).
21	Drain valve/pump
23	Activate door lock. When it is deactivated, the water drain valve will also open.
24	Level check. The parameter corresponding to the actual level will be shown on the display, not code 24. When ”START” is pressed, filling with cold water commences via detergent compartment 1.
25	Motor, wash speed low (30 rpm), counterclockwise.
26	Motor, wash speed low (30 rpm), clockwise.
27	Motor, wash speed high (48 rpm), counterclockwise.
28	Motor, wash speed high (48 rpm), clockwise.
29	Distribution speed (90 rpm), clockwise.
31	Extraction, low (550 rpm), clockwise.
32	Extraction, medium (700 rpm), clockwise.
33	Extraction, high (1000 rpm), clockwise.
34	Extraction, high (1000 rpm), clockwise.
35	Display, test of segments, LED test, and buzzer.
36	Buzzer

Error Code	Cause
37	LED test
41-42	Coin mechanism (see Page 39, Program control unit).
43-44	Counter (hours) for accumulated operating time (see Page 39, Program control unit).
45	Last error code flagged.
51-54	Program EPROM part number (see Page 39, Program control unit).
91	Coin value, coin slot 1. This is set using the price-programming switch (see Page 39, Program control unit).
92	Coin value, coin slot 2. This is set using the price-programming switch (see Page 39, Program control unit).
93	Availability of pause function in coin-operated machines. Can be 1 = Yes or 0 = No. This is set using the priceprogramming switch (see Page 39, Program control unit).
94	Availability of rapid advance function in coin-operated machines. Can be 1 = Yes or 0 = No. This is set using the price-programming switch (see Page 39, Program control unit).
95	Activate coin-op input. Can be 1 = Active or 0 = Off. This is set using the price-programming switch (see Page 39, Program control unit).
96	CALCAD communication enable flag. Set 96 = 0 using price programming switch to disable error code 19E. This flag automatically sets to "1" when a serial communication device is connected to the timer.
97	To program a price reduction on a coin-operated machine, use the price-programming button. You set a price reduction as a percentage between 0 and 99. Rounding-up will take place to the next coin value upwards. A price reduction of 99% means a free wash program.

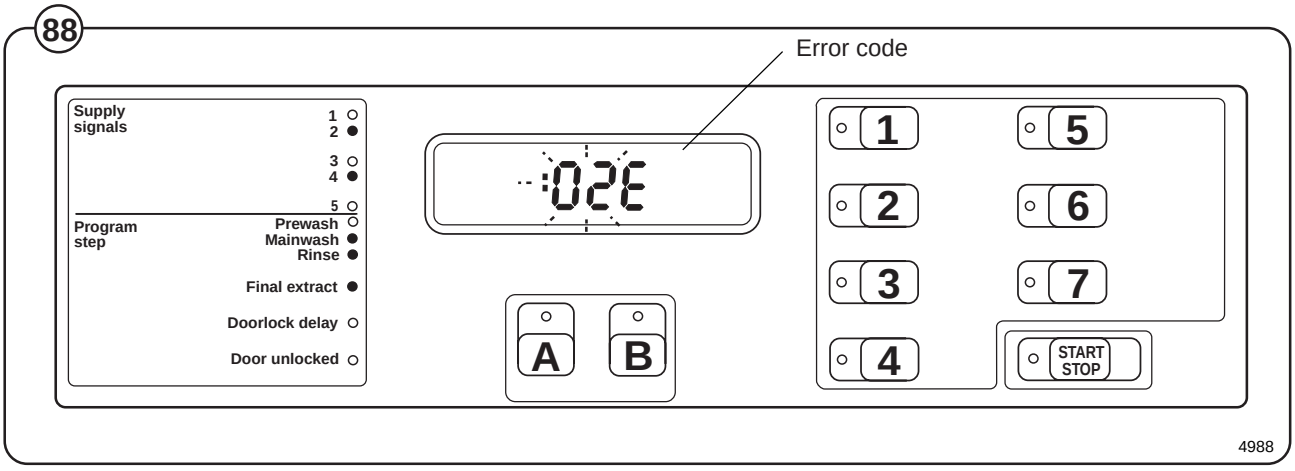
Trouble shooting

If the power supply to the machine should be cut while it is operating, the program unit has a memory which stores the program selected for about 3 to 5 minutes.

Within this period the machine will restart automatically once the power supply is restored.

Indication of faults/errors

Fig. 88 Faults/errors in the program or machine are indicated by a numerical error code followed by the letter E flashing on and off on the control panel display.



In the case of error codes 01E, 02E, 03E and 14E, an attempt to restart the machine may be made as soon as the fault/error has been remedied, without the power supply being switched off. For the other error codes, a service engineer must be called.

WARNING

<u>When working on the motor control unit</u>

The voltage at test points 1 - 4 (TP1 - 4) has a potential difference of up to 300 V in relation to incoming neutral and ground. Because of this, be careful when measuring. Use ungrounded oscilloscopes.

The motor functions as a generator when decelerating. If the motor has not stopped, high voltages may be present on the motor control circuit board even though the power supply to the machine has been disconnected.

Error codes

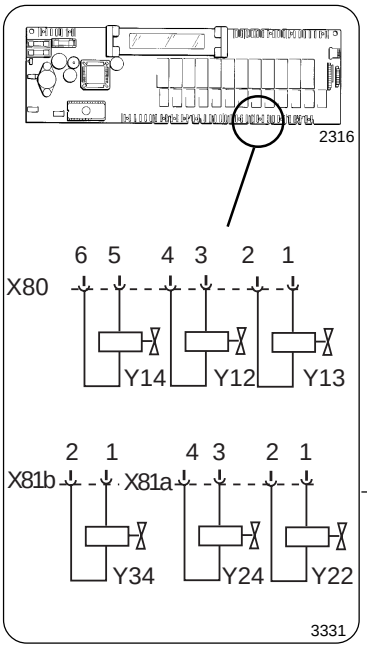
Given below is a brief summary of all the error codes and their causes. Starting on page 5 of this section there are fault-finding charts for all error codes.

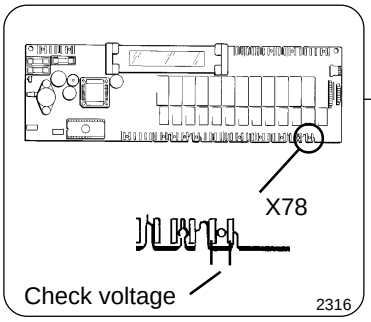
At the end of the chapter there are also charts for faults which do not generate error codes.

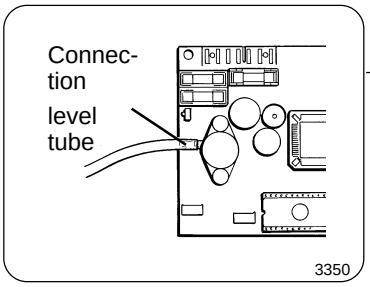
Error code	Cause
01E	Water level not reached within set time. Take necessary action. Press START again.
02E	Door status switch open during program operation. Take necessary action. Press START again.
03E	The lock has not locked the door within the set time. Take necessary action. Press START again.
04E	The temperature sensor indicates temperature below -5°C (open circuit).
05E	The temperature sensor indicates temperature above 98°C (short-circuit).
06E	The water level is above the safety level set for starting.
07E	The water level is above the safety level set for program operation.
08E	Temperature increase in water less than 5°C/10 min. (Heated machines).
10E	The water level is above the safety level set for after drain.
12E	The program control unit cannot read the program EPROM.
13E	Program control unit receiving no response from the motor control unit.
14E	Level system not temperature-calibrated. Press START to run the wash program. Program will run, but the water level will not be optimally adjusted.
17E	Door status switch open, even though the door lock is locked.
19E	Serial communication mode activated but contact with master has been lost.
35E	Short circuit in motor windings, motor harness or problem in motor control unit.
43E	Unbalance switch on when motor not rotating.
45E	Tacho error

Error codes which may arise on the control panel display

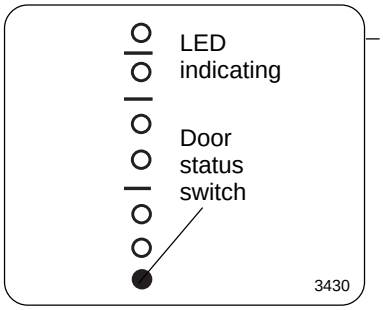
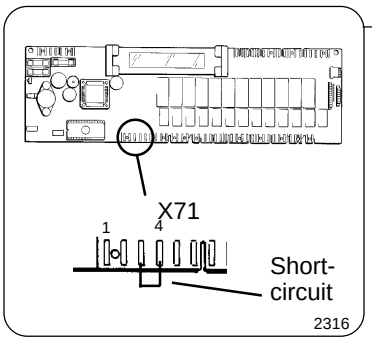
Error code/symptoms	Fault-finding	Cause/Action
01E Acknowledgement signal for water level not received within time allowed.	Check that the manual water valves (taps) are open.	
	Taps turned on. / Taps turned off.	Open taps. Press START again.
	Restart the program and use rapid advance to get to main wash. Check that the machine is filling with water.	
	Machine filling / Machine not filling	
	Check input voltage on relevant water valve (See Program Tables, Chapter 4).	
	Voltage not correct / Voltage correct	Faulty valve. Check function as described in Chapter 34.
	Check water valve input voltage at PCB connector X80, X81a or X81b, according to valve.	
	Voltage not correct / Voltage correct	Faulty wiring between program control unit PCB and water valve. Check wiring and replace where necessary.
	Check input voltage (230 V) at PCB connector X78.	
	Voltage not correct / Voltage correct	Faulty control output from program control unit PCB. Replace PCB.
		Faulty wiring program control unit PCB - transformer T10, or faulty/incorrect strapping on transformer T10.
	Check that the discharge valve is closed, i.e. water level rising in drum.	
	Discharge valve closed / Discharge valve open	Follow fault-finding procedure for error code 06E in this chapter.
	Check that level tube is sound, not kinked, not come loose from mother board.	
	Level tube OK / Level tube not OK	Fit tube properly or replace it.
		Level detection function on program control unit PCB faulty. Replace PCB.





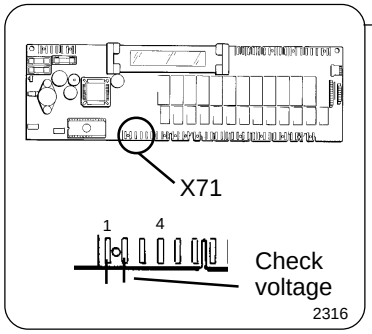


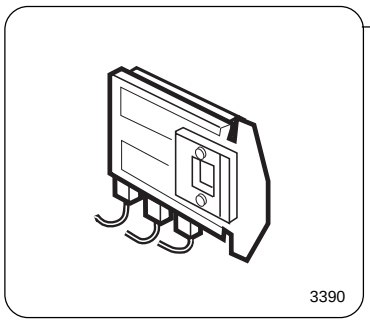
Error codes which may arise on the control panel display

Error code/symptoms	Fault-finding	Cause/Action
02E Door status switch open during program operation.	Open door. Close door and try to restart the machine.	
	Error code returns	No error code → Transient fault in door lock or program PCB.
	Set program control unit to service mode (see ”To switch on service mode”). The door status switch will now be indicated by the LED (illustrated). Press in the door status switch manually and check if this is indicated by the LED.	
	LED does not light.	LED lights. → Check whether the pin on the door or the plastic slide which the pin presses against are worn. Replace any worn parts.
	Disconnect the two wires from the switch. Short-circuit the two wires.	
	LED does not light.	LED lights. → Door lock switch faulty. Replace switch.
	Remove connector X71 from the program control unit PCB. Short-circuit between inputs 3 and 4.	
	LED does not light.	LED lights. → Continuity fault in wiring or connectors. Check wiring and replace if necessary.
		Fault in program control unit PCB. Replace PCB.

Error codes which may arise on the control panel display

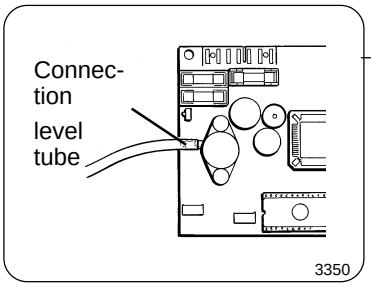
Error code/symptoms	Fault-finding	Cause/Action
03E The lock has not locked the door within the set time.	Open door. Close door and try to restart the machine.	
	Error code returns → Start service program and activate door lock (code 23, press START). Check input voltage to door lock, PCB connector X71 between terminals 1 and 2.	No error code → Transient fault in door lock or program PCB.
	Voltage correct. → Unscrew the door lock. Door and door lock). Check voltage at door lock between terminals X71:1 and 2 as illustrated.	Voltage absent or wrong. → Faulty control output from program control unit PCB. Replace PCB.
	Voltage correct. → Faulty door lock. Replace door lock.	Voltage absent or wrong. → Faulty wiring between program control unit PCB and door lock. Check wiring and change if necessary.





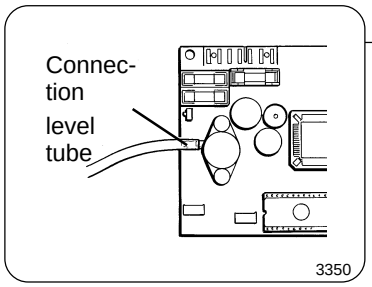
Error codes which may arise on the control panel display

Error code/symptoms	Fault-finding	Cause/Action
06E Water level signal above parameter set, on program start-up.	Are there water in the drum? Yes → No → Disconnect the level tube from the program PCB. Turn the machine's wall switch off and on again. Start a program. Error code 06E → No error code or error code 01E →	Level tube probably blocked, due to fluff of wrongly mounted. Clean or replace tube. Nipple blocked on drain valve. Level sensing device on program control unit PCB not working or incorrectly calibrated. Check zero level in the service program see chapter 12 page 4, code 24, zero level shall be between 0 and 4.
	Turn the machine's wall switch off. Does water run out of the drum? Yes → No →	Check the discharge valve (see Chapter 38). The service program can be used (code 21) to open and close the control valve for the discharge valve.
	Turn on wall switch. Start a program and let it run. Still an error code. → No error code. →	Transient fault. No action required.
	Check to see if the discharge valve is partially blocked or not opening fully. Discharge valve OK → Discharge valve not OK →	Check to see if the discharge valve is partially blocked or not opening fully (see Chapter 38). Faulty control signal to discharge valve from program control unit PCB. Replace PCB.



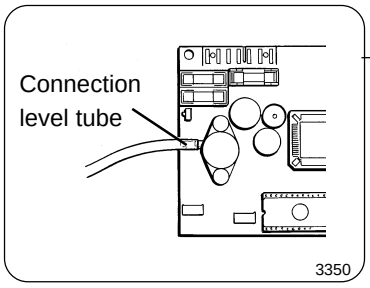
Error codes which may arise on the control panel display

Error code/symptoms	Fault-finding	Cause/Action
07E Water level signal above parameter set for safety, during program.	Turn the machine's wall switch off and on. Start a program. Error code 06 → Is there a valve still drawing water? No error code →	Transient fault or water has been added manually.
	Is there a valve still drawing water? Yes →	
	No → Turn the wall switch off and on. Disconnect level tube from level sensing device on PCB. Start a program. Error 07 or 06 returns →	Level tube probably blocked, due to fluff or wrongly mounted. Clean or replace tube. Nipple blocked on drain valve.
	No error code →	Level sensing device on program control unit PCB not working or incorrectly calibrated. Check zero level in the service program, see chapter 12 page 4, code 24, zero level shall be between 0 and 4.
	Remove connector for valve input voltage. Valve stops drawing water. →	Faulty water valve. Clean or replace valve (see Chap. 34).
	Valve still drawing water. →	Fault in control signal from program PCB. Replace PCB.

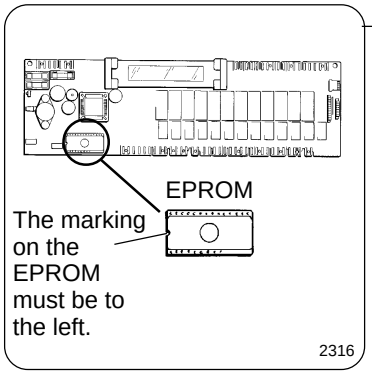


Error codes which may arise on the control panel display

Error code/symptoms	Fault-finding	Cause/Action
10E The water level is above the safety level set for after drain.	Is water visible in the drum? Yes: Remove the water drain valve from the drum. Is there water at the bottom of the drum? Yes: Disconnect the level tube from the program PCB. Turn the machine's wall switch off and on again. Start a program. Error code 06E or error code 10E: Level sensing device on program control unit PCB not working or incorrectly calibrated. No error code or error code 01E: Level tube probably blocked. Clean or replace tube. No: Turn the machine's wall switch off. Does water run out of the drum? Yes: Turn on wall switch. Start a program and let it run. Still an error code: Check to see if the drain valve is partially blocked or not opening fully. Drain valve OK: Faulty control signal to drain valve from program control unit PCB. Replace PCB. Drain valve not OK: Check to see if the drain valve is partially blocked or not opening fully. No error code: Transient fault. No action required. No: Check the drain valve. The service program can be used (code 21) to open and close the control valve for the drain valve.	



Error codes which may arise on the control panel display

Error code/symptoms	Fault-finding	Cause/Action
12E The program control unit cannot read the program EPROM.  	Turn the machine's wall switch off and on again. Start a program. Error code returns — No error code →	Transient fault. No action required.
	Unscrew the program control unit PCB. Remove the EPROM, then refit the same one. Check that the EPROM is turned the right way and that all its leg connectors enter the holder correctly. Restart the machine. Error code 12E returns — Machine normal →	Temporary loss of contact or EPROM fitted incorrectly.
	Replace the EPROM. Check that the new one has the correct program version. Restart machine. Error code 12E returns — Machine normal →	Old EPROM was faulty.
		Faulty program control unit PCB. Replace PCB. The old EPROM can probably be reused.

Error codes which may arise on the control panel display

Error code/symptoms	Fault-finding	Cause/Action
14E Level system not temperature-calibrated	When START is pressed wash programs will run, but the water level will not be optimally adjusted. Turn the machine's wall switch off and on again. Start a program. Error code returns No error code →	Transient fault. No action required. Replace program control unit PCB.

Error codes which may arise on the control panel display

Error code/symptoms	Fault-finding	Cause/Action

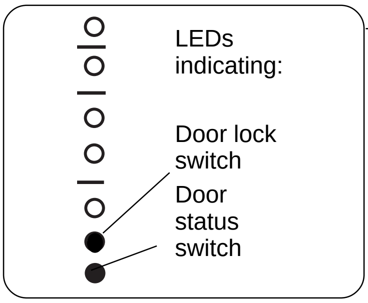
17E

Door status switch open, even though the door lock is locked.

Turn the machine's wall switch off and on again. Start a program.

Error code returns → (continue below)

No error code → Transient fault. No action required.

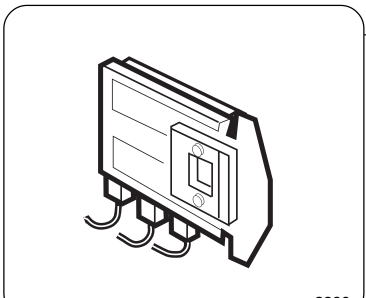


Set program control unit to service mode. The door status switch and door lock switch will now be indicated by the LEDs shown left. Follow this procedure (the door can be locked using code 23 and one press of the START button):

Door switch	Status of LEDs should be for door lock switch:	for door status
open	OFF	OFF
closed, not locked	OFF	ON
closed and locked	ON	ON

Door lock switch LED ON when door not locked → (continue below)

Door status switch LED OFF when door closed → Follow the chart for error code 02E to identify fault.

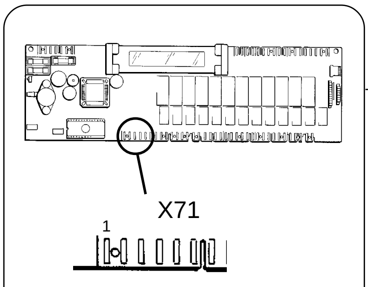


3390

Unscrew the door lock. Remove connection to door lock switch "C" on door lock as illustrated.

LED ON → (continue below)

LED goes out → Door lock faulty. Replace lock.



2316

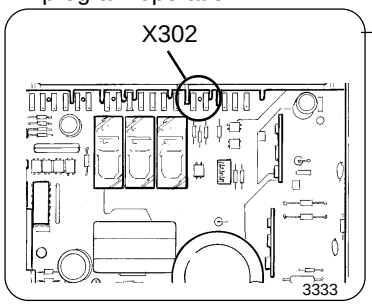
Remove PCB connector X71 from program control unit PCB.

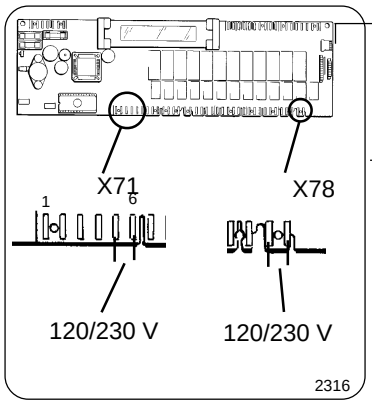
LED ON → Fault in program control unit PCB. Replace PCB.

LED goes out → Fault in wiring between PCB and door lock. Check wiring and replace if necessary.

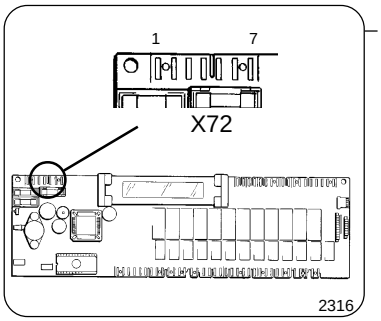
Error codes which may arise on the control panel display

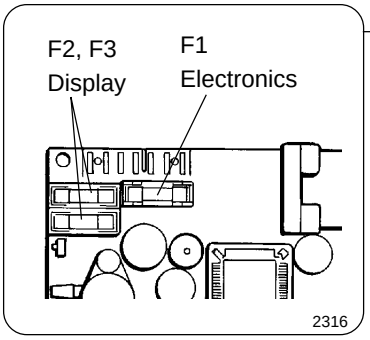
Error code/symptoms	Fault-finding	Cause/Action
20E Interlock signal absent at motor control unit during program operation.	Turn the machine's wall switch off and on again. Start a program.	
	Error code returns	No error code → Transient fault. No action required.
	Check the voltage between terminals 1 and 2 at PCB connector X302 on motor control unit. The voltage should be 120/230 V when the door is closed and locked.	
	Voltage wrong	Voltage correct → Faulty signal detection on motor control unit. Replace motor control unit.
	Check the voltage between terminals 5 and 6 on PCB connector X71 on program control unit PCB. The voltage should be 120/230 V when the door is closed and locked.	
	Voltage wrong	Voltage correct → Fault in wiring between program control unit PCB and motor control unit. Check wiring and replace if necessary.
	Check the input voltage to PCB connector X78 (120/230 V)	
	Wrong voltage	Voltage correct → Faulty output signal on program control unit PCB. Replace PCB.
		Faulty wiring between transformer T10 and program control unit PCB. Check wiring and replace if necessary.

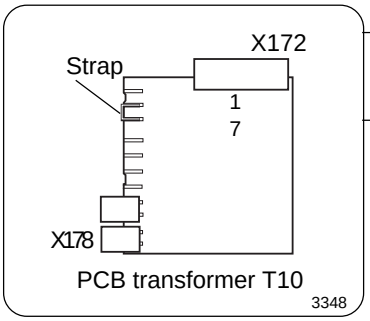




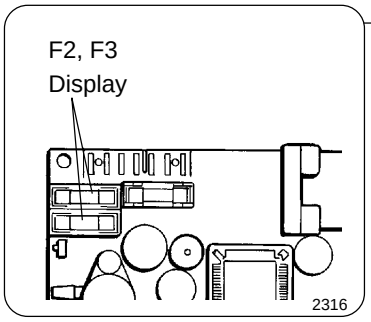
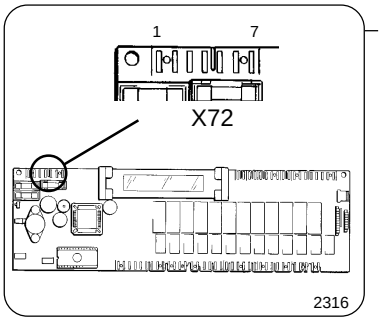
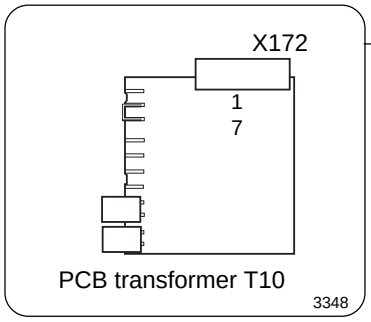
Error code/symptoms	Fault-finding	Cause/Action
Machine completely ”dead”. Display blank.	Turn the machine’s wall switch off and on again.	
	Fault persists.	Machine working → Transient fault. No action required.
	Check fuses F11, F12, F21 and F22.	
	Fuses sound	Fuse fault → Change fuse(s) and check functioning.
	Check that the input voltages to the PCB are correct. Measure on PCB connector X72 between the following inputs:	
	X72:1 - 2 ca 1,75 V ~ X72:2 - 3 ca 1,75 V ~ X72:4 - 5 ca 14,5 V ~ X72:6 - 7 ca 13,5 V ~	
	An incorrect voltage	Voltages correct
		Check the three glass-tube fuses on the PCB. Rating: 1 A/250 V.
		OK → Fuse fault → Change fuse(s) and check functioning.
		OK → Replace program control unit PCB.
	Remove connector X172 on transformer T10. Measure the voltages between the following outputs on the transformer board.	
	5 - 6 ca 1,75 V ~ 6 - 7 ca 1,75 V ~ 3 - 4 ca 14,5 V ~ 1 - 2 ca 13,5 V ~	
	Voltages correct	An incorrect voltage
		On T10 check the input voltage at connector X178 (120/230 V) and that the strap is correctly located and in contact with the circuit board.
		OK → A fault → Voltage fault: investigate cause in power supply beyond machine.
		OK → Replace transformer T10.
		Fault in wiring between transformer and circuit board. Check wiring and replace if necessary.







Trouble shooting

Error code/symptoms	Fault-finding	Cause/Action
Display blank, but machine is working otherwise.	Turn the machine's wall switch off and on again.	
	Fault persists.	Machine working → Transient fault. No action required.
	Check glass-tube fuses F2 and F3 on program control unit PCB. Rating: 1 A/250 V.	
	Fuses sound	Fuse fault → Change fuse(s) and check functioning.
	Check that input voltages to PCB are correct. At connector X72, measure between the following inputs: X72:1 - 2 ca 1,75 V ~ X72:2 - 3 ca 1,75 V ~ X72:6 - 7 ca 13,5 V ~	
	An incorrect voltage	Voltages correct → Program control unit PCB faulty. Replace PCB.
	Remove connector X172 on transformer T10. Measure the voltages between the following outputs on the transformer board. 5 - 6 ca 1,75 V ~ 6 - 7 ca 1,75 V ~ 1 - 2 ca 13,5 V ~	
	Voltages correct	An incorrect voltage → Replace transformer T10.
		Fault in wiring between transformer and circuit board. Check wiring and replace if necessary.

Maintenance

Preventive maintenance has been reduced to a minimum by the careful design of reliable components and material.

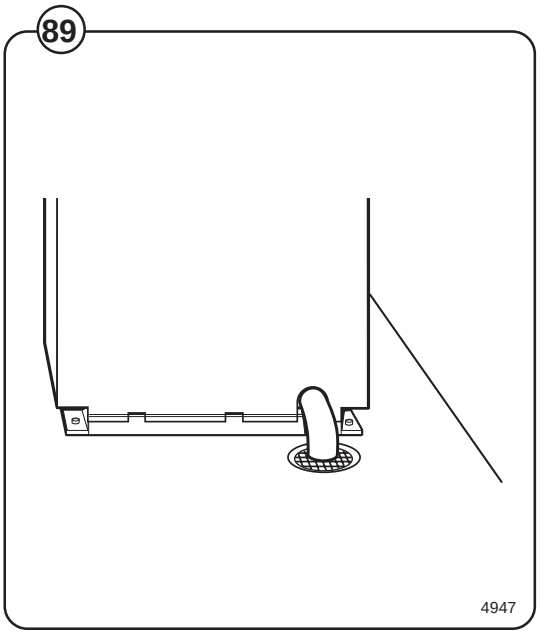
However, the following measures should be taken at regular intervals and in proportion to the hours of service.

Make certain that all electrical power to the machine is shut off before removing top or rear panels.

Daily

- Check the door lock and interlock before starting operations.
- The soap supply box should be cleaned at the end of each working day as follows:
  - Use a spatula to scrape loose any detergent which may have stuck on the inside of the dispenser.
  - Flush the loosened detergent with warm water.
  - Wipe dry and leave lid open.
- Check that the drain valve does not leak and that it opens properly.
- Check that the door does not leak. Clean residual detergent and foreign matter from the door gasket.
- Wipe the outside of the machine.
- When the machine is not in use, leave door slightly open to allow moisture to evaporate.

Fig. 89



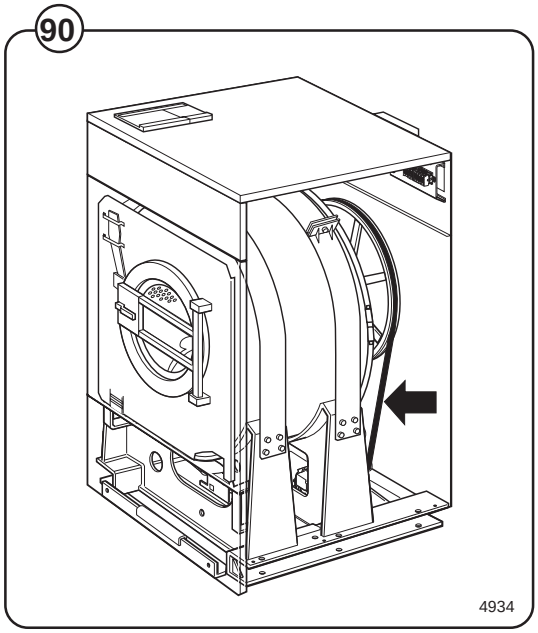
Weekly

- Remove hose from drain connection and clean inside drain valve.

Every three months

Fig. (90)

- Remove the cover plates of the machine and check that the V-belt of the motor is undamaged and correctly tensioned.
- Check that all tubing, piping and connections are free from leaks.
- Wipe and clean the inside of the machine, making sure that the control components are protected from moisture and dirt during the cleaning operation.



The purpose of the trouble-shooting guide is to facilitate the location an correction of the most common machine problems.

Before the top panel is removed, power to the machine is to be switched off at the main source or at the separate circuit breaker.

At each trouble-shooting attempt, the plug in connectors on the control panel should be moved in and out in order to eliminate improper contact due to faulty connection.

Please note that this guide does not include all possibilities, but only those most likely to cause the symptoms listed.

In trouble-shooting electrical problems, always make certain to have the proper electrical schematic or wiring diagram at hand. Test for power using a V-O-M or similar meter on the AC voltage scale. Test for continuity with all electrical power off.

If machine does not start

Fig. 91

A Check circuit breaker in the power feed line to the machine.

B Check door safety switches.

C Check glass cartridge fuse.

D Check for fault indication on display.

If water does not drain

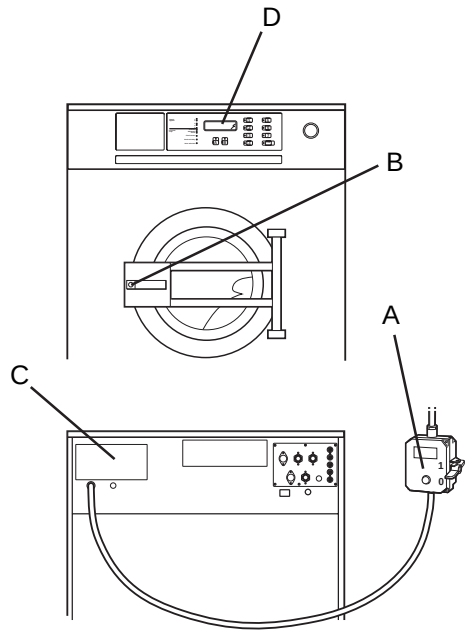
Fig. 92

A Check for fault indication on display.

B Check drain valve and solenoid for proper operation.

C Disconnect drain hose connected to drain line. If full flow of water comes out, the problem is in the main waste line. If water flow is slow, the problem is accumulation of foreign materials between drain valve and shell outlet of machine. Clean valve body of any foreign objects found.

91



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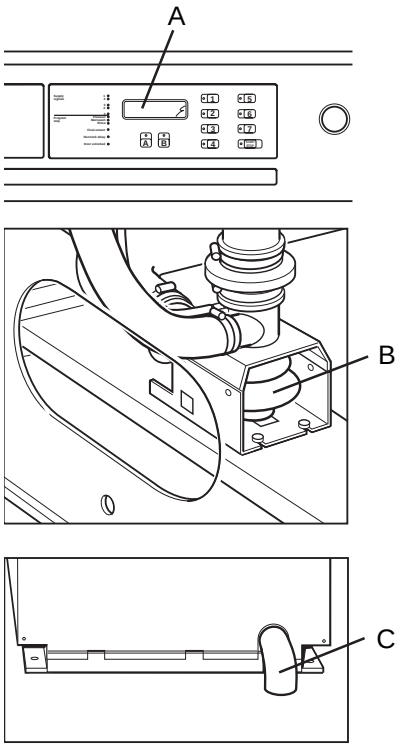
92



4938 A

If machine does not extract

Fig. 93

A Check for fault indication on display (see under the heading "Fault finding").

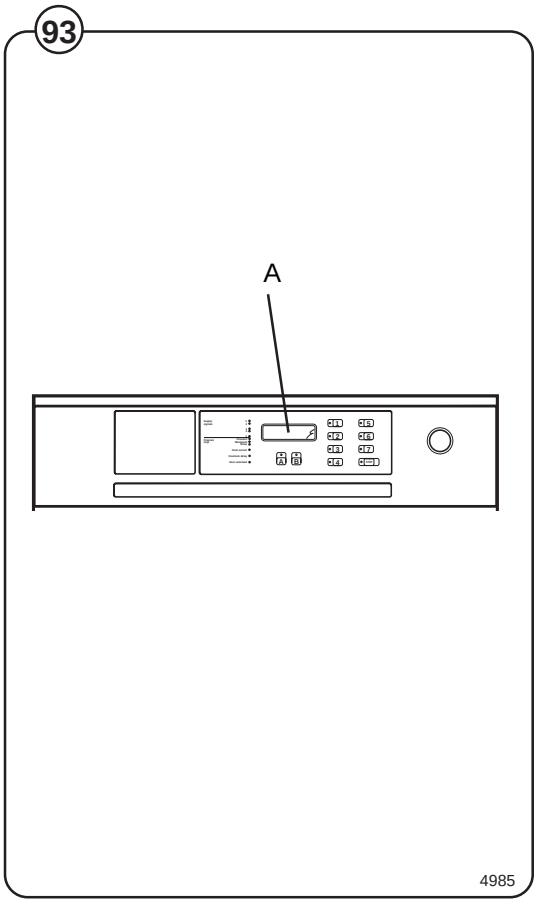
If motor does not operate at wash speed.

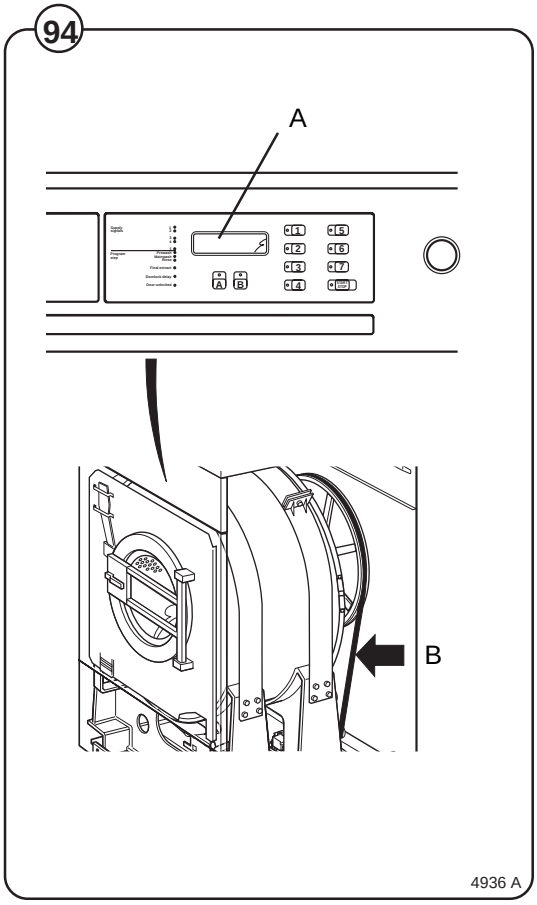
Fig. 94

A Check for fault indication on display (see under the heading "Fault finding").

B Check motor and V-belts.

C Review procedures outlined under section "If machine does not start" above.





If machine runs slowly on wash speed or there is a slapping or thumping noise:

Fig. (95) Replace V-belts.

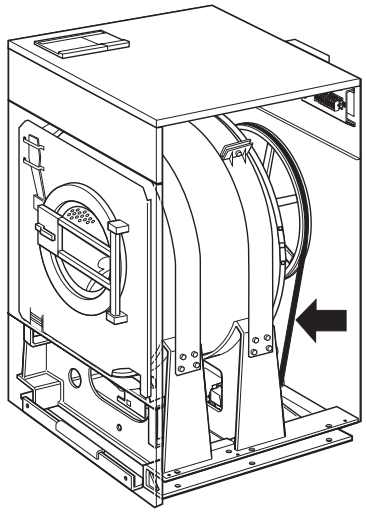
If a metallic noise can be heard at rear of machine:

Fig. (96) Tighten pulley on motor shaft.

If the door is leaking:

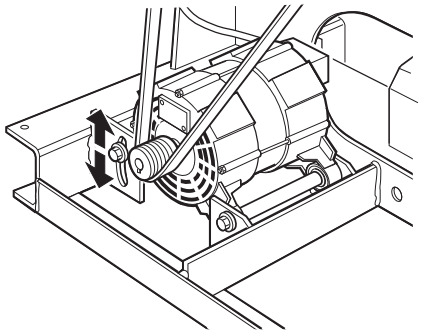
Fig. (97) Check door gasket. If gasket is in good condition check the tension, between door gasket and door frame and adjust.

95



4934

96



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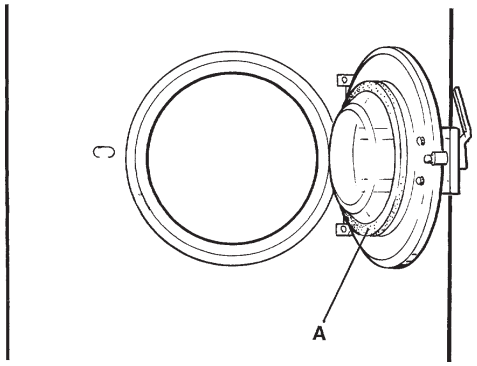
97



1777

If there is leaking around the glass.

Fig. 98

A Re-cement glass in door gasket, if worn.

B Replace door gasket if worn.

If water does not enter the machine.

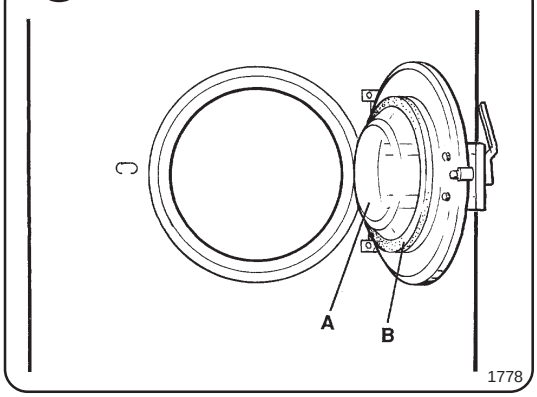
Fig. 99

A Check the valve coils on inlet valves.

B Check wires leading to electric coils.

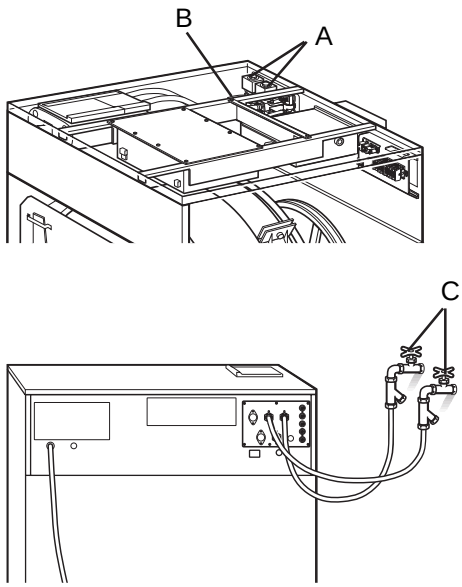
C Be sure manual shut-off valves are in open position.

98



1778

99



4931

If water continues to fill without stopping.

A Check for incorrect programming.

B Check hose attached to level control unit on the printed circuit board.

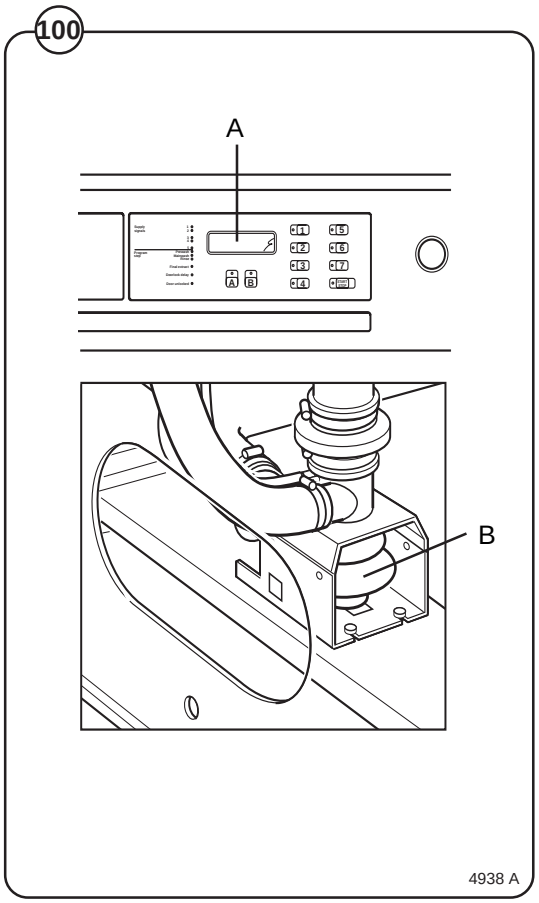
C Check inlet valves for dirt underneath the valve diaphragm. To localize, shut off power. If water continues to flow, inlet valves have foreign material in them and should be thoroughly cleaned.

If water continues to flow without filling machine.

Fig. 100

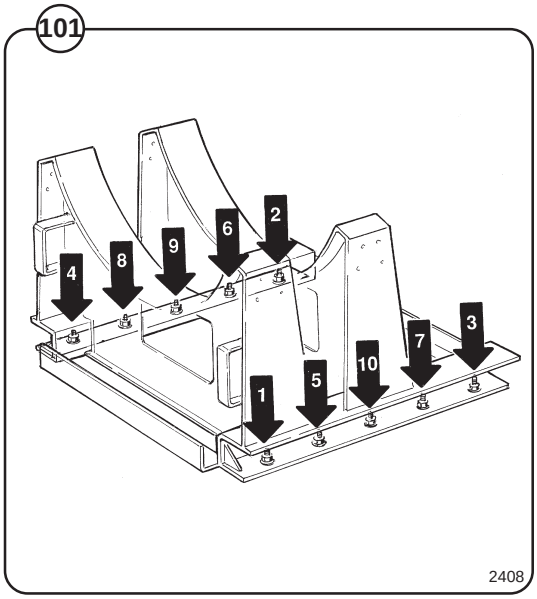
A Check for fault indication on display (see under the heading "Fault finding").

B Check seating of drain valve.



If machine vibrates excessively:

Fig. 101 A Tighten mounting bolts.



Intentionally blank

To keep your machine in proper working order, follow the preventive maintenance recommendations provided below.

The maintenance interval should be adjusted according to machine usage. The suggested schedule assumes an 8 hour work day, and a 5 day work week..

Daily

- Check the door and door lock:
  - Open the door and try starting the machine. The machine MUST NOT START.
  - Close the door, start the machine and try opening the door. It MUST NOT BE POSSIBLE TO OPEN THE DOOR WHILE THE MACHINE IS OPERATING!
  - Check that the door does not leak.
  - Clean the door seal, removing any detergent and fluff.
- Check that the drain valve does not leak during the wash cycle.
- Clean out any detergent remaining in the detergent compartment. Rapid advance through a program and let the water rinse the compartment.
- Inspect liquid chemical tubing and connections for leaks. Repair as necessary.

Every third month (refer this service to qualified personnel)


May only be carried out by authorized personnel.

- Check that the door does not leak.
- Check the drain valve and remove any lint.
- Inspect the interior of the machine (during an actual wash cycle to ensure that no leaks are noticed) by:
  - Turning of the main power switch of the machine.
  - Remove the top cover and the protective front and rear plates.
  - Cover the detergent dispenser to prevent water from splashing inside the machine.
  - Start a wash program.
  - KEEP CLEAR OF MOVING PARTS WHILE MACHINE IS OPERATING!!

- Inspect all internal hoses, seals and gaskets for signs of leakage. Repair as necessary.
- Check that water inlet screens are clean of debris. Dirty screens result in longer fill times, which reduce productivity.
- Inspect the drive belt. Adjust the tension or replace if necessary (see section 30. Motor).
- Check that there are no signs of leakage on the floor beneath the machine. Locate and repair any leak.
- On heated machines, if the heating time is unusually long, check the heating elements (see section 40. Heating). If the water is very hard, check whether there are lime deposits on the heating elements. Decalcify the elements if necessary. Adapt the amount of deliming agent to the manufacturer's guidelines.
- Never switch on the heating elements when there is no water in the machine. This will cause the slow-blow fuse to trigger.
- Inspect the shock absorbers and coil springs. (Only EX- and H-model).

WASCOMAT "S" MODEL*

HOSPITALITY WASH PROGRAMS

(For Hotels/Motels, Restaurants, Retirement Communities, Schools and Universities, Commercial and Institutional Laundries)

1 White Uniforms Sheets & Pillow-cases (Light Soil)	**1A** White Towels (Medium Soil Short Program)	**1B** White Table Linen (Bleach, No Starch)	**1AB** White Table Linen (Bleach and Starch)
2 White Uniforms Sheets & Pillow cases (Light/ Medium Soil)	**2A** Colored Towels	**2B** Colored Table Linen (Bleach, No Starch)	**2AB** Colored Table Linen (Bleach and Starch)
3 White Uniforms, Sheets, Pillow-cases (Medium Soil)	**3A** White Towels (Heavy Soil)	**3B** White or Colored Table Linen (No Bleach, No Starch)	**3AB** White or Colored Table Linen (Starch, No Bleach)
4 Colored Uni-forms, Sheets, Pillowcases (Light Soil)	**4A** Bedspreads/ Delicates (Cold Water)	**4B** White 100% Polyester (VISA) Table Linen	**4AB** Bedspreads/ Delicates (Warm Water)
5 Color Uniforms, Sheets, Pillow-cases (Medium Soil)	**5A** Kitchen & Housekeeping Rags	**5B** Colored 100% Polyester (VISA) Table Linen	**5AB** Light Soil General Wash Formula
6 White Towels (Light Soil)	**6A** Mops	**6B** Chef Coats	**6AB** Extra Rinsing With Extract
7 White Towels (Medium Soil)	**7A** Stain Treat-ment (Short Formula)	**7B** Stain Treat-ment (Long Formula)	**7AB** Test Program

Supply Code: 1 = Detergent, 2 = Chlorine Bleach, 3 = Sour, 4 = Softener, 5 = Starch/Sizing

(*EX30S, EX50S, EXSM230S, EXSM350S, W245S)

(GB:lp/opl117) 1/2000

FORMULA 1

WHITE UNIFORMS, SHEETS, AND PILLOWCASES

(LIGHT SOIL)

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
SUDS/BLEACH	7	HOT	LOW	SUPPLY 1 & 2
DRAIN	1			
RINSE 1	2	HOT	HIGH	NONE
DRAIN	1			
RINSE 2	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
SOUR/SOFT	4	SPLIT	LOW	SUPPLY 3 & 4
DRAIN	40 sec.			
EXTRACT	2			
SHAKEOUT				

FORMULA 2

WHITE UNIFORMS, SHEETS, AND PILLOWCASES

(LIGHT/MEDIUM SOIL)

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
SUDS	7	HOT	LOW	SUPPLY 1
DRAIN	1			
BLEACH	7	HOT	LOW	SUPPLY 2
DRAIN	1			
RINSE 1	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	½			
RINSE 2	2	SPLIT	HIGH	NONE
DRAIN	1			
SOUR/SOFT 3	4	SPLIT	LOW	SUPPLY 3 & 4
DRAIN	40 sec.			
EXTRACT	2			
SHAKEOUT				

FORMULA 3

WHITE UNIFORMS, SHEETS, AND PILLOWCASES

(MEDIUM SOIL)

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
FLUSH	2	SPLIT	HIGH	NONE
DRAIN	1			
SUDS	7	HOT	LOW	SUPPLY 1
DRAIN	1			
BLEACH	7	HOT	LOW	SUPPLY 2
DRAIN	1			
RINSE 1	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	½			
RINSE 2	2	SPLIT	HIGH	NONE
DRAIN	1			
SOUR/SOFT 3	4	COLD	LOW	SUPPLY 3 & 4
DRAIN	40 sec.			
EXTRACT	2			
SHAKEOUT				

FORMULA 4

COLORED UNIFORMS, SHEETS, AND PILLOWCASES

(LIGHT SOIL)

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
SUDS	7	HOT	LOW	SUPPLY 1
DRAIN	1			
RINSE 1	2	SPLIT	HIGH	NONE
DRAIN	1			
RINSE 2	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	½			
RINSE 3	2	SPLIT	HIGH	NONE
DRAIN	1			
SOUR/SOFT	4	SPLIT	LOW	SUPPLY 3 & 4
DRAIN	40 sec.			
EXTRACT	2			
SHAKEOUT				

FORMULA 5

COLORED UNIFORMS, SHEETS, AND PILLOWCASES

(MEDIUM SOIL)

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
FLUSH	2	SPLIT	HIGH	NONE
DRAIN	1			
SUDS	7	HOT	LOW	SUPPLY 1
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	½			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
SOUR/SOFT	4	SPLIT	LOW	SUPPLY 3 & 4
DRAIN	40 sec.			
EXTRACT	2			
SHAKEOUT				

FORMULA 6

WHITE TOWELS

(LIGHT SOIL)

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
SUDS/BLEACH	7	HOT	LOW	SUPPLY 1 & 2
(NO DRAIN)				
CHEATER/RINSE	1	HOT	HIGH	NONE
DRAIN	1			
RINSE 2	2	HOT	HIGH	NONE
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	1			
SOUR/SOFT	4	SPLIT	LOW	SUPPLY 3 & 4
DRAIN	40 sec.			
EXTRACT	3			
SHAKEOUT				

FORMULA 7

WHITE TOWELS

(MEDIUM SOIL)

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
FLUSH	2	SPLIT	HIGH	NONE
DRAIN	1			
SUDS	7	HOT	LOW	SUPPLY 1
DRAIN	1			
BLEACH	7	HOT	LOW	SUPPLY 2
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	½			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
SOUR/SOFT	4	SPLIT	LOW	SUPPLY 3 & 4
DRAIN	40 sec.			
EXTRACT	3			
SHAKEOUT				

FORMULA 1A

WHITE TOWELS

(MEDIUM SOIL, SHORT PROGRAM)

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
SUDS	7	HOT	LOW	SUPPLY 1
DRAIN	1			
BLEACH	7	HOT	LOW	SUPPLY 2
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
SOUR/SOFT	4	COLD	LOW	SUPPLY 3 & 4
DRAIN	40 sec.			
EXTRACT	3			
SHAKEOUT				

FORMULA 2A

COLORED TOWELS

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
SUDS	7	HOT	LOW	SUPPLY 1
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	1			
SOUR/SOFT	4	COLD	LOW	SUPPLY 3 & 4
DRAIN	40 sec.			
EXTRACT	3			
SHAKEOUT				

FORMULA 3A

WHITE TOWELS

(HEAVY SOIL)

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
FLUSH	2	SPLIT	HIGH	NONE
DRAIN	1			
SUDS	8	HOT	LOW	SUPPLY 1
DRAIN	1			
RINSE	2	HOT	HIGH	NONE
DRAIN	1			
BLEACH	7	HOT	LOW	SUPPLY 2
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	½			
RINSE	2	COLD	HIGH	NONE
DRAIN	1			
SOUR/SOFT	4	COLD	LOW	SUPPLY 3 & 4
DRAIN	40 sec.			
EXTRACT	3			
SHAKEOUT				

FORMULA 4A

BEDSPREADS/DELICATES

(COLD WATER / GENTLE ACTION)

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
SUDS	5	COLD	HIGH	SUPPLY 1
DRAIN	1			
RINSE	2	COLD	HIGH	NONE
DRAIN	1			
RINSE	2	COLD	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	1			
SOUR/SOFT	4	COLD	LOW	SUPPLY 3 & 4
DRAIN	40 sec.			
EXTRACT	2			
SHAKEOUT				

FORMULA 5A

KITCHEN AND HOUSEKEEPING RAGS

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
FLUSH	2	SPLIT	HIGH	NONE
DRAIN	1			
FLUSH	2	SPLIT	HIGH	NONE
DRAIN	1			
SUDS	7	HOT	LOW	SUPPLY 1
DRAIN	1			
BLEACH	7	HOT	LOW	SUPPLY 2
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	2			
SHAKEOUT				

FORMULA 6A

MOPS

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
FLUSH	2	SPLIT	HIGH	NONE
DRAIN	1			
FLUSH	2	SPLIT	HIGH	NONE
DRAIN	1			
FLUSH	2	SPLIT	HIGH	NONE
DRAIN	1			
SUDS	8	HOT	LOW	SUPPLY 1
DRAIN	1			
RINSE	2	HOT	HIGH	NONE
DRAIN	1			
BLEACH	7	HOT	LOW	SUPPLY 2
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT`	3			
SHAKEOUT				

FORMULA 7A

STAIN TREATMENT (SHORT FORMULA)

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
SUDS/BLEACH	7	HOT	LOW	SUPPLY 1 & 2
DRAIN	1			
SUDS/BLEACH	8	HOT	LOW	SUPPLY 1 & 2
DRAIN	1			
RINSE	2	HOT	HIGH	NONE
DRAIN	1			
RINSE	2	HOT	HIGH	NONE
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	½			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	3			
SHAKEOUT				

FORMULA 1B

WHITE TABLE LINEN

(BLEACH, NO STARCH)

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
FLUSH	2	SPLIT	HIGH	NONE
DRAIN	1			
SUDS	9	HOT	LOW	SUPPLY 1
DRAIN	1			
RINSE	2	HOT	HIGH	NONE
DRAIN	1			
BLEACH	7	HOT	LOW	SUPPLY 2
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	½			
SOUR	4	COLD	LOW	SUPPLY 3
DRAIN	40 sec.			
EXTRACT	3			
SHAKEOUT				

FORMULA 2B

COLORED TABLE LINEN

(BLEACH, NO STARCH)

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
FLUSH	2	SPLIT	HIGH	NONE
DRAIN	1			
SUDS	9	HOT	LOW	SUPPLY 1
DRAIN	1			
RINSE	2	HOT	HIGH	NONE
DRAIN	1			
BLEACH	7	HOT	LOW	SUPPLY 2
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	½			
SOUR/SOFT	4	COLD	LOW	SUPPLY 3 & 4
DRAIN	40 sec.			
EXTRACT	2			
SHAKEOUT				

FORMULA 3B

COLORED TABLE LINEN

(NO BLEACH, NO STARCH)

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
FLUSH	2	SPLIT	HIGH	NONE
DRAIN	1			
SUDS	9	HOT	LOW	SUPPLY 1
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	½			
SOUR/SOFT	4	SPLIT	LOW	SUPPLY 3 & 4
DRAIN	40 sec.			
EXTRACT	2			
SHAKEOUT				

FORMULA 4B

WHITE 100% POLYESTER (VISA) TABLE LINEN

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
FLUSH	2	SPLIT	HIGH	NONE
DRAIN	1			
SUDS	9	HOT	LOW	SUPPLY 1
DRAIN	1			
BLEACH	7	HOT	LOW	SUPPLY 2
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
SOUR	4	SPLIT	LOW	SUPPLY 3
DRAIN	40 sec.			
EXTRACT	1			
SHAKEOUT				

FORMULA 5B

COLORED 100% POLYESTER (VISA) TABLE LINEN

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
FLUSH	2	SPLIT	HIGH	NONE
DRAIN	1			
SUDS	9	HOT	LOW	SUPPLY 1
DRAIN	1			
RINSE 1	2	SPLIT	HIGH	NONE
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
RINSE	2	COLD	HIGH	NONE
DRAIN	1			
SOUR	3	COLD	LOW	SUPPLY 3
DRAIN	40 sec.			
EXTRACT	1			
SHAKEOUT				

FORMULA 6B

CHEF COATS

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
SUDS	5	HOT	LOW	SUPPLY 1
DRAIN	1			
SUDS	8	HOT	LOW	SUPPLY 1
DRAIN	1			
RINSE 1	2	HOT	HIGH	NONE
DRAIN	1			
BLEACH	7	HOT	LOW	SUPPLY 2
DRAIN	1			
RINSE 2	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	½			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
SOUR/SOFT	4	SPLIT	LOW	SUPPLY 3 & 4
DRAIN	40 sec.			
EXTRACT	3			
SHAKEOUT				

FORMULA 7B

STAIN TREATMENT – (LONG FORMULA)

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
SUDS/BLEACH	30	HOT	LOW	SUPPLY 1 & 2
DRAIN	1			
RINSE	2	HOT	HIGH	NONE
DRAIN	1			
BLEACH	7	HOT	LOW	SUPPLY 2
DRAIN	1			
RINSE	2	HOT	HIGH	NONE
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	½			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	3			
SHAKEOUT				

FORMULA 1AB

WHITE TABLE LINEN

(BLEACH AND STARCH)

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
SUDS	9	HOT	LOW	SUPPLY 1
DRAIN	1			
RINSE	2	HOT	HIGH	NONE
DRAIN	1			
BLEACH	7	HOT	LOW	SUPPLY 2
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	½			
SOUR	2	SPLIT	LOW	SUPPLY 3
(NO DRAIN)				
STARCH	4	SPLIT	LOW	SUPPLY 5
DRAIN	40 sec.			
EXTRACT	3			
SHAKEOUT				

FORMULA 2AB

COLORED TABLE LINEN

(BLEACH AND STARCH)

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
FLUSH	2	SPLIT	HIGH	NONE
DRAIN	1			
SUDS	9	HOT	LOW	SUPPLY 1
DRAIN	1			
BLEACH	7	HOT	LOW	SUPPLY 2
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	½			
SOUR	2	SPLIT	LOW	SUPPLY 3
(NO DRAIN)				
STARCH	6	SPLIT	LOW	SUPPLY 5
DRAIN	40 sec.			
EXTRACT	3			
SHAKEOUT				

FORMULA 3AB

WHITE OR COLORED TABLE LINEN

(STARCH, NO BLEACH)

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
FLUSH	2	SPLIT	HIGH	NONE
DRAIN	1			
SUDS	9	HOT	LOW	SUPPLY 1
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	½			
SOUR	2	SPLIT	LOW	SUPPLY 3
(NO DRAIN)				
STARCH	6	SPLIT	LOW	SUPPLY 5
DRAIN	40 sec.			
EXTRACT	3			
SHAKEOUT				

FORMULA 4AB

BEDSPREADS/DELICATES

(WARM WATER)

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
SUDS	5	SPLIT	HIGH	SUPPLY 1
DRAIN	½			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	½			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	½			
SOUR/SOFT	4	SPLIT	LOW	SUPPLY 3 & 4
DRAIN	40 sec.			
EXTRACT	2			
SHAKEOUT				

FORMULA 5AB

LIGHT SOIL – GENERAL WASH FORMULA

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
SUDS/BLEACH	9	HOT	LOW	SUPPLY 1 & 2
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
SOUR/SOFT	4	SPLIT	LOW	SUPPLY 3 & 4
DRAIN	40 sec.			
EXTRACT	3			
SHAKEOUT				

FORMULA 6AB

EXTRA RINSING WITH EXTRACT

OPERATION	TIME	TEMP	LEVEL	SUPPLIES
RINSE	2	SPLIT	HIGH	NONE
DRAIN	1			
EXTRACT	1			
RINSE	2	SPLIT	HIGH	NONE
DRAIN	40 sec.			
EXTRACT	2-1/2			
SHAKEOUT				

FORMULA 7AB

Test Program

On all Selecta-28 machines, Program 7AB is a test program. The test program should be run whenever you start-up a machine and after performing service and troubleshooting to be sure it is operating properly. This is the test program, step-by-step:

1. Fill to low level with cold water, no drum rotation.

2. When low level is reached, rotate 90 seconds with normal action (12 seconds rotation, 3 seconds pause, then reverse direction and repeat). After 90 seconds normal action, stop rotation. No drain.

3. Continue to fill to high level with hot water with no drum rotation.

4. When high level is reached, rotate for 90 seconds with gentle action (3 seconds rotation, 12 seconds pause, then reverse direction and repeat). After 90 seconds gentle action, stop rotation.

5. Drain with gentle action.

6. Fill to high level with cold and hot water with normal action. When high level is reached, proceed to step 7 with normal action.

7. Supply signals 1, 2, 3, 4, and 5, on simultaneously for 60 seconds. Check for 220V between terminals 1, 2, 3, 4, 5, and C.

8. Drain with normal action.

9. Extract 2 minutes. On two-speed models, first go to distribution speed, and then extract 2 minutes at both low and high speeds.

10. Fill to low level with cold water with normal action. When low level is reached, rotate 30 seconds with normal action.

11. Drain. End of test program.

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