MAXI

INSTRUCTION MANUAL

MODEL
MWHE100

IM1508-HE0806-06

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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.

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

SECTION 1

IMPORTANT INFORMATION

HARDMOUNT ECONOMY SERIES

This machine is the professional fixed mount washer – extractor series of machines from Accurate Technologies Co., Ltd. It is an open pocket washer – extractor with a large and unloading. It has been developed for the in premise market, and is suitable for commercial laundries, hotel and other places where laundry might be processed.

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 Hardmount Economy 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 suit any textile fiber used today and tomorrow. The high speed final extraction saves time and energy in the finishing operation.

A single compartment supply dispenser for powder and liquid detergents is standard (three compartment positional) and machine is designed to accept the connection of 4 chemical lines and pumps.

SAFETY CHECK LIST

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.

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.

IMPORTANT INFORMATION

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 in fury.

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 following conditions are present.

   - The door does not remain securely locked during the entire cycle.

   - Excessively high water level is evident.

   - 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 °F (0 °C) or below. Temperatures above 120 °F (50 °C) 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 hose leaks, 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 – 5 bar). Although the machine will function properly at lower pressure, increased fill time will occur. Water pressure higher than 120 psi (8 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 – 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.

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 pipes. An easy – access disconnect switch **should be** provided. Ensure that a ground wire from a proven earth ground. Is connected to the ground lag 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** disconnected before service is performed

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 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. **<u>Do not</u>** 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.

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.

SPECIFICATION/COMPONENT IDENTIFICATION

A. TECHNICAL SPECIFICATION

Model	Metric	US	20 lbs.	30 lbs.	40 lbs.	60 lbs.	80 lbs.	100 lbs.
Maximum capacity:	kg.	lbs.	9 (20)	13.6 (30)	18.1 (40)	27.2 (60)	36.3 (80)	45.3 (100)
OVERALL DIMENSIONS:								
A – Machine Width	mm.	inch	735 (28.9")	735 (28.9")	785 (30.9")	880 (34.6")	1050 (41.5")	1050 (41.5")
B – Machine Depth	mm.	inch	795 (31")	920 (36.2")	1103 (43.4")	1182 (46.5")	1225 (48.2")	1374 (54.1)
C – Machine Height	mm.	inch	1181 (46.5")	1266 (49.8")	1315 (51.8")	1530 (60.2")	1716 (67.6")	1720 (67.7")
CYLINDER INFORMATION:								
Basket Diameter	mm.	inch	610 (24")	610 (24")	680 (26.8")	790 (31.1")	920 (36.2")	920 (36.2")
Basket Depth	mm.	inch	345 (13.5")	470 (18.5")	525 (20.7")	595 (23.4")	574 (22.6")	718 (28.3")
Basket Volume	cu.m	cu.ft	0.11 (4)	0.14 (5)	0.19 (7)	0.29 (10)	0.4 (13)	0.5 (17)
DOOR OPENING AND HEIGHT:								
Door Opening Diameter	mm.	inch	365 (14.4")	365 (14.4")	365 (14.4")	450 (17.7")	510 (20.1")	510 (20.1")
Height Of Door Bottom Above Floor	mm.	inch	387 (15.2")	445 (17.5")	465 (18.3")	540 (21.3")	610 (24")	627 (24.7")
DRIVE INFORMATION:								
Number of Motors	Number		1	1	1	1	1	1
Size of Motor	kW	HP	0.75 (1)	1.5 (2)	2.2 (3)	3.7 (5)	5.5 (7.5)	7.5 (10)
CYLINDER SPEEDS (PROGRAMMABLE):								
Wash	RPM	G-Force	48.5 (0.8)	48.5 (0.8)	44.4 (0.8)	43 (0.8)	39.5 (0.8)	39.5 (0.8)
Distribution	RPM	G-Force	76.5 (2)	77 (2)	70.2 (2)	67 (2)	62 (2)	62 (2)
Extract	RPM	G-Force	484 (80)	664 (150)	608 (150)	583 (150)	534 (150)	542 (150)
WATER INLETS AND CONSUMPTION:								
Hot water size			3/4"	3/4"	3/4"	3/4"	3/4"	1"
Cold water size	NPT		3/4"	3/4"	3/4"	3/4"	3/4"	1"
Additional water Inlet			3/4"	3/4"	3/4"	3/4"	3/4"	1"
Average **HOT** water consumption/cycle	Liters	Gal	22 (6)	22 (6)	23 (6)	46 (12)	48 (13)	58 (15)
Average **COLD** water consumption/cycle	Liters	Gal	67 (18)	67 (18)	69 (18)	104 (27)	137 (36)	168 (44)
DRAIN OUTLETS AND CAPACITY:								
Number of drains	Number		1	1	1	1	1	1
Drain size	mm	inch	50.8 (2")	50.8 (2")	50.8 (2")	76.2 (3")	76.2 (3")	76.2 (3")
Drain capacity	liters/min	gpm	117 (31)	117 (31)	310 (81.9)	581 (153.5)	581 (153.5)	581 (153.5)
STEAM INLETS AND CONSUMPTION:								
Steam Inlet Size	NPT		1/2"	1/2"	1/2"	1/2"	3/4"	3/4"
Steam Pressure	bar	psi	6 (100)	6 (100)	6 (100)	6 (100)	6 (100)	6 (100)
Steam Consumption	kg/hr	lb/hr	11 (24.15)	11 (24.15)	23.5 (51.75)	34.4 (75.9)	56.3 (124.2)	56.3 (124.2)
WEIGHT AND SHIPPING INFORMATION:								
Net Weight	kg.	lbs.	240 (530)	286 (630.5)	437 (963.4)	499 (1100)	740 (1631)	875 (1930)
Domestic shipping weight	kg.	lbs.	286 (630.5)	302 (665.8)	455 (1003)	519 (1144)	767 (1691)	895(1973)
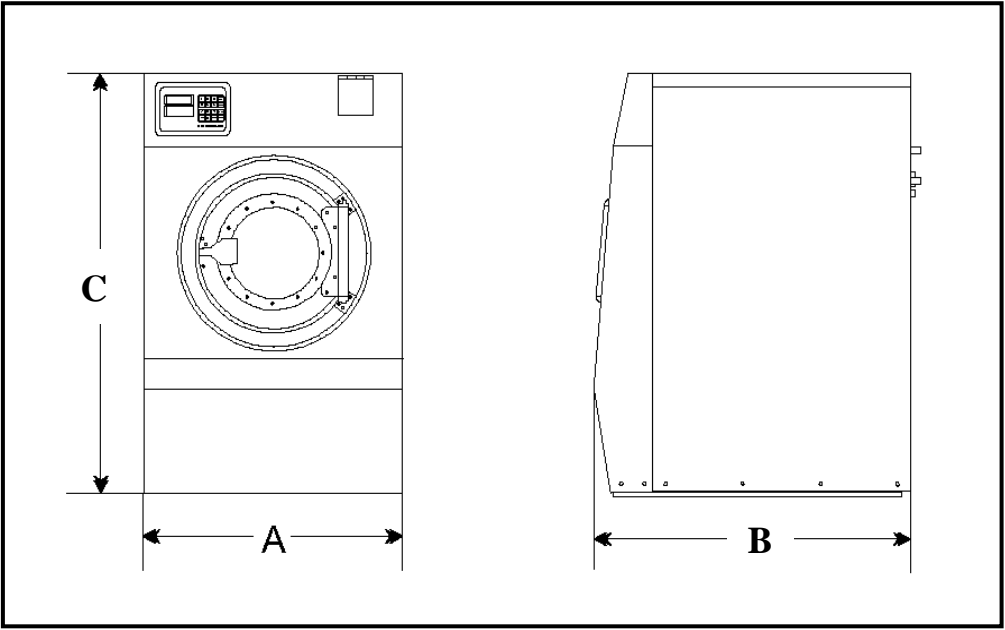
SECTION 3

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	Metric	US	Hardmount Economy Series			
			Recommended		Minimum	
(A) Minimum rear clearance	mm	inch	760	30	305	12
(B) Minimum clearance between machine and wall	mm	inch	455	18	25	1
(C) Minimum clearance between machines	mm	inch	455	18	25	1
(D) Minimum font clearance	mm	inch	838	33	838	33

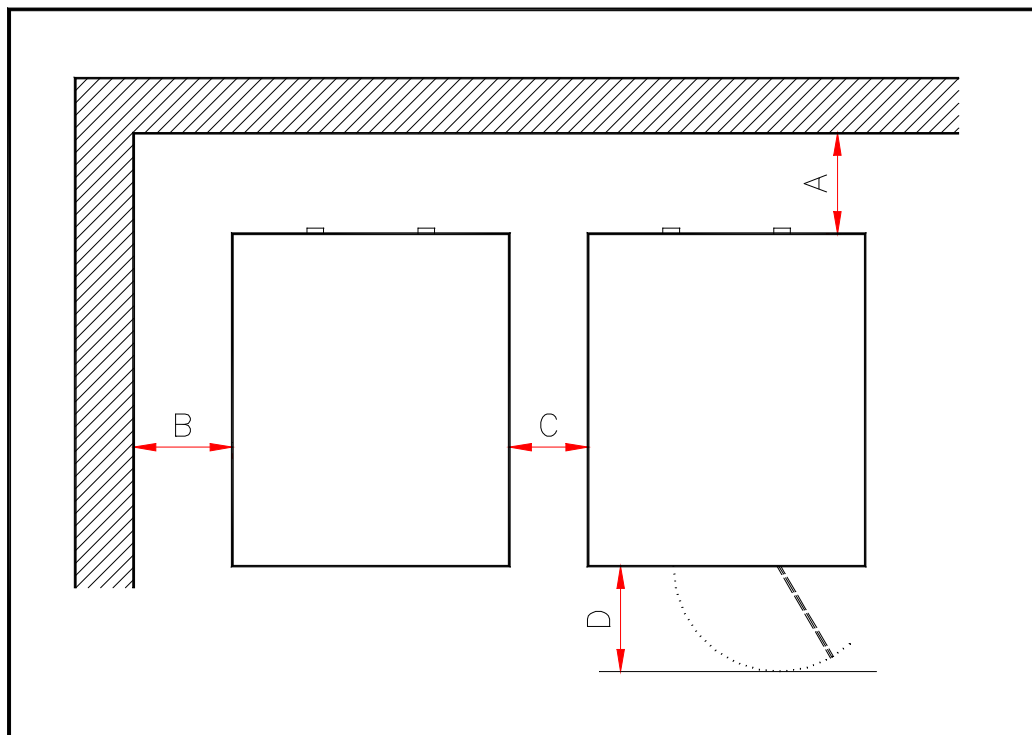**Figure 3-1** Dimensions for construction

B. MACHINE FOUNDATION

A proper foundation is an absolute necessity when installing a fixed mount washes extractor. **Do not** neglect details when doing foundation work. These details will ensure a stable installation, reducing the possibility of excess vibration at high speeds.

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

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

A concrete base designed to elevate the washer – extractor to a more comfortable working height may be used. Use care when designing a base, as the forces generated during extract are extreme. The base **must be** adequately tied into existing floor.

Do not attempt to install this machine on wooden flooring of any kind, above ground level, or over basements. Installation **must be** slab on grade or equal.

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

Model	Standard	Metric	Static Load		Dynamic Load		Dynamic Frequency
100 lb.	lbs	kN	3152	14	4047	18	10.4
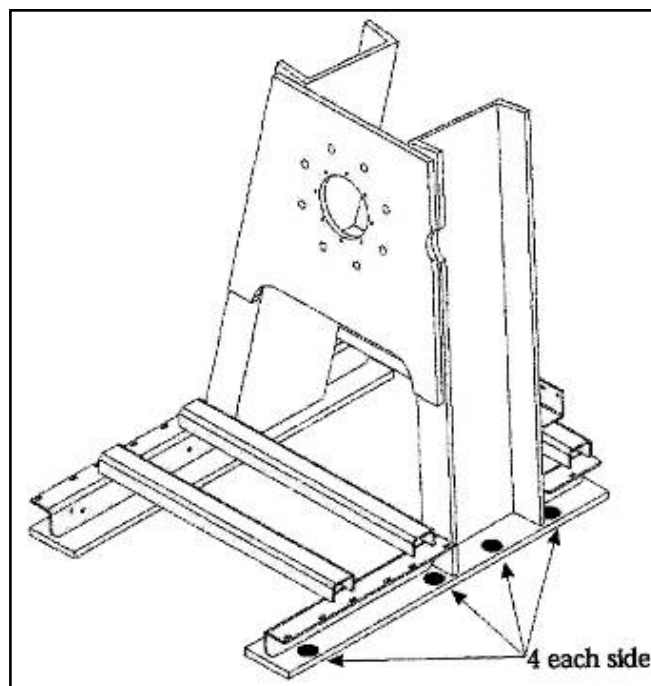
Figure 3-2 Foundation Bolt Hole Location
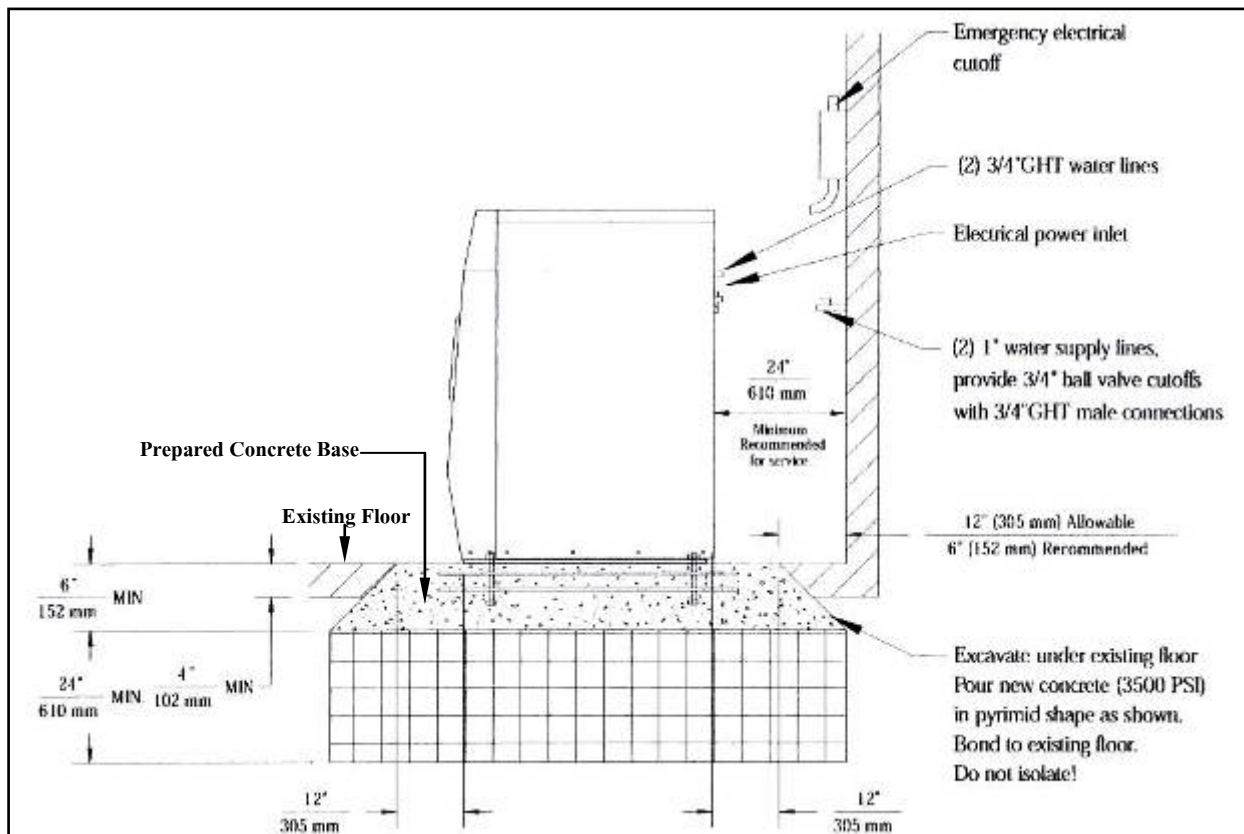
Figure 3-3 Machine Installation

C. MOUNTING BOLT INSTALLATION

All washers – extractors **must be** secured by the use of inlayed J – Bolt or similar Fixing method. The anchors **should be** embedded in 3500 psi (24000 N/m^2) reinforced concrete. See Figure below. The following information is just an example A, B, C, D.
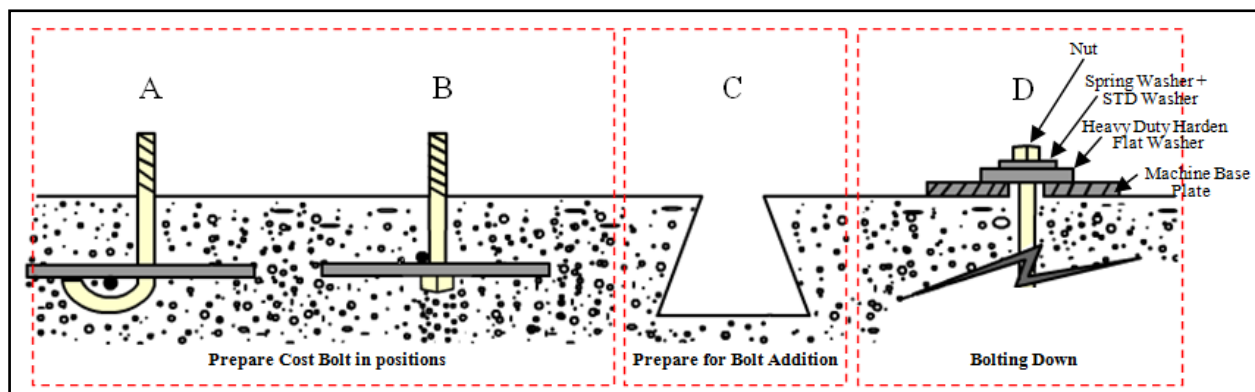
Figure 3-4 Mounting Bolt Installation

(1) Concrete Base

A+B   Prepared with Anchors Bolt precast in the concrete.

C   Prepared with Cavity for J-Bolts to be inserted with concrete when the machine placed in position.

D   Prepare bolting down.

(2) Large ν Hardened Flat Washer for placing over bolting down hold.

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 concrete base of the machine.

2. Carefully place the machine over the anchor bolts. Raise the machine and level it 1/2 inch above the concrete base on four points, using spacers that can be removed easily.

3. Fill the spaces between the machine base and floor with machinery grout. Remove front panel and rear panel to gain access to all frame members. Grout completely under 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. Place the Large hardened flat washer over the Archer bolt. Erasure there is no grout in and around the Archer bolt in the hole. If there is, clean it out so Lange flat washer makes contact with the machine base plate upper surface.

6. 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.

Machine Base Mounting Hole Configuration

Below are the standard hole configurations for the Hardmount Economy Series mounting.

Figure 3-5 Mounting Bolt Installation

Mounting Bolt Installation

100 lb. uses 3/4 – 10 × 8" (M 20) bolts.

Embed the bolts in 3500 psi reinforced concrete with a minimum of 12" thickness. The threaded end of his bolt **should extend** 2 inches from the surface of the floor. As an option, a welded bolt locating fixture is available (rebar frame). This rigid welded assembly is made of reinforcing rod (rebar) and is designed to be encased in concrete.

D. DRAIN CONNECTION

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

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 Size

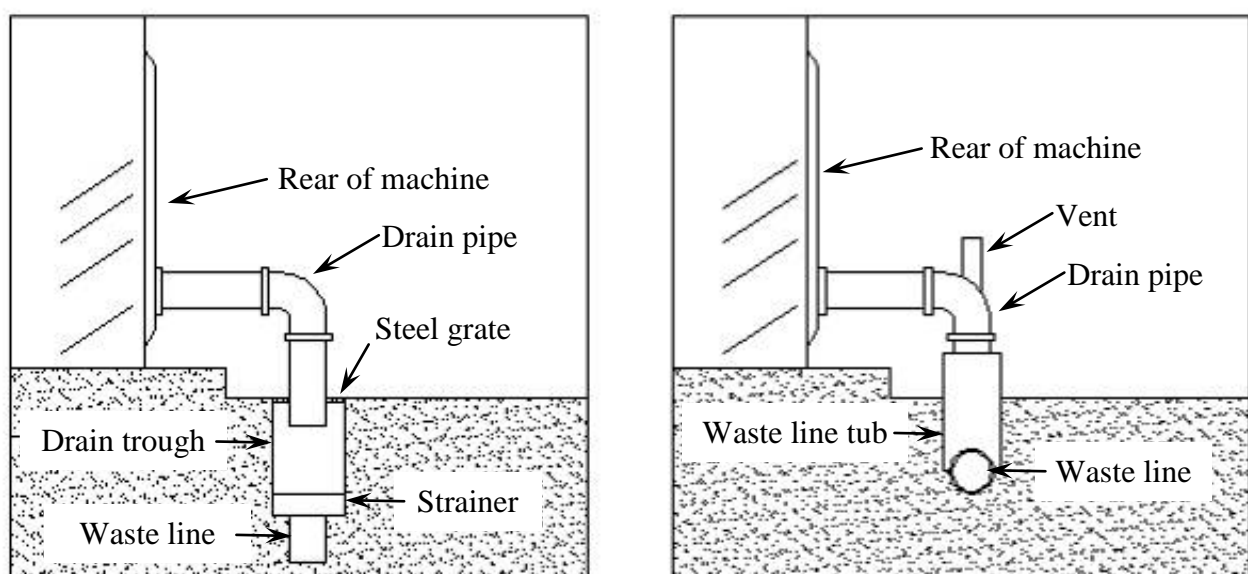| Detail	Metric	US	100 lb.	
Drain connection Size	mm.	inch	76	3
Drain flow capacity	liters/min	gpm	581	150
Minimum drain it size	liters	gal	388	100

Figure 3-6 Drain installation

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 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 theca 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 Breaker Size

Electrical Specification								
Model	Voltage	Phase	Approx. Amp Draw		Wire Size		Circuit Breaker	
			Hot water, Steam	Elec.	Hot water, Steam	Elec.	Hot water, Steam	Elec.
100 lb.	200-240	1	20	100	14 AWG / 2.5 sq.mm.	4 AWG / 25 sq.mm.	25	125
	200-240	3	26.0	100	12 AWG / 4 sq.mm.	4 AWG / 25 sq.mm.	40	125
	380-480	3	14.0	68.7	14 AWG / 2.5 sq.mm.	6 AWG / 16 sq.mm.	25	80

NOTE: For single phase (1Ø) operation, connect input power to L1 and L2, leaving the L3 terminal open.

The machine **should be** connected to an individual branch circuit not shared with lighting or other equipment because this is a vibrating machine, the use of cable or similar, with a twist – lock plug, to connect the machine to main power is recommended. A shielded liquid tight or approved

flexible conduit with proper conductor of correct size installed in accordance with National Electric Code (USA) or other applicable codes is also acceptable. The connection **must be** made by a qualified electrician using 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 – 30m). 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 Electric 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.

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 °F (70 °C). 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 Drain Pipe Size

NUMBER OF MACHINES	Pipe Size	
	DN (mm)	NPS (in)
1	25	1
2	25	1
3	40	1 – ½
4	40	1 – ½
5	50	2
6	50	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.

STEAM INLET and CONSUMPTION:	UNITS		100 lb.	
Steam inlet size	DN(mm)	NPS(in)	20	3/4
Required steam to heat bath 10 °F (5.55 °C) LOW	kg	lbs	6.4	14
Required steam to heat bath 10 °F (5.55 °C) HIGH	kg	lbs	7.3	16.1
Average Steam consumption per cycle	kg/hr	BHP	56.3	3.6

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 warranty.
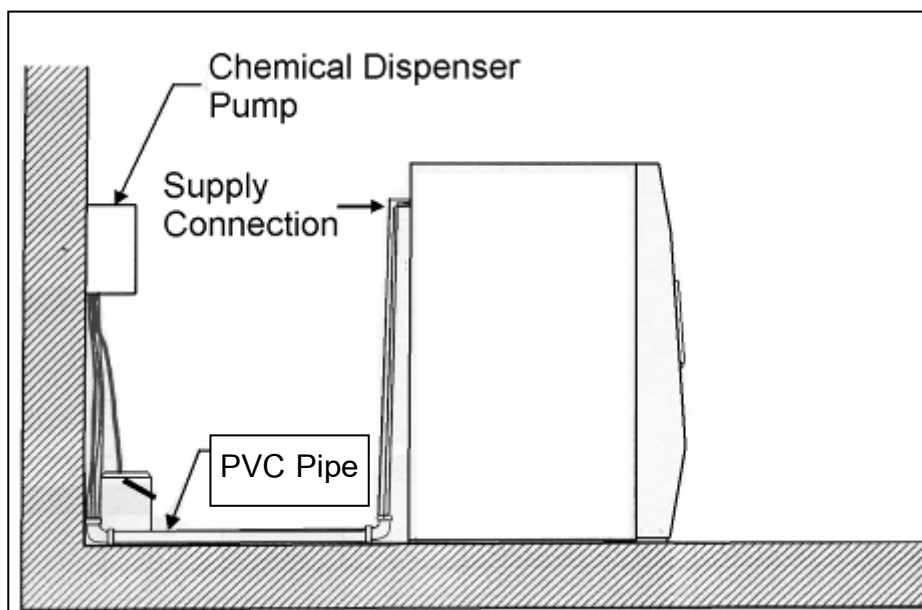
Figure 3-7 External chemical supply

The supply compartments on the Hardmount Economy Series are 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 right of the machine to the left. External supply connections for the Hardmount Economy Series are located on rear of the machine. Hose connections **should be** made via the threaded connectors.

1. Remove plug from base. Are assembled inside the tubing ring.

2. Install strain relief, included in the seal nut.

3. Insert tubes into the adapter.

For the plastic supply box, you must drill the nipples prior to use (max 1/4" bit). A 1/2 NPT connection is also provided for flushing systems.

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 24VAC 50/60Hz.

Do not attempt to increase fuse rating as this cause damage to the washer-extractor circuitry.

Any injection system pump, which requires 24VAC, **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 Hardmount Economy Series 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 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 °F to 200 °F (20 – 95 °C) 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 from the wash solution and allow the load to tumble and falling back into the solution when the load reaches the approximate 10 – 1 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

WE 01

The WE 01 is a powerful and versatile solid state control. Up to 30 programs can be stored and executed. The computer comes standard with 12 pre – programmed cycles, which are discussed later in the manual (see table of contents for locations).

NOTE: **Do not** power off the machine while the mode switch is in Program position. Doing this will result in program data corruption, requiring a reprogramming of some or all of the cycles. Always move the Program switch into the Run position before powering down the equipment.

Keypad

The user interface for the WE 01 control is a four push button keypad with an LED (Light Emitting Diode) display. This interface is located on the front of the machine. In Run mode, the keys function as follows:

Used to stop cycle in progress

Used to start a cycle

Used in cycle selection:
Pressing this key increments.
The cycle up by one.

Used in cycle selection:
Pressing this key decrement the cycle down by one.
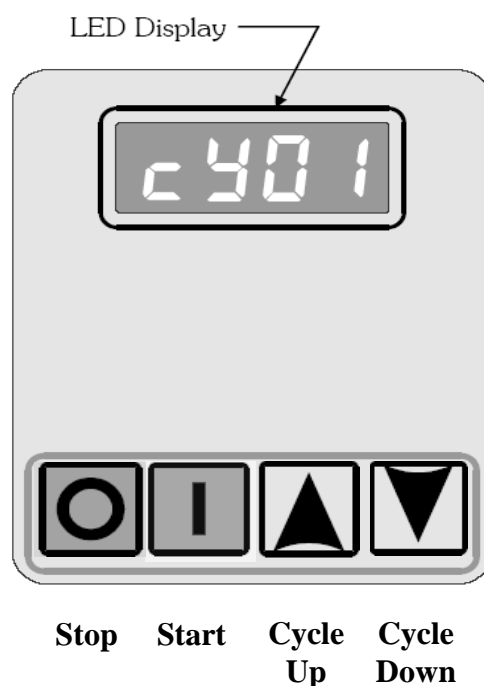
Figure 4-1 Keypad Main Controller

Cycle Selection

Press the up or down key until the desired cycle number is showing on the display. Press the keys just hard enough to activate them. Pressing harder will cause undue wear on the keypad. After you arrive at the desired cycle, ensure the goods are loaded, and the door is closed. Then press Start. If the doors is not properly closed and locked, the display will read door until the door is properly closed and locked. After the door is closed, press start button.

Cycle execution

A cycle can be aborted at any time by pressing the stop key. The machine will enter the stop routine after witch the door may be unlocked (display reads donE).

To display the temperature of the wash solution during a cycle, press the up key. To display the cycle number currently in process, press the start key. To display segment name currently in process, press the down key.

Display Indications

The following table lists the displays the WE 01 putter is capable of and their meanings. Familiarize yourself with these displays and their meanings.

Display	Meaning	Display	Meaning
504	Rom code. Example only	cFlL	Cold Fill
hold	Wait – machine just powered up	bFlL	Warm Fill (both hot and cold)
cy	Cycle number (followed by 2 digits)	hFlL	Hot Fill
chEc / cYc	Test Cycle	LoLE	Low water level
FRr	Degrees Fahrenheit	MdL	Medium water level
cEL	Degrees Celsius	hlLE	High water level
PrE	Prewash segment (1st of 8 segments)	SUP 1	Supply 1
URSh	Wash segment (2nd of 8 segments)	SUP 2	Supply 2
FlL 1	First rinse (3rd of 8 segments)	SUP 3	Supply 3
FlL 2	Second Rinse (4th of 8 segments)	SUP 4	Supply 4
FlL 3	Third Rinse (5th of 8 segments)	SUP 5	Supply 5 (Supply 1 & 2)
FlL 4	Fourth Rinse (6th of 8 segments)	SUP 6	Supply 6 (Supply 2 & 3)
FlL 5	Fifth Rinse (7th of 8 segments)	SUP 7	Supply 7 (Supply 3 & 4)
FlL 6	Sixth Rinse (8th of 8 segments)	StoP	Stop Routine
Sr ln	Spray Rinse	SdLy	Spin coast down delay
Dr ln	Dilution Rinse	donE	Cycle complete, open the door
PrEu	Normal Prewash selected	door	Door not closed and locked
SP ln / lnE	Reads "spin" for one second, then "time" followed by the spin time	FlLL / StoP	Programmed water level not reached after 30 minutes
tSFL	Temperature sensor failure or temperature out of range.	FULL	Water level is detected when none **should be** present. Can indicate a clogged drain.
FLUS	Overflow prewash selected		

Each of the 30 cycles consists of 8 segments. A typical cycle has Pre wash, Wash, and Rinses (up to six are available. Upon the completion of the last rinse, a final spin occurs. Following is a description of each cycle segment.

Fill

After the start key is pressed, the drain is closed and the machine begins filling to the appropriate water level. Each wash segment begins with a fill. After the water level is reached, the cycle time begins to count down (the cycle timer is paused during fill, heat and drain steps). If a supply is programmed during the segment, the dispenser will be flushed during the fill.

If the machine is connected to an external chemical supply system, the programmed supply will begin 10 seconds into the programmed water level is reached, or sixty seconds have elapsed. If the water level is not reached after 30 minutes, the display will flash Stop and Fill The onboard beeper will also sound for 10 seconds. The machine will then enter the stop routine.

Wash

Standard Wash

As soon as the programmed water level is reached (and any programmed temperature is reached) the display begins to count down the remaining time left in the cycle.

All except three cycles use the standard agitation profile. This agitation profile is active during prewash, wash, and rinses. The standard sequence is:

➢ 12 seconds counterclockwise at wash speed

➢ 3 second pause

➢ 12 seconds clockwise at wash speed

➢ 3 second pause

Gentle Wash

Cycles 8, 16, and 24 use a gentle agitation profile. This profile is used in the prewash, wash, and rinse steps. The gentle wash agitation profile is:

Heat

If a wash segment contains a heat step, the heating elements will begin to heat the wash solution after the programmed level has been reached. If the water does not reach the desired temperature after 30 minutes, the machine will progress to the next step.

Selection Advance

Advance Mode

While any cycle is running, operator can end the current step and advance to the next one by pressing the up and down key together.

This mode use for skip currently to next step in segment.

NOTE: During fill water, drain step of each segment the advance function can not execute.

NOTE: Water level to be reached before advance is possible

- Fill (Heater start) to wash

- Wash to drain

- Spin to stop routine segment

Press ▼▲ together for advance step in this program.

➢ 3 seconds counterclockwise at wash speed

➢ 12 second pause

➢ 3 seconds clockwise at wash speed

➢ 12 second pause

Drain

At the conclusion of a prewash, wash, or rinse segment, the drain valve opens and the wash cylinder turns clockwise at wash speed. The machine should drain in less than 30 seconds. If draining takes longer than this, a clogged drain hose is usually to blame. Contact a qualified service technician.

After the water level has fallen below the low level, there is a fifteen second delay, during which the computer monitors the water level. If water is sensed, the computer waits until both high and low level inputs show that there is no water in the wash cylinder. Assuming no water is detected, the drain sequence concludes, and the computer proceeds to the next segment.

Spin

After the drain sequence, the machine progresses to spin speed if the spin time is not zero. The displayed time will continue counting down. After the programmed spin time has elapsed, the next segment of the wash cycle begins or the stop routine begins, if the spin was the final spin of the wash cycle.

Stop Routine

When the final spin of the wash cycle is complete, the stop routine is activates. The stop routine sequence looks like this:

➢ All inputs are turned off

➢ The coast down delay timer is activated (after a spin). This sequence time dependent by coast down delay time selection in setup mode.

➢ 12 seconds clockwise at wash (if no spin)

➢ 3 seconds pause (if no spin)

➢ 12 seconds counterclockwise at wash

➢ 5 second pause

➢ The display shows donE

Once the display shows **donE**, the door can be opened. Once the door is opened, the display reverts to the cycle number of the cycle just completed. The machine is now ready to run another wash program.

WARNING! Never insert any part of your body or any object into the wash cylinder until it has completely stopped. Doing so could result in serious injury.

NOTE: If the display shows **donE** and the wash cylinder continues to rotate for an abnormally long time, this means that.

The water failed to completely drain, or the water level switch is faulty. The door will not until the problem is corrected.

The computer board is located inside the control module. In the middle of the board is a small toggle switch used to change from Run mode to Program mode (see illustration).

⚠ **WARNING!**	Dangerous voltages can be present inside the control module. Only qualified service technicians with specific knowledge of test procedures and safety precautions **should attempt** troubleshooting and repair. Disconnect power before removing panels and covers, and before attempting service procedures.

The Run/Program switch is normally in the up position (Run mode) position. To enter program mode, flip the switch to the down position (Program mode). The display changes to show the current temperature in the wash cylinder. See the next section for key functions while in program mode.

Key Functions in program Mode

The Stop key saves all data and terminates the programming procedure. If you press this key first when entering program mode, the computer will enter Setup.
If the stop key is pressed again, you will exit Setup mode and return to Program mode.

The Start key is the Enter command while in Program mode. Pressing this key enters the data, and moves to the next programming function in the cycle.

The Up key is used to increase cycle numbers and other numerical values, like time and temperature, when creating wash formulae.

The Down key is used to decrease cycle numbers and other numerical values, like time and temperature, when creating wash formulae.

The wash control WC01 Version b263 control is a four push button keys with an LED (Light Emitting Diode) display. This interface is located on the front of the machine.

Normal Display

After power **ON** the machine. The display will show as the picture below.
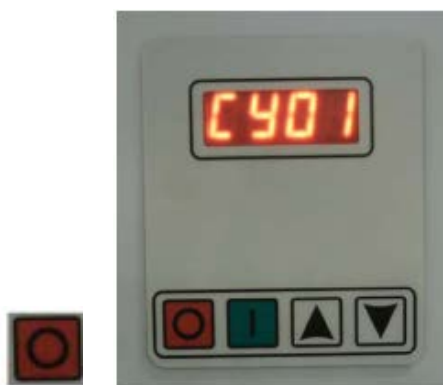
Figure 4-2 Nomal Display

The controller shows **CY01.** That means now the program No. 1. If you need to operate with this program You can press start button ▯ If your need to change to another program. You can press Key UP or DOWN ▲ ▼ for select the program.

Setup Program

The controller this version use the password for go into setup program. The password is 1234.

- Password menu. Press Key UP and DOWN ▲ ▼ at the same time.
- Press Key UP ▲ 1. time. The monitor will show 1. Then Press Enter ▯
- Press Key UP ▲ 2. times. The monitor will show 12. Then Press Enter ▯
- Press Key UP ▲ 3. times. The monitor will show 123. Then Press Enter ▯
- Press Key UP ▲ 4. times. The monitor will show 1234. The Press Enter ▯

Figure 4-3 Password Mode Display.

After put password correct. The monitor will show temperature default 30 °C.

Figure 4-4 Set Mode Display

Then the controller can program. Prewash, Wash, Fill (Rinse), and Spin.

After Programming finish. Press Key UP and DOWN ▲▼ at the same time for out of Setup mode to operate mode. In the operate mode you can fine program for checking the machine.

Figure 4-5 Operate Mode Display.

Step after Setup Program

1.1 The controller monitor will show **CY 01** when finished the program setting, then the controller monitor will display currently inside drum temperature.

1.2 Push start button, the controller monitor will show **PrE**.

1.3 Push stop button again. The controller monitor will show currently inside drum temperature such as 32 °C.

1.4 Push the UP and DOWN button at same time then the beep louder twice time.

1.5 The controller monitor will display **CY 01** again that means ready for start operating.

1.6 If the machine can not start after pressed start button and the controller monitor have shown **PrE**. Please go back to Item 1.1.

Setup Mode

The setup options are programmable options that are in operation during all wash cycles. The options are:

➢ Temperature displayed in degrees Celsius or Fahrenheit.

➢ Spray Rinse and Supply 4 enabled

➢ Auxiliary heat and Spray Rinse enabled

➢ Auxiliary heat and Supply 4 enabled

➢ Advance function

➢ Coast down delay timer function

Take note that these options can only be changed while in Setup mode.

Temperature Display

This setup option affects the display and programming of all temperatures. **cEL** selects programming/display in degrees Celsius, while **FRr.** selects degrees Fahrenheit. The UP and DOWN keys toggle between the two settings. The Start key accepts the selection and moves you to the next setup option.

Spray Rinse, Supply 4, and Auxiliary Heading

This setup option allows you to select among the following options:

➢ Spray Rinse and Supply 4 enabled

➢ Auxiliary heat and Spray Rinse enables

  ➢ Auxiliary heat and Supply 4 enables

To enable **Spray Rinse** and **Supply 4**, use the up and down key to see **Srin**. When this option is selected, Spray Rinse and Supply 4 are enabled, as well as Supply 7 (Supply 3 and Supply 4 combined). This is the default setting. When this option is selected, no further programming in Setup is possible. Press the Stop key to exit Setup.

To enable **Spray Rinse** and **Auxiliary Heating,** use the up or down key to see **heat** instead of **Srin**, as above. Now press the Start key (enter). Now use the up or down key to see **Srin**. Press the start key (enter). No further Setup programming is possible. Press the Stop key exit Setup.

To enable **Auxiliary Heat** and **Supply 4,** press the Up or Down key to see **hEAt.** Press the start key (enter). Now press the Up or Down key to see **SUP4**. Press the Start key to select, and press the Stop key to save and exit Setup mode. This is the default mode for machines without Spray Rinse.

To enable advance. Press the up or down to see " ¦ ". Press the start SP40, SP60, SP90. Press start key to select and press the stop key to save and exit setup mode

To enable advance function, use the up or down key to see " ¦ ". Press start key accepts the selection and mores to next setup option. When this function is enabled. The machine operator can use the advance function during running.

To disable advance function, use the up or down key to see " ▯ ". Press start key accepts the selection and mores to next setup option.

Cycle Count

To display the current cycle count, press the Start key after entering Program mode (the display will show the current temperature in the wash cylinder). The display will show a 2 digit number indicating how many cycles have been completed (cycles interrupted are not counted). Press the Start key again to return to program mode without resetting the count. Press the Up or Down key to reset the count to zero and return program mode.

Cycle Programming

To edit an existing cycle, or create a new one, press the Up key while the wash cylinder temperature is displayed. The display will change to show cY01. Press the up or down key until the cycle number you wish to change/create is displayed. Now press the Start key to begin editing your cycle. Please note that the test cycle cannot be displayed or altered.

All programmed cycles follow a certain routine, consisting of eight program segments, displayed in the table below.

Cycle Segments			
Segment	**Display**	**Segment**	**Display**
Prewash	**PrE**	Fill3	**FIL3**
Wash	**URSh**	Fill4	**FIL4**
Fill1	**FIL1**	Fill5	**FIL5**
Fill2	**FIL2**	Fill6	**FIL6**

When modifying a cycle time, a time must be entered for each segment. To skip a segment or spin, enter 00 for the time and press the Start key. The following table shows the range of tine allowed for each segment and spins, as well as the allowed temperature range for machines equipped with auxiliary heat.

Time and Temperature Parameters		
Function	Minimum	30 minutes
Prewash	2 minutes	20 minutes
Wash	2 minutes	15 minutes
Fill1	2 minutes	15 minutes
Fill2	2 minutes	15 minutes
Fill3	2 minutes	15 minutes
Fill4	2 minutes	15 minutes
Fill5	2 minutes	15 minutes
Fill6	2 minutes	15 minutes
Intermediate Spin	30 secouds	102 secouds
Final Spin	1 minutes	10 minutes
Tem perature	75F/25C	200F/93C

Note that spin times are programmed in seconds for in seconds for intermediate spins following Prewash, Wash, and Fills 1 throung5. The final spin, following Fill 6 is programmed in minutes.

To begin programming, press the Up key shows the segment to be edited, and then press the Start Key.

For the Prewash segment, you can select either **PrEU** (normal Prewash) or **FLUS** (overflow fill Prewash). If Overflow Prewash is selected, the fill valves will remain on for the duration of the Prewash step. Press the Start key to make your selection.

If the Spray Rinse option is enabling in Setup, you have the option of Spray Rinse or Dilution Rinse during Fill 1 through Fill 5. The display shows **Srin** for spray rinse or **drin** for dilution rinse.

Use the Up and Down keys to select the fill temperature. The following table shows the available options.

Fill Temperature Options	
Display	**Fill Type**
hFIL	Hot Fill
cFIL	Cold Fill
bFIL	Warm Fill

After you have selected the appropriate fill temperature, press the Start key.

Now you can select the Fill level by using the UP or DOWN key. Select your Fill level according to the following to the following table.

Fill Level Options	
Display	**Fill Level**
LoLE	Low Level
∏dLE	Medium Level
hILE	High Level

Note that if you selected FLUS for the Prewash segment, this selection is skipped. After your Fill level selection, press the Start Key.

Next select the desired Supply option. See the table.

Supply Options	
Display	Supply
SUP0	No Supply
SUP1	Supply 1
SUP2	Supply 2
SUP3	Supply 3
SUP4	Supply 4
SUP5	Supply 1 & 2
SUP6	Supply 2 & 3
SUP7	Supply 3 & 4
Supply 4 & 7 are only available if is Supply 4 was enabled in Setup	

After selecting your desired supply option, press the Start key.

If your machine is equipped with Auxiliary heating, and it was enabled during Set up programming, you may use the up or down key to select the target temperature for the segment. To disable Auxiliary heat for the segment, set the value to zero. If the machine does not have temperature here. If you program a target temperature that the machine is unable to achieve, the machine will try for 30 minutes during the segment. It is also important not to flush fill. After you have selected the temperature, press the Start key.

Now select the spin time for the segment. If you wish to skip the spin, set the value to zero. After you have set the spin time, press the Start key, the display will now show the name of the next program segment and what the display indicates for each.

Cycle Segment Charts

Prewash Segment	
Display	**Details**
	Use Up or Down to change. Start key is enter or advance
	PrE
PrE or FLUS	Select Regular prewash or Flush
00 or 02 - 30	Segment time: 00 to skip,or any time between 0 and 30 minutes
HFIL cFIL bFIL	Fill temperature: Hot, Cold, or Warm (both fill)
SUP0 – SUO7	Select Supply 0-7 (0 for no supply during the step)
00, 75 - 200	Enter temperature: 75-200 deg F, 25-93 deg C. 00 for no heat Select 00 if you
00, 25 – 93	have programmed a Flushing Prewash
SPIn flases for 1 sec	
t IrE flases for 1 sec	
00 or 30 - 120	Select time for spin: 30-120 seconds. 00 for no spin
NOTE: Supply 4 and 7 are only available if enabled in Setup	
NOTE: Heat is only available if enabled in Setup	

Wash Segment	
Display	**Details**
	Use Up or Down to change. Start key is enter or advance
URSh	
00 or 02 - 30	Segment time: 00 to skip, or any time between 0 and 30 minutes
HFIL cFIL bFIL	Fill temperature: Hot, Cold, or Warm (both fill)
LoLE or hILE	Select Fill level, Low or High
SUP0 – SUO7	Select Supply 0-7 (0 for no supply during the step)
00, 75 - 200	Enter temperature: 75-200 deg F, 25-93 deg C. 00 for no heat Select 00 if you
00, 25 – 93	have programmed a Flushing Prewash
SPIn flases for 1 sec	
t IrE flases for 1 sec	
00 or 30 - 120	Select time for spin: 30-120 seconds. 00 for no spin
NOTE: Supply 4 and 7 are only available if enabled in Setup	
NOTE: Heat is only available if enabled in Setup	

Fill Segment (Fill 1 through Fill 5)	
Display	**Details**
	Use Up or Down to change. Start key is enter or advance
FIL 1 FIL 2 FIL 3 FIL 4 FIL 5	
dr In or Srin	(1) Select Rinse Method: Dilution Rinse or Spray Rinse
00 or 02 - 30	(2) Segment time: 00 to skip, or any time between 0 and 30 min
HFIL cFIL bFIL	(3) Fill temperature: Hot, Cold, or Warm (both fill)
LoLE or hILE	(4) Select Fill level, Low or High
SUP0 – SUP7	(5) Select Supply 0-7 (0 for no supply during the step)
00, 75 - 200	(6) Enter temperature: 75-200 deg F, 25-93 deg C, 00 for no heat. Select 00 if
00, 25 - 93	you have programmed a Flushing Prewash
SPIn flases for 1 sec	
t IrE flases for 1 sec	
00 or 30 - 120	(7) Select time for spin: 30 – 120 seconds. 00 for no spin
NOTE: Supply 4 and 7 are only available if enabled in Setup	
NOTE: Heat is only available if enabled in Setup	
NOTE: If Spray Rinse is selected for the segment, steps 3 to 6 are skipped.	

Fill 6 Segment	
Display	**detiail**
	Use Up or Down to change. Start key is enter or advance
FIL 6	
00 or 02 - 30	Segment time: 00 to skip, or any time between 0 and 30 minutes
HFIL cFIL bFIL	Fill temperature: Hot, Cold, or Warm (both fill)
LoLE or hILE	Select Fill level, Low or High
SUP0 – SUO7	Select Supply 0-7 (0 for no supply during the step)
00, 75 - 200	Enter temperature: 75-200 deg F, 25-93 deg C. 00 for no heat Select 00 if you
00, 25 – 93	have programmed a Flushing Prewash
SPIn flases for 1 sec	
t IrE flases for 1 sec	
00 or 30 - 120	Select time for spin: 30-120 seconds. 00 for no spin
NOTE: Supply 4 and 7 are only available if enabled in Setup	
NOTE: Heat is only available if enabled in Setup	

PROGRAM SPEEDS IN RPM FROM G – FORCE POINTS

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-20-30	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
SI-450	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-20-30	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
SI-450	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-20-30	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
SI-450	1.629 m	549.7	574.2	597.6	620.2

SECTION 5

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.

NOTE: 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:

        -   Bearing grease fitting, 2 strokes.

        -   Seal grease fitting, 1 stroke.

    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.

    a. 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.
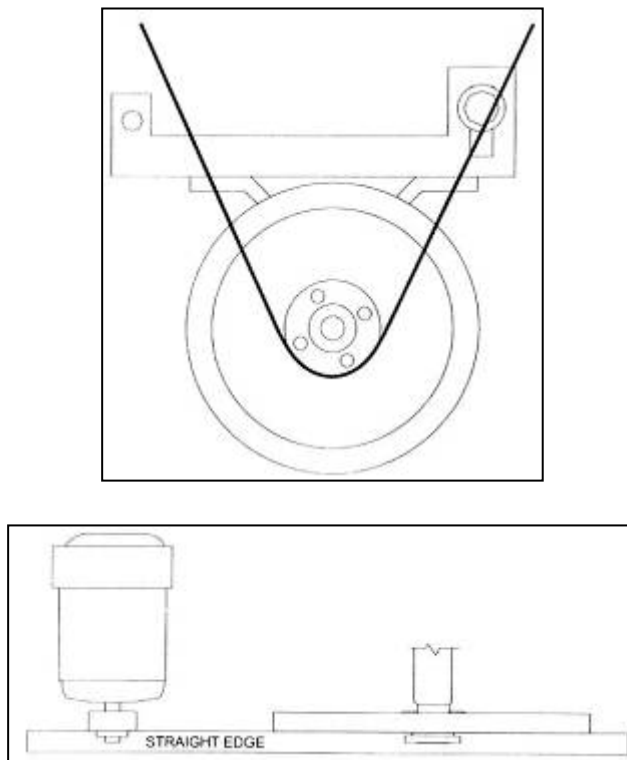
STRAIGHT EDGE

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.

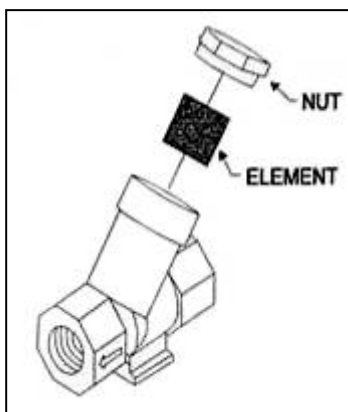2. Contact with dissimilar metal should be avoided whenever possible. This will help prevent galvanic corrosion when salty or acidic solutions are present.

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.

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 ha been turned off. Then remove the control circuit and main circuit terminal block covers. Check that the DE link circuit voltage between main circuit terminals P (+) and N (-) does not exceed the safety voltage (+25 VDC) with a multi meter and start the maintenance and inspection. Electric shock may occur.

-   Maintenance, inspection, and parts replacement **should be** mace only by authorized persons.

-   Take off the watch, rings and other metallic matter before starting work.

-   Use insulates 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.

-   Check for traces of overheats 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.)

Part Replacement Judgment with Menu#5 "Maintenance Information"

Parts to be replaced	Judgment 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 40 ºC).

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 off 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. Turn off water supply.

   b. 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 disconnect 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 L2/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 multi – meter.

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 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.7-8
OC2		
OC3		
OU1	Over voltage protection	P.7-9
OU2		
OU3		
LU	Under voltage protection	P.7-10
L in	Input phase loss protection	P.7-11
OPL	Output phase loss protection	P.7-11
OH1	Overheat protection for heat sink	P.7-11
OH2	External alarm input	P.7-12
OH4	PTC thermistor for motor protection	P.7-12
dbH	Overheat protection for braking resistor	P.7-13
OL1	Electronic thermal overload relay	P.7-14
OLU	Overload protection	P.7-14
Er1	Memory error	P.7-15
Er2	Remote keypad communications error	P.7-15
Er3	CPU error	P.7-16
Er6	Operation protection	P.7-16
Er8	RS485 communications error	P.7-16
ErF	Data save error during under voltage	P.7-17

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 her value of the set frequency to the same of higher than that of the starting or stop frequency (F23 of 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 fre3quency command, signal converter, switches, or relay contacts are malfunctioning, replace them. → Connect the external circuit wires to terminals (13), (12), (11), and (C1) correctly.
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. →
	Check the data of function codes F18, C50, C32, C34, C37 and C39 → Change the bias and gain to correct values.
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 heard from motor.

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. The motor dose not accelerates and decelerates at the set time.

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).
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.
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 (+) 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" Over current protection

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

OC1 Over current occurred during acceleration.

OC2 Over current occurred during deceleration.

OC3 Over current 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 Mugger 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" Over voltage protection

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

OU1 Over voltage occurs during the acceleration.

OU2 Over voltage occurs during the deceleration.

OU3 Over voltage 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 over voltage 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 over voltage 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" Under voltage protection

Problem DC link circuit voltage was below the under voltage 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.
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 alarms 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.

Possible Causes	What to Check and Suggested Measures
3. Inter – phase 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.

Possible Causes	What to Check and Suggested Measures
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). → Decrease 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).

Possible Causes	What to Check and Suggested Measures
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).

Possible Causes	What to Check and Suggested Measures
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, and then restart the operation.
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, and then restart the operation.
3. The CPU did not operate normally.	Initialize the function code data by setting H03 to 1, and 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 functions 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 (y08=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 insulated converter.
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 **<u>do not</u>** hesitate to call if we can be of any assistance to you.
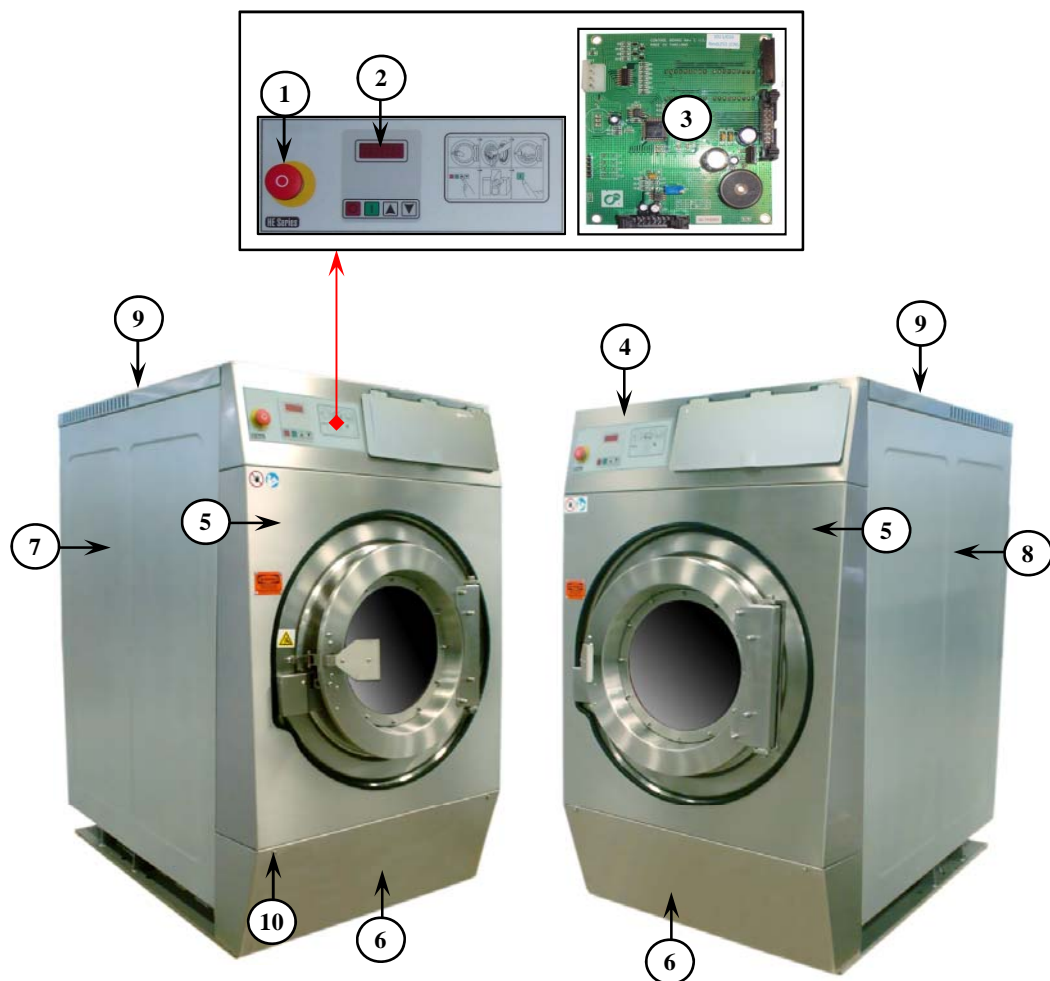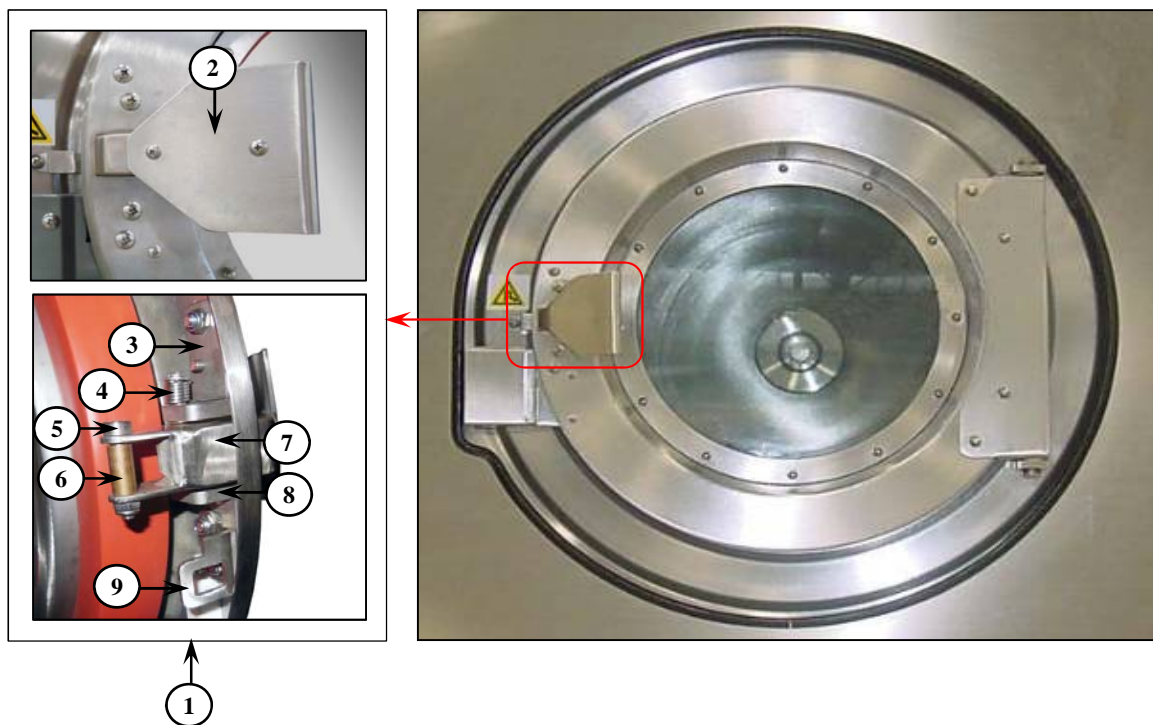
Item	Part No.	Qty.	Description
1	A0-E032-022	1	Emergency stop button, (Head)
	A0-E032-023	1	Connector base
	A0-E032-024	1	Contact block
2	A0-E007-012	1	Key pad
3	A0-E007-177	1	WE 01 Control CPU Link Inverter
4	A1-S802-043	1	Panel, Front top 4 Cup (Plastic)
5	A1-S802-002	1	Panel, Front middle
6	A1-S802-003	1	Panel, Front lower
7	A1-S102-002	1	Right panel assembly (SUS)
	A1-S102-003	1	Right panel assembly (Painted)
8	A1-S102-004	1	Left panel assembly (SUS)
	A1-S102-005	1	Left panel assembly (Painted)
9	A1-S102-006	1	Top panel assembly, Front (SUS)
	A1-S102-007	1	Top panel assembly, Front (Painted)
	A1-S102-008	1	Top panel assembly, Rear (SUS)
	A1-S102-009	1	Top panel assembly, Rear (Painted)
10	A0-A068-013	-	Screw stainless
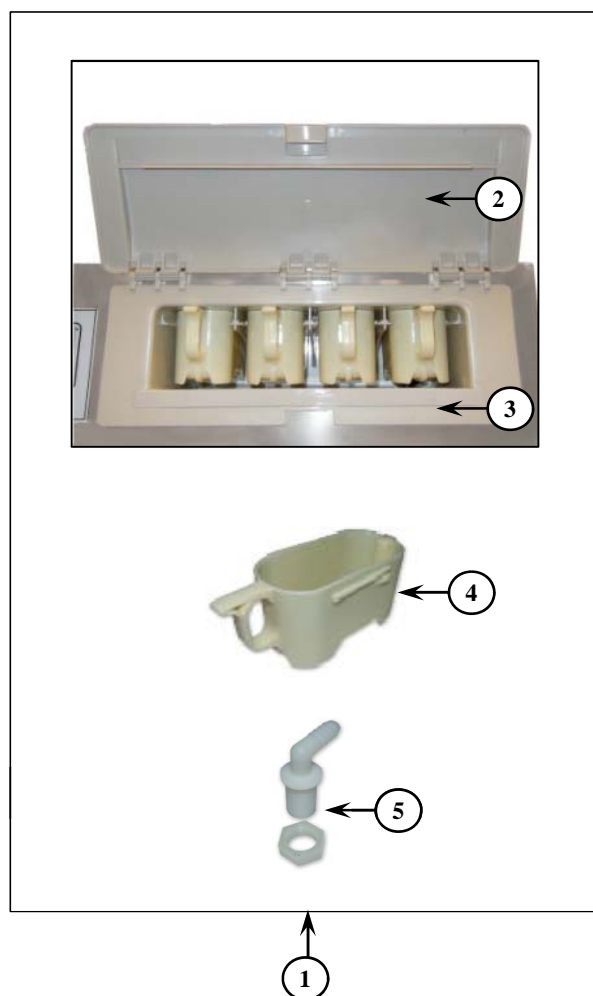
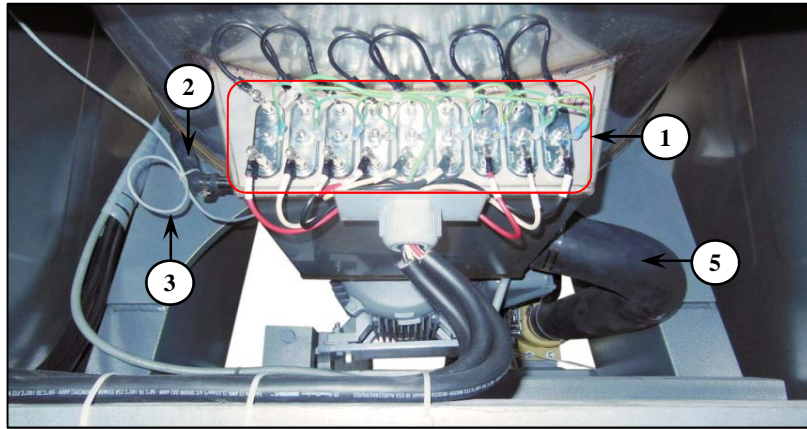| Item	Part No.	Qty.	Description
1	A0-A178-004	1 Set	Set, Chemical dispenser 4 compartments (Plastic)
2	A0-A095-062-02	1	Lid, Chemical dispenser 4 compartments (Plastic)
3	A0-A095-062-01	1	Body, Chemical dispenser 4 compartments (Plastic)
4	A0-A030-006	4	Plastic cups (Plastic dispenser)
5	A0-A095-002	4	Nozzle, (Plastic dispenser)
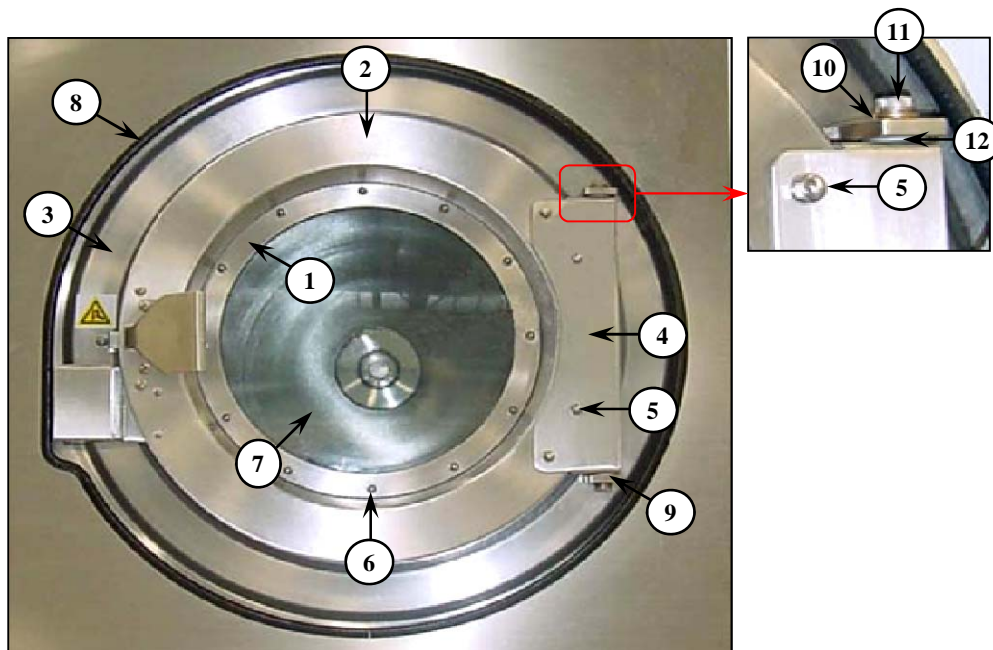
Item	Part No.	Qty.	Description
1	A1-S802-010	1	Glass retainer ring
	A0-A001-042	1	Gasket, Door glass
2	A1-S802-011	1	Door tub
3	A1-S802-012	1	Front panel tub
4	A1-S802-015	1	Door hinge
5	A0-A081-006	4	Cap nut
	A0-A057-003	4	Bolt studs stainless
6	A0-A057-002	12	Bolt studs stainless
	A0-A081-005	12	Cap Hex. nut
7	A0-A003-004	1	Door glass
8	A0-A001-004	1	Rim protection gasket
9	A1-S802-029	1	Door hinge bracket
10	A0-A033-002	1	Door hinge bushing
11	A0-A033-003	1	Bolt, Shoulder, Door Hinge
12	A1-SSP2-005	1	Door hinge washer

Item	Part No.	Qty.	Description
1	A1-ST00-001	1 Set	Assembly door handle and brackets complete set
2	A1-ST00-001-03	1	Door Handle-B Grip
3	A1-ST00-001-01	1	Door Handle Upper hinge bracket-B
4	A0-TSA01-496	1	Door Handle Pivot Spring
5	A0-A033-005	1	Door Latch Shoulder Bolt
6	A0-A033-004	1	Door Handle latch Bush
7	A1-ST00-001-04	1	Door Handle- B body
8	A1-ST00-001-02	1	Door handle Lower hinge Bracket-B
9	A1-ST00-001-05	1	Door Lock Tongue (Square)
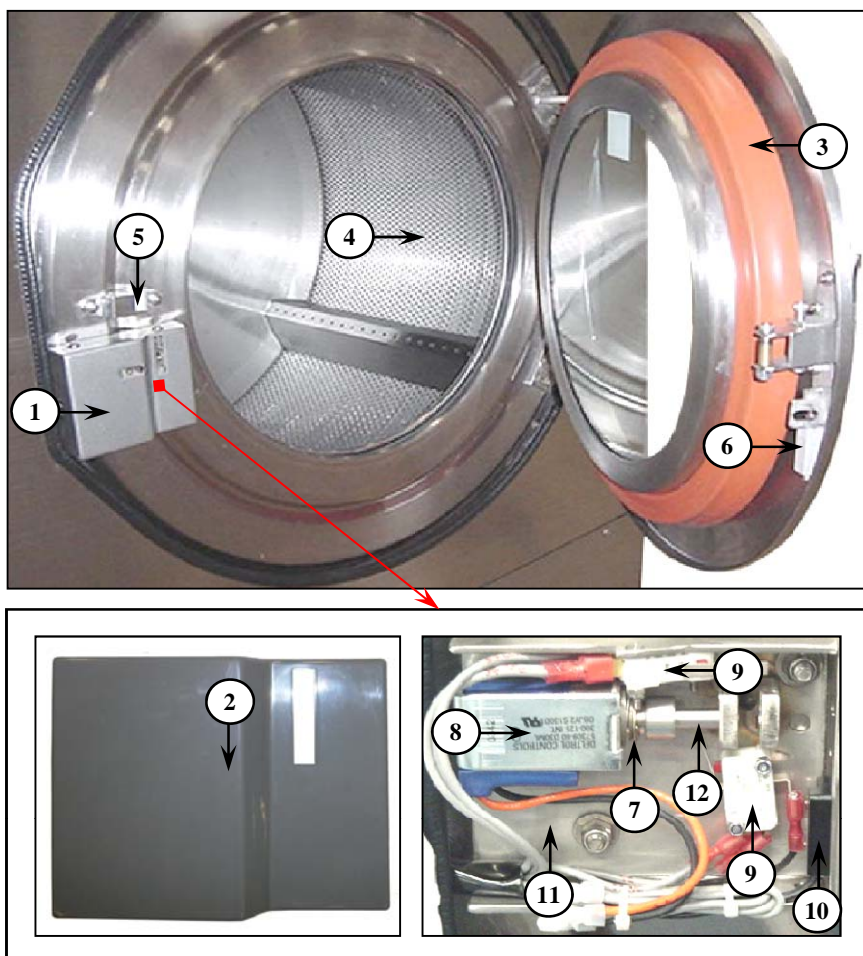
Item	Part No.	Qty.	Description
1	A1-ST00-002	1	Door lock assembly complete set
2	A0-A237-001	1	Door lock cover Plastic
3	A0-A001-014	1	Door Gasket
4	A1-S101-018	1	Basket stainless steel
5	A0-A013-009	1	Door lock block
6	A0-A036-001	1	Magnet actuator for magnetic reed Switch (White)
7	A0-A008-120	1	Spring, Solenoid lock
8	A0-E015-024	1	Solenoid door lock (for DC)
9	A0-E014-015	2	Micro switch
10	A0-E014-007	2	Switch, Magnet reed
11	A1-ST00-002-01	1	Base box with Guides
12	A0-A033-014	1	Pin, Door Lock (DC)

Electric Type
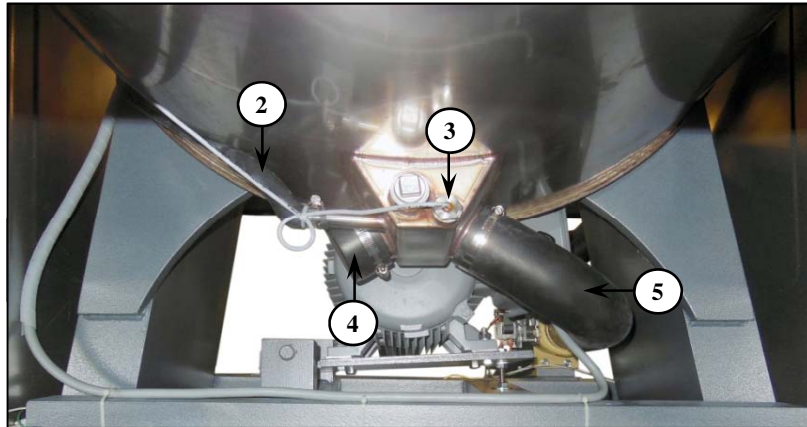
Steam Type & Hot Water Tpye

Item	Part No.	Qty.	Description
1	A0-E005-001	9	Heater (For type electrical)
2	A0-A018-090	1	Hose water level
3	A0-E007-059	1	A-Computer Temp probe
4	A0-A001-034	1	Reuse, Drain plug
5	A0-A018-070	1	Drain hose
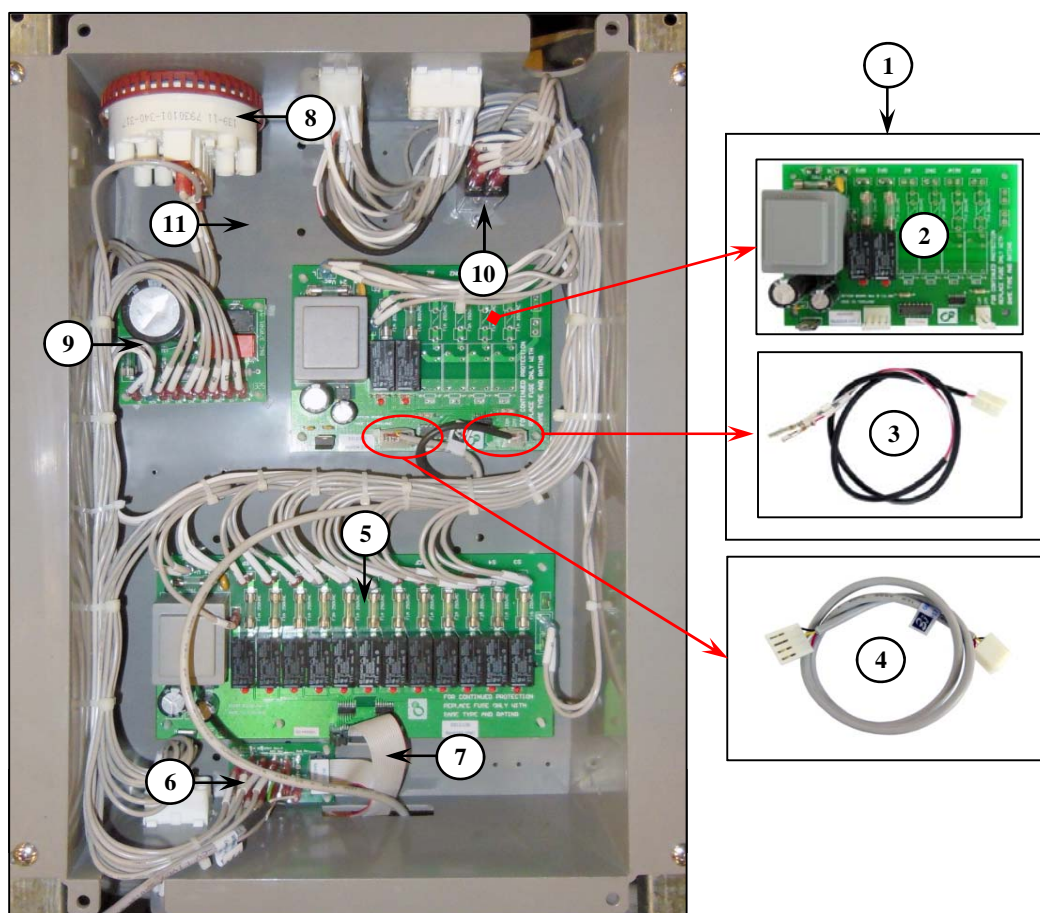
Item	Part No.	Qty.	Description
1	A0-E007-170	1	WE 01 Option Board (2 RELAY FUJITSU) +DE WIRE 2C 2Pin
2	A0-E007-233	1	WE 01 Option Board
3	A0-E007-234	1	Synchronise Inverter Cable
4	A0-E007-171	1	WE 01 (For Option Board Rev.b253)
5	A0-E007-178	1	WE 01 Power Board I/O Link Inverter
6	A0-E007-060	1	Ribbon Cable 14 Pin
7	A0-E007-015	1	Ribbon Cable 16 Pin
8	A0-E049-006	1	Pressure switch, Water level
8	A0-E049-003	1	Pressure switch, Water level
9	A0-E015-026	1	Board PCB, Door lock
10	A0-E009-017	1	Relay, Coil 24VAC 50/60HZ.
11	A0-A050-027	1	Electrical Control Box Upper

for Steam Type
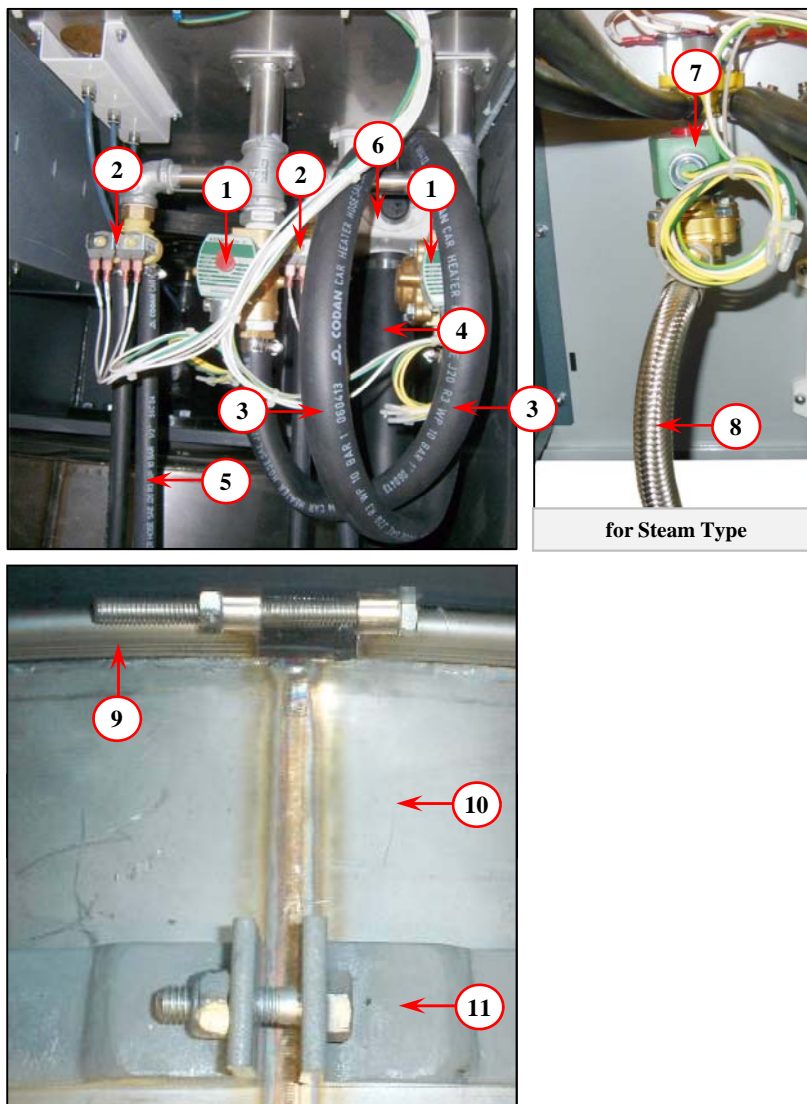
Item	Part No.	Qty.	Description
1	A0-E047-074	2	Solenoid Steam Valve 1" 24V/50HZ
2	A0-E040-001	2	Supply Valve 2-Way, 3/4", 24V, 50/60HZ
3	A0-A018-013	2	Hose, Water inlet 1"
4	A0-A018-030	1	Hose, Water dispenser (2-1/2")
5	A0-A018-016	4	Hose, Water flush 1/2"
6	A0-A127-003	1	Vacuum Breaker
7	A0-E047-076	1	Solenoid Steam Valve 1/2" (for Steam Type)
8	A0-A017-012	1	Flexible Pipe, 1/2"X1800 mm. (for Steam Type)
9	A1-S802-023	1	Shell assembly ring
9	A0-A001-003	1	Gasket front panel tub
10	A1-S102-010	1	Shell assembly
11	A1-S802-022	1	Shell Ring
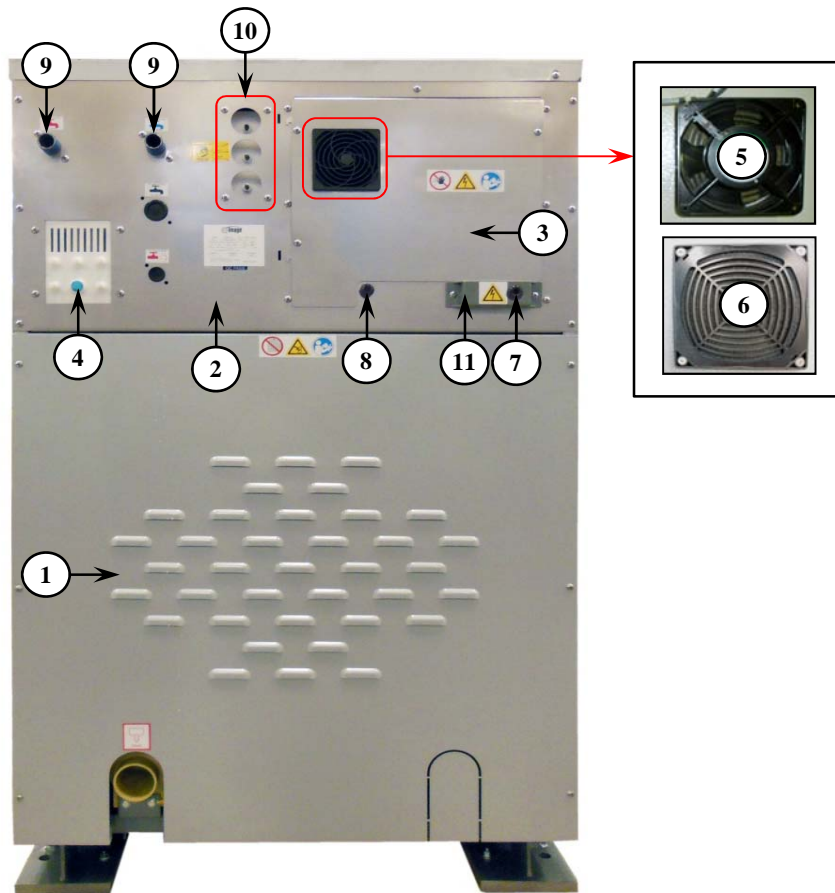
Item	Part No.	Qty.	Description
1	A1-S802-008	1	Rear panel assembly
2	A1-S102-011	1	Rear panel assembly, Top
3	A1-S802-006	1	Service panel assembly
4	A0-A105-011	1	Plug PVC, PVC 1/2"
5	A0-E012-026	1	Fan, Cooling
6	A0-E012-009	1	Filter for fan
7	A0-A028-003	1	Electrical connection (Main power)
8	A0-A028-002	1	Electrical connection (Chemical)
9	A1-SSP2-001	2	Pipe, water inlet
10	A0-A024-001	3	Grease Fitting 1/8"
11	A0-A237-003	1	Electric Service Mounting Plate (Plastic)
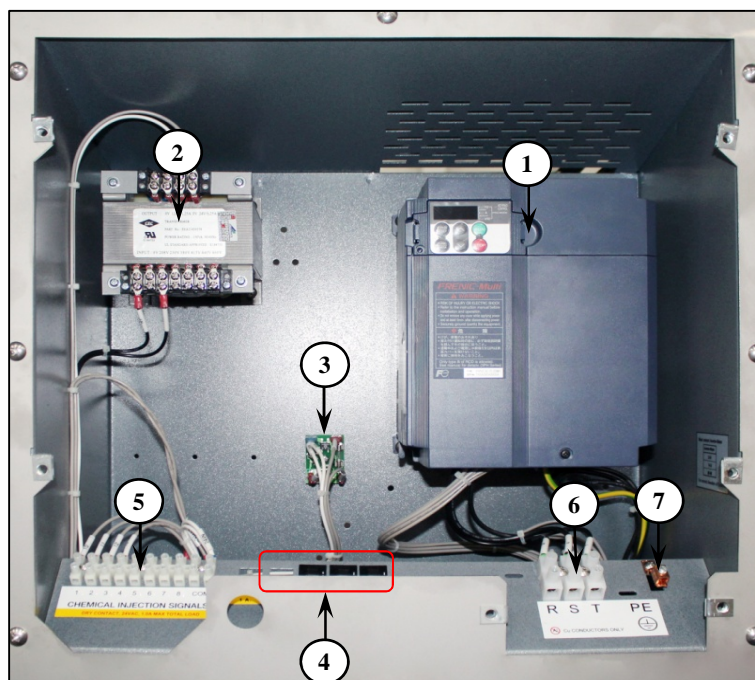
Item	Part No.	Qty.	Description
1	A0-E001-904	1	Inverter 7.5HP, 230V. 3PH.
	A0-E001-908	1	Inverter 7.5HP, 430V. 3PH.
2	A0-E006-031	1	Transformer
3	A0-E007-319	1	Power Supply 24VDC.
4	A0-E010-035	2	Circuit breaker 2A
	A0-E010-029	1	Circuit breaker 6A
5	A0-E021-039	1	Block, Terminal
6	A0-E021-031/1	1	Block, Terminal 3 Pole
	A0-E021-031/2	1	Block, Terminal 4 Pole
7	A0-E055-001	1	Connector, Ground Lug
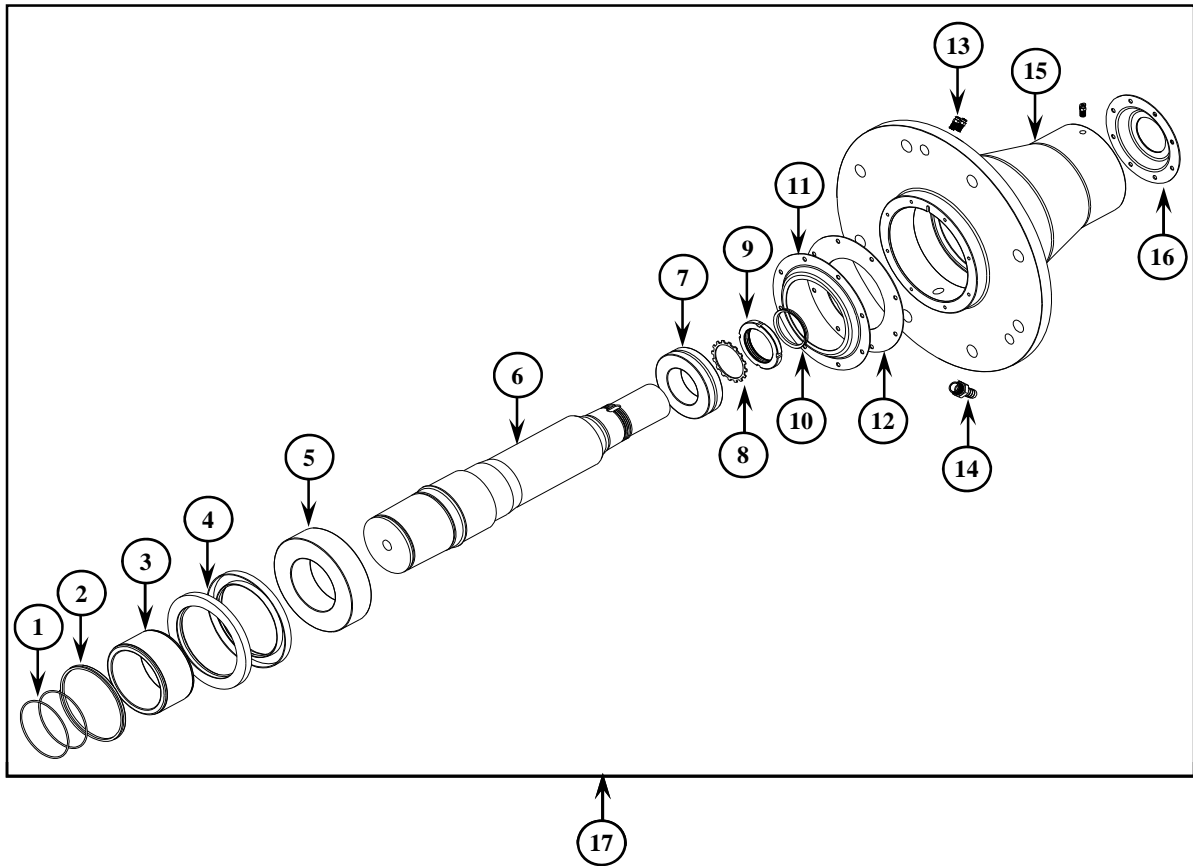
Item	Part No.	Qty.	Description
1	A0-A005-148	2	Seal, O-Ring
2	A0-A005-003	1	Seal, V-ring
3	A0-A006-023	1	Collar Seal
4	A0-A005-016	2	Seal, Oil
5	A0-A004-058	1	Bearing
6	A0-M011-073	1	Basket Shaft
7	A0-A004-008	1	Bearing
8	A0-A006-014	1	Lock, Washer
9	A0-A006-015	1	Lock, Nut
10	A0-A005-102	1	Seal, V-Ring
11	A1-S101-043	1	Seal Plate, Front
12	A1-S101-045	1	Seal Plate, Flat Front
13	A0-P006-070	3	Fitting
14	A0-A106-004	1	Hose Nipple
15	A0-A007-014	1	Housing
16	A1-S101-044	1	Seal Plate, Rear
17	A1-S102-012	1 Set	Bearing Housing Complete set
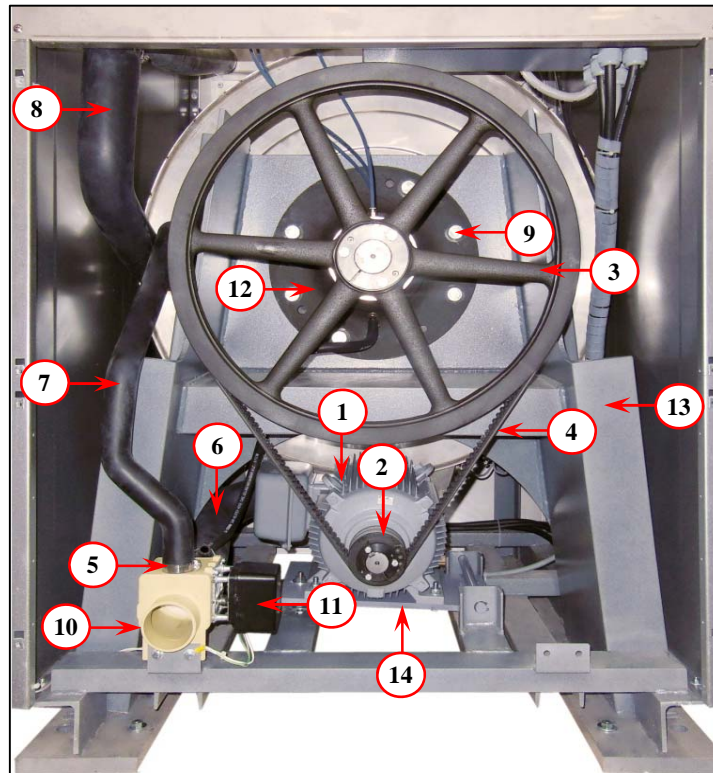
Item	Part No.	Qty.	Description
1	A0-E008-883	1	Motor 10 HP. /4 P /190/380V. 60HZ.
2	A0-M008-123	1	Motor pulley
	A0-M009-091	1	Motor pulley bushing
3	A0-M008-120	1	Basket pulley
	A0-M009-082	1	Basket pulley bushing
4	A0-A002-173	2	V-Belt
5	A0-A052-010	6	Hose clamp No.10
6	A0-A018-070	1	Drain hose
7	A0-A018-077	1	Overflow, Hose
8	A0-A018-068	1	Fill hose
9	A0-A074-558	8	Hex. Bolt
10	A0-E041-002	1	Drain Valve With Overflow 3"
11	A0-E041-250	1	Cover box and mounting drain valve motor
	A0-E041-020	1	Drain valve stator coil 24V
	A0-E041-211	1	Drain valve motor 24V
12	A0-A007-014	1	Housing
13	A1-S102-013	1	Main frame
14	A1-S802-045	1	Motor support

Dec.5, 2006

K.H.T. Central Supply Co., Ltd.
27/3-4 Yenakat Lane 2,
Yannawa, Bangkok 10120, Thailand
Tel: (662) 249-0987
Fax: (662) 249-0986

Dear Mr. Wittaya Mahachavaroj,

Subject : Phase Loss Protection of Fuji Electric AC Low voltage Inverters

We supply the following series of inverters for your machines at present.

1) FRNXXXC1S-2J/ 4J/ 7J
2) FRNXXXE1S-2BM/ 4BM
3) FRNXXXE1S-2A/ 4A
4) FRNXXXG11S-2BK/ 4BK
5) FRNXXXG11S-2BM/ 4BM

All of the above mentioned models have "Phase Loss Protection" at both input and output of the inverters. This function for input protects the inverter from being damaged by adding extreme stress caused by a power phase loss or imbalance between phases.

The one for output detects breaks in inverter output wiring at the start of operation and during running, and shut off the inverter output.

We hope you could understand above answers.
Should you have any questions on that, please feel free to contact us.

Yours faithfully,

A.Shirayama
Sales Manager/ Drive Systems Division
Fuji Electric FA Singapore Pte. Ltd
/ Regional HQ of Fuji Electric FA Components and Systems Co., Ltd. , Japan