Washer Extractor

INSTRUCTION MANUAL

Model
SA475
Steam

A272508120731
IM0803-SA0201-02

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KEY SYMBOLS

Anyone operation or servicing this machine must follow the safety rules in this manual. Particular attention **must be** paid to the **DANGER**, **WARNING**, and **CAUTION** blocks which appear throughout the manual

The lightening flash and arrowhead within the triangle is a warning sign alerting you of the presence of dangerous.

The exclamation point within the triangle is a warning sign alerting you of important instructions concerning the machine.

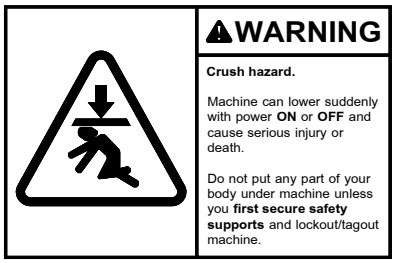
This warning symbol alerts you to the presence of possible dangerous drive mechanisms within the machine. Guards **should always be** in place when the machine is in operation.

This warning symbol indicated the presence of possibly dangerous chemicals. Proper precautions **should be** taken when handling corrosive or caustic material.

This warning symbol indicated the presence of hot surfaces that could cause serious burns. Stainless steel and steam lines can become extremely got and **should not be** touched.

This warning symbol indicates the presence of possible dangerous pinch – points. Moving mechanical parts can crush and / or sever body parts.

Before servicing any equipment, make certain it is disconnected from the electrical power source. Never allow operation of the machine when any safety device is malfunctioning. Never bypass safety devices.



WARNING! Crush hazard. Machine can lower suddenly with power **ON** or **OFF** and cause serious injury or death. **Do not** put any part of your body under machine unless you **first secure safety supports** and lockout / tagout machine

SECTION 1

IMPORTANT INFORMATION

SA Series Washer – Extractors

The SA line is the industrial freestanding washer – extractor series of machines from B&C Technologies Co., Ltd. It is an open pocket washer – extractor with a large door opening for easy and quick loading and unloading. It has been developed for the institutional and industrial market, and is suitable for commercial laundries, hotel, food processing plants, factories and other places where laundry might be process.

The design allows for top performance at lowest possible operation cost and investment. The flexible electronic control center ensures that maximum productivity is obtained.

The SA series utilizes high quality material, such as 304 (18/8) stainless steel in vital parts in contact with the wash solution. It has a stainless steel cabinet for long life with easily removable panels.

The key advantages of this series are the simplicity of the microprocessor and the electronic AC drive system, which utilizes only one motor. The system allows for washing and extraction at any speed and mechanical action to suit any textile fiber used today and tomorrow. A built in suspension system isolate objectionable vibration and the high speed final extraction saves time and energy in the finishing operation.

The main bearing is located the wash solution and will not be damaged, should the shell seals leak. The machine is provided with two V – seals, which are very reliable and will last for many years. The calculated life expectancy of the bearing is in excess of twenty years.

The five compartments, side mounted supply dispenser for powder and liquid detergents are standard and the machine is designed to accept the connection of 5 additional external chemical lines and pumps. More chemical connections are available as an option.

The SA series can be provided with tilt devices that can tilt the machine one or both ways. This option provides for easy loading and unloading and unloading and saves hard labor.

The SA series is also prepared to accept the connection of water reuse systems. These systems can be installed separate or on top of the machine. They are available in either single or dual tanks for maximum savings of water up to 40%. The tanks can be equipped with or without steam or electrical heat depending on installation and operation. The water reuse system is programmable by the machines electronic control center.

Before Initial start up of a washer – extractor perform the following safety check:

A. Make sure all electrical and plumbing connections have been made in accordance with applicable codes and regulations.

B. Make sure the machine is grounded electrically.

C. Make sure the machine has flexible water fill and drain connections of the correct size, length and type, with no kinks, and that they are securely attached and/or clamped.

D. Make sure the transport brackets have removed.

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

A. When the washer is energized electrically and in operation, the loading door **must be** locked in the closed position. Verify this by attempting to open the loading door when the machine is operating. If necessary, check the door safety interlock and sensors for proper operation. Consult the service manual, or call a qualified service technician if necessary.

B. When the washers loading door is open, it **should not be** possible to start the machine. Verify this by attempting to start the washer with the door open. Also, close the door without locking it and verify that it is not possible to start the machine with the door not locked. If necessary, check the door lock sensors for proper operation. Consult the service manual, or call a qualified service technician. If additional information is required, contact your local distributor or call the manufacturer of the machine

Before servicing any equipment, make certain it is disconnected from the electrical power source. Never allow operation of the machine when any safety device is malfunctioning. Never bypass safety devices.

To provide personal safety and keep the machine in proper working order, follow all maintenance and safety procedures presented in this manual. If questions regarding safety arise. Contact the factory immediately.

Use factory authorized spare parts to avoid safety hazards.

Operator safety

Never insert hands or objects into basket until it has completely stopped. Doing so could result in serious injury.

To ensure the safety of machine operators the following maintenance checks **must be** performed daily.

1. Prior to operating the machine, verify that all warning signs are present and legible. Missing or illegible signs **must be** replaced immediately. Make certain that spares are available.
2. Check door interlock before starting operation of the machine, see safety checklist.
3. **Do not** attempt to operate the machine if any of the flowing conditions are present.
   - 3.1 The door does not remain securely locked during the entire cycle.
   - 3.2 Excessively high water level is evident.
   - 3.3 Machine is not connected to a properly grounded circuit.

Do not bypass any safety devices in the machine.

Never operate the machine with a bypassed or disconnected out – of – balance switch. Operating the machine with severe out – of – balance loads could result in personal injury and serious equipment damage.

Safe Operation Environment

Safe operation requires an appropriate operating environment for both the operator and the machine. If questions regarding safety arise, contact the factory.

Environmental Conditions

1. Ambient temperature.

Water in the machine will freeze at temperatures of 32 ºF (0 ºC) or below. Temperatures above 120 ºF (50 ºC) will result in more frequent motor overheating and, in some cases, malfunction or premature damage to solid state devices that are used in the machines. Special cooling devices may be necessary.

2. Humidity.

Relative humidity above 90% may cause the machine's electronics or motors to malfunction or may trip the ground fault interrupter. Corrosion problems may occur on some metal components. If the relative humidity is below 30% belts and rubber hoses may eventually develop dry rot. This condition can result in hose leaks, which may cause hazards external to the machine in conjunction with adjacent electrical equipment.

3. Ventilation.

The need for make – up air openings for such laundry room accessories as dryers, ironers, water heaters, etc. **must be** evaluated periodically. Louvers, screens, or other separating devices may reduce the available air opening significantly.

4. Radio Frequency Emissions.

A filter is available for machines in installations where floor space is shared with equipment sensitive to radio frequency emissions. All machined that are shipped to CE countries are equipped with this filter and comply with the EMI regulations.

5. Elevation.

If the machine is to be operated at elevations over 3280 feet (100 meter) above sea level, pay special attention to water levels and electronic settings (particularly temperature) or desired result may not be achieved.

6. Chemicals.

Keep stainless steel surfaces free of chemical residues to avoid corrosion.

7. Water damage.

Do not spray the machine with water. Short circuiting and serious damage may result. Repair immediately all seepage due to faulty gaskets, etc.

Do not place volatile or flammable fluids in any machine. **Do not** clean the machine with volatile or flammable fluids such as acetone, lacquer thinners, enamel reducers, carbon tetrachloride, carbon tetrachloride, gasoline, benzene, naphtha, etc. Doing so could result in serious personal injury and / or damage to the machine.

Machine Location

1. Foundation.

The concrete floor **must be** of sufficient strength and thickness to handle the floor loads generated by the machine at high extract speeds.

2. Service / Maintenance Space.

Provide sufficient space to allow comfortable performance of service procedures and routine maintenance. This is especially important in connection with machine equipped with AC inverter driver. Consult installation instructions for specific details.

Replace all panels that are removed to perform service to perform service and maintenance procedures. **Do not** operate the machine with missing guards or with broken or missing parts. **Do not** bypass any safety devices.

Input and output services

1. Water pressure.

Best performance will be realized if water or provided at a pressure of 30 – 85 psi (2.0 – 5.7 bar). Although the machine will function properly at lower pressure, increased fill time will occur. Water pressure higher than 120 psi (8.0 bar) may result in damage to machine plumbing. Components failure (s) and personal injuries.

2. Optional Steam heating pressure.

Best performance will be realized if steam pressure is provided at a pressure of 30 – 80 psi (2.0 – 5.4 bar). Steam pressure higher than 125 psi (8.5 Bar) may result in steam components and may cause personal injuries. For machines equipped with optional steam heat, install piping in accordance with approved commercial steam practices. Failure to install the supplied steam filter may void the warranty.

3. Compressed Air.

For machines requiring compressed air service, best performance will be realized if air is provided at a pressure of 80 – 100 psi (5.4 – 6.7 bar). Large capacity machines could experience door seal failures if compressed air service is interrupted.

4. Drainage System.

Provide drain lines or trough large enough to accommodate the total quantity of water that could be dumped if all machines on the site drained at the same time from the highest attainable level. If drain troughs are used, they **should be** covered to support light foot traffic.

5. Power.

For personal safety and for proper operation, the machine **must be** grounded in accordance with state and local codes. The ground connection must be to a proven earth ground, not to conduits or water popes. An easy – access disconnect switch **should be** provided.

Ensure that a ground wire from a proven earth ground is connected to the ground lug in the electrical junction box on this machine. Without proper grounding personal injury form electrical shock could occur and machine malfunctions may be evident. Computer – controlled machines must have a proper ground to prevent computer malfunctions.

Always disconnect power and water supplies before a service technician performs any service procedure. Where applicable, steam and / or compressed air supplies should also be

AC Inverter Drive

Machines equipped with AC drives require special attention with regard to the operating environment.

1. An especially dusty or linty environment will require more frequent cleaning of the AC drive cooling fan filter and of the AC drive itself.
2. Power line fluctuations from sources such as an interruptible power supplies (UPS) can adversely affect machines equipped with the AC drive. Proper suppression devices should be utilized on the incoming power to the machine to avoid problems.
3. A clean power supply free from voltage spikes and surges is absolutely essential for machines equipped with the AC drive. Nonlinear inconsistencies (peaks and valleys) in the power can cause the AC drive to generate nuisance errors. If voltage is above 230V for 200V installations or above 440V for 400V installations, a buck/boost transformer is recommended. If voltage is above 240V or 480V, a buck / boost transformer is required unless the factory advises differently.
4. Sufficient space to perform service procedures and routine preventive maintenance is especially important for machines equipped with AC drives.

Misuse

Even though this machine is an atmospheric vessel, never use it for any purpose other than washing fabrics.

1. Never wash petroleum – soaked rags in the machine. This could result in an explosion
2. Never wash machine parts or automotive parts in the machine. This could result in serious damage to the basket.
3. Never stone wash in the machine. It could wear the basket and serious damage might occur to the machine.
4. Never use the machine for dying and with harsh chemicals that can cause corrosion and other health hazards.
5. Never allow children to play on or around this machine become trapped in the machine. **Do not** leave children unattended while the machine door is open. These cautions apply to animals as well.

SECTION 2

SPECIFICATIONS/COMPONENT IDENTIFICATION

Delivery inspection

Upon delivery, visually inspect crate, protective cover, and unit for any visible shipping damage. If the crate, protective cover, or unit are damaged or signs of possible damage are evident, have the carrier note the condition on the shopping document before the shopping receipt is signed, or advise the carrier of the conditions as soon as it is discovered.

Remove the crate and protective cover as soon after delivery as possible. If any damages discovered upon removal of the crate and / or protective cover, advise the carrier and file a written claim immediately.

Customer Service

If literature or replacement parts are required contact the source from whom the machine was purchased or contact manufacturer.

A record of each machine is on file with the manufacturer. The serial number decal is located at the rear of the machine. Always provide the machine's serial number and model number when ordering part or when seeking technical assistance.

NOTE: Keep the manuals, installation instruction and the wiring diagrams which accompany the machine in a safe place for ready reference. They have been included with the machine at no charge. Additional copies are available at a nominal charge.

A. TECHNICAL SPECIFICATION

SA 475 Technical Specifications

MODEL	Units		SA 475 Tilt	
	Metric	US		
CAPACITY:	kg	lbs	475	216
OVERALL DIMENSIONS:				
A – Width	mm	in	2620	103.15
B – Height	mm	in	2540	100
C – Depth	mm	in	2475	97.44
D – Tilted Height (2 – tilt)	mm	in	3040	119.7
WEIGHT AND SHIPPING INFORMATION:				
Net Weight	kg	lbs	8550	18849.5
Domestic shipping weight	kg	lbs	8806	19414
Export shipping weight	kg	lbs	9100	20062
CYLINDER INFORMATION:				
Diameter	mm	in	1622	63.85
Depth	mm	in	1025	40.35
Volume	liters	cu ft	2118	74.8
Perforation size	mm	in	4.76	0.188
Perforation open area	%	%	-	-
CYLINDER SPEEDS:				
Wash	rpm		30	
Distribution	rpm		50	
Intermediate extraction	rpm		-	
High extraction 1	rpm		270	
High extraction 2	rpm		435	
High extraction 3	rpm		500	
CENTRIFUGAL FORCES (Programmable) :				
Wash	g		0.8	
Distribution	g		1.5	
Intermediate extraction	g		-	
High extraction 1	g		66	
High extraction 2	g		171.5	
High extraction 3	g		226.5	

MODEL	Units		SA 475 Tilt	
	Metric	US		
DOOR OPENING AND HEIHGT:				
Diameter	mm	in	1016	40
Height of door bottom above floor	mm	in	1611	63.43
DRIVE INFORMATION:				
Number of motors	Number		1	1
Size of motor	kW	Hp	30	40
WATER INLETS:				
Hot water size	DN	in	50.8	2
Cold water size	DN	in	50.8	2
Additional water Inlet	DN	in	-	-
Average HOT water consumption / cycle	liters	gal	-	-
Average COLD water consumption / cycle	liters	gal	-	-
DRAIN OUTLETS AND CAPACITY:				
Number of drains standard	Number		2	
Number of drains optional (water re – use)	Number		2	
Drain size	mm	in	203.2	8
Drain capacity	liter / cycle	g.p.m.	1050	277
STEAM INLET AND CONSUMPTION:				
Steam inlet size	DN	in	38.1	1-1/2
Required steam to heat bath 10 ºF (5.55 ºC) LOW	kg	lbs	-	-
Required steam to heat bath 10 ºF (5.55 ºC) HIGH	kg	lbs	-	-
Average steam consumption	kg / hr	lbs / hr	94	207
AIR INLET AND CONSUMPTION:				
Air inlet size	DN	in	12.7	1/2
Average air consumption per cycle	m^3	cfm	0.01	0.1

SECTION 3

INSTALLATION PROCEDURES

A. DIMENSION CLEARANCES

When installing the washer – extractor, it is important to allow adequate clearance on all sides of the machine. When multiple machines are installed, it is important to allow for the specified minimum clearances between machines. The following table shows recommended minimum clearances for the various freestanding models.

NOTE: The dimensions are approximate and subject to normal manufacturing tolerances. If exact dimensions are required for construction purposes, request certified drawings from the factory. We reserve the right to make changes at any time without notice.

Table.3-1 Dimension Clearances

Detail	UNTIS		SA Series Tilt	
	Metric	US		
(A) Minimum rear clearance	mm	in	850	33.46
(B) Minimum clearance between machine and wall	mm	in	455	18
(C) Minimum clearance between machines	mm	in	850	33.46
(D) Minimum font clearance	mm	in	1200	47.24

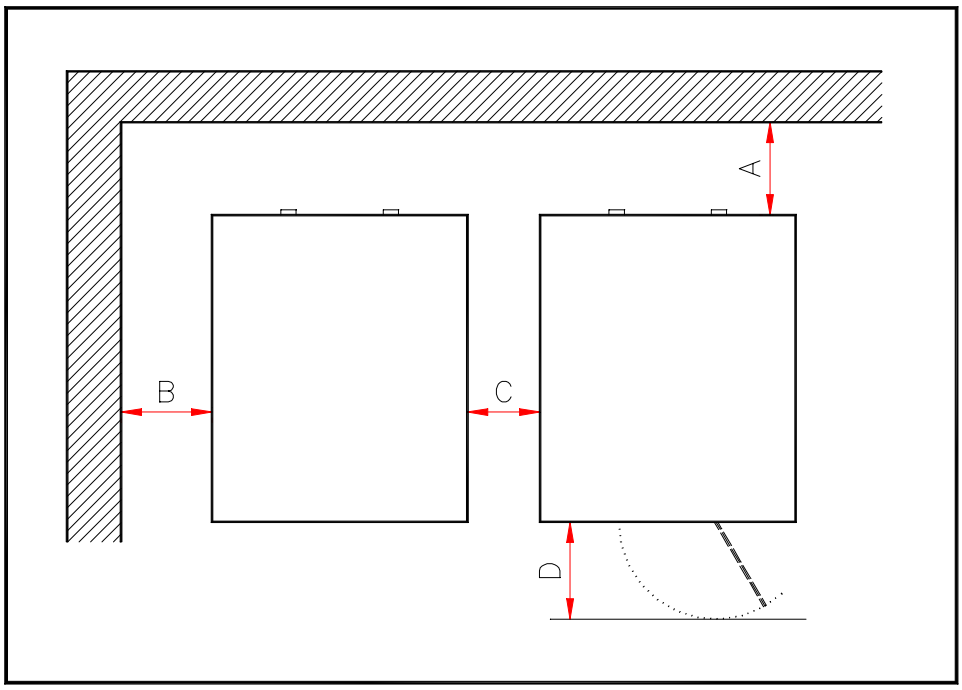


Figure.3-1 Dimensions for construction

B. MACHINE FOUNDATION

Thoroughness of details **must be** stressed with all foundation work to insure a stable unit installation, eliminating possibilities of excessive vibrations during extraction.

The machine **must be** anchored to a smooth level surface so that the entire base of the machine is supported and rest on the mounting surface.

NOTE: **Do not** support the machine on only four points.

NOTE: Freestanding washer-extractors do not require anchoring bolts unless specified by state or local codes. However it is always recommended that the machines be anchored.

Special care **must be** taken when machines are installed on an upper floor. Make sure that the floors are designed to carry the static and dynamic loads of the machines.

Further vibrations **should be** taken into consideration so that the machine does not create vibrations in the building. Static and dynamic loads on the floor or foundation are shown in the table below. This table can be used as reference when designing floors and foundations. See figure for mounting bolt layout measurement and pattern.

Ensure that the machine is installed on a level floor of sufficient strength and that the recommended clearances for inspection and maintenance are provided. Never allow the inspection and maintenance space to be blocked.

Table.3-2 Machine Foundation

Machine	Static floor load		Static pressure		Dynamic floor load		Max dynamic load		Dynamic pressure	
	kN	lbs	kN/m^2	lbs - ft^2	kN	lbs	kN	lbs	kN/m^2	lbs - ft^2
SA 475	67	15,000	11.3	234	1,253	-	-	-	3.2	66.7

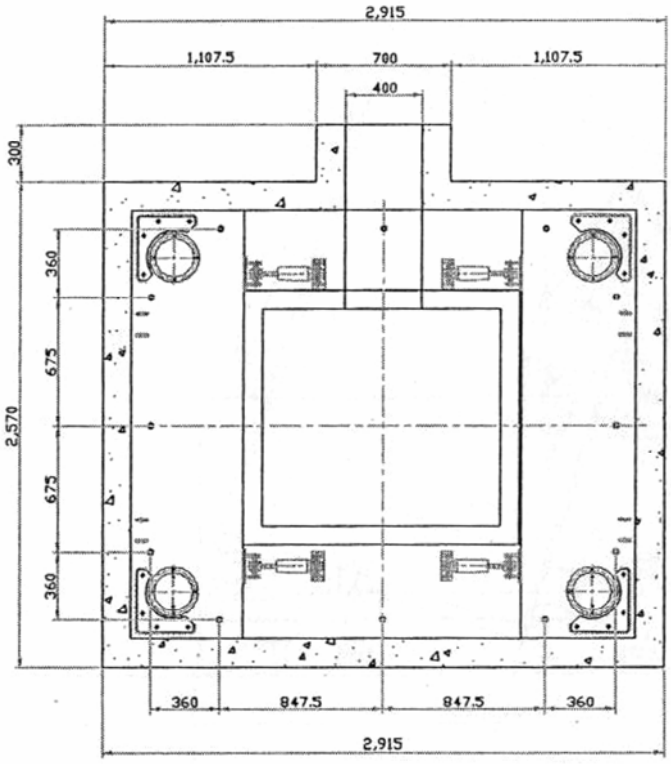


Figure.3-2 Foundation Bolt Location

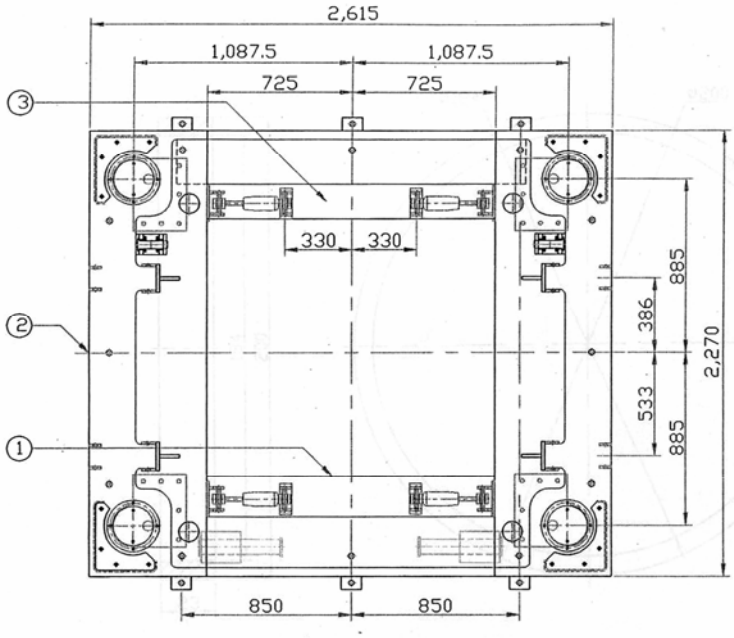
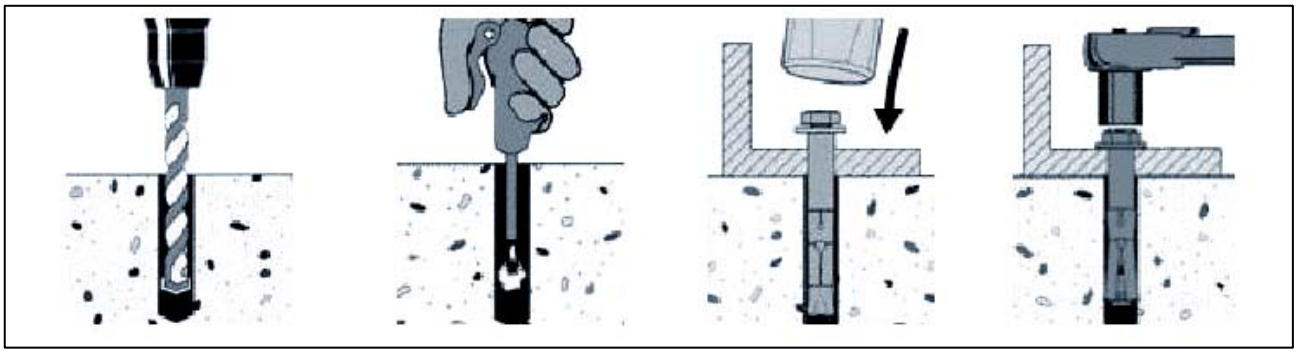


Figure.3-3 Type Grouting Pattern

C. MOUNTING BOLT INSTALLATION

All washers – extractors **must be** secured by the use of machinery anchor bolts. High strength machinery anchors **should be** embedded in 3,500 psi (24,000 N/m^2) reinforced concrete. See Figure. For detailed information regarding the machine anchor bolt, see the instructions included with the anchor bolts themselves. The following information is just an example.

After the concrete has cured, proceed as follows:

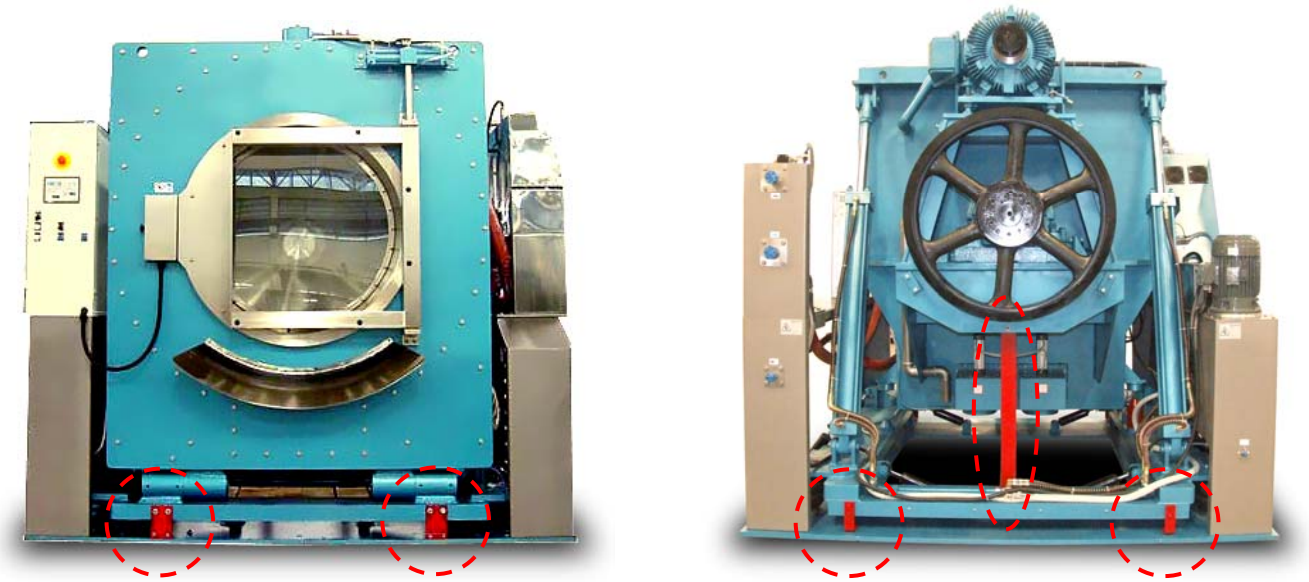


Select a carbide drill bit with a diameter equal to the anchor diameter. Drill hole to any depth exceeding the desired embedment.	Clean hole or continue drilling to accommodate drill fines (concrete dust). Please wear eye protection.	Drive the anchor into the hole through material being fastened until washer is flush with material.	Expand bolt by tightening the anchor 3 to 5 turns, or to the specified torque requirements.

Figure.3-4 Mounting Bolt Installation

Place the machine adjacent to the foundation. **Do not** attempt to move it by pushing on the sides.

1. Remove the wood skid by unscrewing the carriage bolts holding it to the bottom frame of the machine.
2. Carefully place the machine over the anchor bolts. Raise and level it 1/2 inch above the floor on four points, using spacers that can be removed.
3. Fill the spaces between the machine base and floor with machinery grout. Grout completely under all frame members. Remove front panel and rear panel to gain access to all frame members. Force grout under the machine base until all voids are filled.
4. Remove the spacers carefully, allowing the machine to settle into the wet grout.
5. Attached the mounting bolt washers and lock nuts to the anchor bolts after the grout has hardened. Tighten the lock nuts by even increments – one after the other – until all are tightened evenly and the machine is fastened securely to the floor. The nuts **should be** tightened in a diagonal fashion, which will help ensure equal tension at all anchor points.
6. Remove the four red transportation brackets which secure the moving component of the machine during shipping.



Front side the machine | **Rear side the machine**

Figure.3-5 Location of transportation brackets inside the machine

D. DRAIN CONNECTION

A drain system of adequate capacity is essential to the machine performance. Ideally the water should empty through a 4 inches vented pipe directly into a sump or floor drain.

A flexible connection **must be** made to a vented drain system to prevent an airlock or siphon effect. If proper drain size is not available or practical, a surge tank is required. A surge tank in conjunction with a sump pump **should be** used when gravity drainage is not possible, such as in below – ground – level installations.

Before any deviation from specified installation procedures is attempted, the customer or installer should contact the manufacturer. Increasing the drain hose length, installing elbows, or causing bends will decrease drain flow rate and increase drain time, impairing machine performance. If the drain arrangement is inadequate, the machine will not extract and will not discharge water properly.

See table below for specific drain information.

Table.3-3 Drain Sizing

Detail	Units		SA Series	
	Metric	US		
Drain connection Size	mm.	in	215	8 1/2
Drain flow capacity	liters / min	g.p.m.	-	-
Minimum drain it size	liters	gal	-	-

E. ELECTRICAL INSTALLATION

The AC drive requires a clean power supply free from voltage spikes and surges. A voltage monitor **should be** sued to check incoming power. The customer's local power company may provide such a monitor.

The AC drive provides for an internal circuit breaker. A separate circuit breaker governs the control circuit.

If input voltage measures above 230V for a 200V drive, or above 440V for a 400V drive, either ask the power company if their representative can lower the voltage or install a step – down transformer kit available from the manufacturer. Voltages above 250V and 490V require additional measures. Contact the distributor or the manufacturer for assistance.

This machine **must be** installed, adjusted, and serviced by a qualified electrical maintenance personnel familiar with the construction and operation of this type of machinery. They must also be familiar with the potential hazards involved. If this warning is not observed, personal injury or equipment damage resulting in voiding the warranty may result.

When controlling the AC drive with a parameter unit, the machine's computer and its safety features are bypassed. This would allow the basket to rotate at high speeds with the door open. When using a parameter unit to control the AC drive, a large sign **should be** placed on the front of the machine warning people of the imminent danger.

Never touch terminals or components of the AC drive unless power is disconnected and the "**CHARGE**" indicator LED is off. The AC drive retains potential deadly voltage for some time after the power is disconnected. There are no users – serviceable parts inside the AC drive. Tampering with the drive will void the warranty.

Dangerous voltages are present in the electrical control boxes and at the motor terminals. Only qualified personnel familiar with electrical test procedures test equipment, and safety precautions should attempt adjustments and troubleshooting. Disconnect power from form the machine before removing the control box cover, and before attempting any service procedures.

Table.3-4 Table for breaker size

Machine	200 – 240V			380 – 480V		
	Max Amps	Breaker	Wire Size	Max Amps	Breaker	Wire Size
SA 475	110 A.	150 A.	2 AWG. 35 Sq. mm.	60 A.	100 A.	6 AWG. 16 Sq. mm.

NOTE: Wire sizes shown are for copper, THHN, 90 conductors per NEC article 310 (USA).

The machine **should be** connected to an individual branch circuit not shared with lighting or other equipment.

The connection **should be** shielded in a liquid tight or approved flexible conduit with proper conductor of correct size installed accordance with National Electrical Code (USA) or other applicable codes. The connection must the wiring diagram provided with the machine. See the Electrical Connection data Chart for correct wire sizes.

Use wire sizes indicated in the chart for runs up to 50 feet (15 m). Use next larger size for runs of 50 to 100 feet (15 – 30 m). Use 2 sizes larger for runs greater than 100 feet (30 m).

For personal safety and for proper operation, the machine **must be** grounded in accordance with state and local codes and in the USA in accordance with the National Electrical Code, article 250 – 96.

The ground connection must be to a proven earth ground, not to conduit or water pipes. **Do not** connect the system is used, the neutral (N) leg at the terminal strip.

If a DELTA supply system is used, the high leg may be connected to L1, L2 or L3, as the machines are equipped with control transformer.

F. WATER CONNECTION

Individual hot and cold plumbing lines with individual shut – off valves **must be** available to the machine. Hot water **should be** minimum of 160 ºF (70 ºC). If lower temperature water is used the machine **should be** equipped for steam heating to heat the wash solution to desired temperature. Best performance will be realized if water is provided at a pressure of 30 – 85 psi (2 – 7 bar). Although the machine will function properly at lower pressures, increased fill times will occur.

Flush the water system for at least two minutes prior or initial use.

Use flexible hoses and install separate screen filters in the lines to keep rust and other foreign particles out of the solenoid valves. Hang the hoses in a large loop. **Do not** allow the hoses to link. The water connections to the machine **should be** supplied by a hot and cold water line of least the sizes shown in the table below. Installation of additional machines will require proportional larger water lines, see table.

To avoid eventual water hammer in the water line, suitable devices to reduce the water hammer **should be** installed.

Table.3-5 Table for drain size

NUMBER OF MACHINES	SUPPLY LINE PIPE SIZES	
SA 475	**DN**	**Inch**
1	-	1/2
2	-	1/2
3	-	1/2
4	-	1/2
5	-	1/2

G. STEAM CONNECTION

Never touch internal or external steam pipes, connections, or components. These surfaces can be extremely hot and will cause severe burns. The steam **must be** turned off and the pipe, connections, and components allowed to cool before the pope can be touched

For machines equipped with optional steam heat, install piping in accordance with approved commercial steam practices. Steam requirements are shown in the table below. Failure to install the supplied steam filter may void the warranty.

Table.3-6 Table for steam size

MODEL	Units		SA 475	
STEAM INLET and CONSUMPTION:	**Metric**	**US**		
Steam inlet size	DN	in	1 1/4	1 1/4
Required steam to heat bath 10 ºF (5.55 ºC) LOW	kg	lbs	-	-
Required steam to heat bath 10 ºF (5.55 ºC) HIGH	kg	lbs	-	-
Average Steam consumption per cycle	kg	lbs	-	-

H. EXTERNAL CHEMICAL SUPPLIES

Wear Eye and hand protection when handling chemicals. Always avoid direct contact with raw chemicals. Read the manufacturer's directions for accidental contact before handling chemicals. Ensure that an eye – rinse facility and an emergency shower are within easy reach. Check at regular intervals for chemical leaks.

The following procedures **must be** observed when connecting any chemical injector to the washer – extractor. See the figure for a typical supply injection system setup. Undiluted chemicals dripping can damage the machine. Therefore, all chemicals supply dispenser pumps **should be** mounted below the washer's injection point. All dispensers tubing should also run below the injection point. Loops **do not** prevent drips if these instructions are not followed. Failure to follow these instructions could damage the machine and void the warrant.

The supply compartment on the SA models is located on the front of the machine. Supply cups can be accessed by opening the dispenser lid. The supply cups can be removed and filled as desired. Supply compartments are numbered 1, 2, 3 and 4 from the left of the machine to the right External supply connections for the SA washer – extractors are located on rear of the machine. Hose connections **should be** made via the threaded connectors. See figure.

1. Remove plug from base. See figure. Plugs are assembled inside the tubing ring.
2. Install strain relief, included in the seal nut.
3. Insert tubes through base, **do not** remove cups. Tube should extend into the plastic cup, with the exception of the softener be routed to the outside of the cup.
4. Tighten the seal nut to prevent tubing from escaping the assembly.

I. ELECTRICAL CONNECTIONS

Connection terminals are located in the rear control box for output signals to the chemical injection supply pump.

Terminals SUPPLY 1 through SUPPLY 4 provide contact closings for external chemical supply pumps. The contact rating is maximum 3 amps at 24 – 220 V 50/60 Hz.

Do not attempt to increase fuse rating as this cause damage to the washer – extractor circuitry. Any injection system pump, which requires 24 – 220 V AC, **must be** powered by a separate external power source.

Attempting to obtain power from the machine terminals may damage the machine circuit and / or the chemical injection system. Consult the chemical injection supply system instructions for operational details.

J. CONTROL FUNCTION TEST

The machine **should be** cleaned after the installation is complete. A function test **should then be** executed on the unloaded machine as follows:

1. Check the proper supply for such characteristics as correct voltage, phase, and cycles to be certain they are correct for the machine.
2. Open manual shut – off water valves to the machine.
3. Press Emergency Stop button.
4. Apply power to the machine.
5. Release the Emergency button.
6. Check the door interlock before starting the machine.
   a. Attempt to start the machine with the door open. The machine **should not** start with the door open.
   b. Close the door without locking it and attempt to start the machine. The washer **should not** start with the door unlocked.
   c. Close and lock the door and start a cycle. Attempt to open the door while the cycle is in progress. The door **should not** open.

   If the door lock and interlock are not functioning properly, call a service technician.
7. For standard processing, select program 30 by pressing key 3 and key 0 on the keypad. Then press enter and the Start key. Run the complete program, checking operation of water inlet valves, drain, and extract functions. Program 30 is a test program that goes through most machine functions.
8. Cylinder rotation **must be** counter clockwise in the extract step. If rotation is not correct, disconnect the power to the machine. A qualified technician must reverse any two leads between the AC drive and the motor.

K. THEORY OF OPERATION

The SA models use a single – speed motor to drive the cylinder is supported via V – belts in all speeds. The cylinder is supported by two spherical roller bearings located in a bearing housing made of cast iron.

The motor is controlled by the computer control located in the front and the AC inverter drive located in the rear panel. Any speed can be programmed for any wash cycle. Some speed ranges are blocked out for programming due to safety reasons. This speed range is not important and normally speeds for wash or extraction are not selected within this range. Any wash speed in the range of 10 – 50 RPM and extraction speeds 150 – 660 maximum RPM can be programmed. Further any reversing action can be programmed. Normal reversing action is 18 seconds forward, pause for 3 seconds, and 18 seconds reverse. Any temperature between 70 ºF to 200 ºF (20 – 95 ºC) can be programmed. Any water level in the range of the machine parameters can be programmed is centimeters. The computers will automatically provide safety levels for steam injection and door operations.

Water entry into the machine is through electromagnetic water valves controlled by the computer. The computer also controls the drain, supply dispenser, any external liquid supplied, steam injection and any other vital functions of the wash program. The computers can even record cycles and data of importance that could be used for maintenance purpose.

The steam, if installed is injected in the bottom of the shell via a steam injector. The steam is controlled by a steam valve that is programmed by the micro computer.

The cylinder is perforated, allowing water to pass through and drain from within during drain and extract steps. Lifting ribs inside the cylinder lift the load from the wash solution and allow the load to tumble and falling back into the solution when the load reaches the approximate 10 – 11 o'clock or 1 – 2 o'clock positions. This mechanical action removes soil from the fabric. Furthermore, the lifters are perforated on the top so that water can cascade over the goods and wet them quickly. This reduces water consumption as water is picked up at the cylinder's lowest point and lifted and splashed over the goods at the highest point as the cylinder rotates.

A stainless steel door is provided for loading and unloading. A door lock system prevents operation of the machine when the door is open. The door is locked during operation utilizing an air cylinder and a manual latch for safety reasons. The door lock is provided with magnetic sensor to indicate that the machine is locked and provide for start of the machine when the door is closed and locked.

The AC drive, contractor, circuit overload protectors, input power supply connections, external supply connection, and control transformer are behind a cover of the rear of the machine.

The supply dispenser is mounted on the front of the machine and is accessed by unlatching the cover door. Supplies, both liquid and powder may be added by pulling the dispenser cups out and placing the appropriate supply in each. Supplies are flushed into the machine at the proper time in the cycle, controlled by the microcomputer.

Holes are provided at the rear of the machine for connection to an external, central liquid supply unit. Electrical connections are provided for the liquid supply unit on a terminal strip inside the rear control module.

SECTION 4

OPERATING INSTRUCTIONS

A. LOADING DIRTY ITEMS

STEP 1: Select switch **F** turn to **"Manual".**

STEP 2: Select switch **C** turn to **"Load"** and release**.**

STEP 3: Press and hold button **G** to open the door.

STEP 4: Load dirty items.

STEP 5: Press and hold button **H** to close the door**.**

STEP 6: To return the machine to centre position use switch **C** turn to **"Unload"** and release.

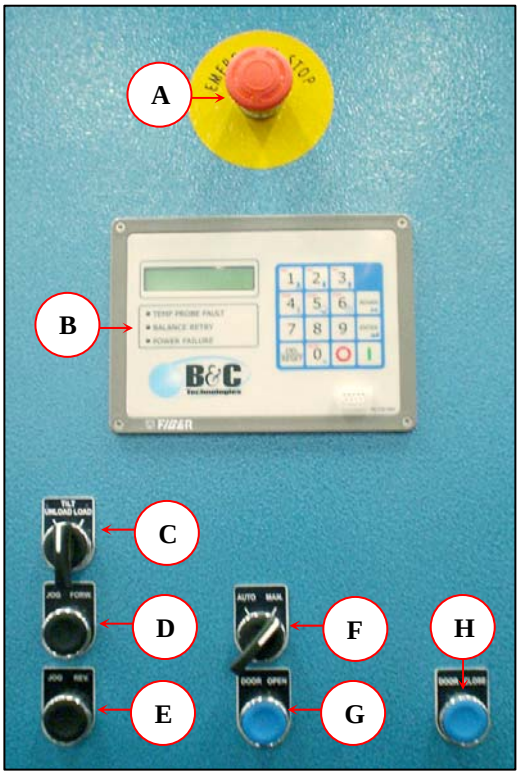


Figure.4-1 Controller Side

B. WASH

STEP 1: Select switch **F** turn to **"Auto"** (Air cushion will rise up and door can not be opened).

STEP 2: Select the program at **B** and press "**START"**.

C. UNLOADING WASHED ITEMS

STEP 1: Select switch **F** turn to **"Manual".**

STEP 2: Select switch **C** turn to **"Unload"** and release.

STEP 3: Press and hold button **G** to open the door.

STEP 4: Unload clean items**.** Use button **D** for jog cylinder **"Forward"**, Use button **E** for jog cylinder **"Reverse".**

STEP 5: Press and hold button **H** to close the door**.**

STEP 6: To return the machine to centre position use switch **C** turn to **"Load"** and release.

NOTE: Incase the case of needing to stop the machine (Emergency). Can press "**EMEGENCY STOP**" **(A)**

D. PROGRAM INSTRUCTIONS

WC03 Computer

The WC03 Computer is a powerful and programmable solid state controller. Up to 30 programs, each with up to 15 cycles can be freely programmable. In addition, the WC03 can be programmed in 6 languages – English, Italian, German, Spanish and French. The water level can be programmed, and is accurate to 1 cm (0.4 in). Spin speeds are fully programmable in RPM. In the event of power failure, the operator is prompted to continue the cycle, or abort it.

Keypad

INS 1	Number key, Insert Key. Enables a new cycle to be inserted in an existing program during programming. During operation, press and hold for cylinder RPM.
DEC 2	Number key, Decrement Key. Lowers the current value during programming mode.
INC 3	Number key, Increment Key. Raises the current value during programming mode. If pressed simultaneously with the TEMP or LEVEL key, allows temporary modification.
TEMP 4	Number key, Temperature Key. Allows temporary modification of the target temperature if used with the INC and DEC keys. Displays current temperature in wash cylinder.
LEVEL 5	Number key, Level Key. Allows temporary modification of the target water level if used with the INC and DEC keys. Displays current water level in wash cylinder.
TIME 6	Number key, Time Key. Displays the watch dog timer value for the current step.
7	
8	Number keys.
9	
PAUSE 0	Number key, Pause Key. If pressed during operation, pauses the wash program indefinitely. **Not active** during distribution or spin.
UNLOCK DOOR	On SA series equipment, this button unlocks the door and allows it to open. **Not used** on other equipment.

ADVAN	Advances to the next program step. During final spin, the remainder of the spin is aborted. If pressed before starting a program, it allows the operator to begin the program at any segment. During programming, skips to the next segment.
ENTER	Confirms settings in creation and editing of wash programs. During operation, shows the current segment or program number.
DEL RESET	Deletes any selection or setting.
STOP	Terminates the current activity (operation or programming). While the machine is powered but not executing a program, can be pressed with **RESET** to see the current firmware version.
START	Starts execution of the currently selected wash program. Restarts a paused program. When pressed with RESET, function codes can be entered to program and setup the machine. See the quick reference list on the next page.

To access this mode, press START and RESET together, then at the prompt, key in the desired number.

Programming	
12	Programming cycles
27	Creation of Programs
45	Programming motors
System Setup	
118	Disable Machine
181	Resets controller – erases all memory
201	Language option (1 – Italian, 2 – English, 3 – German, 4 – Spanish, 5 – French)
205	16 or 24 outputs
207	Maximum RPM
209	Temperature Hysterisis (min 1 deg, max 10 deg) Default is 3 deg.
210	Display temperature in degrees C
211	Display temperature in degrees F
212	Maximum water level that can be set (10 – 100 cm.)
213	Minimum water level for heating (2 – 30 cm.)
214	Display number of hours of operation
215	Display total number of washes
216	Display number of washes since the last maintenance
217	Reset maintenance request
218	Display and set number of washes until maintenance request
219	Spin slow down time (40 – 200 sec)
220	Erases Programs and cycles
221	Copy from control to memory card
222	Copy from memory card to control (only programs and cycles)
223	Copy from memory card to control (programs, cycles, and parameters)
225	Disables Advance Key
230	Maximum water level allowed during spin (2 – 60 cm.)

Highlighted items are safety related and **should not be changed**.

Do not alter these values without consulting a qualified technician.

Programming

Programming the WC03 takes place on three levels:

1. Programming motors (45)

Allows 15 different operating modes to be created for each mode, the clockwise rotation time, the counterclockwise rotation time and the pause time can be programmed.

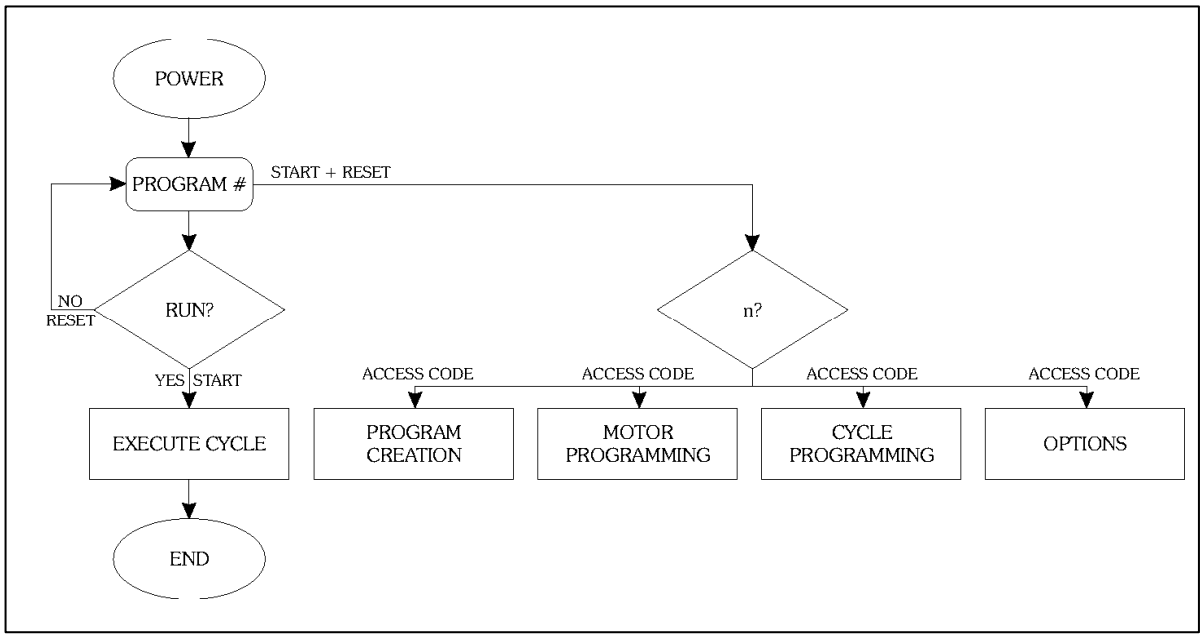
2. Programming the cycles (12)

For each sequence of steps, creates a sequence of events in which various functions can be activated or deactivated (drain, cold fill, spin, etc.). Going from one step to another may require reaching a water level or temperature, or a time value. There are five different programmable cycle

types: Prewash, Wash, Rinse, Spin and Unroll (Shakeout). Each cycle can be assigned a number between 1 and 99.

3. Creation of Wash Programs (27)

Consists of putting the various cycles as programmed above together to form a complete wash program. Up to 30 programs can be stored each with 15 cycles (segments).



Motor Programming

To access the motor programming mode, press **START** and **RESET** together. The display shows:

NO. ?

Enter 45 at this prompt, followed by the **ENTER** key. For two seconds, the display will show:

*** EDIT MOTORS ***

You are then asked to enter the motor routine number to be programmed (1 – 15).

MOTOR NO.

You may now enter the number and press the **ENTER** key. There are now two cases:

1. The motor routine does not exist.
2. The motor routine does exist

New motor routine

In this case, you are prompted to enter a clockwise rotation time with this message:

T. FORWARD = S

Enter the desired time in seconds, followed by the **ENTER** key. The display will change

T. PAUSE = S

Enter the desired time in seconds, followed by the **ENTER** key. The display will change

T. BACKWARDS = S

Enter the counterclockwise time in seconds, followed by the **ENTER** key. The display will show:

STORE?

Pressing **ENTER** will store the motor timing routine and the display will change to request a new access code:

NO. ?

Enter 45 at the prompt to program additional motor timing sequences as required. Pressing **RESET** instead of **ENTER** will exit programming.

Editing an Existing Routine

If the motor routine number you entered id already present, the display will show:

ALREADY EXISTS!

Pressing the **ENTER** key again displays the forward rotation time:

T. FORWARD = XXs

Pressing the **INC** and **DEC** keys allow you to step through the values for Forward, Pause, and Backwards. Pressing **ENTER** will allow you to modify the value on the display

After having viewed or modified the backwards value, pressing the **INC** or **ENTER** key displays:

STORE?

Pressing **ENTER** confirms the changes mode (if any) and exits programming. Pressing **RESET** exits the current programming mode and leaves the existing values as they were.

Notes on Motor Programming

There are a number of different moles available for motor programming:

1. Forwards – Pause k – Backwards

T. FORWARD = XXs

T. PAUSE = XXs

T. BACKWARDS = XXs

2. Forwards – Pause

T. FORWARD = XXs

T. PAUSE = XXs

3. Forwards

T. FORWARD = XXs

T. PAUSE = SO

4. Pause – Backwards

T. FORWARD = SO

T. PAUSE = XXs

T. BACKWARDS = XXs

5. Backwards

T. FORWARD = SO

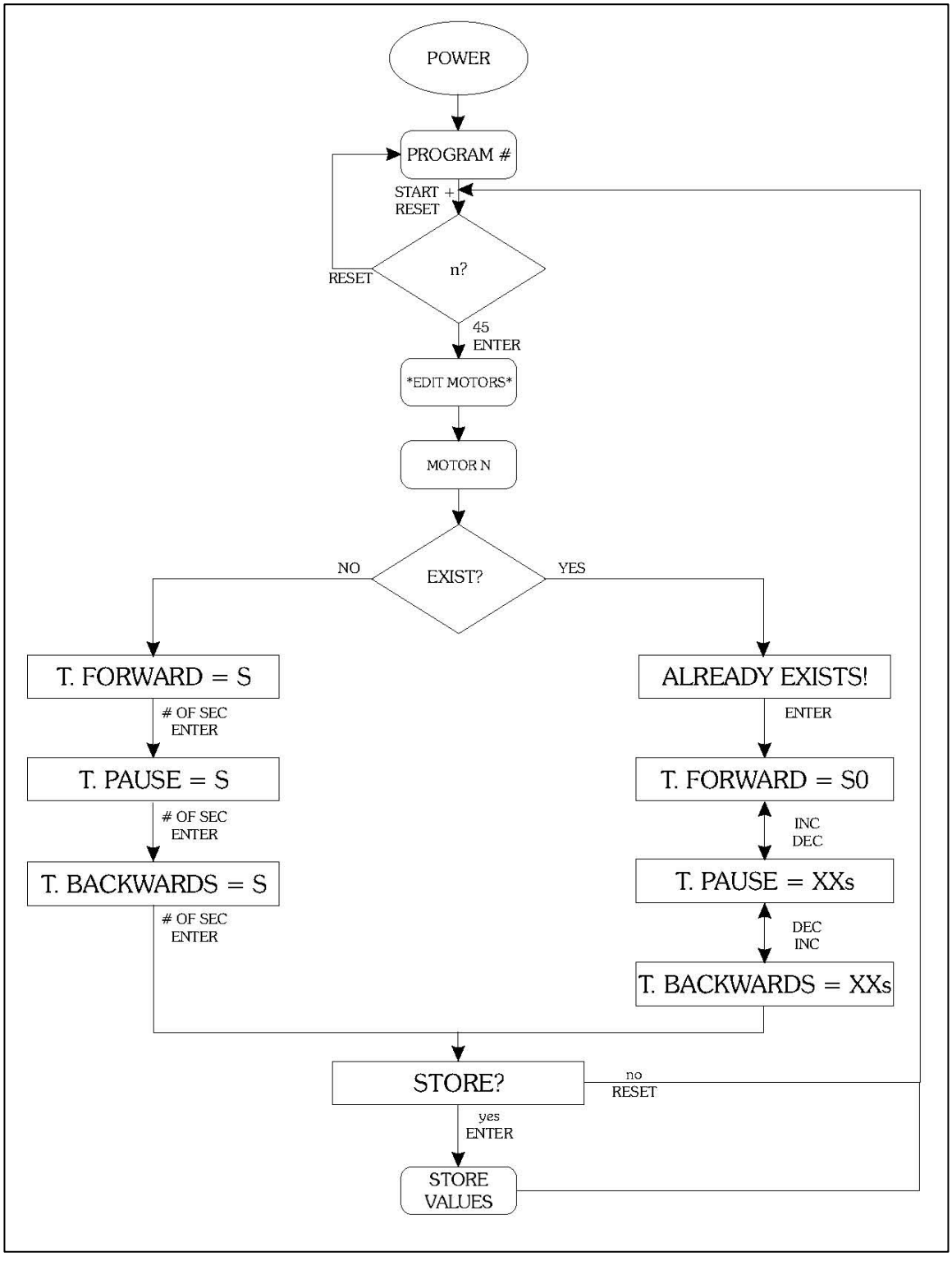
T. PAUSE = SO

T. BACKWARDS = XXs

The minimum pause time that can be programmed between forward and backwards is 2 seconds.

Cylinder speed is programmed during cycle programming. In this mode, step can be programmed with different values if desired.

Motor Programming Flow Chart



Cycle Programming

Cycle libraries can be created for later use in the wash programming step. When the machine is stopped, press the **START** and **RESET** buttons together. The display is:

No. ?

Using the keypad, type 12 and press **ENTER**. For two seconds, the display shows:

*** EDIT CYCLES ***

The message for choosing the programming cycle is then displayed:

PREWASH = ?

Pressing **INC** or **DEC** will show the other cycle types in succession:

WASH = ?
SPIN = ?
RINSE = ?
UNROLL = ?

When the cycle type you wish to edit is displayed, press **ENTER** to begin creating or editing of the cycle. As an example, we will go through programming a prewash cycle.

PREWASH = ?

Using the numerical keypad, enter the cycle you wish to create or modify. After you have entered the number and pressed **ENTER**, there are two possible cases:

New Cycle Creation

If the cycle you chose does not exits, you will be taken directly into the programming mode. For two seconds, the display will show:

START STEP 1

The display then changes to:

COOLING? NO

You can now define for step 1 whether the cool down feature is activated. If you wish to activate cool down, press **ENTER**, and the display changes to:

COOLING? YES

To implement the cool down phase, five additional parameters must be entered. These are discussed in the next section. If you **do not** wish to activate the cool down phase press **INC.** the display will show:

BALLOAD? NO

You can now define for step 1 whether the load balancing is enabled. Load balancing is essentially a modulated fill. A target temperature can be programmed and the machine will use a combination of the hot water fill valve and the cold water fill valve to maintain a given temperature. If you wish to activate temperature controlled fill, press **ENTER**. The display will change to:

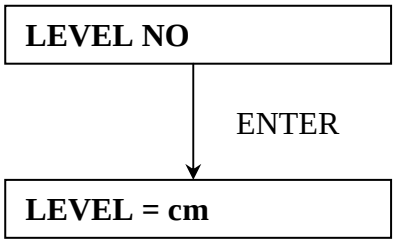
BALLAD? NO

To implement temperature controlled fill, four additional parameters must be entered. These are discussed in the next section. If controlled fill, press **INC.** The display will:

DRAIN? NO

To activate the Drain and end Step 1, press **ENTER**, pressing **INC** or **DEC** will scroll through the other functions to end the step. The step can end with a Drain, a Water Level, a Water Temperature, or an elapsed Time. Selecting on of the functions by pressing **ENTER** changes the display and prompts you to enter a value for the particular function.

EXAMPLE:



Type the required value in using the numerical keypad and press **ENTER**. In the event that you choose a level or a temperature to end the step, you will be prompted with:

WDT = NO

This is the Watch Dog Timer. Press **ENTER** to set the value.

WDT = m

Set the time in minutes, press **ENTER**

WDT = s

Set the time in seconds, press **ENTER.** This timer provides a time in which the temperature or water level you have programmed can be reached. If the level or temperature cannot be reached in the given amount of time, the wash program will continue. Be sure do enter a time that is reasonably longer than the presumed time for filling or heating.

The display now shows:

STORE?

Pressing **STOP** will cancel the programming and abort any parameters you have entered. To save, press **ENTER**. Now the start of a new step will be indicated. For two seconds the display show:

STAET STEP 2

The display then changes to:

COOLING? NO

At this point, you may continue assign steps to the cycle using the same programming sequence as used for step 1. If programming is complete, press **STOP**. the

PREWASH = ?

You may now program another Prewash cycle, or select one of the other cycle types and continue programming. To exit from cycle programming, press **RESET**.

Cool down Phase

The cool down phase allows you to specify a temperature to reach before draining the machine. There are five parameters to be programmed: Minimum Level, Maximum Level, Temperature, WDT, and Motor. The cool down phase operates as follows:

- The water is drained to the minimum level as mentioned above.
- Cold water is then added up to the maximum level as mentioned above, and the temperature is monitored.
- Draining and filling continue until either the temperature is reached, or the WTD (watch dog timer) has expired.

The motor profile chosen is active throughout this step.

Load Balancing / Temperature Controlled Fill

The Load Balancing option is essentially a temperature controlled, or modulated, fill. Cold and Hot water are added to the machine while the temperature and level are monitored. Four parameters **must be** entered: Level, Temperature, WDT, and Motor. The option functions as follows: Cold or Hot water is added to the machine depending upon the temperature set (Hot if the water temperature is lower than programmed or cold if it is higher) until the programmed water level is reached. Then the next step of the cycle can begin. During this phase, the WDT (watch dog timer) is active, which will flag a fault if the fill time is longer than the programmed WDT. The chosen motor routine is active for this entire process.

Heating

Throughout the programming of the steps, when heating is inserted, this tells the control to regulate the temperature. In a step that ends with a required temperature, the heating value **must be** greater than or equal to the step ending temperature. For example, if 50 degrees was set for heating, but 70 degrees was required to end the step, the machine could never reach 70 degrees, causing a fault from the Watch Dog Timer. In cases where the step is ended by time or level, the temperature can

be selected from 30 to 93 degrees C.

Motor

For the motor function, after pressing **ENTER**, you are asked to enter a motor function. When you have confirmed the selection with **ENTER**, the display shows:

RPM =

Enter the desired value and press **ENTER** to confirm. In Prewash, Wash, Rinse, and Unroll, the maximum speed is 100 RPM. Use Programming Code 207 to set maximum Spin RPM.

Programming Sequence for Prewash, Wash, Rinse and Unroll, the programming sequence is as follows:

- » Cooling
- » Load Balanced (Temp Controlled Fill)
- » Drain
- » Cold Water
- » Hot Water
- » Heating
- » Detergent 1
- » Detergent 2
- » Detergent 3
- » Detergent 4
- » Hard Water
- » Relay 16 (Detergent 7)
- » Relay 11 (Aux Fill)
- » Relay 12 (Injection Flush)
- » Relay 13 (Drive Balancing)
- » Motor
- » Relay 17 (Detergent6)
- » Relay 18 (Not used)
- » Relay 19 (Detergent 8)
- » Relay 20 (Aux Drain)
- » Relay 21 (Not Used)
- » Relay 22 (Not Used)
- » Relay 23 (Not Used)
- » Relay 24 (Not Used)

Editing an existing cycle

If the cycle you chose already exists, the display will show:

ALREADY EXISTS!

At this point, four choices are possible:

1. Choose another cycle by pressing **STOP**
2. Access the existing cycle by pressing **ENTER**. In this case, **INC** or **DEC** will display the various segments, and the configuration can be modified by using the **ENTER** and **RESET** keys as described in the previous section.
3. Insert one or more steps. To do so, scroll through the steps by using the **ADVAN** key. The display will show **START** STEP 1 for two seconds, followed by ALREADY EXISTS! To insert a step, press INS and to:

START STEP 1

Followed by:

COOLING? NO

You may now proceed to program the new step using the techniques described earlier. After confirming storage of the new steps, press **STOP**.

Remove one or more of the steps from the existing ones. Proceed by pressing **ADVAN** as describe above in (3). When the message appears after the step you wish to remove,

ALREADY EXISTS!

Press the DEL key. The following message appears:

DELETE?

To confirm deletion of the step, press the **ENTER** key or press **RESET** to cancel the operation. After confirmation, press the **STOP** key to exit.

Each cycle can comprise a maximum of 100steps. A total of 400 steps can be programmed.

Wash Program Creation

When the machine is stopped, press the **START** and **RESET** buttons together. The display is:

No. ?

Using the keypad, type 27 and press **ENTER**. For two seconds, the display shows:

EDIT PROG. No

At this prompt, type the program number you wish to create or edit, followed by the **ENTER** key. Again, two situations are possible:

- The Program does not exist and must be created.
- The Program already exists and can be viewed and modified.

Creating a new Wash Program

The display reads.

NOT FOUND!

For two seconds, then:

C1>?

At this prompt, press **ENTER**. The display changes to:

C1>PREWASH = ?

Using the INC or DEC key, you can select the type of cycle to insert: Prewash, Wash, Spin, Rinse, and Unroll. For example, if you wish to insert a wash cycle you have named 3; press **INC** until the display changes to:

C1>WASH = ?

Confirm the selection by pressing **ENTER**. The display changes to:

C1>WASH = No.

Type 3 on the keypad, the press **ENTER**. Wash 3 is now stored as the first segment of the program. The display will prompt you to enter a second cycle:

C2>?

At this prompt, press **ENTER**. The choice of cycle will be displayed as previously. Programs can be compiled with up to 15 cycles chosen from those in available in the cycles library. The same cycle can be used repeatedly in a wash program. After you are through programming, and have confirmed the last cycle, press **STOP** to terminate programming. The display then shows:

STORE?

Press **ENTER** to store the program. Press **RESET** to cancel and return to the beginning if while programming, you enter a wash cycle that does not exist, the following message will appear.

NOT FOUND!

Since the wash cycle doesn’t exist, you will have to create it before adding it to a wash program.

Editing an Existing Program

In the event the wash program already exists, the display will change to:

ALREADY EXISTS!

For two seconds, followed by the display of the program contents. For example:

C1>RINSE = 1

By using the **INC** or **DEC** keys, the various cycles comprising the wash program can be viewed. The program can be modified, and cycles can be added or deleted.

Deleting a Cycle

Using the INC and DEC keys, find the cycle you wish to delete. While the cycle is displayed, press the delete key, and then press the **STOP** key when the display changes to:

STORE?

Confirm by pressing the **ENTER** key. The cycle in question will be deleted, and the cycles following will be decremented by one.

STORE?

Inserting a Cycle

To insert a cycle, use the **INC** and **DEC** keys to find the cycle that will follow the cycle you are about to insert. The new cycle will be inserted just before the cycle displayed. Now press the **INS** key, the request to enter a new cycle will be displayed:

C->?

Press **ENTER** to confirm that you wish to insert a new cycle:

Cn> PREWASH=?

Use the **INC** and **DEC** keys to reach the required cycle and press **ENTER** to confirm. You will then be asked to enter the cycle number:

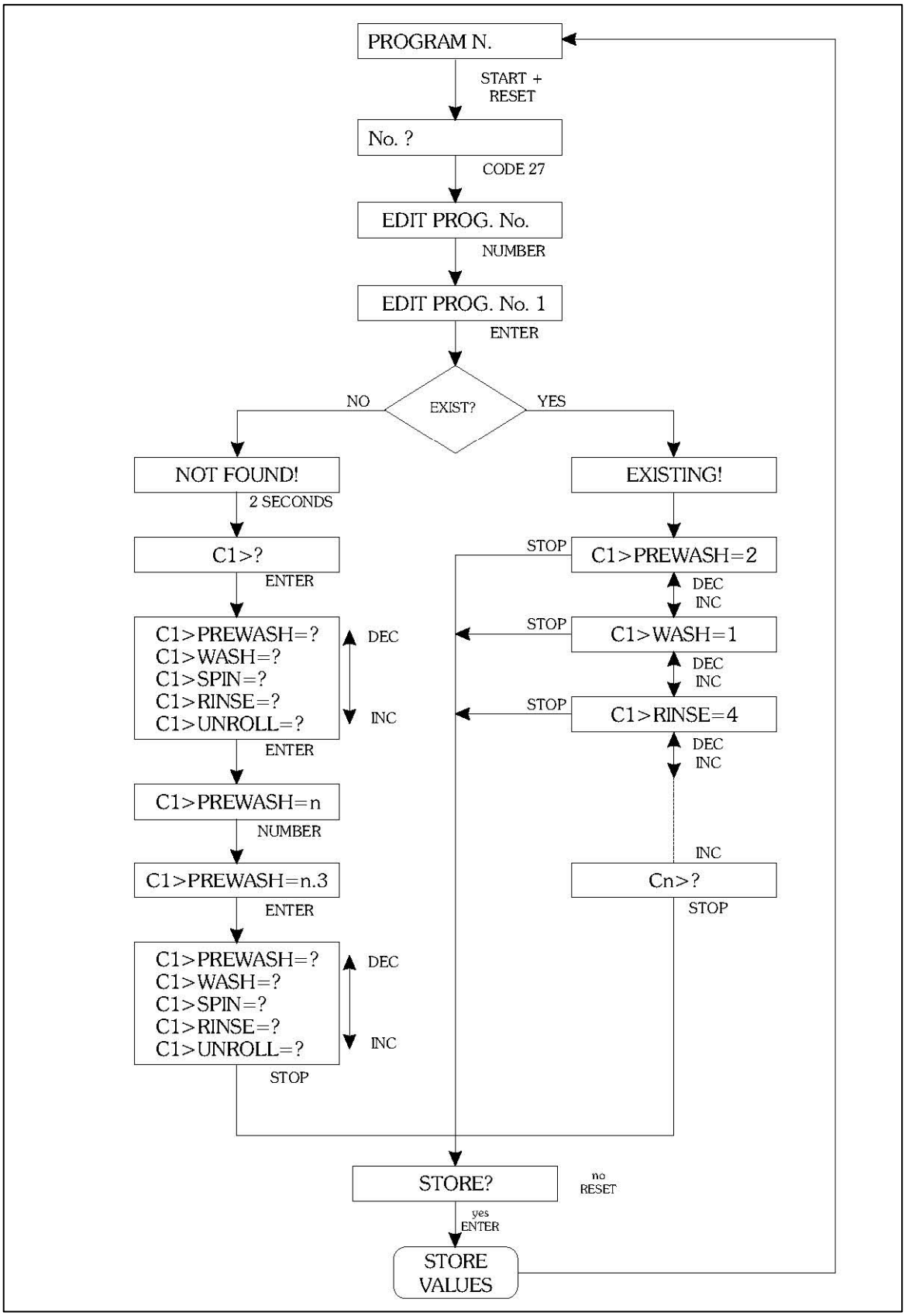
Cn> PREWASH=No.?

After entering the cycle number and pressing the **ENTER** key, you can leave programming by pressing **STOP**. The display changes to:

STORE?

Press the **ENTER** key to store the altered program. All the following cycles will be incremented by one. If you don’t want to change the program, press the **RESET** key rather than the **ENTER** key. This will cancel all modifications made.

Wash Program Creation Continued



After power is applied to the machine, and the internal diagnostics are complete, the machine is ready for a program to be chosen. The display will show:

PROGRAMN._

Using the keypad, type the number of the program you wish to run followed by the **ENTER** key. The display will change to show the fist cycle of the selected program:

PRWH 1 EXECUT.?

Press **START** to execute the program, or **RESET** to return to program selection. While the program is executing, the display shows the current segment of the program, and the ending condition of the segment. See the following examples:

Level

If the end requirement of the segment (cycle) is a particular water level, the display will show:

RINSE1 LVL = cm 12

cm 12 is the actual water level in the machine (12 centimeters). Pressing the **LEVEL** key shows, for 3 seconds, the required value to advance. If **INC** or **DEC** is pressed, you can temporarily modify the value for the current step. Pressing **TEMP** allows you to see the current temperature of the water. Pressing the **TIME** key shows the watch dog timer (WDT) value for the current step.

Temperature

If the end requirement of the segment is a particular temperature, the display will show: where 35C is the actual temperature of the wash solution.

WASH3 TEMP = 35 C

By pressing **TEMP** the display will change, for 3 seconds, show the required step temperature for advance. Pressing **INC** or **DEC** allows modification of the value for the step. Pressing **LEVEL** allows you to see the current water level. Pressing the **TIME** key shows the watch dog timer (WDT) value for the current step.

Time

If the end this case, the display shows: the remaining time left in the step.

RINSET1 T =2m 30s

INC and DEC allow you to add or subtract minutes for the current cycle. TEMP allows you to view the current water temperature, and LEVEL shows the current water level.

NOTE: During heating, fill and drain phases, the WDT (watch dog timer) is activated. If the phase does not complete before the timer expires, an alarm will be displayed indicating that the particular phase did not complete within the maximum time allowed.

Single Step Execution

A single step or cycle of a wash program can be executed. At the main prompt, enter zero for the program number. For two seconds, the display changes to:

SINGLE CYCLE

Then, using the **INC** and **DEC** keys, you may choose the cycle you wish to run (PREWASH, WASH, RINSE, SPIN, UNROLL). When you have selected you cycle, confirm by pressing **ENTER.** The display changes to:

RUN?

Pressing the **START** key will start the machine.

Partial Program

A program can be partially run. After selecting the program you wish to execute, the display will show:

RUN?

Instead of pressing **ENTER** to execute the program, press the **ADVAN** key. The cycles within the program will be displayed incrementally. Choose the point at which you would like to begin, and press the **START** key. The machine will begin operation from this point.

Displaying the Current Program and Step

While the machine is in operation, pressing then **ENTER** key will cause the display to show the current program number and step.

PRG 1 STP 3

Soak

You can insert a pause at any point of the wash program with the exception of distribution and spin. To do so, simply press the **PAUSE** key. The display will begin showing a time, counting up as long as the machine remains paused. Pressing the **START** key will restart the program at the point it was paused. As long as the machine is paused, all other WDT (watch dog timers) are paused as well.

Advance

While any program is running, you can end the current step and advance to the next one by pressing the **ADVAN** key. If the key is pressed during a spin, the spin will be aborted, and the standard spin slow down time will be activated.

Halting a Program

At any time during the execution of the wash program, the running program can be terminated by pressing the **STOP** key.

Water Level Refresh

While a program is running, if the water level drops to a level which is 3 cm. below the target level, cold water will automatically be added to replenish the level.

Unbalance

If, during a spin segment, the load is excessively out of balance, the spin will stop, and a redistribution of the goods will take place. If three consecutive out of balances occur, the machine will end the program. After the first unbalance, the balance indicator will light on the control panel.

Power Failure

If the power fails during execution of a program, and is of less than one second, it is ignored. If the failure is longer than one second, the machine stops. Upon restoration of mains power, the display shows "**RESTART CYCLE?**" and the power failure indicator illuminates on the front panel. If you wish to restart the program at the point in which power failed, press the **START** key. At this point, the program restarts at the point of power failure and the power failure indicator turns off. If you wish to cancel the program, simply press the **RESET** key.

***** This function is not active while a single cycle is running.

End of Program

When a program has completed, the message "**PLEASE WAIT**" is displayed and the buzzer sounds for 40 seconds. Then, if the water level is lower than 3 cm. and the temperature is lower than 40 ºC, the message "**END OF ACTIVITIES**" is displayed and the door may be opened. The buzzer can be silenced by pressing the **RESET** key. If the temperature or water level are out of bounds, the display shows the offending value and the door cannot be opened.

Malfunction Alarms

The state of the water temperature and water levels are constantly monitored to prevent functioning problems with these devices. Watch Dog Timers (WDT) is used to prevent cycle failure when temperatures, fills, drains, and levels don't meet programmed values. In the event of a program fault, the buzzer sounds and the display changes to show the fault:

LEVEL FAULT

Indicates a problem with the level sensing system. This could be a loose or cracked water level tube, the level sensor, or the level sensing circuit. As long as the system detects a problem with the level sensing system, the machine will be inoperable. The buzzer can be disabled with the **RESET** key.

TEMP FAULT

Indicates a problem with the temperature sensing circuitry, temperature probe, or wiring. The machine continues to function, although auxiliary heating (if equipped) is not possible. The Temperature fault indicator on the control panel will be illuminated.

WDT TEMP EXPIRED

Indicates the programmed temperature was not reached within the allotted time. The most common cause is a malfunctioning auxiliary heating system. A short WDT time and very cold water can also cause this problem. Pressing the **START** key will cancel the alarm.

WDT LEVEL EXPIRED

Indicates the programmed level was not reached within the allotted time. The most common causes:

During Fill

- Faulty water inlet
- Low or no water pressure
- Faulty drain valve
- Problem with water level tube Pressing **START** will continue the program, while **RESET** will cancel the program.

During Fill

- Drain valve blocked
- Drain hose blocked
- Faulty Drain valve

Press **RESET** to end the program.

OVERLOADED!

Indicates a fault in the drive system. On inverter driven equipment, indicates a drive fault, on non inverter driven equipment, indicates a motor overload condition. Press **RESET** to clear the fault. If this fault recurs during the next wash program, contact a qualified service technician.

DOOR OPEN!

Indicates the door is not closed properly. This fault disables the machine until cleared, and aborts a program if active. Press **RESET** to clear the fault.

DRAIN

Indicates a water level of greater than 2 cm. an onset of spin. The machine will resume the spin when the level falls below the threshold. Press **RESET** to abort the cycle.

Access Functions

All machine functions are accessed by pressing **START** and **RESET** simultaneously. At the changed prompt, enter the required function.

12 Cycle (segment) Programming

27 Wash Programming

45 Motor rotation programming (agitation profiles).

181 Clears all programs. Will delete anything programmed in memory.

201 Language: 1 – Italian, 2 – English, 3 – German, 4 – Spanish, 5 – French.

205 16 or 24 relay output.

207 Maximum RPM.

209 Temperature hysterisis (1 – 10 degrees C). 3 degrees C is default.

210 Temperature displayed in degrees C.

211 Temperature displayed in degrees F.

212 Maximum water level (10 -100cm).

213 Minimum water level for heating (230cm).

214 Display number of hours in operation.

215 Display total number of programs run.

216 Display number of wash programs run since last maintenance request.

217 Reset maintenance request.

218 Display and set the number of washes between maintenance requests.

219 Coast down safety timer. **DO NOT MODIFY!**

220 Deletes all programs and cycles from memory.

221 Copy from control to the memory card.

222 Copy from memory card to the control (programs and cycles only).

223 Copy from memory card to the control (programs, cycles and parameters).

225 Disables the **ADVANCE** key.

230 Maximum water level allowed during spin **DO NOT MODIFY!**

Maintenance Request

It is possible to set a number of wash programs to execute, following which the machine will call for maintenance:

MAINT. REQ.

The message appears at the start of a program, and is repeated at the beginning of each wash program until reset by a qualified service technician.

Disable the Machine

Function 118

Upon entering this function, the machine will not operate. The power **must be** cycled (turned off, then back on) for the function to activate. Upon power up, the display will show:

!

To re – enable the machine, type 118 at prompt. **START** + **RESET** are not needed.

Change Language

Function 201

The control can display in 5 different languages. To change the language, use function 201. Upon entering the function, the display changes to:

Lingua No.

Type the number which corresponds to your language, followed by **ENTER**:

1. Italian
2. English
3. German
4. Spanish
5. French

16 or 24 Relays

Function 205

Each time function 205 is entered, the controller toggles between 16 and 24 relay setup. After entering 205, the display shows the current mode.

Maximum Spin Speed

Function 201

This function allows you to display or modify the maximum spin speed. Upon entering the function, the display will show the current value. To exit without changing, press **RESET.** If you wish to change the value, press **ENTER**, type the new value, and press **ENTER** again. If the value is within the acceptable range, the display will show **YES.** Otherwise, the display will show **NO.**

Temperature Hysterisis

Function 209

This function sets the allowed temperature variation parameter. The default value is 3 degrees. If you wish to change the value, press **ENTER**, key in the new value (1 – 10 degrees C), then press ENTER again to confirm. To exit without changing, press **RESET.**

Temperature Display

Function 210

Function 211

During program execution, the temperature may be displayed in degrees Fahrenheit or degrees Centigrade. For degrees F, enter function 211. For degrees C, enter function 210. Please note that this is for display only. Programming is always done in degrees C. See the handy conversion chart in the back of this manual.

Maximum Water Level

Function 212

This function allows display and modification of the maximum programmable water level. To change the value, press **ENTER**, type in the new value, and press **ENTER** again to confirm. To

exit without modification, press **RESET.** The allowable values are 11 to 100 cm. Minimum Level for Heat Function 213.

This function sets the minimum allowable water level for heat to activate. Upon entering the function, the value will be displayed. To modify, press **ENTER**. Type the new value, and press ENTER again to confirm.

Hours of Work

Function 214

Entering function 214 displays the total number of hours the machine has operated. The display shows the value for about 3 seconds. Only complete cycles are counted for this timer – partially complete cycles are not counted as part of the total work time.

Total Number of Washes

Function 215

This function shows the total number of wash programs executed since the machine was installed.

Number of Washes since last Maintenance

Function 216

This function shows the total number of wash programs executed since the last required maintenance was performed (set with function 218).

Reset Maintenance Alarm

Function 217

This function resets the maintenance alarm, but does not clear the number of washes counter (function 215).

Maintenance Required

Function 218

This function sets the number of washes before the maintenance alarm is activated. The default value is 450. This means that after 450 wash programs have been completed, the maintenance alarm will be displayed. To change the value, use the **INC** or **DEC** keys. The value changes by 10 each time a key is pressed. You may hold down the key to change the number quickly. Once the desired value is reached, press the **ENTER** key to confirm.

Spin Safety Coast Down Time

Function 219

Upon entering function 219, you display the spin safety coast down time. If you wish to change this (not recommended), press **ENTER**, followed by the new value, then **ENTER** to confirm. To exit without changing the value, press **RESET**

Memory Erasure

Function 181

Function 220

Partial or total clearing of the control memory is possible. Function 220 clears all programs and cycles, but machine parameters are not erased. Function 181 erases all programs and cycles, and also erases all machine parameters, thus reinitializing the control. After keying in the function, the display reads: "**DELETE EEPROM?**" Press **ENTER** to confirm. Press **RESET** to abort the procedure.

Memory Card

Function 222

Function 223

The control allows transfer of programs from and to a credit card sized memory card. This allows great flexibility in programming. The card must be inserted into the control with the contacts facing up. Card insertion and removal must be done with the machine powered down.

Function 221

To transfer programs, cycles and parameters onto the memory card, use function 221.

1. Power down the machine
2. Insert the memory card
3. **START** + **RESET**
4. 221
5. **ENTER** the display now shows "**COPY TO M. CARD?**"
6. Press **ENTER** the display now shows "**COPY TO CARD**" followed by "**COPY OK.**"

Function 222

Function 222 works exactly like function 221, except it transfers programs and cycles from the memory card to the control.

1. Power down the machine
2. Insert the memory card
3. **START** + **RESET**
4. 221
5. **ENTER** the display now shows "**COPY FROM M. CARD?**"
6. Press **ENTER** The display now shows "**COPY FROM CARD**" followed by "**COPY OK.**"

Function 223

Function 223 works exactly like function 222, except it transfers programs, cycles and machine parameters from the memory card to the control.

1. Power down the machine
2. Insert the memory card
3. **START** + **RESET**

4. 221
5. **ENTER** the display now shows "**COPY FROM M.CARD?**"
6. Press **ENTER** The display now shows "**COPY FROM CARD**" followed by "**COPY OK.**"

Disabling the Advance Key

Function 225

This function disables the **ADVAN** key. This function toggles between enabled (**YES**) and disabled (**NO**). Default value is enabled (**YES**).

Maximum Level in Spin

Function 230

This function sets the maximum water level during execution of a spin. If you **do not** wish to modify the value, press **RESET**. If you want to modify the value, press **ENTER**, followed by the new value, then **ENTER** again to confirm. Allowed values are from 2 to 60 cm.

Software Version

STOP + RESET

Pressing the **STOP** and **RESET** keys simultaneously displays the installed firmware version.

Cylinder Speed INS

Pressing the **INS** key during execution of a wash program displays the commanded wash cylinder speed in RPM.

Metric Conversions

Fahrenheit to Centigrade

F	C		F	C		F	C
86	30		129.2	54		172.4	78
87.8	31		131	55		174.2	79
89.6	32		132.8	56		176	80
91.4	33		134.6	57		177.8	81
93.2	34		136.4	58		179.6	82
95	35		138.2	59		181.4	83
96.8	36		140	60		183.2	84
98.6	37		141.8	61		185	85
100.4	38		143.6	62		186.8	86
102.2	39		145.4	63		188.6	87
104	40		147.2	64		190.4	88
105.8	41		149	65		192.2	89
107.6	42		150.8	66		194	90
109.4	43		152.6	67		195.8	91
111.2	44		154.4	68		197.6	92
113	45		156.2	69		199.4	93
114.8	46		158	70		201.2	94
116.6	47		159.8	71		203	95
118.4	48		161.6	72		204.8	96
120.2	49		163.4	73		206.6	97
122	50		165.2	74		208.4	98
123.8	51		167	75		210.2	99
125.6	52		168.8	76		212	100
127.4	53		170.6	77			

Centimeters to Inches

cm	in		cm	in		cm	in		cm	in		cm	in
1	0.39		21	8.27		41	16.14		61	24.02		81	31.89
2	0.79		22	8.66		42	16.54		62	24.41		82	32.28
3	1.18		23	9.06		43	16.93		63	24.8		83	32.68
4	1.57		24	9.45		44	17.32		64	25.2		84	33.07
5	1.97		25	9.84		45	17.72		65	25.59		85	33.46
6	2.36		26	10.24		46	18.11		66	25.98		86	33.86
7	2.76		27	10.63		47	18.5		67	26.38		87	34.25
8	3.15		28	11.02		48	18.9		68	26.77		88	34.65
9	3.54		29	11.42		49	19.29		69	27.17		89	35.04
10	3.94		30	11.81		50	19.69		70	27.56		90	35.43
11	4.33		31	12.2		51	20.08		71	27.95		91	35.83
12	4.72		32	12.6		52	20.47		72	28.35		92	36.22
13	5.12		33	12.99		53	20.87		73	28.74		93	36.61
14	5.51		34	13.39		54	21.26		74	29.13		94	37.01
15	5.91		35	13.78		55	21.65		75	29.53		95	37.4
16	6.3		36	14.17		56	22.05		76	29.92		96	37.8
17	6.69		37	14.57		57	22.44		77	30.31		97	38.19
18	7.09		38	14.96		58	22.83		78	30.71		98	38.58
19	7.48		39	15.35		59	23.23		79	31.1		99	38.98
20	7.87		40	15.75		60	23.62		80	31.5		100	39.37

Blank Programming Chart

Prewash:		Wash:		Rinse:		Spin:		Unroll:	

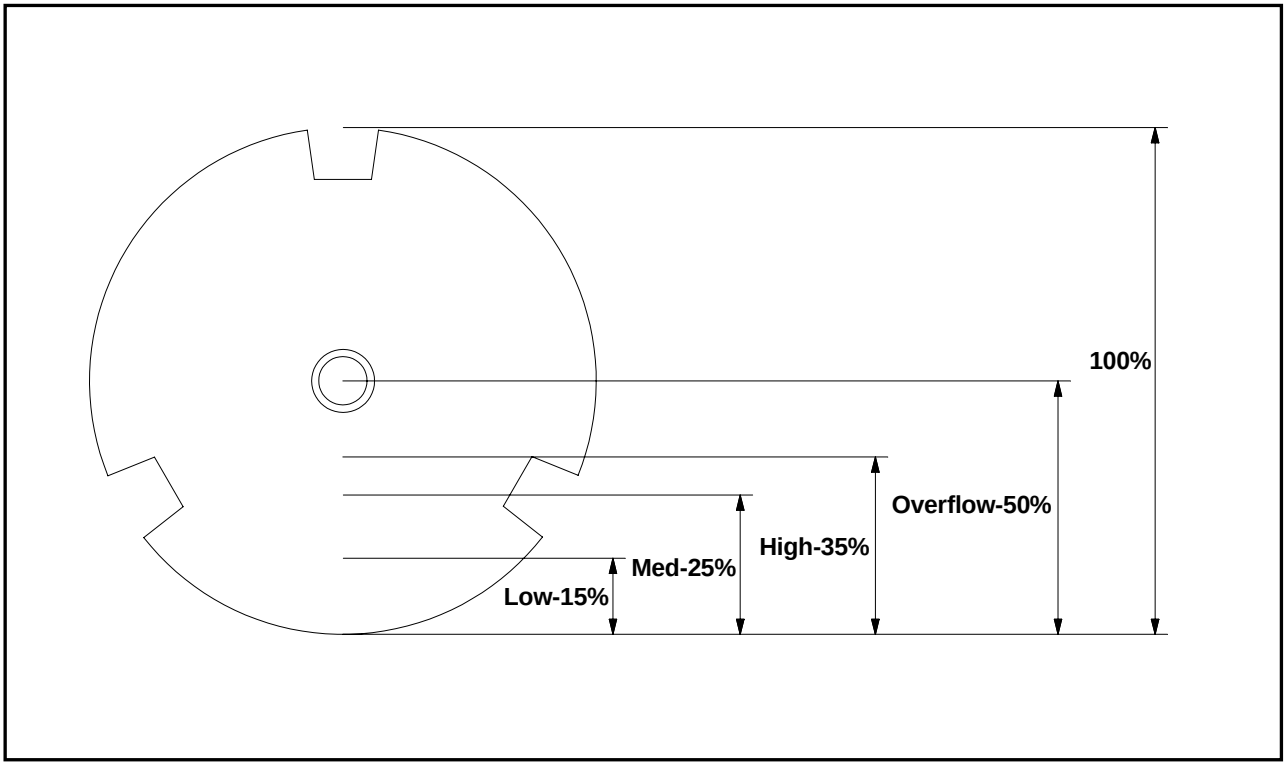
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Function																						
Cooling																						
Temp Cont Fill																						
Drain																						
Cold Water																						
Hot Water																						
Heating																						
Detergent 1																						
Detergent 2																						
Detergent 3																						
Detergent 4																						
Detergent 5																						
Relay 16																						
Aux Fill																						
Injection Flush																						
Balancing																						
Motor Profile																						
Speed RPM																						
Detergent 6																						
Detergent 7																						
Detergent 8																						
Aux Drain																						
Relay 21																						
Relay 22																						
Relay 23																						
Relay 24																						
End Step																						
Level cm																						
Temp C																						

Cooling		Temperature Controlled Fill		Heating	
Level min	cm=	Level	cm=	Temperature	C=
Level max	cm=	Temperature	C=		
Temperature	C=	WDT m:s	:		
WDT m:s	:				

Notes:

Water Level Guide

Machine	Cylinder Dia	Offset	Low-15%		Med – 25%		High – 35%	
SP-40	0.680 m	6 cm	16 cm	6.4 in	23 cm	9.1 in	30 cm	11.7 in
SP-60	0.790 m	6 cm	18 cm	7.0 in	26 cm	10.1 in	34 cm	13.2 in
SP-100	0.940 m	6 cm	20 cm	7.9 in	30 cm	11.6 in	39 cm	15.3 in
SI-110	0.940 m	10 cm	24 cm	9.5 in	34 cm	13.2 in	43 cm	16.9 in
SI-135	1.092 m	10 cm	26 cm	10.4 in	37 cm	14.7 in	48 cm	19.0 in
SI-200	1.169 m	10 cm	28 cm	10.8 in	39 cm	15.4 in	51 cm	20.0 in
SI-275	1.321 m	10 cm	30 cm	11.7 in	43 cm	16.9 in	56 cm	22.1 in
SI-300	1.321 m	10 cm	30 cm	11.7 in	43 cm	16.9 in	56 cm	22.1 in
SA-475	1.629 m	10 cm	34 cm	13.6 in	51 cm	20.0 in	67 cm	26.4 in
HI-85	0.914 m	10 cm	24 cm	9.3 in	33 cm	12.9 in	42 cm	16.5 in
HI-125	1.060 m	10 cm	26 cm	10.2 in	37 cm	14.4 in	47 cm	18.5 in



WC03 PROGRAM SPEEDS IN RPM FROM G-FORCE POINTS

C. Oswald 01/26/05, rev. C

Machine	Cylinder Dia	0.4 G	0.8 G	1.0 G	1.5 G	3.0 G	50 G	150 G	320 G	350 G
HE-30	0.612 m	34.2	48.4	54.1	66.2	93.7	382.4	662.4	967.5	1011.8
SP/HP/HE-40	0.680 m	32.4	45.9	51.3	62.8	88.9	362.8	628.4	917.5	959.9
SP/HP/HE-60	0.790 m	30.1	42.6	47.6	58.3	82.4	336.6	583.0	851.5	890.6
HE-80	0.924 m	27.8	39.4	44.0	53.9	76.2	311.2	539.1	797.4	823.4
SP/HP-100	0.940 m	27.6	39.0	43.6	53.4	75.6	308.6	534.5	780.6	816.4
SI-110	0.940 m	27.6	39.0	43.6	53.4	75.6	308.6	534.5	780.6	816.4
SI-135	1.092 m	25.6	36.2	40.5	49.6	70.1	286.3	495.9	724.3	757.5
SI-200	1.169 m	24.7	35.0	39.1	47.9	67.8	276.7	479.3	700.0	732.1
SI-275	1.321 m	23.3	32.9	36.8	45.1	63.8	260.3	450.9	658.5	688.7
SI-300	1.321 m	23.3	32.9	36.8	45.1	63.8	260.3	450.9	658.5	688.7
SA-475	1.629 m	21.0	29.6	33.1	40.6	57.4	234.4	406.0	593.0	620.2

EXTRAC RPM TO G – FORCE

Machine	Cylinder Dia	50 G	75 G	100 G	125 G	150 G	175 G	200 G	225 G	250 G
HE-30	0.612 m	382.4	468.4	540.8	604.7	662.4	715.5	764.9	811.2	855.1
SP/HP/HE-40	0.680 m	362.8	444.3	513.1	573.6	628.4	678.7	725.6	769.6	811.2
SP/HP/HE-60	0.790 m	336.6	412.2	476.0	532.2	583.0	629.7	673.2	714.0	752.7
HE-80	0.924 m	311.2	381.2	440.2	492.1	539.1	582.3	622.5	660.2	695.9
SP/HP-100	0.940 m	308.6	377.9	436.4	487.9	534.5	577.3	617.1	654.6	690.0
SI-110	0.940 m	308.6	377.9	436.4	487.9	534.5	577.3	617.1	654.6	690.0
SI-135	1.092 m	286.3	350.6	404.9	452.7	495.9	535.6	572.6	607.3	640.2
SI-200	1.169 m	276.7	338.9	391.3	437.5	479.3	517.7	553.4	587.0	618.7
SI-275	1.321 m	260.3	318.8	368.1	411.6	450.9	487.0	520.6	552.2	582.0
SI-300	1.321 m	260.3	318.8	368.1	411.6	450.9	487.0	520.6	552.2	582.0
SA-475	1.629 m	234.4	287.1	331.5	370.6	406.0	438.5	468.8	497.2	524.1

Machine	Cylinder Dia	275 G	300 G	325 G	350 G
HE-30	0.612 m	896.9	936.7	975.0	1011.8
SP/HP/HE-40	0.680 m	850.8	888.7	925.0	959.9
SP/HP/HE-60	0.790 m	789.4	824.5	858.2	890.6
HE-80	0.924 m	729.9	762.4	793.5	823.4
SP/HP-100	0.940 m	723.7	755.8	786.7	816.4
SI-110	0.940 m	723.7	755.8	786.7	816.4
SI-135	1.092 m	671.4	701.3	729.9	757.5
SI-200	1.169 m	648.9	677.8	705.5	732.1
SI-275	1.321 m	610.5	637.6	663.6	688.7
SI-300	1.321 m	610.5	637.6	663.6	688.7
SA-475	1.629 m	549.7	574.2	597.6	620.2

SECTION 5

MAINTENANCE

A. THE MACHINE MAINTENANCE

Routine Maintenance

Routine maintenance maximizes operating efficiency and minimizes downtime. The maintenance procedures described below will prolong the life of the machine and help prevent accidents.

Daily, weekly, monthly, and quarterly checklists are provided at the end of this section. Laminate the checklists to preserve them for repeated copying. Operators and technicians are encouraged to add checks specific to their machine's particular application. When possible, space is provided on the checklists for this purpose.

The following maintenance procedures **must be** performed regularly at the required intervals.

Install all panels that are removed to perform service and maintenance procedures. **Do not** operate the machine with missing guards or with broken or missing parts. **Do not** bypass any safety devices!

Daily

1. Inspect water inlet valve hose connections on the back of the machine for leaks.
2. Inspect steam hose connections for leaks, where applicable.
3. Verify that insulation is intact on all external wires and that all connections are secured. If bare wire is evident, call a service technician.
4. Check door interlock before starting operation:
    a. Attempt to start the washer with the door open. The washer **should not** start with the door open.
    b. Close the door without locking it and attempt to start the machine. The machine **should not** start with the door open.
    c. Close and lock the door and start a cycle. Attempt to open the door while the cycle is in progress. The door **should not** open. If manual latch is moved out of position the machine should stop.

    If the door lock and interlock are not functioning properly, call a service technician.

End of the day

1. Clean the door gasket of residual detergent and foreign matters.
2. Clean the automatic supply dispenser and the lid inside and out with mild detergent. Rinse with clean water.
3. Clean the washer's top, front and side panels with mild detergent. Rinse with clean water.
4. Leave loading door open at the end of each day to allow moisture to evaporate.

NOTE: Leave loading door open at end of each complete cycle to allow moisture to evaporate. Unload the machine promptly after each completed cycle to prevent moisture build up.

Weekly

1. Check the machine for leaks.
   a. Start an unloaded cycle to fill the machine.
   b. Verify that door and door gaskets do not leak.
   c. Verify that the drain valve is operating. If water does not leak or during the prewash segment, drain valve is closed and functioning properly.
2. Clean the AC drive box air filters.
   a. Snap off the external plastic cover which contains the filter. Remove the foam filter from the cover.
   b. Wash the filter in a mild soap solution or vacuum it clean.

Monthly

NOTE: Disconnect power to the machine at its source before performing the monthly maintenance procedures.

1. Each month or after every 200 hours of operation, lubricate bearing and seals. See instructions on the machine.
   a. Use premium grade lithium based #2 grease, Never mix two types of grease, such as petroleum and silicone.
   b. Pump the grease gun slowly, permitting only the following number of strokes. **Do not** pump the grease gun if grease comes out of the bearing housing. This can result in over lubrication, causing damage to bearings and seals.
2. If the machine is provided with automatic lubricators, check that they are injecting grease. Normally they last for approximately one year. Mark new lubricators with installation date.
3. Clean the AC drive fins:
   a. Remove the AC drive box cover.
   b. Blow the fins clean using compressed air at a pressure of 60 – 90 psi (4 - 6 bar) or by using canned compressed air. Use care to avoid damaging cooling fan or other components.

NOTE: No amount of visible foreign matter **should be** allowed to accumulate on fins or the finger guard.

4. Use the following procedures to determine if v-belts require replacement or adjustment. Call a qualified service technician in either case.
   8. Check V – belts for uneven wear and frayed edges.
   b. After disconnecting power to the machine and removing all panels necessary for access to the drive belts, use the following method to verify that the V – belts are properly tensioned. Belt tensioning is straight forward, and accomplished by loosening the tension

adjusting bolts and adjusting the belts to the proper tension. Then the bolts **should be** tightened. See figure.

c. Verify that V – belts are properly aligned by checking pulley alignment. Place a straight edge across both pulley faces. The straight edge should make contact with pulleys in four places. See figure.

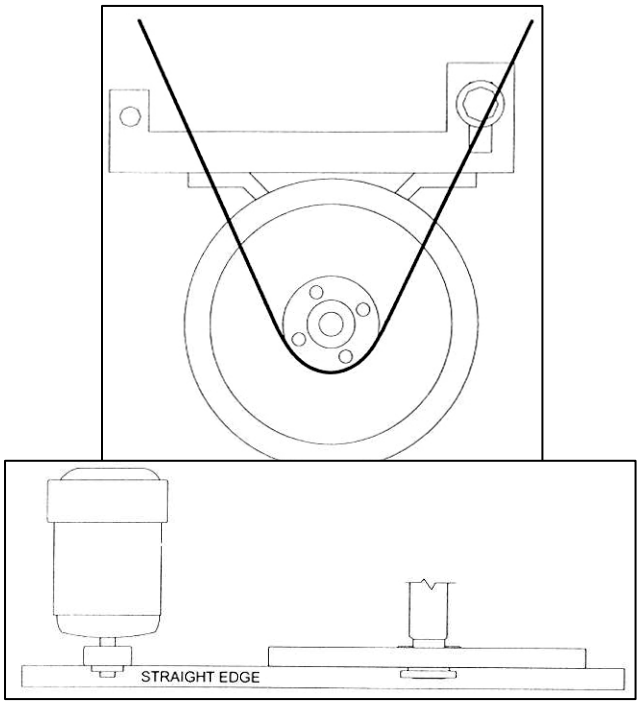


Figure.5-1 Straight edge the V – belt

5. Remove back panel and check overflow hose and drain hose for leaks.
6. Unlock the hinged lid and check the supply dispenser hoses and hose connections.
7. Clean inlet hose filter screen:
   a. Turn water off and allow valve to cool, if necessary.
   b. Unscrew inlet hose and remove filter screen.
   c. Clean with compressed air and reinstall. Replace if worn or damage.
8. Tighten motor mounting bolt lock nuts and bearing bolt lock nuts, if necessary.
9. Use compressed air to clean lint from motor.
10. Clean external water and steam filters.

Quarterly

NOTE: Disconnect power to the machine before performing the quarterly maintenance procedures.

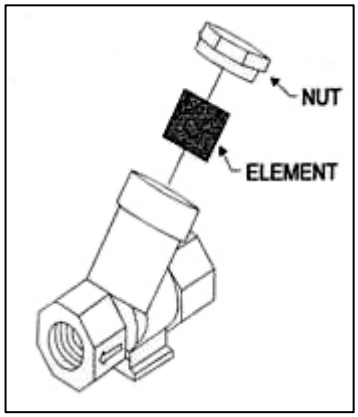
1. Tighten door hinges and fasteners, if necessary.
2. Tighten anchor bolts, if necessary.
3. Check all painted surfaces for bare metal (matching paint is available from the manufacturer.)

a. If bare metal is showing, paint with primer or solvent – based paint.

b. If rust appears, remove it with sandpaper or chemical means. Then paint with primer or solvent-based paint.

4. Clean steam filter, where applicable. See picture of steam filter.

   1. Turn off steam supply and allow time for the value to cool if necessary.
   2. Unscrew nut.
   3. Remove element and clean.
   4. Replace element and nut.



Care of stainless steel

Maintain the natural beauty of stainless steel and prolong its service lift by following these steps.

1. Ordinary deposits if dirt and grease can be remove with detergent and water. The metal **should be** thoroughly rinsed and dried after washing. Periodic cleaning will help to maintain the bright surface appearance and prevent corrosion.
2. Contact with dissimilar metal **should be** avoided whenever possible. This will help prevent galvanic corrosion when salty or acidic solutions are present.
3. Salty or acidic solutions **should not be** allowed to evaporate and dry on stainless steel. They may cause corrosion. Ensure that the stainless steel is wiped clean of acidic solution residues.
4. Deposits that adhere to the stainless steel should be removed, especially from crevices and corners. When using abrasive cleaners, always rub in the direction of the polish lines or grain of the stainless steel to avoid scratch marks. Never use ordinary steel wool or steel brushes on the stainless steel. Use stainless steel wool or soft non-metal bristle brushes.
5. If the stainless appears to be rusting the source of the rust may actually be an iron or steel part not made of stainless steel, such as a nail or screw. One remedy is to paint all carbon steel parts with a heavy protective coating. Stainless steel fasteners should be used when possible.
6. Discoloration or heat tint from overheating may be removed by scouring with powder or by employing special chemical solutions.
7. Sanitizes or sterilizing solution **should not be** left in stainless steel equipment for prolonged periods of time. They often contain chlorine, which may cause corrosion. The stainless steel **should be** cleaned and rinsed thoroughly of any solution containing chlorine.
8. When an external chemical supply system is used, make certain that no siphoning of chemicals occurs when the washer – extractor is not in use. Highly concentrated chemicals can cause severe damage to stainless steel and other components within the machine. Damage of this

kind is not covered by the manufacturer warranty. Locate the pump below the washer's injection point to prevent siphoning of chemicals into the machine.

B. THE AC DRIVE MAINTENANCE

Perform daily and periodic inspection to avoid trouble and keep reliable operation for a long time. Take care of the following during work.

WARNING

The electric charge in the DC bus capacitor may be being charged even after the power is turned off. Therefore, it may take a long time until the DC link circuit voltage reaches a safety potential. **Do not** open the control circuit terminal block cover within 5 minutes after the power has been turned off. Then remove the control circuit and main circuit terminal block covers. Check that the DC link circuit voltage between main circuit terminals P (+) and N (-) does not exceed the safety voltage (+25 VDC) with a multimeter and start the maintenance and inspection.

Electric shock may occur.

- Maintenance, inspection, and parts replacement **should be** made only by authorized persons.
- Take off the watch, rings and other metallic matter before starting work.
- Uses insulate tools.
- Never remodel

Daily Inspection

Visually inspect errors in the state of operation from the outside without removing the covers while the inverter operates or while it is turned on.

- Check if the expected performance (satisfying the standard specification) is obtained.
- Check if the surrounding environment satisfies "Operating Environment".
- Check that the LED monitor displays normally.
- Check for abnormal noise, odor, or excessive vibration.
- Checks for traces of overheat discoloration and other defects.

Judgment of service life using maintenance information

Menu #5 "Maintenance information" in Programming mode can be used to display data for the judgment of replacement of "DC bus capacitor," "electrolytic capacitor on the printed circuit board" and "cooling fan" as a guide.

If the replacement data is out of the judgment level for early warning, an early warning signal is output to an external device through terminal (Y1) (function code E20). (When any replacement data is out of the judgment level, terminal (Y1) outputs ON signal.)

Table 5-1 Parts Replacement Judgment with Menu #5 “Maintenance Information”

Parts to be replaced	Judgement level
DC bus capacitor	85% or lower of the capacitance than that of the factory setting
Electrolytic capacitor on the printed circuit board.	61,000 hours or longer as accumulated run time
Cooling fan (Applicable motor rating: 1.5 to 3.7 kW).	61,000 hours or longer as accumulated run time (Assumed life of cooling fan at ambient inverter temperature of 40ºC).

1. DC bus capacitor

Measure the capacitance of the DC bus capacitor as follows:

The capacitance is displayed in the reduction ratio (%) of the initial value written in the inverter memory before shipment.

Capacitance measurement procedure

1. Remove the RS485 communications card (option) from the inverter if it is mounted. Disconnect the DC bus link circuit to other inverters from terminals P (+) and N (-) of the main circuit if any. A DC reactor (option) and braking resistor (option) may not be disconnected. Keep the ambient temperature at 25 $\pm$ 10 °C.
2. Turn off the digital inputs (FWD, REV, and X1 to X3) at the control terminals.
   - If an external potentiometer is connected, to terminal (13), remove it.
   - Set the data of function codes E20 and E27 as the transistor output (Y1) or relay output (30A, B, C) does not come on while the inverter power is turned off. E.g. recommended settings are to assign normal logic signal (RUN) and (ALM) to terminals (Y1) and (30A, B, C,) respectively.
3. Turn the inverter power on.
4. Check that the cooling fan rotates and the inverter is on halt.
5. Turn the main power supply off. Start measuring the capacitance of the DC bus capacitor.
6. After the LED monitor is unlit completely, turn the main power supply on again.
7. Select Menu #5 “Maintenance Information” in Programming mode, and check the reduction ratio (%) of the capacitance of the DC bus capacitor.

2. Electrolytic capacitor on the printed circuit board

The inverter keeps an accumulative total of the number of hours that power has been applied to the control circuit and displays it on the LED monitor. Use this to determine when the capacitor **should be** replaced. The display is in units of 1000 hours.

3. Cooling fan

The inverter accumulates hours for which the cooling fan has run. The display is in units of 1000 hours.

The accumulated time **should be** used just a guide since the actual service life will be significantly affected by the temperature and operation environment.

SECTION 6

DECOMMISSIONING

In the event that the machine **must be** decommissioned, follow the following steps:

1. Remove the chemical injection supply system, if applicable.
   a. Have a qualified electrician disconnect power to the chemical infection supply system and the re – circulation pump at their source.
   b. Using the manufacturer's instructions, carefully remove the chemical injection supply system from the machine. Make certain that no chemicals come in contact with or clothing.
2. Clean interior of machine, both basket and shell.
   a. Flush supply dispenser with water.
   b. Run a short rinse cycle to clean chemical residues from the interior of the machine.
3. Disconnect electrical power.
   a. Shut of main power supply at the breaker box or main control panel.
   b. **Do not** attempt to disconnect power supply wires from power supply. Have a qualified electrician disconnect power to machine at is source.
4. Disconnect hoses.
   a. Disconnect drain hose from sump, gutter or drain.
   b. Turn off water supply. Disconnect individual hot and cold water inlet hoses from the machine.
   c. Disconnect the compressed air supply to the machine.
   d. Allow time for residual water in the machine to drain. Then disconnects drain hoses from the machine.
   e. Disconnect necessary plumbing on the re-circulation system, if applicable.
5. Disconnect steam hoses, if applicable
   a. Turn off steam supply and allow time for the valve to cool.
   b. Disconnect steam hose from machine.
6. Remove the machine from its foundation pad.
   a. Keep all panels in place to provide stability when moving the machine.
   b. Verify that door is closed and secure.
   c. Loosen and remove anchor bolts holding the machine base to the floor.
   d. Break the grout seal at each corner of the machine, using a crowbar.
   e. Place the machine on skid and bolt the frame to the skid. This will facilitate the removal of the machine, on to a truck.
7. Recycle.

The manufacturer uses the highest quality material in their products so that those materials may be recycled at the end of the product's service life.

SECTION 7

TROUBLE SHOOTING

Before Proceeding with Troubleshooting

WARNING

If any of the protective functions have been activated, first remove the cause. Then, after checking that the all run commands are set to off, reset the alarm. Note that if the alarm is reset while any run commands are set to on, the inverter any supply the power to the motor which may cause the motor to rotate.

Injury may occur.

- Even though the inverter has interrupted power to the motor, if the voltage is applied to the main circuit power input terminals L1/R, L2/S and L3/T (L1/L and L2/N for single – phase voltage input), voltage may be output to inverter output terminals U, V, and W.

- Some electric charge may remain in the DC bus capacitor even after the power is turned off. Therefore, it may take some time until the DC link circuit voltage reaches a safe level. Before touching the circuit, wait for at least five minutes after the power has been turned off and check that the DC voltage between main circuit terminals P (+) and N (-) is less than +25 VDC using a multimeter.

Electric shock may occur.

Follow the procedure below to solve problems.

1. First, check that the inverter is correctly wired, referring "Wiring for Main Circuit Terminals and Grounding Terminals"
2. Check whether an alarm code is displayed on the LED monitor.
   - If no alarm code appears on the LED monitor
   - If an alarm code appears on the LED monitor

If any problems persist after the above recovery procedure, contact the shop where you bought the inverter or your local Fuji branch office.

Quick reference table of alarm codes

Alarm code	Name	Refer to
OC1	Over current protection	**P.7-9**
OC2		
OC3		
OU1	Over voltage protection	**P.7-10**
OU2		
OU3		
LU	Under voltage protection	**P.7-10**
L in	Input phase loss protection	**P.7-11**
OPL	Output phase loss protection	**P.7-12**
OH1	Overheat protection for heat sink	**P.7-12**
OH2	External alarm input	**P.7-13**
OH4	PTC thermister for motor protection	**P.7-13**
dbH	Overheat protection for braking resistor	**P.7-14**
OL1	Electronic thermal overload relay	**P.7-14**
OLU	Overload protection	**P.7-15**
Er1	Memory error	**P.7-15**
Er2	Remote keypad communications error	**P.7-16**
Er3	CPU error	**P.7-16**
Er6	Operation protection	**P.7-17**
Er8	RS485 communications error	**P.7-17**
ErF	Data save error during under voltage	**P.7-18**

If no alarm code appears on the LED monitor

Motor is running abnormally

1. The motor does not rotate.

Possible Causes	What to Check and Suggested Measures
1. No power supplied to the inverter.	Check the input voltage, output voltage and inter phase voltage unbalance. → Turn on a molded case circuit breaker, an earth leakage circuit breaker (with the exception of those exclusively designed for protection from ground faults) or a magnetic contactor. → Check for voltage drop, phase loss, poor connections, or poor contacts, and fix them if necessary.
2. No forward / reverse operation command was inputted, or both the commands were inputted simultaneously (external signal operation).	Check the input status of the forward / reverse command with Menu #4 "I/O checking" using the keypad. → Input a run command. → Set either the forward or reverse operation command to off if both commands are being inputted. → Correct the assignment of commands (FWD) and (REV) to function codes E98 and E99. → Connect the external circuit wires to control circuit terminals (FWD) and (REV) correctly.
3. No indication of rotation direction (keypad operation).	Check the input status of the forward/reverse rotation direction command with Menu #4 "I/O Checking" using the keypad. → Input the rotation direction (F02=0), or select the keypad operation with which the rotation direction is fixed (F02=2 or 3)
4. The inverter could not accept any run commands from the keypad since it was not in running mode.	Check which operation mode the inverter is in, using the keypad. → Shift the operation mode to Running mode.
5. A run command with higher priority than the one attempted was active and the run command was stopped.	While referring to the block diagram of the drive command generator* check the higher priority run command with Menu #2 "Data checking" and Menu #4 "I/O checking" using the keypad. *Refer to the FRENIC – Mini User's Manual (MEH446). → Correct any incorrect function code data settings (e.g., cancel the higher priority run command).
6. The set frequency was set to the same or lower than the value of the starting or stop frequency.	Check that a frequency command has been entered, with Menu #4 "I/O checking" using the keypad. → Set the value of the set frequency to the same of higher than that of the starting or stop frequency (F23 or F25). → Reconsider the starting and stop frequencies (F23 and F25), and if necessary, change them to lower values. → Inspect the frequency command devices, signal converters, switches or relay contacts. Replace any ones that are faulty. → Connect the external circuit wires correctly to terminals (13), (12), (11) and (C1).

Possible Causes	What to Check and Suggested Measures
7. A frequency command with higher priority than the one attempted was active.	Check the higher priority run command with Menu #2 "Data checking" and Menu # 4 "I/O checking" using the keypad, referring to the block diagram of the drive command generator. *Refer the FRENIC – Mini User's Manual (MEH446). → Correct any incorrect function code data settings (e.g. cancel the higher priority run command).
8. The peak and bottom frequencies for the frequency limiters were set incorrectly.	Check the data of function codes F15 and F16. → Change the peak and bottom frequencies (F15 and F16) the correct ones.
9. The coast – to – stop command was effective.	Check the data of function codes E01, E02, E03, E98 and E99 with Menu #2 "Data Checking" and the input signal status with Menu #4 "I/O checking" using the keypad. → Release the coast – to – stop command setting.
10. Broken wire, incorrect connection or poor contact with the motor.	Check if the output current and connection are correct. → Repair the wires to the motor, or replace them.
11. Overload	Check that the output current is not too large. → Lighten the load (e.g. operate the mechanical brake correctly).
12. Torque generated by the motor was insufficient.	Check that the motor starts running if the value of torque boost (F09) is increased. → Increase the value of torque boost (F09) and try to run the motor
	Check the data of function codes F04, F05, H50, and H51. → Change the V/f pattern to match the motor's characteristics.

2. The motor rotates, but the speed does not increase.

Possible Causes	What to Check and Suggested Measures
1. The maximum frequency was set to too low a value.	Check the data of function code F03. → Correct the data of the maximum frequency (F03).
2. The peak frequency of the frequency limiter was set to too low a value.	Check the data of function code F15. → Correct the data of the peak frequency of the frequency limiter (F15).
3. The set frequency was set to too low a value.	Check the signals for the set frequency from the control circuit terminals with Menu #4 "I/O checking" using the keypad. → Increase the set frequency. → If an external potentiometer for frequency command, signal converter, switches, or relay contacts are malfunctioning, replace them. → Connect the external circuit wires to terminals (13), (12), (11), and (C1) correctly.

Possible Causes	What to Check and Suggested Measures
4. A frequency command with higher priority than the one attempted (e.g. multistep frequency, communications or jogging operation, etc.) was active and the set frequency was set to too low a value.	Check the higher priority run command with Menu #2 "Data checking" and Menu #4 "I/O checking" using the keypad, referring to the block diagram of the drive command generator. *Refer to the FRENIC – Mini User's Manual (MEH446). → Correct any incorrect function code data settings (e.g., cancel the higher priority run command, etc).
5. The acceleration / deceleration time was too long.	Check the data of function code F07, F08, E10, E11 and H54. → Change the acceleration / deceleration time to match the load.
6. Overload	Measure the output current. → Lighten the load (e.g., operate the mechanical brake correctly).
7. The current limiting operation did not increase the output frequency.	Check whether current limiting is active or not with Menu #3 "Drive monitoring" and check the current limiting level (F44) using the keypad. → Change the level of the current limiting (F44) to an appropriate value. Decrease the value of torque boost (F09), then turn the power off and back on again and check if the speed increases. → Adjust the value of the torque boost (F09). Check the data of function codes F04, F05, H50, and H51 to ensure that the V/f pattern is right. → Match the V/f pattern values with the motor ratings.
8. Bias and grain set incorrectly.	Check the data of function codes F18, C50, C32, C34, C37 and C39 → Change the bias and gain to correct values.

3. The motor runs in the opposite direction to the command.

Possible Causes	What to Check and Suggested Measures
1. Wiring had been connected to the motor incorrectly	Check the wiring to the motor. → Connect terminals U, V, and W of the inverter to the respective U, V, and W terminals of the motor.
2. Incorrect connection and settings for run commands and rotation direction command (FWD) and (REV)	Check the data of function codes E98 and E99 and the connection to terminals (FWD) and (REV). → Correct the data of the function codes and the connection.
3. The setting for the rotation direction via keypad operation is incorrect.	Check the data of function code F02. → Change the data of function code F02 to 2 (forward rotation) or 3 (reverse rotation).

4. If the speed variation and current vibration (such as hunting) occur at the regular speed.

Possible Causes	What to Check and Suggested Measures
1. The frequency command fluctuated.	Check the signals for the frequency command with Menu #4 "I/O checking" using the keypad. → Increase the filter constants (C33 and C38) for the frequency command.
2. The external frequency command device was used.	Check that there is no noise in the control signal wires from external sources. → Isolate the control signal wires from the main circuit wires as far as possible. → Use shielded or twisted wires for the control signal.
3. The slip compensation gain was too large.	Check that the motor vibration is absorbed if the slip compensation (P09) is cancelled. → Correct or cancel the slip compensation (P09) data.
4. The vibration system having low stiffness in a load caused hunting or the current is irregular due to special motor constants.	Cancel the automatic control system (automatic torque boost, slip compensation, energy saving operation, overload prevention control, current limiting) and check that the motor vibration is suppressed (F37, P09, H70, and F43). → Cancel the functions causing the vibration. → Readjust the data of the oscillation suppression gain (H80) currently set. Check that the motor vibration is suppressed if you decrease the carrier frequency (F26) or set the sound tune to level 0 (F27=0). → Decrease the carrier frequency (F26) or set the sound tune level 0 (F27=0).

5. If grating sound can be hard

Possible Causes	What to Check and Suggested Measures
1. The carrier frequency was set too low.	Check the data of function codes F26 and F27. → Increase the carrier frequency (F26). → Select the optimal value to the selection function (F27).

6. If grating sound can be hard

Possible Causes	What to Check and Suggested Measures
1. The inverter ran the motor by S – curve or curvilinear pattern.	Check the data of function code H07. → Select the linear pattern.
2. The current limiting prevented the output frequency from increasing.	Check that current limiting is enabled with Menu #3 "Drive monitoring" and check the current limiting level (F44) using the keypad. → Change the current limiting level (F44) to a correct value. → Increase the acceleration and deceleration time (F07, F08, E10, and E11).

Possible Causes	What to Check and Suggested Measures
3. The automatic deceleration was active.	Check the data of function code H69. → Consider the use of a braking resistor. → Increase the deceleration time (F08 and E11).
4. Overload	Measure the output current. → Lighten the load.
5. Torque generated by the motor was insufficient.	Check that the motor starts running if the value of the torque boost (F09) is increased. → Increase the value of the torque boost (F09).
6. An external frequency command device is being used.	Check that the there is no noise in the external signal wires. → Isolate the control signal wires from the main circuit wires as far as possible. → Use shielded wire or twisted wire for the control signal wires.

7 Even if the power recovers after an instantaneous power failure, the motor does not restart.

Possible Causes	What to Check and Suggested Measures
1. The setting of function code F14 did not make the motor restart even if the power recovered after an instantaneous power failure.	Check if an under voltage trip occurs. → Change the data of function code F14 to 4 or 5.
2. The run command stayed off even after the power recovered.	Check the input signal with Menu #4 "I/O checking" using the keypad. → Check the power recovery sequence with an external circuit. If necessary, consider the use of a relay that can keep the run command on.

Problems with inverter settings

1. If the data of function codes cannot be changed

Possible Causes	What to Check and Suggested Measures
1. An attempt was made to change function code data that cannot be changed when the inverter is running.	Check if the inverter is running with Menu #3 "Drive monitoring" using the keypad and then confirm whether the data of the function codes can be changed when the motor is running by referring to the function code tables. → Stop the motor then change the data of the function cades.
2. The data of the function codes is protected.	Check the data of function code F00 → Disable data protection of function codes.

Possible Causes	What to Check and Suggested Measures
3. The WE - KP command ("Enable editing of function codes data from keypad") is not input though it has been assigned to a digital input terminal.	Check the data of function code E01, E02, E03, E98 and E99 and the input signals with Menu #4 "I/O checking" using the keypad. → Cancel data protection of the function codes or turn on the "Enable editing of function codes data from keypad" command.
4. DC link circuit voltage was below the under voltage detection level.	Check the DC link circuit voltage with Menu #5 "Maintenance information" and measure the input voltage using the keypad. → Supply power to match the inverter's input rating and change the data of the function codes.

2. The desired menu is not displayed.

Possible Causes	What to Check and Suggested Measures
1. The limiting menus function was not selected appropriately.	Check the data of function code E52. → Change the data of function code E52 to display the desired menu.

3. Nothing appears on the LED monitor.

Possible Causes	What to Check and Suggested Measures
1. No power supplied to the inverter.	Check the input voltage, output voltage and inter phase voltage unbalance. → Connect a molded case circuit breaker, an earth leakage circuit breaker (with the exception of those exclusively designed for protection from ground faults) or a magnetic contactor. → Check for voltage drop, phase loss, poor connections, or poor contacts, and fix them if necessary.
2. The power for the control circuit did not reach a high enough level.	Check if the jumper bar has been removed between terminals P1 and P (+) or if there is poor contact between the jumper bar and the terminals. → Connect the jumper bar to terminals P1 and P (+) or tighten the screws. Or connect a DC reactor. → Replace the inverter if it is malfunctioning.

If an alarm code appears pm the LED monitor

1. "OCn" Overcurrent protection

Problem The inverter output current momentarily exceeded the over current level.

OC1 Overcurrent occurred during acceleration.

OC2 Overcurrent occurred during deceleration.

OC3 Overcurrent occurred when running at a constant speed.

Possible Causes	What to Check and Suggested Measures
1. The inverter output terminals were short circuited.	Remove the wires connected to the inverter output terminals (U, V, and W) and measure the inter phase resistance. Check if the resistance is too low. → Remove the part that short – circuited (including replacement of the wires, relay terminals and motor).
2. Ground faults occurred at the inverter output terminals.	Remove the wires connected to the inverter output terminals (U, V, and W) and perform a Megger test. → Remove the part that short – circuited (including replacement of the wires, relay terminals and motor).
3. Loads were too heavy.	Measure the motor current with a measuring device, and to trace the current trend. Therefore, use this information to judge if the trend is over the calculated load value for your system design. → If the load is too heavy, decrease it or raise the inverter capacity. Trace the current trend and check if there are any sudden changes in the current. → If there are any sudden changes, make the load variation smaller or raise the inverter capacity. → Enable current limiting (H12)
4. The value set for torque boost (F09) was too large. F37 = 0, 1, 3, or 4)	Check that the output current decreases and that the motor does not come to stall if you set a lower value than the current one for F09. → Lower the value for torque boost (F09) if the motor is not going to stall.
5. The acceleration / deceleration time was too short.	Check that the motor generates enough torque required during acceleration / deceleration. That torque is calculated from the moment of inertia for the load and the acceleration / deceleration time. → Increase the acceleration / deceleration time (F07, F08, E10, E11, and H54). → Enable current limiting (F43). → Raise the inverter capacity.
6. Malfunction caused by noise.	Check if noise control measures are appropriate (e.g., correct grounding and routing of control and main circuit wires). → Implement noise control measures. → Enable the auto – reset function (H04).

2. "OUn" Overvoltage protection

Problem The DC link circuit voltage was over the detection level of overvoltage.

OU1 Overvoltage occurs during the acceleration.

OU2 Overvoltage occurs during the deceleration.

OU3 Overvoltage occurs during running at constant speed.

Possible Causes	What to Check and Suggested Measures
1. The power supply voltage was over the range of the inverter's specifications.	Measure the input voltage. → Decrease the voltage to within that of the specifications.
2. The acceleration time was too short.	Check if the overvoltage alarm occurs after sudden acceleration. → Increase the acceleration time (F07, E10, and H54). → Select the S – curve pattern (H07). → Consider the use of a braking resistor.
3. The deceleration time was too short for the moment of inertia for load.	Recalculate the deceleration torque from the moment of inertia for load and the deceleration time. → Increase the deceleration time (F08, E11, and H54). → Enable automatic deceleration (H69=1) so that when the DC link circuit voltage exceeds the overvoltage suppression level, the inverter changes the deceleration time to three times longer than the set value. → Set the rated voltage (at base frequency) (F05) to 0 to improve braking ability. → Consider the use of a braking resistor.
4. Loads were suddenly removed.	Check if the alarm occurs when loads are suddenly removed. → Check if the inverter operation suddenly changes from driving operation to braking operation. → Consider the use of a braking resistor.
5. Braking load was too heavy.	Compare the braking torque of the load with that of the inverter. → Set the rated voltage (at base frequency) (F05) to 0 to improve braking ability. → Consider the use of a braking resistor.
6. Malfunction caused by noise.	Check if the DC link circuit voltage was below the protective level when the alarm occurred. → Improve noise control. → Enable the auto-reset function (H04).

3. "LU" Undervoltage protection

Problem DC link circuit voltage was below the undervoltage detection level.

Possible Causes	What to Check and Suggested Measures
1. An instantaneous power failure occurred.	Reset the alarm. → If you want to restart running the motor without making the alarm occur, set 4 or 5 to F14 depending on load.

Possible Causes	What to Check and Suggested Measures
2. The power inverter was switched back on too soon (with F14 = 1)	Check that you switch the inverter on after the power for the control circuit had reached an appropriate level. This can be checked using the display on the LED monitor. → Wait for a longer time than the last time before switching the inverter on.
3. The power supply voltage did not reach the range of the inverter's specifications.	Measure the input voltage. → Increase the voltage to within that of the specifications.
4. Peripheral equipment for the power circuit malfunctioned, or the connection was incorrect.	Measure the input voltage to find where the peripheral equipment malfunctioned or which connection is incorrect. → Replace any faulty peripheral equipment, or correct any incorrect connections.
5. Other loads were connected to the same power system and required a large current to start running to the extent that it caused a temporary voltage drop.	Measure the input voltage and check the voltage variation. → Reconsider the power system configuration.
6. Inrush current caused the power voltage drop because power transformer capacity was insufficient.	Check if the alarm occurs when you switch on a molded case circuit breaker, an earth leakage circuit breaker (with the exception of those exclusively designed for protection from ground faults) or a magnetic contactor. → Reconsider the capacity of the power transformer.

4. "Lin" Input phase loss protection

Problem Input phase loss occurred, or interphase voltage unbalance rate was large.

Possible Causes	What to Check and Suggested Measures
1. Main circuit power input wires broken.	Measure the input voltage. → Repair or replace the wires.
2. The terminal screws for the main circuit power input were not tight enough.	Check if the terminal screws have become loose. → Tighten the terminal screws to the recommended torque.
3. Interphase unbalance rate of three – phase voltage was too large.	Measure the input voltage. → Connect an AC reactor (ACR) or a DC reactor (DCR) to lower the rate. → Raise the inverter capacity.
4. Overload cyclically occurred.	Measure ripple wave of DC link circuit voltage. → If the ripple is large, raise the inverter capacity.
5. Single-phase voltage was inputted to the inverter instead of three-phase voltage input.	Check the inverter type. → Change the inverter to one for single-phase voltage input.

5 "OPL" Output phase loss protection

Problem Output phase loss occurred.

Possible Causes	What to Check and Suggested Measures
1. Inverter output wires are broken	Measure the output current. → Replace the output wires.
2. Wire for motor winding are broken	Measure the output current. → Replace the motor.
3. The terminal screws for inverter output were not tight enough.	Check if any terminal screws have become loose. → Tighten the terminal screws to the recommended torque.
4. A single – phase motor has been connected	Single – phase motor cannot be used. Note that the FRENIC – Mini only drives three-phase induction motors.

6. "OH1" Overheat protection for heat sink

Problem Temperature around heat sink rose.

Possible Causes	What to Check and Suggested Measures
1. Temperature around the inverter exceeded that of inverter specifications.	Measure the temperature around the inverter. → Lower the temperature around the inverter (e.g., ventilate the enclosure well). → Lighten the load.
2. Accumulated running time of the cooling fan exceeded the standard period for replacement, or the cooling fan malfunctioned	Check the accumulated running time (E52 = 2). Refer to "Reading Maintenance Information". → Replace the cooling fan. Visually check that the cooling fan rotates normally. → Replace the cooling fan.
3. Air vent is blocked.	Check if there is sufficient clearance around the inverter. → Increase the clearance. Check if the heat sink is clogged. → Clean the heat sink.
4. Load was too heavy.	Measure the output current. → Lighten the load (e.g., lighten the load before the overload protection occurs using the overload early warning (E34). → Decease the carrier frequency (F26). → Enable the overload protection control (H70).

7. "OH2" External alarm input

Problem External alarm was inputted (THR).

Possible Causes	What to Check and Suggested Measures
1. An alarm function of the external equipment was activated.	Inspect external equipment operation. → Remove the cause of the alarm that occurred.
2. Connection ha been performed incorrectly.	Check if the wire for the external alarm signal is correctly connected to the terminal to which the "Alarm from external equipment" has been assigned. → Connect the wire for the alarm signal correctly.
3. Incorrect settings.	Check if the "Alarm from external equipment" has been assigned to an unassigned terminal. → Correct the assignment.

8. "OH4" PTC thermistor for motor protection

Problem Temperature of the motor rose abnormally.

Possible Causes	What to Check and Suggested Measures
1. Temperature around the motor exceeded that of motor specifications.	Measure the temperature around the motor. → Decrease the temperature. → Lighten the load.
2. Cooling system for the motor malfunctioned.	Check if the cooling system is operating normally. → Repair or replace the cooling system.
3. Load was too heavy.	Measure the output current. → Lighten the load (e.g. lighten the load before overload occurs using the overload early warning (E34) function). → Decrease the temperature around the motor. → Increase the carrier frequency (F26).
4. The set activation level (H27) of the PTC thermistor for motor overheat protection was inadequate.	Check the thermistor specifications and recalculate the detection voltage. → Reconsider the data of function code H27.
5. A PTC thermistor and pull – up resistor were connected incorrectly or their resistance was inadequate.	Check the connections and resistance. → Correct the connections and resistance.
6. The value set for the torque boost (F09) was too high.	Check the data of function code F09 and readjust the data so that the motor does not stall even if you set the data to a lower value. → Change the data of the function code.
7. The V/f pattern did not match the motor.	Check if the base frequency (F04) and rated voltage (at base frequency) (F05) match the values on the nameplate on the motor. → Match the function code data to the values on the nameplate of the motor.

9. "dbH" Overheat protection for barking resistor

Problem Thermal protection for braking resistor activated.

Possible Causes	What to Check and Suggested Measures
1. Braking load was too heavy.	Recalculate the relation between the braking load and braking capacity. → Lighten the braking load. → Reconsider the braking resistor in order to improve braking ability. Resetting the data of function codes F50 and F51 is also required.
2. The deceleration time was too short.	Recalculate the required deceleration torque and time from the moment of inertia for the load and the deceleration time. → Increase the deceleration time (F08, E11, and H54). → Reconsider the braking resistor in order to improve the braking ability. Resetting the data of function codes F50 and F51 is also required.
3. Incorrect values have been set for the data of function codes F50 and F51.	Check the braking resistor specifications. → Reconsider and change the data of function codes F50 and F51.

NOTE: The inverter does not detect the overheating alarm of a braking resistor by monitoring its surface temperature, but by monitoring its load magnitude. Therefore, even if the surface temperature itself does not rise, the alarm may be detected if the resistor is used more frequently than the set data of function codes F50 and F51. If you use the resistor to the limit of its capacity, you must adjust the data of function codes F50 and F51 while checking the surface temperature of the resistor.

10. "OL1" Electronic thermal overload relay

Problem Electronic thermal function for motor overload detection activated.

Possible Causes	What to Check and Suggested Measures
1. Load was too heavy.	Measure the output current. → Lighten the load (e.g. lighten the load before overload occurs using the overload early warning (E34).
2. The acceleration / deceleration time was too short.	Check that the motor generates enough torque for acceleration / deceleration, This torque is calculated from the moment of inertia for the load and the acceleration / deceleration time. → Increase the acceleration / deceleration time (F07, F08, E10, E11 and H54).
3. The characteristics of electronic thermal did not match those of the motor overload.	Check the motor characteristics. → Reconsider the data of function codes P99, F10 and F12. → Use an external thermal relay.
4. Activation level for the electronic thermal relay was inadequate.	Check the continuous allowable current of the motor. → Reconsider and change the data of function code F11.

11. "OLU" Overload protection

Problem Temperature inside inverter rose abnormally.

Possible Causes	What to Check and Suggested Measures
1. Temperature around the inverter exceeded that of inverter specifications.	Measure the temperature around the inverter. → Lower the temperature (e.g., ventilate the enclosure well). → Lighten the load.
2. The service life of the cooling fan has expired or the cooling fan malfunctioned.	Check the accumulated running time of cooling fan (E52 = 2). Refer to "Reading Maintenance Information". → Replace the cooling fan. Visually check that the cooling fan rotates normally. → Replace the cooling fan.
3. Air vent is blocked.	Check if there is sufficient clearance around the inverter. → Increase the clearance. Check if the heat sink is clogged. → Clean the heat sink.
4. Load was too heavy.	Measure the output current. → Lighten the load (e.g. lighten the load before overload occurs using the overload early warning (E34). → Decrease the carrier frequency (F26). → Enable overload protection control (H70).
5. The acceleration / deceleration time was too short.	Recalculate the required acceleration / deceleration torque and time from the moment of inertia for the load and the deceleration time. → Increase the acceleration / deceleration time (F07, F08, E10, E11 and H54).
6. The wires to the motor are too long and caused a large amount of current to leak from them.	Measure the leak current. → Connect an output circuit filter (OFL).

12. "Er1" Memory error

Problem Error occurred in writing the data to the memory in the inverter.

Possible Causes	What to Check and Suggested Measures
1. The power supply was turned off when the inverter was writing data (especially initializing data), and the remaining control circuit voltage was not high enough to enable writing of data.	Check if pressing the PRG / RESET key resets the alarm after the function code data are initialized by setting the data of H03 to 1. → Return the initialized function code data to their previous settings, then restart the operation.

Possible Causes	What to Check and Suggested Measures
2. A high intensity noise was given to the inverter while data (especially initializing data) was being written.	Check if appropriate noise control measures have been implemented (e.g., correct grounding and routing of control and main circuit wires). Alternatively, perform the same check as described in (1) above. → Improve noise control. Alternatively, return the initialized function code data to their previous settings, then restart the operation.
3. The CPU did not operate normally.	Initialize the function code data by setting H03 to 1, then reset the alarm by pressing the PRG / RESET key and check that the alarm goes on. → This problem was caused by a printed circuit board (PCB) (including the CPU) malfunction, so it is necessary to replace the PCB.

13. "Er2" Remote keypad communications error

Problem A communications error occurred between the remote keypad and the inverter.

Possible Causes	What to Check and Suggested Measures
1. Break in the communications cable or poor contact.	Check continuity of the cable, contacts and connections. → Replace the cable.
2. A high intensity noise was given to the inverter.	Check if appropriate noise control measures have been implemented (e.g. correct grounding and routing of control and main circuit wires). → Improve noise control.
3. The remote keypad malfunctioned.	Check that alarm Er2 does not occur if you connect another remote keypad to the inverter. → Replace the remote keypad.
4. The RS485 communications card malfunctioned.	Check that alarm Er2 does not occur even if you connect another remote keypad to the inverter. → Replace the card.

14. "Er3" CPU error.

Problem A CPU error (e.g. erratic CPU operation) occurred.

Possible Causes	What to Check and Suggested Measures
1. A high intensity noise was given to the inverter.	Check if appropriate noise control measures have been implemented (e.g. correct grounding and routing of control and main circuit wires). → Improve noise control.
2. The printed control circuit board in the inverter malfunctioned.	→ Replace the board.

15. "Er6" Operation protection

Problem An error occurred due to incorrect operation of the motor.

Possible Causes	What to Check and Suggested Measures
1. The STOP key was pressed when H96 = 1 or 3.	→ Change the setting for H96 so that the STOP key priority function is invalid to ensure that the inverter does not operate unexpectedly.
2. The start check function was activated when H96 = 2 or 3.	Check that Er6 occurs when: - The power is switched on - An alarm is released (by pressing the PRG/RESET key or turning reset alarm (RST) on). - The link command (LE) has switched the inverter operations. → Reconsider the running sequence to avoid input of the run command when Er6 has occurred. → Change the setting for H96 so that the STOP key priority function is invalid to ensure the inverter does not operate unexpectedly. (To reset the alarm, turn the run command off.)

16. "Er8" RS485 communications error

Problem A communications error occurred during RS485 communications.

Possible Causes	What to Check and Suggested Measures
1 Host controllers (e.g. PLCs and personal computers) did not operate due to incorrect settings and / or defective software / hardware.	Check the controllers. → Remove the cause of the controller error.
2 Relay converters (e.g., RS232C / RS485 converter) did not operate due to incorrect connections and settings, and defective hardware.	Check the converter (e.g. check for poor contact). → Change the various converter settings, reconnect the wires, or replace hardware (such as recommended devices) as appropriate.
3 Broken communications cable or poor contact.	Check continuity of the cable, contacts and connections. → Replace the cable.
4 Even though no response error detection time (y08) has been set, communications did not occur cyclically.	Check the host controllers. → Change the settings of host controller software, or make the no response error detection time invalid (y 08=0).
5 A high intensity noise was given to the inverter.	Check if appropriate noise control measures have been implemented (e.g. correct grounding and routing of control and main circuit wires). → Improve noise control. → Improve measures against noise from host controllers. → Replace the relay converter with a recommended insulate converter

Possible Causes	What to Check and Suggested Measures
6 Conditions for communications differ between the inverter and host controllers.	Compare the settings of the y codes (y01to y10) with those of the host controllers. → Correct any settings which differ.
7 The RS485 communications card malfunctioned.	→ Replace the card.

17. "ErF" Data save error during under voltage

Problem The inverter was unable to save data such as the frequency commands, timer, and PID process commands set through the keypad when the power was switched off.

Possible Causes	What to Check and Suggested Measures
1. The control circuit voltage dropped suddenly while the data was being saved when the power was turned off, because the electric charge in the DC bus capacitor was rapidly discharged.	Check how long it takes for the DC link circuit voltage to drop to the preset voltage when the power is turned off. → Remove whatever is causing the rapid discharge of the electric charge. After pressing the PRG / RESET key and releasing the alarm, reset the data (such as the frequency commands, timer, and PID process commands) set with the keypad to the correct settings and then restart the motor.
2. A high intensity noise was given to the inverter while data was being written when the power was turned off.	Check if appropriate noise control measures have been implemented (e.g. correct grounding and routing of control and main circuit wires). → Improve noise control. Press the PRG / RESET key to release the alarm, then reset the data (e.g. frequency commands, timer, and PID process commands) set through the keypad to the correct settings. Restart the motor.
3. The CPU did not operate normally.	Check if ErF occurs each time the power is switched off. → This problem was caused by a printed circuit board (PCB) (including the CPU) malfunction, so it is necessary to replace the PCB.

SECTION 8

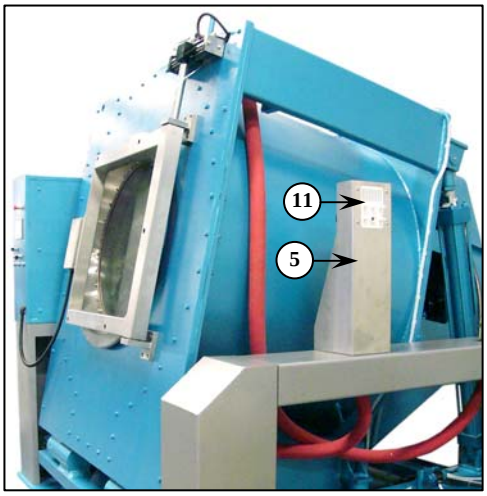
PARTS LIST

ORDERING SPARE PARTS

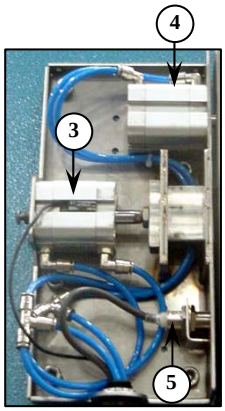
In case spare parts are needed, please include the following information with your order:

1. Model and serial number of the equipment (located on the name plate).
2. Part number, part name, and quantity required. Use this manual to facilitate ordering.
3. When ordering electrical motors, please include complete name plate data, motor manufacturer, and wiring diagram number.

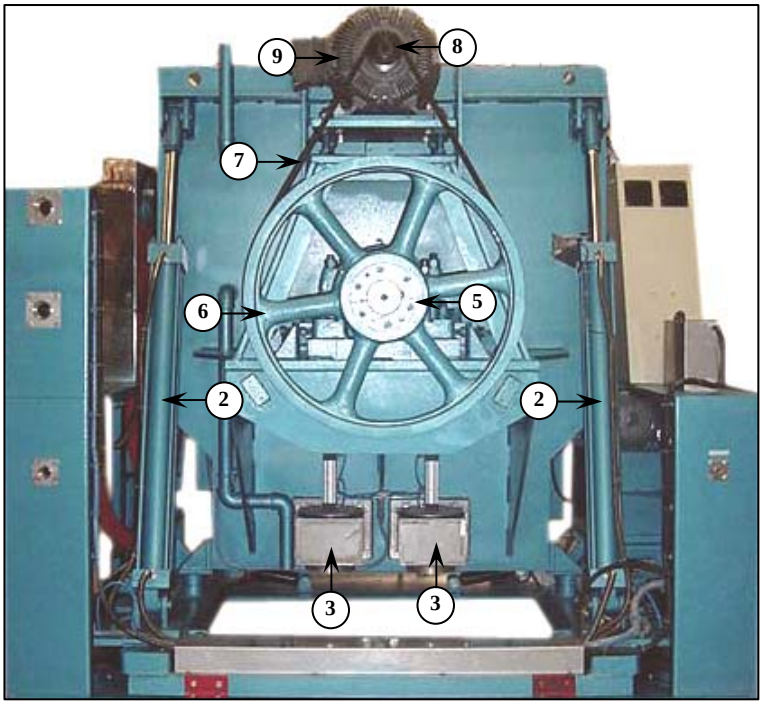
Our service and spare parts department consists of specially trained personnel to assist you with your needs. Please do not hesitate to call if we can be of any assistance to you.

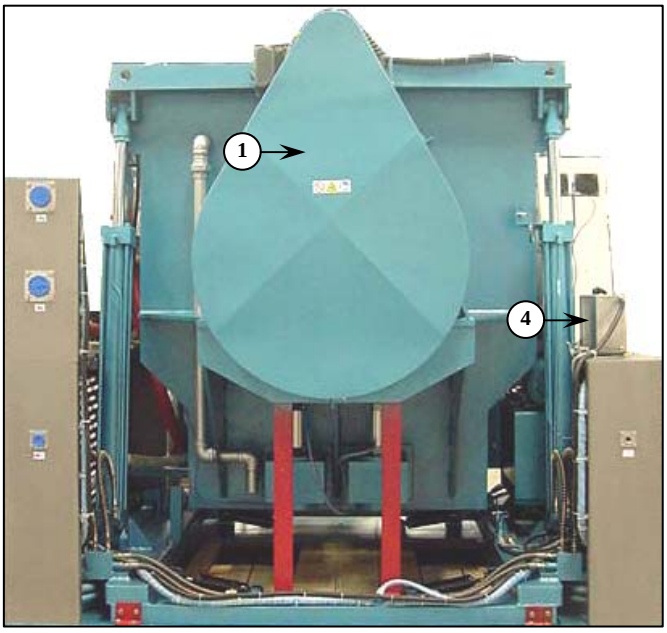


Item	Part No.	Qty.	Description
1	A1-S450-001	1	Electrical control box
2	A1-S450-002	1	Front plate panel
3	A1-S450-003	1	Unloading shuttle
4	A1-S450-004	2	Hinge Tilt
5	A1-S450-031	1	Supply dispenser
6	A1-S450-006	1	Cover plate for door lock
7	A1-S450-017	1	Door Yoke
8	A1-S450-018	1	Door Tub
9	A1-S450-019	1	Door ring
10	A1-S450-020	1	Door plate
11	A0-A127-001	1	Vacuum breaker, Plastic 12/60



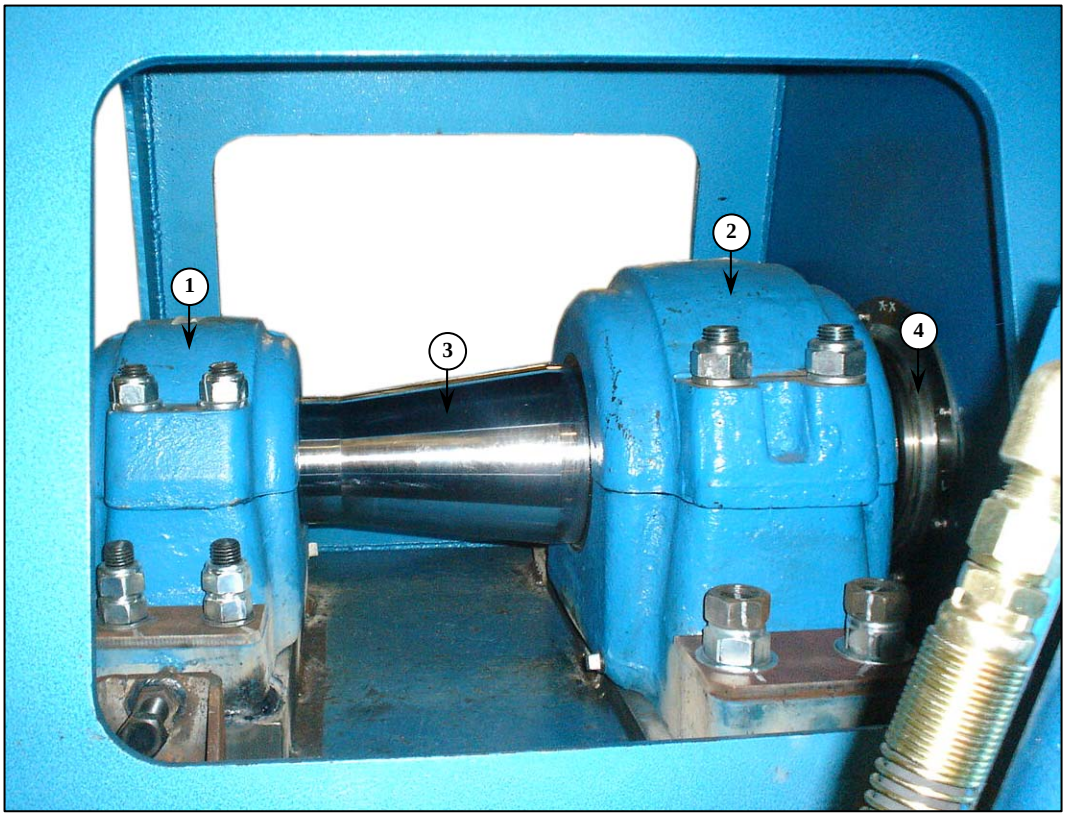
Item	Part No.	Qty.	Description
1	A0-A001-030	1	Door gasket
2	A0-A003-020	1	Door glass (Tempered)
3	A0-P003-039	1	Air Cylinder, Lock
	A0-TSP01-046	1	Switch, Magnet reed
4	A0-P003-040	1	Air Cylinder, Safety
5	A0-E023-004	1	Proximity switch
6	A1-S450-015	1	Basket



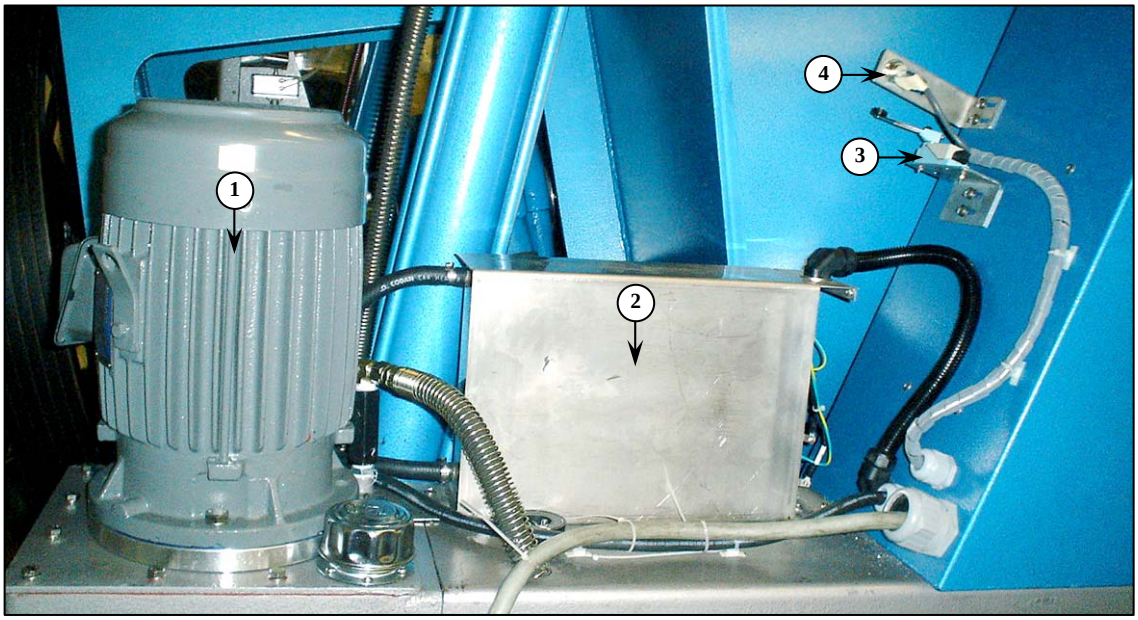


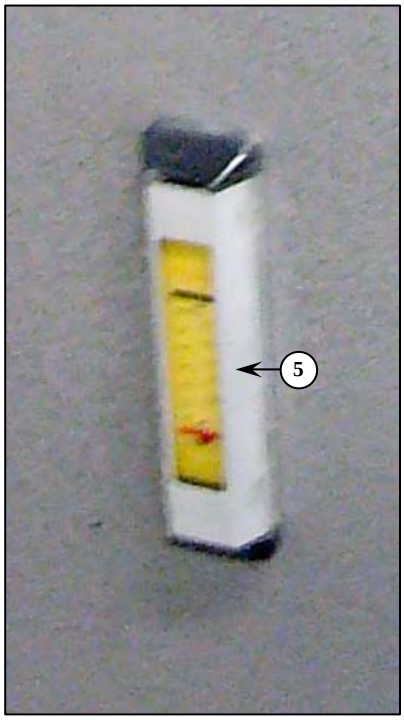
Item	Part No.	Qty.	Description
1	A1-S450-007	1	Rear guard, Safety for belt
2	A0-P011-002	2	Hydraulic cylinder bore
3	A1-S450-012	2	Drain box
4	A0-E005-001	2	Heating element
5	A0-M009-079	1	Sleeve Basket pulley bushing
6	A0-M008-132	1	Basket pulley
7	A0-TSA01-1296	6	V-Belt
8	A0-M008-133	1	Motor pulley
9	A0-E008-920-01	1	Motor
	A0-E012-005	1	Fan, cooling

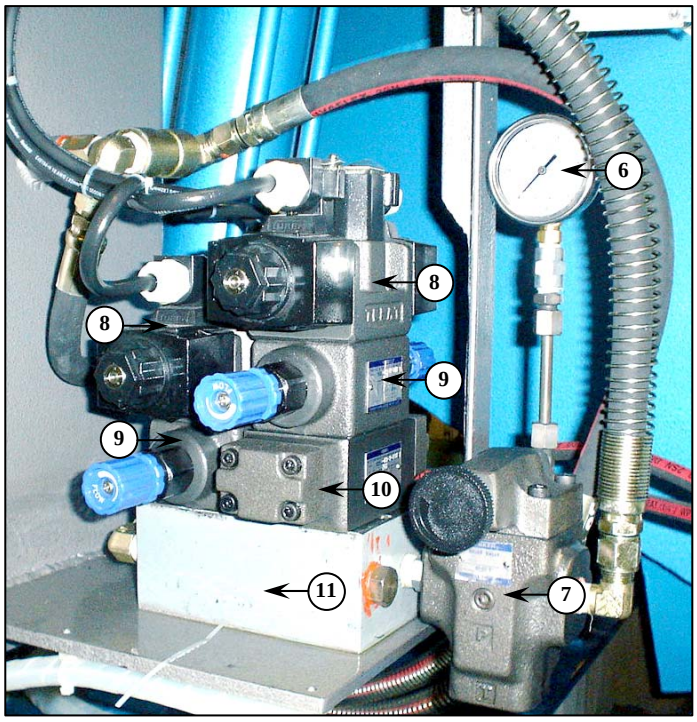
Item	Part No.	Qty.	Description
1	A1-S450-008	1	Door cover Electrical control (Left)
2	A1-S450-009	1	Door cover Electrical control (Right)
3	A1-S450-010	1	Side Panel Right
4	A1-S450-011	1	Side Panel Left



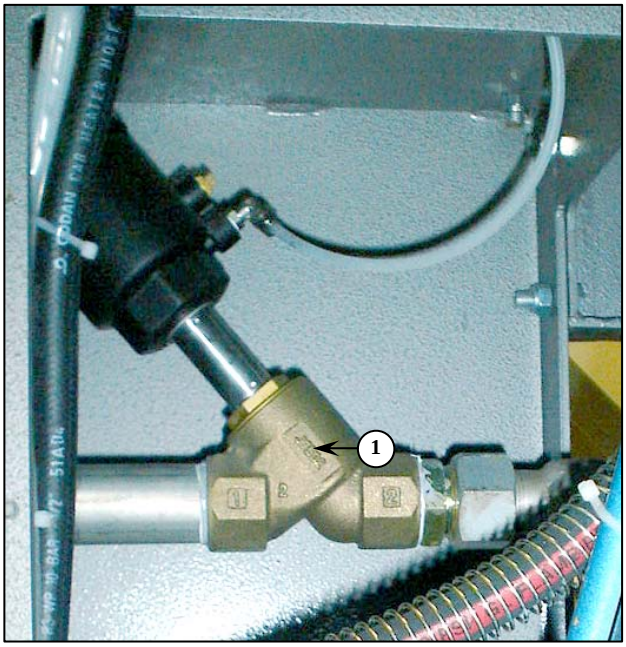
Item	Part No.	Qty.	Description
1	A0-A007-005	1	Housing
	A0-A004-005	1	Bearing
	A0-TSA01-1028	1	Adapter sleeve
	A0-A005-022	2	Seal
2	A0-A007-007	1	Housing
	A0-A004-078	1	Bearing
	A0-A006-136	1	Adapter sleeve
	A0-A005-039	2	Seal
3	A0-M011-034	1	Basket shaft
4	A0-A005-109	5	Seal, V-ring,

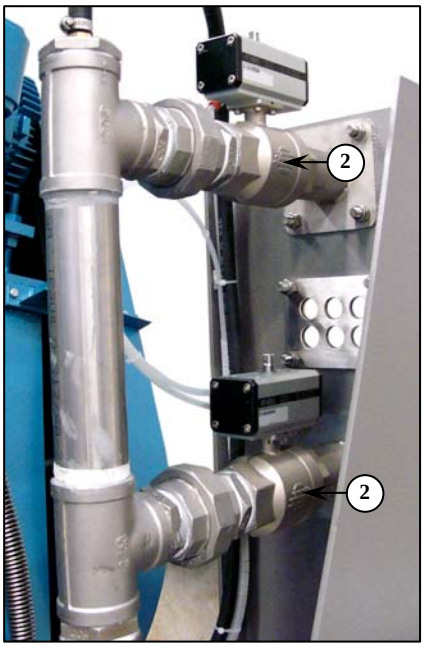


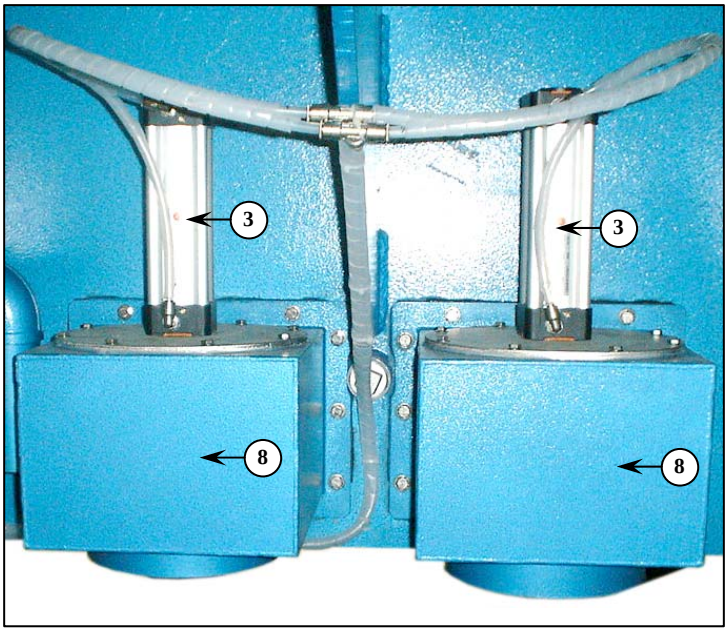


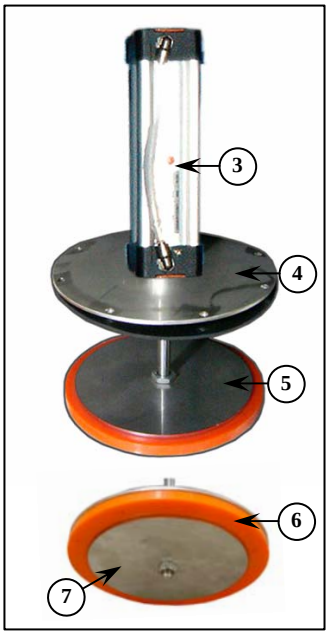


Item	Part No.	Qty.	Description
1	A0-TSE01-918	1	Pump motor
2	A0-E005-001	2	Heating element for brake
3	A0-E011-018	1	Limit switch
4	A0-E023-013	1	Proximity switch
5	A1-S450-035	1	Oil level
6	A1-S450-036	1	Pressure gauge
7	A1-S450-037	1	Relief valve
8	A1-S450-038	2	Solenoid valve
9	A1-S450-039	2	Flow control
10	A1-S450-040	1	Check valve
11	A1-S450-041	1	Sub plate

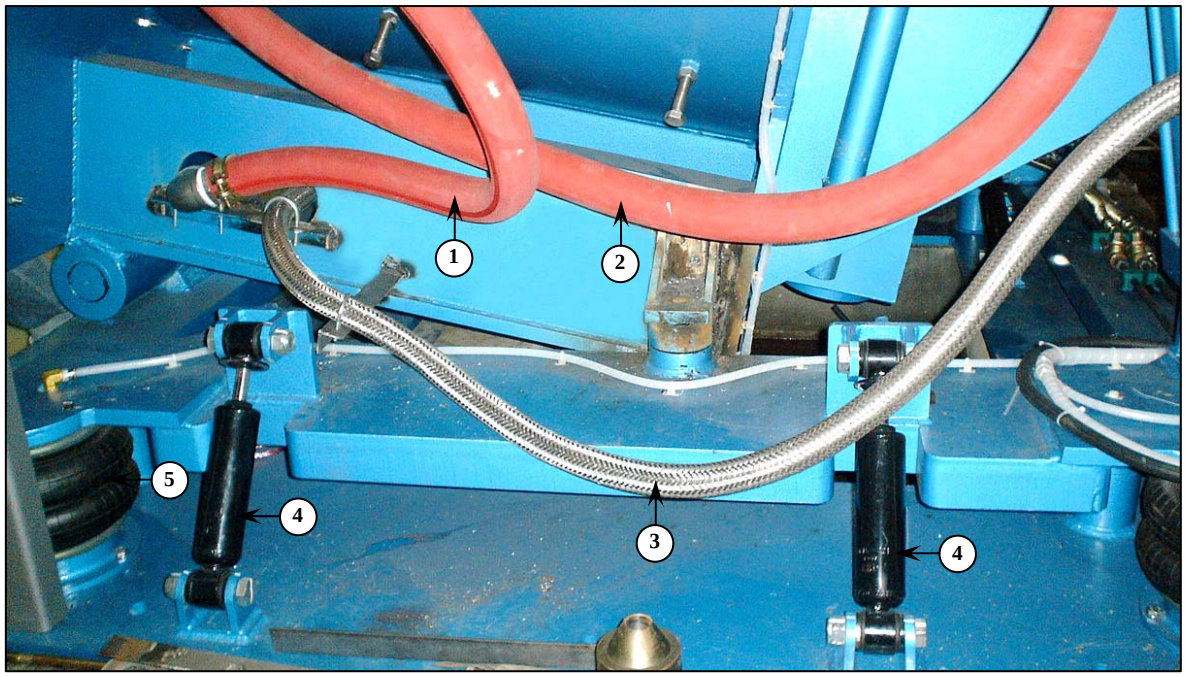


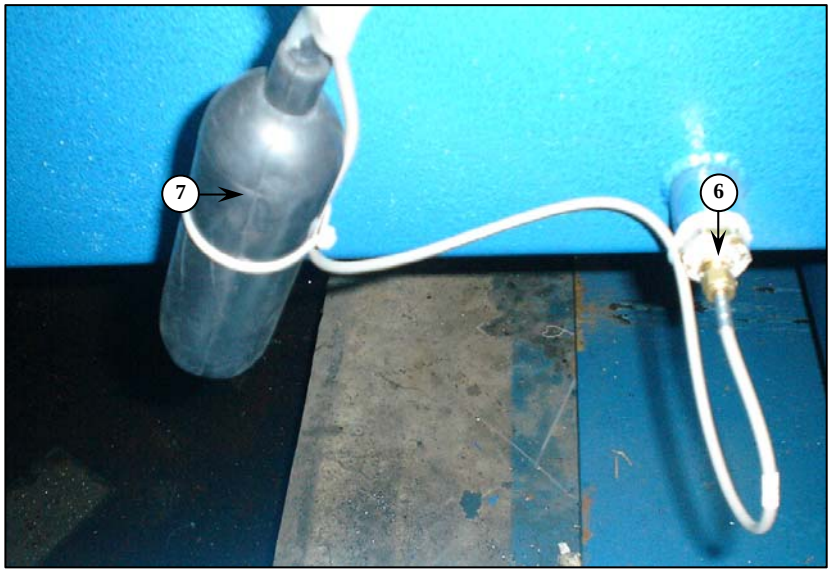




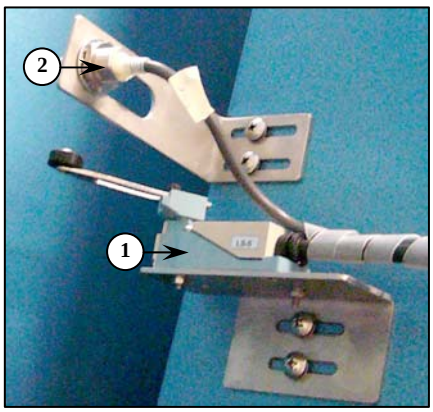


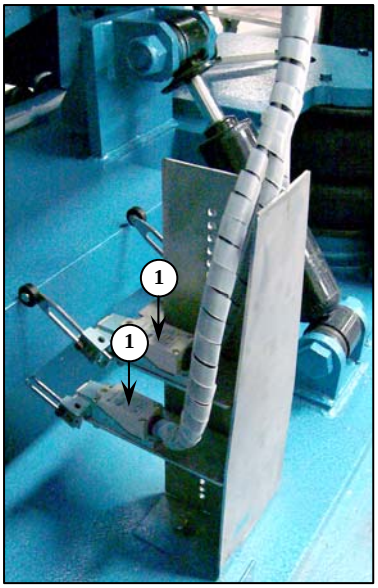
Item	Part No.	Qty.	Description
1	A0-E047-070	1	Steam valve
2	A0-P012-008	2	Water valve
3	A0-TSA01-534	2	Drain valve
4	A1-S450-032	2	Drain air cylinder mounting plate
5	A1-S450-034	2	Seal backing plate
6	A0-A001-047	2	Drain rubber seal
7	A1-S450-033	2	Seal front plate
8	A1-S450-012	2	Drain box

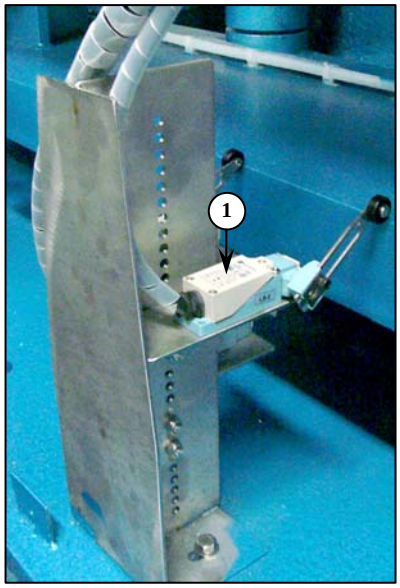


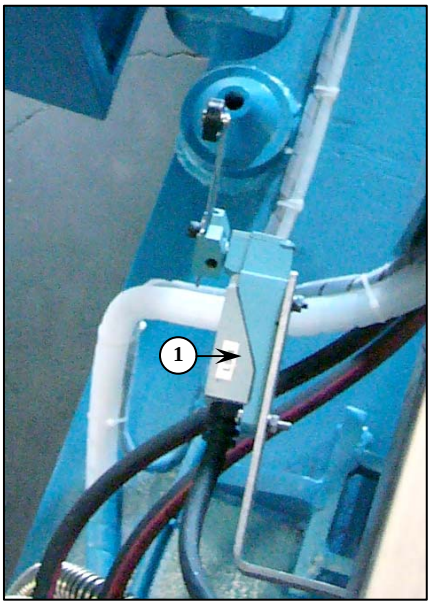


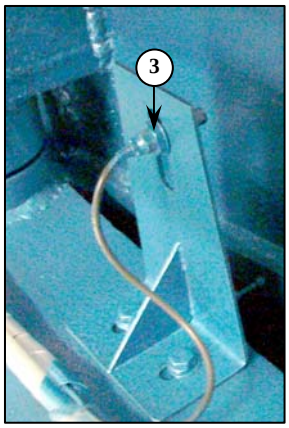
Item	Part No.	Qty.	Description
1	A0-TSA01-1292	1	Water hose
2	A0-TSA01-1291	1	Water hose
3	A0-TEST01-182	1	Flexible steam pipe
4	A0-A031-121	2	Shock
5	A0-P002-003	1	Air cushion
6	A0-E027-007	1	Temperature probe
7	A0-A018-091	1	Hose, Water level

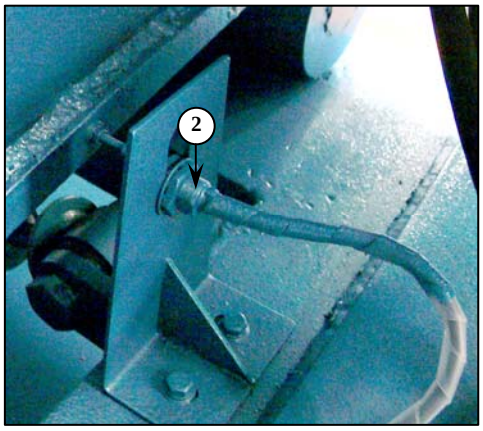


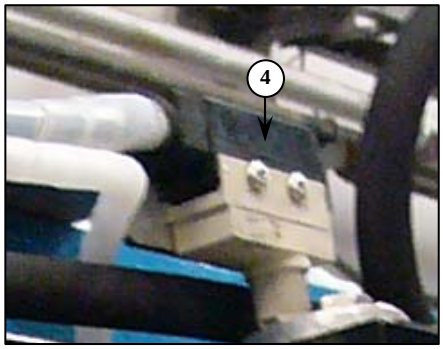




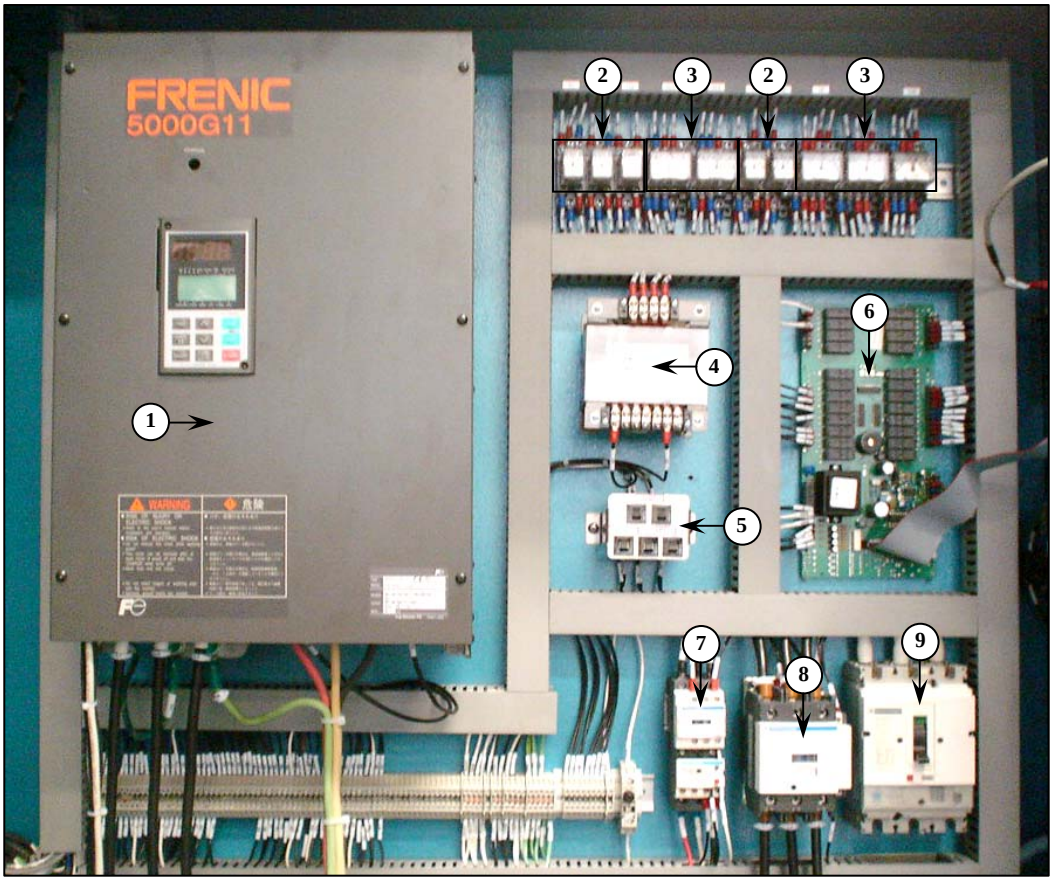


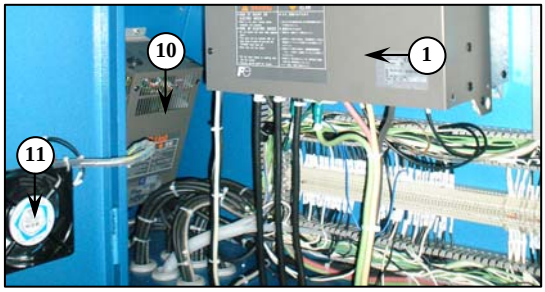




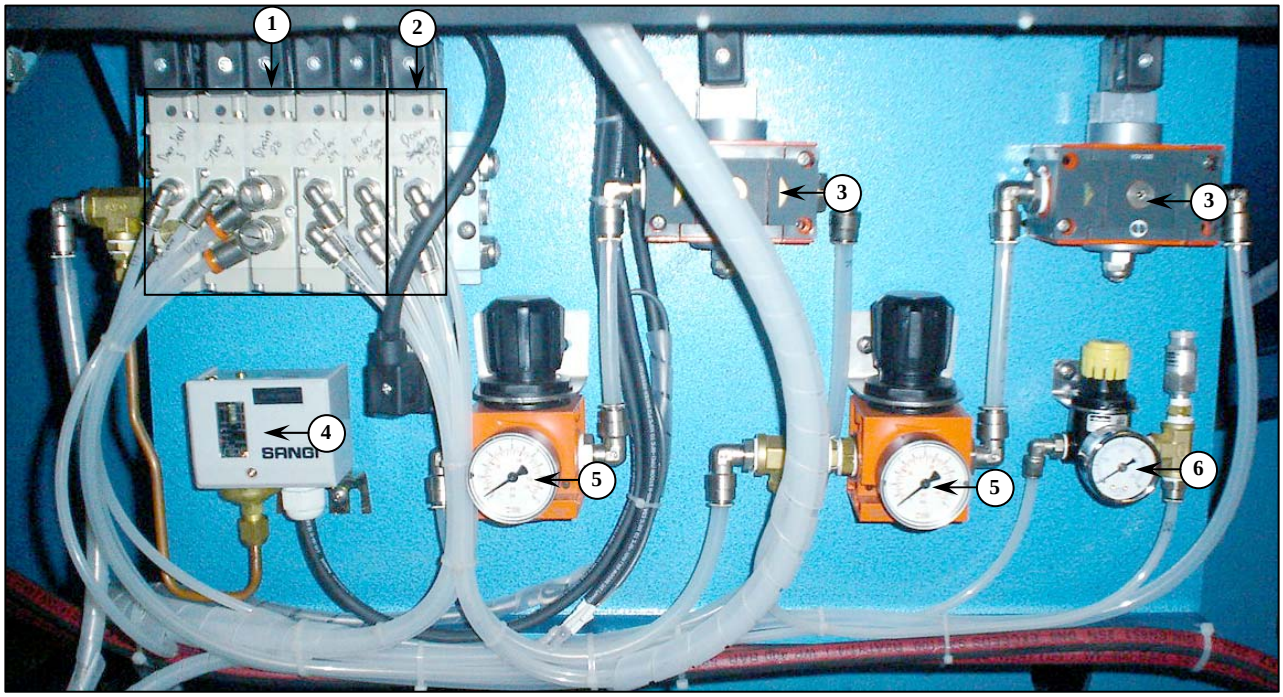


Item	Part No.	Qty.	Description
1	A0-E011-018	5	Limit switch
2	A0-E023-013	2	Proximity switch
3	A0-TSE01-219	1	Proximity switch
4	A0-E011-019	1	Limit switch





Item	Part No.	Qty.	Description
1	A0-E001-142	1	AC Drive inverter
2	A0-E009-001	5	Relay
	A0-E009-020	5	Socket relay
3	A0-E009-011	5	Relay
	A0-E009-021	5	Socket relay
4	A0-E006-032	1	Transformer
5	A0-E010-029	2	Circuit breaker 6A
	A0-E010-034	2	Circuit breaker 3A
	A0-E010-035	1	Circuit breaker 2A
6	A0-E007-003	1	EL6 Output board
7	A0-E004-001	1	Magnetic contactor
	A0-E025-026	1	Overload
8	A0-E004-013	1	Magnetic contactor
9	A0-E010-057	1	Circuit breaker
10	A0-E002-019	1	Break unit
11	A0-E012-008	1	Fan, Cooling
	A0-E012-009	1	Filter, Fan cooling



Item	Part No.	Qty.	Description
1	A0-P005-137	5	Air solenoid valve
2	A0-P005-143	1	Air solenoid valve
3	A0-P005-171	2	Air solenoid valve
4	A0-TSE01-005	1	Pressure control
5	A0-P004-023	2	Air regulator
6	A0-P004-007	1	Air regulator

Item	Part No.	Qty.	Description
1	A0-E032-018	1	Emergency stop button
2	A0-E007-001	1	EL6 CPU Control
3	A0-E033-003	1	Selector switch
4	A0-E032-004	2	Push button switch
5	A0-E032-002	1	Selector switch
6	A0-E032-003	2	Push button switch