

SINCE 1889



Laboratory Washer

AW 83

Operating instructions

Yamato Scientific Co., Ltd.

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1. Specifications

Model	AW83	
Functions	Washing chamber	Two chambers: Upper washing chamber and lower washing chamber
	Washing system	Pressurized water sprayed in 2 directions: upward and downward Rotating injection nozzles. Rack: fixed type (They can be replaced with mount type jet racks.)
	Washing pattern	Selectable from three patterns. Pattern indicated in parenthesis is optional. 1) Pre-wash → Wash → Rinse → (final rinse) 2) Wash → Rinse → (final rinse) 3) Rinse → (final rinse)
	Washing time	Pre-wash 1 to 99 min. can be set. Wash 1 to 99 min. can be set. Rins 1 to 99 min. can be set. Rinsing can be performed five times repeatedly by batch system Final rinsing (pure water supply device (optional) is required) 50 liters of pure water /time, it can be repeat five times. Washing starts when water level reaches to the specified level. Timer starts counting at the time when the water temperature reaches to the set value.
	Feed water temperature	Room temperature to 80°C
	Washing water temperature	Feed water temperature to 80°C Water shall be set for both pre-washing and washing. Rinse water is not heated.
	Liquid detergent supply system	Automatic supply with a pump (supply amount can be adjusted)
	Liquid detergent tank capacity	2L
	Amount of water used	Approx. 28L for each process of pre-wash, wash and rinse
	Hot water supply system	Heating water by a heater (6kW heater built-in) or connection of hot water piping system (main body: 1 ^B female screw)
	Feed water pressure	98 - 294 kPa (1 - 3 kg/cm ²)
	Container bed	Two shelf boards (standard)
Constructions	Water feeding and draining method	Water feeding: supplied by OPEN/CLOSE of solenoid valve and water quantity is controlled by a float switch (excessive water quantity prevention device provided) Water discharging: drained forcibly by a pump.
	Power supply	AC200V 3-phase 50/60Hz 30A
	Exterior material	Steel plate, melamine resin coated
	Inner tank material	Stainless steel plate SUS304
	External dimensions	860(W) x 770(D) x 1,795(H)
	Inner tank dimensions	600(W) x 630(D) x 1,080(H)
	Pump	Washing pump: Three-phase, 200V 355W/560W (50Hz/60Hz) Drain pump: Single phase 200V 45W
	Shelf board	550 x 550, withstand load 254N (25kg)
	Door	Vertical OPEN/CLOSE type (2 stages)
	Weight	Approx. 200 kg

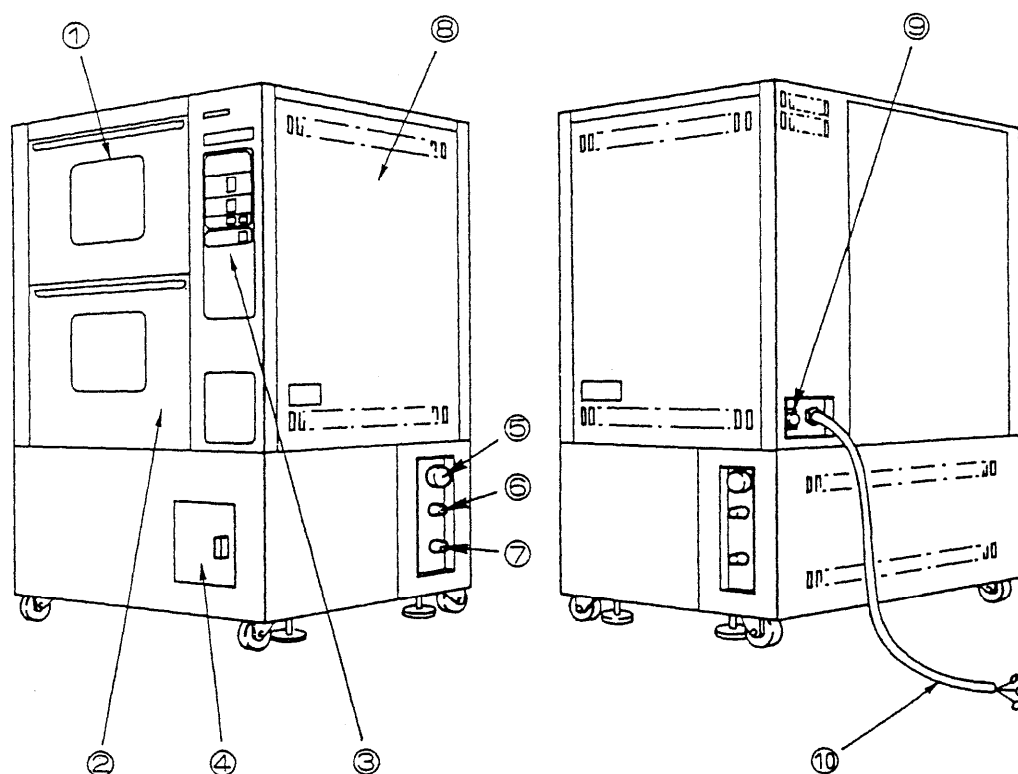
Accessories	Feed water hose (with coupler)	2 m	1pc
	Drain hose (inside dia. 18 mm x outside dia. 24 mm)	2m	1pc
	Test tube rack support		1pc
	Powder detergent (“Murinluster”)(Non-phosphate Luster:)		1 kg
	Measuring spoon		1pc
	Hose clamp		1pc
Optional accessories	<ul style="list-style-type: none"> • Pure water supplying unit <ul style="list-style-type: none"> Outer dimensions: W 420 x D 600 x H 1,065 Pump: 355W/560W (50/60Hz) Pure water tank capacity: 50L Ion exchange cartridge: Mixed bed type/resin amount: 10L • Jet rack • Beaker rack • Test tube rack • Flask rack 		

Notes:

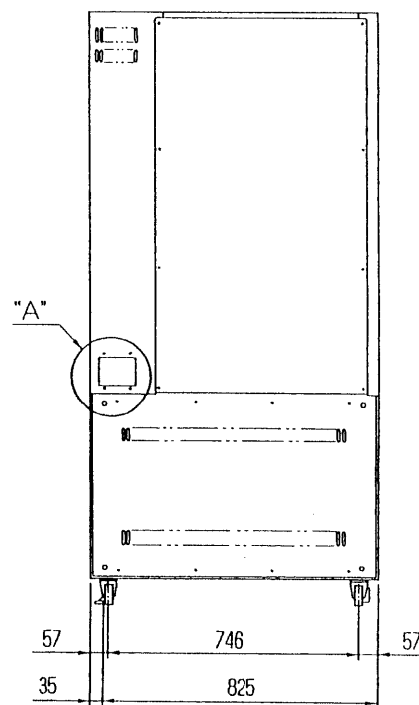
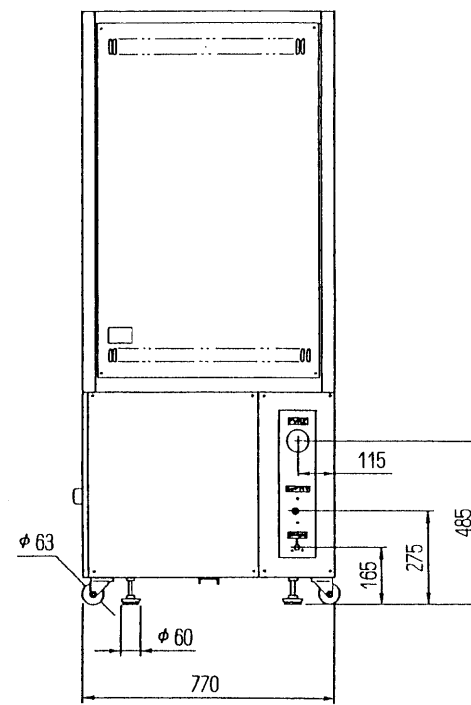
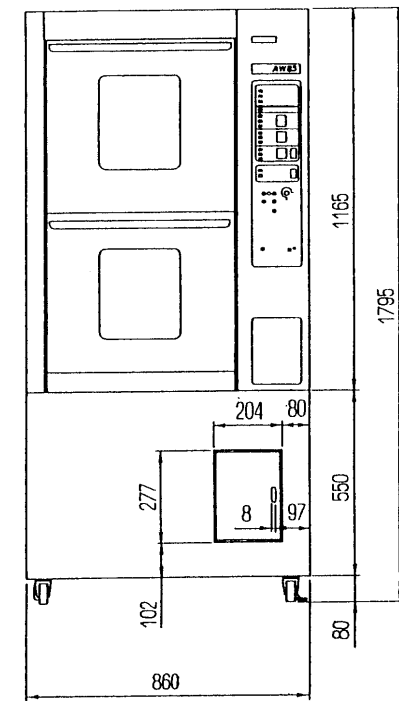
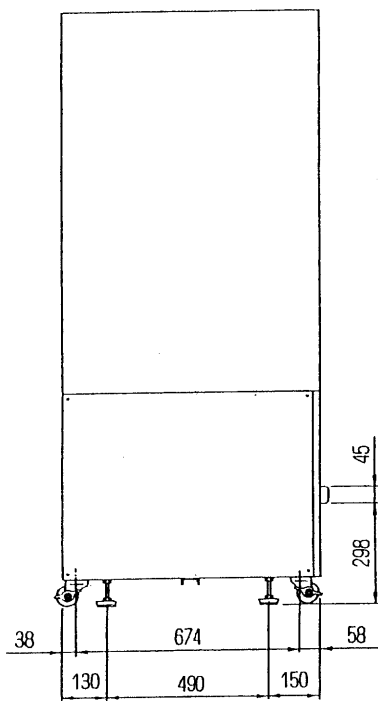
1. This unit supports both liquid type and powder type detergents.
2. Supplying and draining ports are on the right side of the unit as standard, which can be changed to the left side. (Contact us for changing port positions as necessary.)

2. Outer appearance

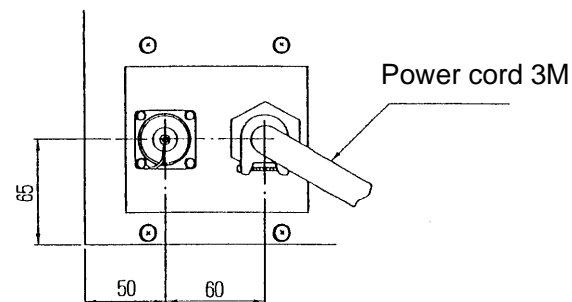
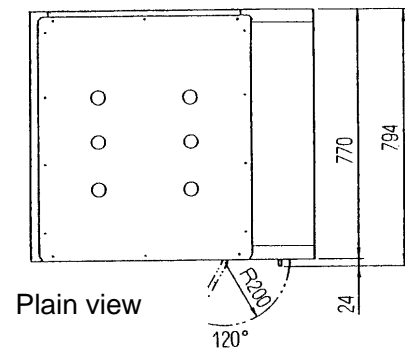
(Outer appearance)



- | | |
|----------------------------------|--|
| ① Upper door | ⑥ Feed water port |
| ② Lower door | ⑦ Drain port |
| ③ Operation panel | ⑧ Controller door |
| ④ Liquid detergent compartment | ⑨ Pure water supply unit connecting receptacle |
| ⑤ Pure water hose insertion part | ⑩ Power cord |

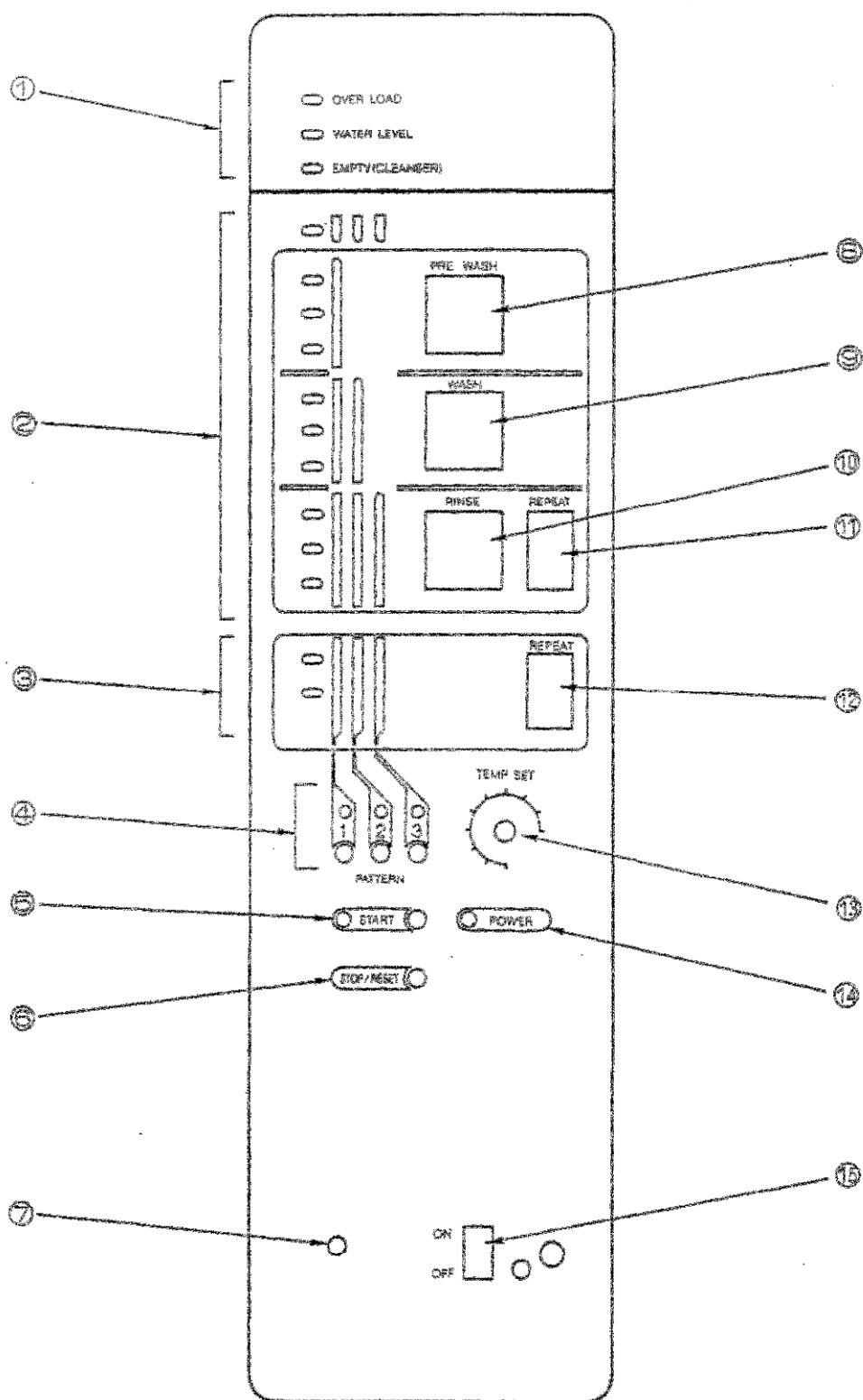


Details of "A"



(Outer appearance)

3 Descriptions of operation/display panel



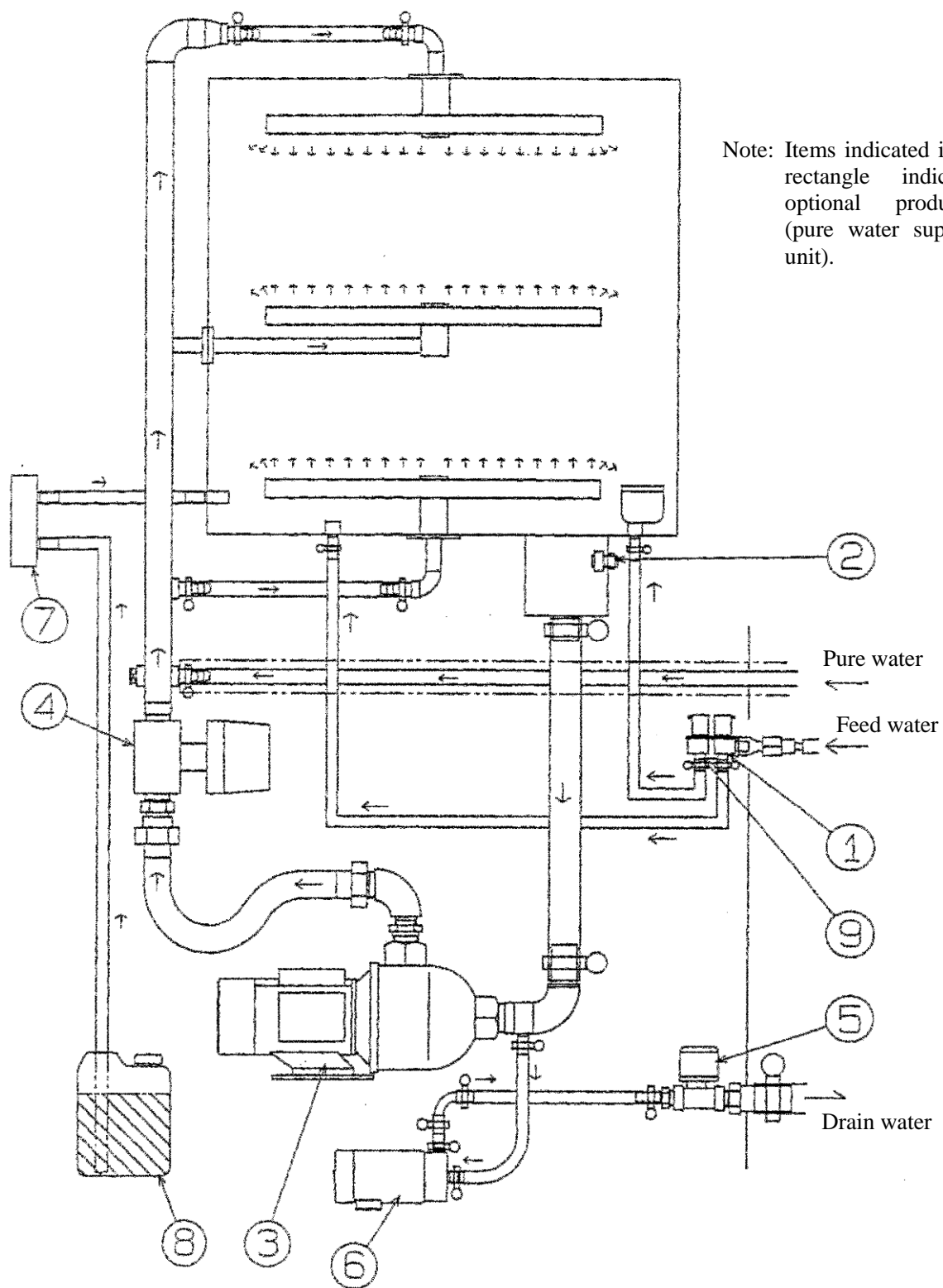
① Error warning lamp	This lamp indicates where an error has occurred.
② Sequence lamp	This lamp indicates process sequence of the selected washing pattern. Once washing has started, this indicates a process currently in session.
③ Final rinse process lamp (pure water rinse process)	This lamp comes on when the pure water rinse process is added. Once washing has started, this lamp indicates process progress. See Note 1.
④ Washing pattern select switch (lamp)	This switch is used to select a washing pattern from three alternatives. Pressing this switch will illuminate the lamp for the washing pattern selected and the sequence lamp.
⑤ Start switch (lamp)	This switch is used to start washing after a washing pattern is selected. The start lamp stays on during operation. Note: The washer will not start before a washing pattern is selected.
⑥ Stop/Reset switch	This switch is used to stop operation. This switch can also be used to cancel the currently selected washing pattern.
⑦ Detergent supply amount adjusting screw	This screw is used to adjust amount of detergent to be supplied. (Use a Philips driver for adjusting.) Although this screw is set at the optimal value at the time of factory shipping, adjust this as necessary when a detergent other than those we recommend.
⑧ Pre-wash time setting digital switch	This switch is used to set pre-wash (pre-washing with tap water) time when the pattern 1 is selected. Settable range is from 1 to 99 minutes. See Note 2.
⑨ Washing time setting digital switch	This switch is used to set washing (washing with detergent) time when the pattern 1 or 2 is selected. Settable range is from 1 to 99 minutes. See Note 2.
⑩ Rinse time setting digital switch	This switch is used to set rinse time. Settable range is from 1 to 99 minutes. See Note 2.
⑪ Rinse/Repeat number setting digital switch	This switch is used set a number of repetitions of rinse processes. This product employs a batch rinse system. Set a number of repetitions as necessary. (Up to five times)
⑫ Final rinse repeat times setting digital switch	This switch is used to set a number of repetitions of final rinse (rinse with pure water) processes. (Up to five times) See Note 1.
⑬ Temperature setting knob	This knob is used to set temperature for pre-washing or washing. Set this to OFF when you want to wash with tap water temperature (without heating). See Note 3.
⑭ Power lamp	This lamp comes on when power is turned on.
⑮ Power breaker	This breaker also functions as the main switch. It includes a leak detection function.

Note 1: An optional pure water supply unit or pure water piping will be necessary when final rinse is performed.

Note 2: This washer operates for one minute when time is set to 00 here.

Note 3: Set temperature for pre-washing and washing will be the same.

4 Piping system diagram



- | | |
|-------------------------------|-----------------------------------|
| ① Supply water solenoid valve | ⑥ Drain pump |
| ② Float switch | ⑦ Liquid detergent supply pump |
| ③ Washing pump | ⑧ Liquid detergent bottle |
| ④ Washing ball valve | ⑨ Powder detergent solenoid valve |
| ⑤ Drain ball valve | |

5 Operating principle (See 4. Piping system diagram)

(1) Initial draining

Initial draining is performed to drain any water remaining from the last operation. Open the drain valve to start the drain pump. After about 15 seconds the drain valve will close to stop the drain pump.

(2) Pre-wash process (preliminary washing)

This process washes with water or hot water without detergent.

Open the water supply valve to supply water to the tank. When the float switch inside the tank is turned ON, the supply valve close and the washing pump starts. The nozzles start according to the flow amount in the washing pump to start pre-washing. When set temperature is OFF or below the tap water temperature, the pre-wash timer starts counting at the same time when the washing pump starts operation. When the set temperature is above the tap water temperature, the pre-wash timer starts counting when the heater is turned ON and the water temperature reaches the set temperature. Then the heater keeps adjusting temperature.

When the pre-wash timer counts up, the washing pump and heating with the heater stop. Then open the drain valve, start the drain pump and start draining. After about three minutes, the drain valve will close to stop the drain pump.

(3) Wash process (washing)

This process washes with water or hot water with detergent.

Although the basic processes are the same as for pre-wash, detergent is introduced at the same time as supplying water. When liquid detergent is used, it is fed into the tank with the detergent supply pump at the time of supplying water. Also, when powder detergent is used, the detergent supply solenoid valve opens when supplying water and detergent in the powder detergent pot (see figure 7 in page 17) will be solved with water and then fed into the tank.

(4) Rinse process (rinsing)

In this process, water supply and draining processes are performed in the same way as the pre-wash and wash processes, introduction of detergent and heating with the heater are not performed.

Since this washer employs the batch rinse system, the rinse process will be repeated for the set number of times. The buzzer sounds when draining for the last session is finished to notify you the whole processes have been completed. (about 10 seconds)

This washer allows selection from three washing patterns that combine pre-wash, wash and rinse processes.

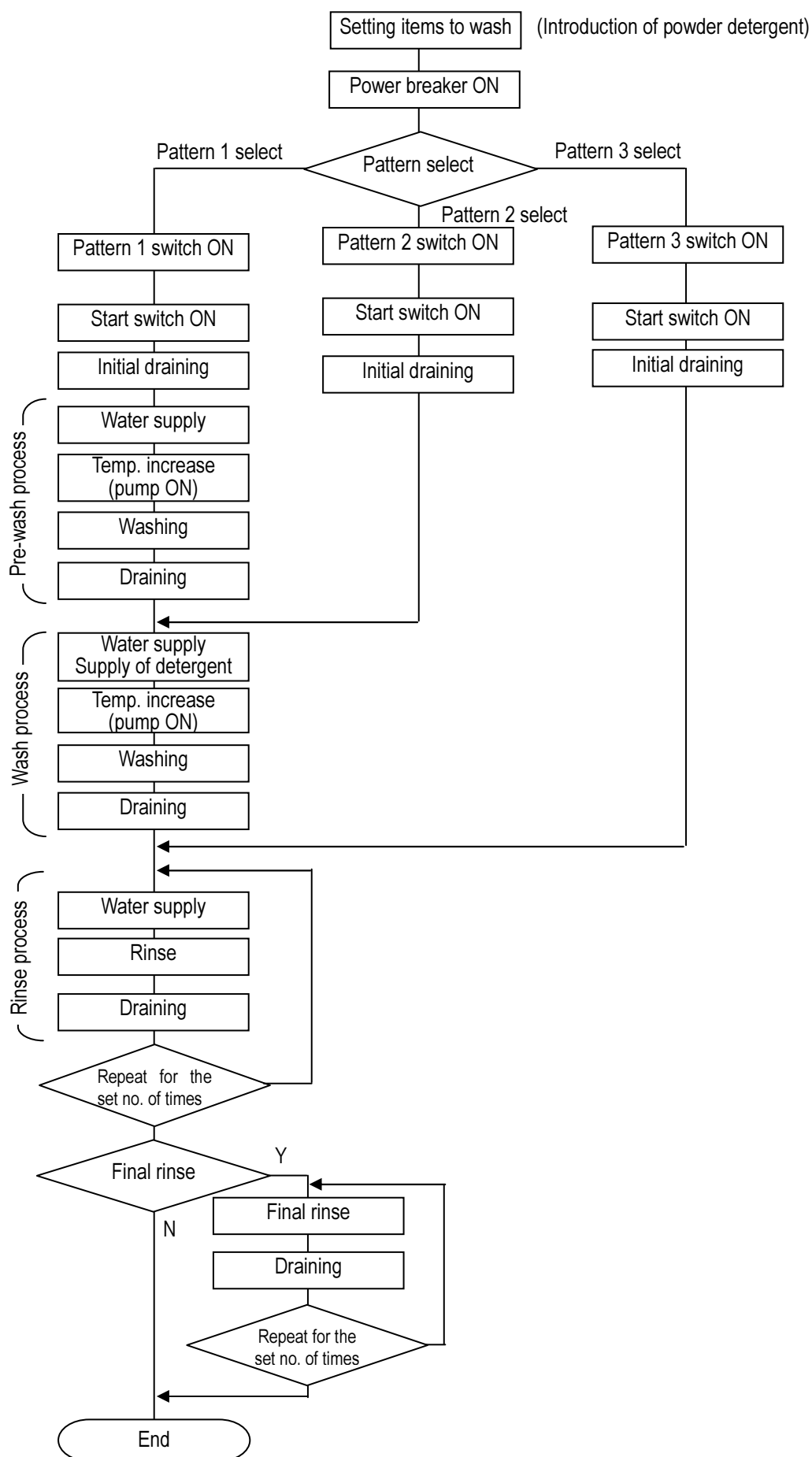
Pattern 1: Initial draining→Pre-wash process→Wash process→Rinse process

Pattern 2: Initial draining→Wash process→Rinse process

Pattern 3: Initial draining→Rinse process

Note: See page 27 for the final rinse.

6 Operation flow



7 Installation

First loosen the fixing screws for the rear cover (top) on the rear of the main unit and remove the rear cover (top).

A counter weight for opening/closing the door is fixed. Unfix the weight and then replace the rear cover.

Then open the upper and lower doors and take out the accessory box. Find that an instruction manual, water supply and drain hoses in the accessory box.

Then unfix the upper, middle and lower jet nozzles.

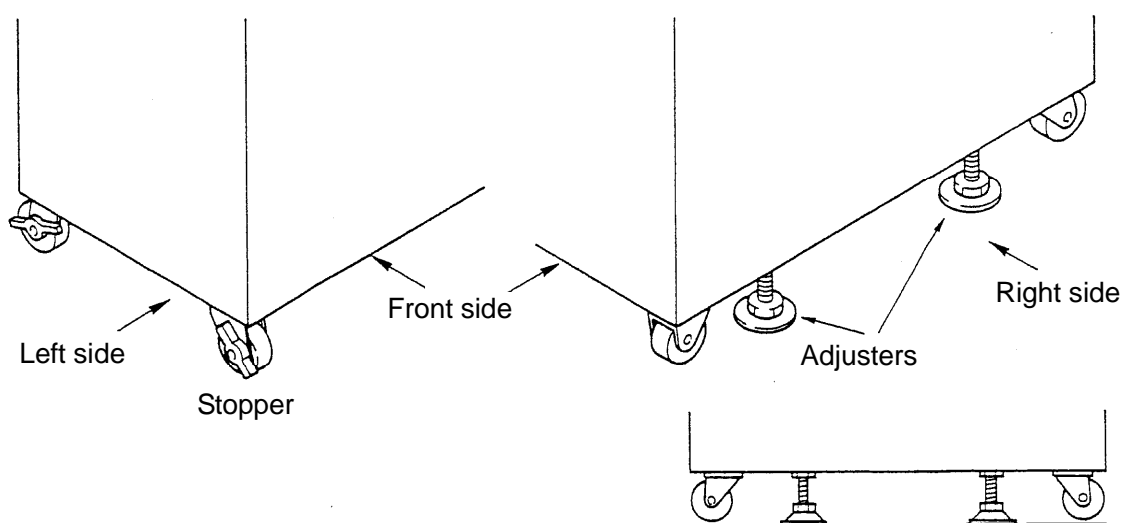
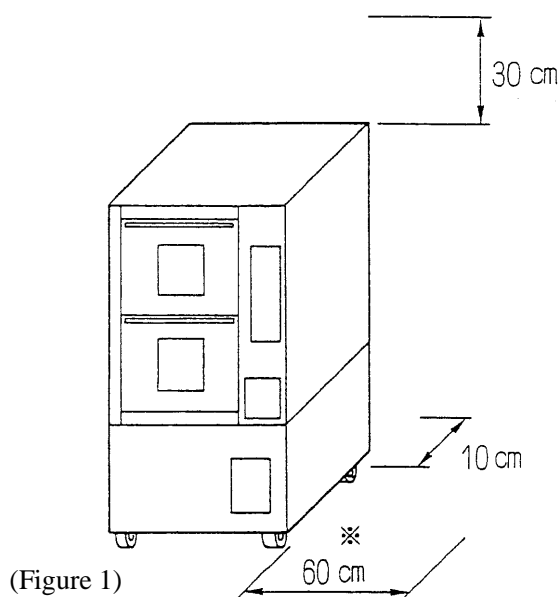
Now preparation for installation of the main unit is completed.

7-1 Installation of the main unit (see figures 1 & 2)

Install the main unit on a level and stable surface close to a faucet and a sink. Make proper clearance as shown in figure 1 around AW83.

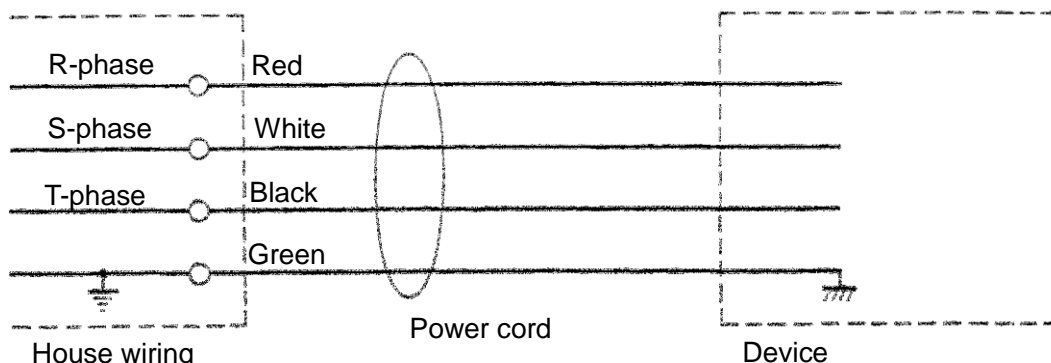
After having installed the unit, be sure to lock the stoppers for two casters (front and rear) on the left side. And two adjusters are installed between two casters on the right side. Adjust the height so that two casters on the right are slightly off the floor and fix the adjuster with nuts.

* This space is necessary for opening/closing the controller door.



7-2 Connecting the power cord (see Figure 3)

- 1) Prepare an AC200V, 3-phase, 30A power supply.
- 2) Securely connect the power cord (4-core flexible cable) from the main unit to the power supply as shown in the figure below. Be sure to ground the green wire.



(Figure 3)

Caution: Note that a water pipe often used non-metal (vinyl-chloride) pipe halfway, which cannot be used for grounding. Also, never ground to a city gas pipe or an LPG pipe.

If three wires of the power cord are connected in the inverted phase, pump output will be insufficient and the jet nozzle will hardly rotate. If this occurs, immediately turn off the power switch. Then, switch any two of three wires to resume normal operation.

7-3 Connecting the water supply hose

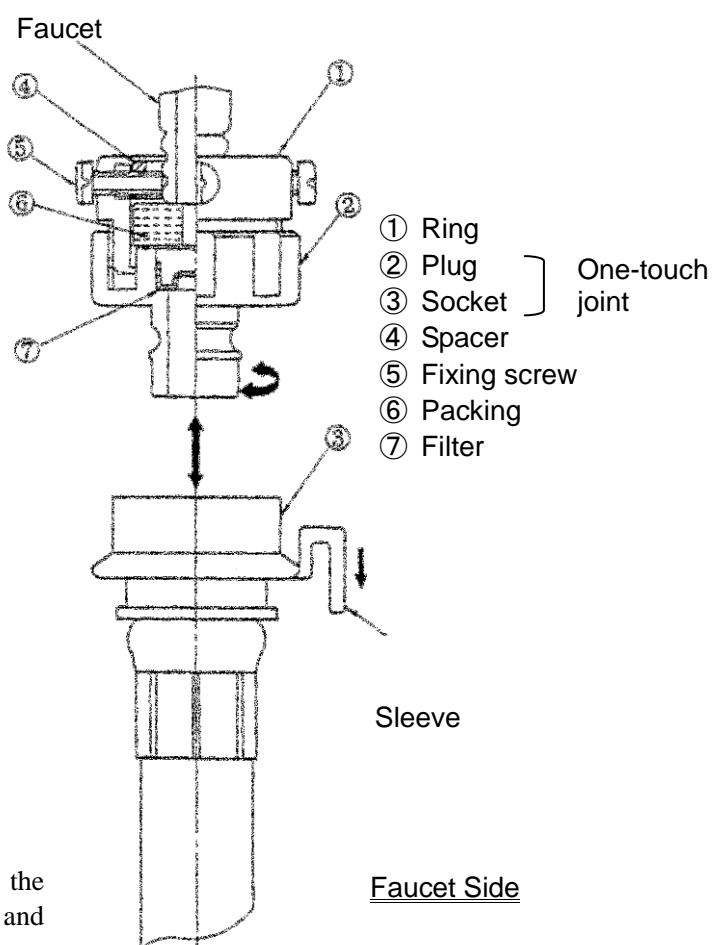
A. Faucet side (see figure 4-A)

- (1) Slide the socket ③ sleeve in the direction of arrow to separate the connecting port and the hose. First separate them.
- (2) Loosen the plug ② off the ring ①.
- (3) While lightly pressing the packing ⑥ evenly so that it contacts flat to the faucet, evenly tighten four fixing screws ⑤.

When the faucet is a chemical type, adjust the position so that the fixing screws will be the lowest groove on the faucet nipple as shown in the figure.

- (4) Securely tighten the plug ② by turning it clockwise. This allows the faucet and the connecting port tightly sealed with the packing ⑥.
- (5) With the sleeve slid to the direction of arrow, securely insert the socket ③ into the plug ②. If the sleeve returns to the original position when released, connection is completed.

Caution: Dusts in supply water will accumulate on the filter ⑦. Regularly disassemble the unit and clean the filter.

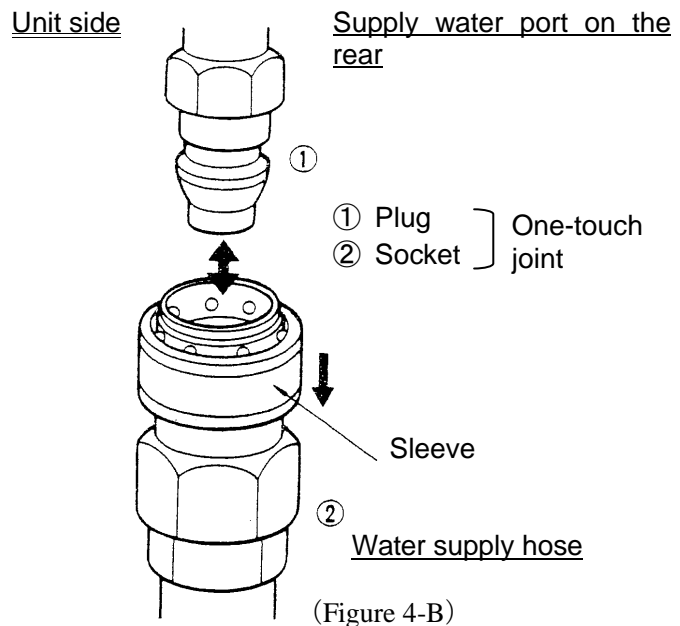


(Figure 4-A)

B. On the unit side (see figure 4-B)

- (1) Remove the rubber cap off the plug ①.
- (2) With the sleeve slid to the direction of arrow, securely insert the socket ② into the plug ① on the main unit. If the sleeve returns to the original position when released, connection is completed. Note that the socket includes a valve, which will not open for supplying water unless it is not connected to the plug.

Caution: Ports for connecting supply and draining are on the right side of the unit in the standard setting (when shipped from the factory). Ask your dealer if you want to change them to the left side.

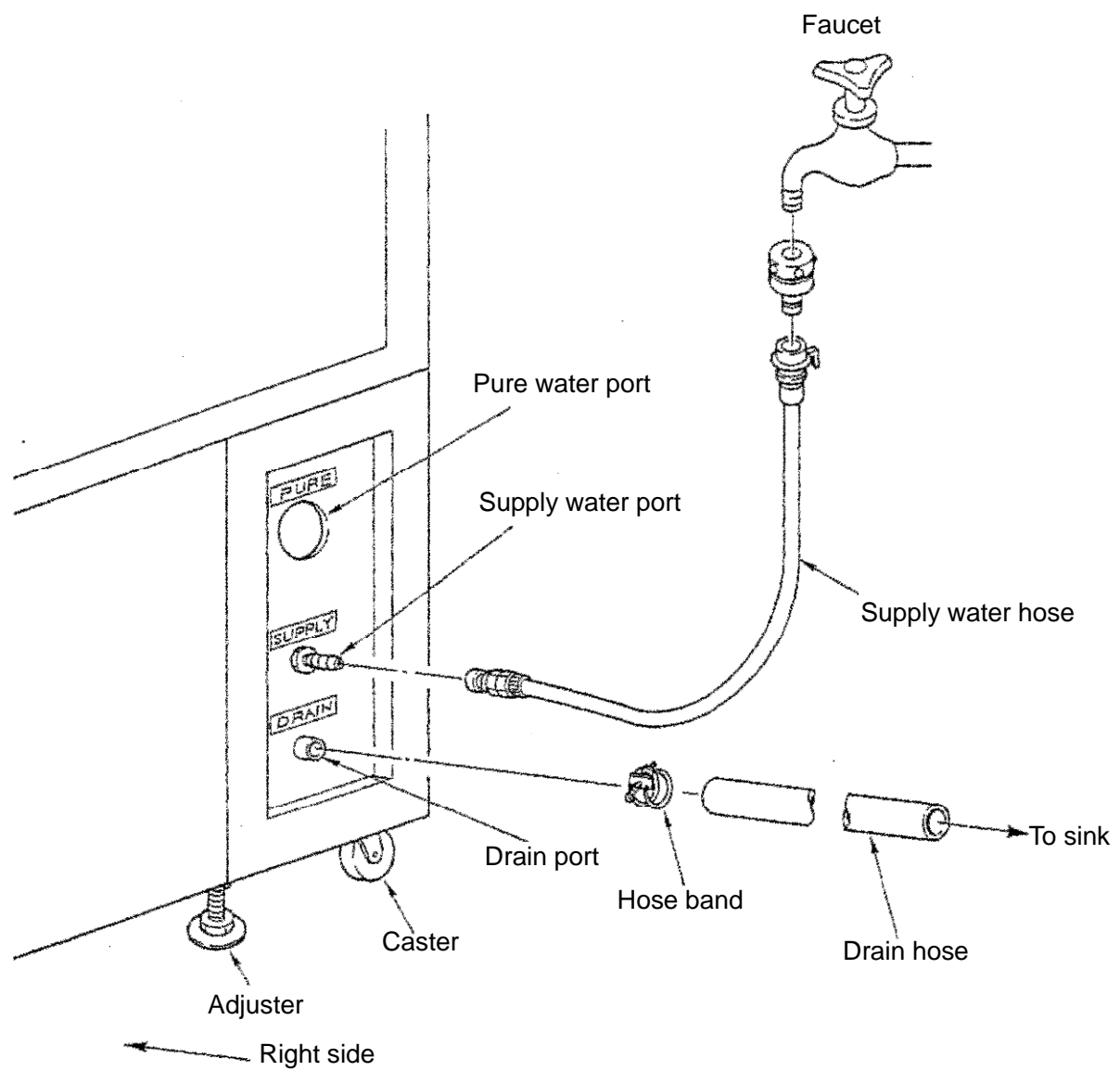


7-4 Connecting the drain hose (see figure 5)

- (1) Remove the rubber cap off the drain port at the lower part on the right side.
- (2) Insert the drain hose into the drain port, and securely tighten it with a hose band supplied.
- (3) Fix the other end of the drain hose to any place suitable for draining. When draining washing water at the drain hose, the water may be extremely hot. For this reason, fix the end of the drain hose at a point as far from the work area as possible when draining in a sink.

Be sure to make a trap when connecting directly to a vinyl chloride pipe. Do not roll up the drain hose and cut into a necessary length before use. Never kink the hose. Piping that may trap water in the hose or at the outlet will hamper draining and a malfunction may result.

Do not allow the end of the drain hose at a height one meter higher than the installation floor.



(Figure 5)

8 Operation

8-1 Preparing for operation

A. Preparation of detergent

This washer supports liquid and powder type detergents.

Caution: This washer is dedicated for alkaline detergent. Never use acid detergent for this unit.

Recommended detergent

Liquid: Extran AP15 strong alkaline (Major component: sodium hydroxide, non-phosphate)

Powder: "Murinluster"(Non-phosphate Luster): strong alkaline (Major component: silicate, carbonate, etc.)

- Extran AP15, pH12.2 at concentration 0.4%

AP15 is used as 0.3~0.5% water solution. This unit uses approx. 28l of water per process, which means required amount of detergent is 84~140ml. (It is adjusted to 112ml when shipped from the factory.)

- "Murinluster" (Non-phosphate Luster", pH11~12 at concentration of 0.5%

Non-phosphate Luster is used as 0.5% water solution. Thus required amount of detergent is 140g.

<When liquid detergent is used> (See "2. Outer appearance" and figure 6.)

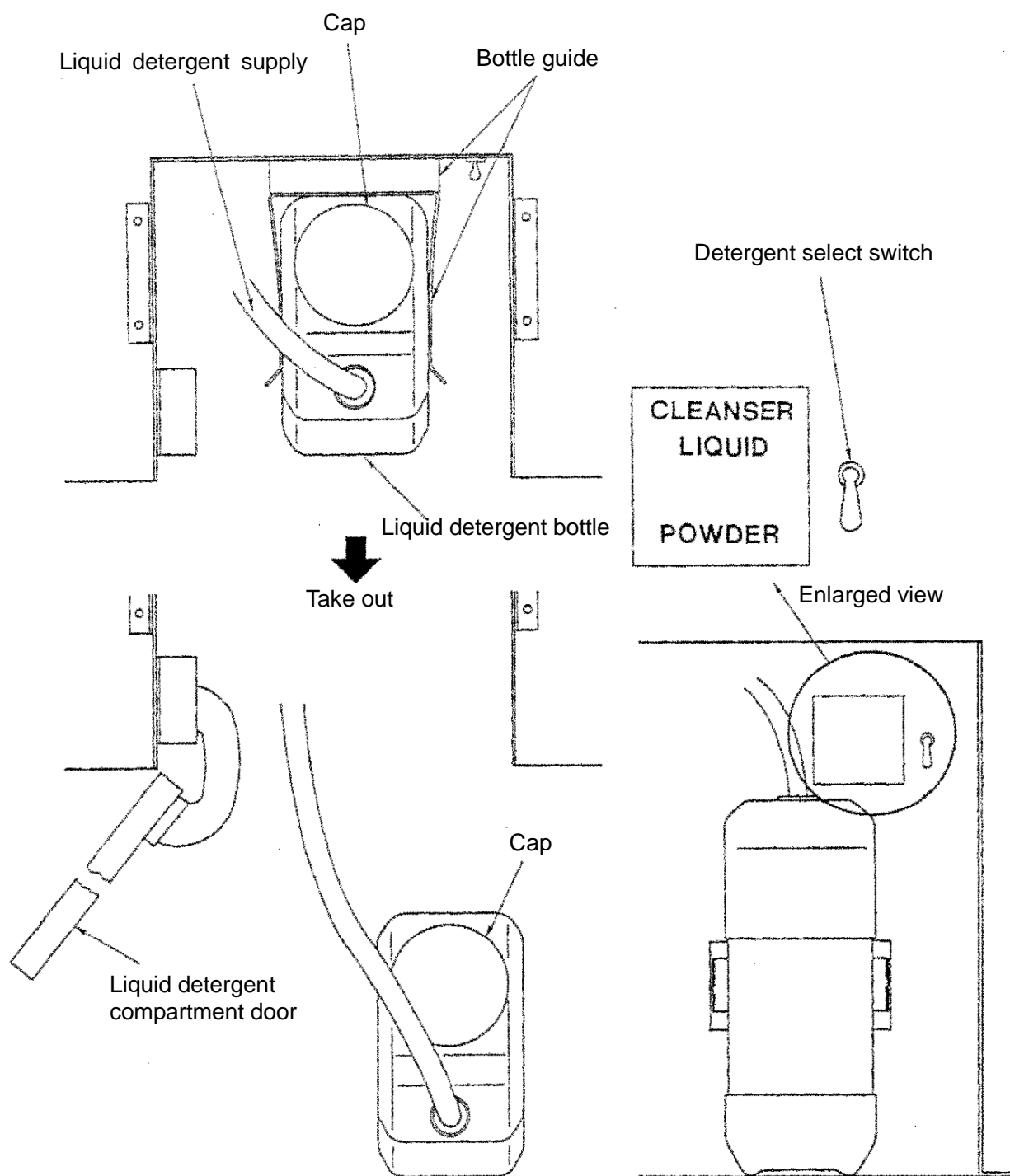
Open the liquid detergent compartment (See 2. Outer appearance) and set the detergent select switch at the upper right back to LIQUID (Up). (This switch is set at POWDER when shipped from the factory.) (See figure 6.)

Then replenish liquid detergent. Take out the bottle out of the liquid detergent compartment. Open the cap of the bottle and pour liquid detergent into the bottle. The bottle can hold 2 liters of liquid detergent.

When you have finished pouring liquid detergent in the bottle, tighten the cap securely, then push the bottle aligning to the guide in the compartment until it touches the rear end of the guide. When there is any gap between the guide end and the bottle, the CLEANSER EMPTY lamp may not work properly.

Cautions

1. Extran AP15 contains 7% sodium hydroxide and designated as non-pharmaceutical hazardous substance. Take extreme care for handling of it.
2. Liquid detergent may dry off when left contact with air for a longer period of time. Tighten caps of bottles or containers securely.

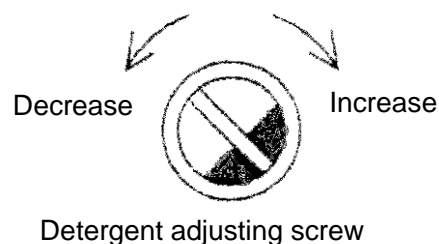


(Figure 6)

- About the supply amount of liquid detergent (See “3. Description of the operation display panel.”)

This unit has been adjusted before shipping so that an optimal amount of detergent for one washing process will be supplied when automatic feed is set (when the recommended liquid detergent is used).

Required amount per washing process may be different when liquid detergent other than those we recommend is used. In that case, adjust the supply amount with the detergent feed amount adjusting screw on the left side of the power breaker on the operation panel.

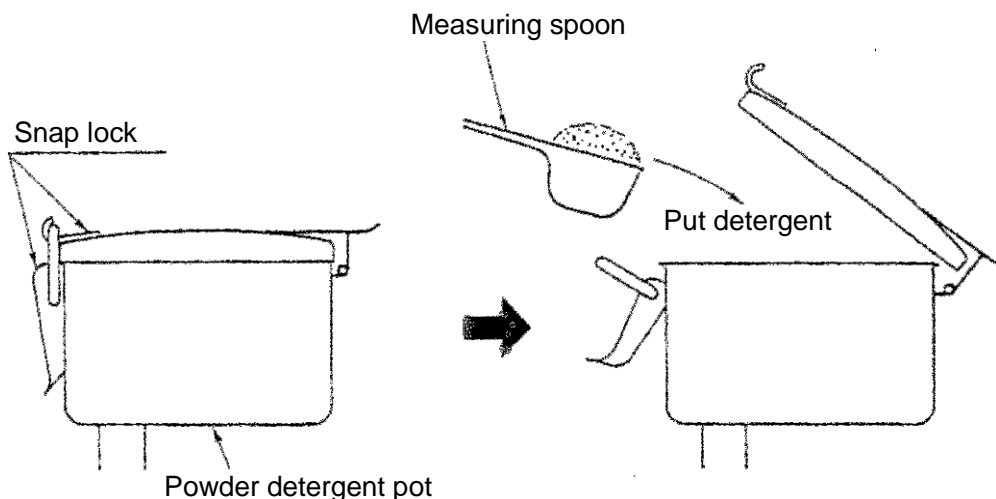


<When powder detergent is used> (See figure 6 & 7)

Open the liquid detergent compartment door and make sure that the detergent select switch at the upper right back to POWDER (Down). (This switch is set at POWDER when shipped from the factory.)

Release the snap lock on the powder detergent pot on the lower washing chamber (front right) and open the cover. Put powder detergent of approx. 140g (amount for one process), close the cover and securely lock with the snap lock.

Caution: With the included measuring spoon, three light spoonfuls of detergent will be about 140g.



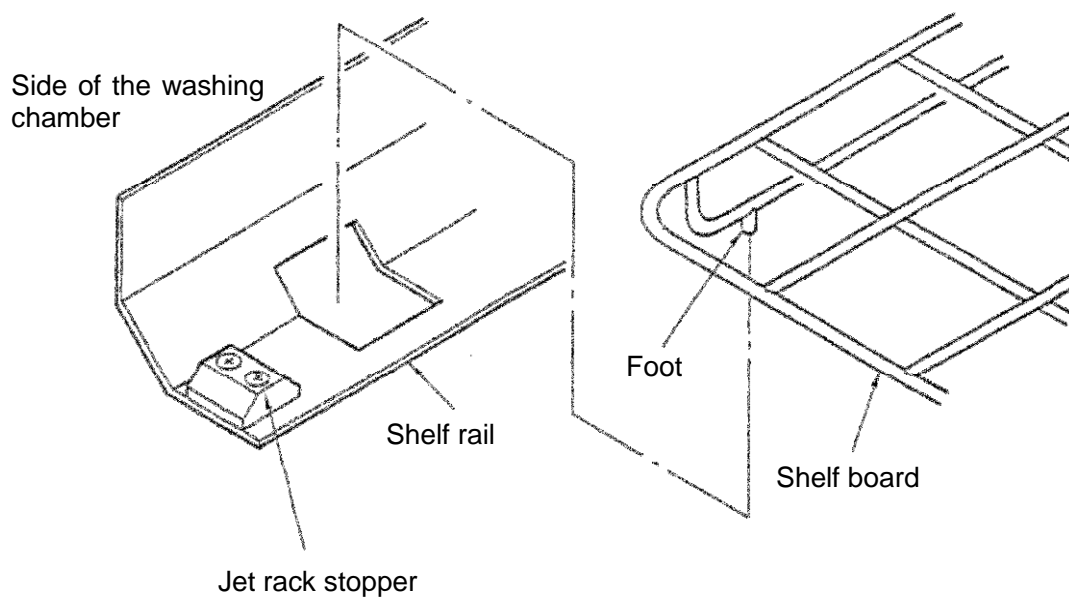
(Figure 7)

Detergent in the pot will be used up for one washing process. Replenish each time you have finished washing.
Caution: Do not put powder detergent in the pot if you are going to perform the rinse process only (when pattern 3 is selected).

B. Placing shelf boards (See figure 8)

This product includes two shelf boards: one for the upper washing chamber and the other for the lower washing chamber. First open the upper door of the main unit. Place the shelf board so that its feet (hooked part) engage into rectangle holes (four points for both sides) on the both sides of the upper washing chamber.

Then open the lower door. Repeat the procedures above to place the shelf board.



(Figure 8)

C. Setting items to wash

Set items to wash on the rack before washing.

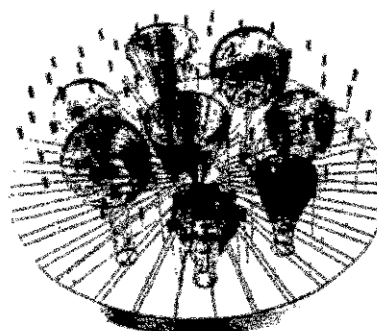
This unit supports different optional racks. Select a rack that suits to your specific needs.

Cautions

1. Four racks are available: flask rack, beaker rack, test tube rack, and jet rack. A special rack can be manufactured on request. Notify your request to the nearest dealer.
2. This AW83 unit is an update version of AW82 and three racks except for the jet rack for the old version can be used for this model without modification.

(1) Flask rack (material: SUS304)

When flasks are to be washed, set them, putting the mouth portion of flask onto the rod of flask rack. In addition, measuring cylinders and funnels can be set on this rack.



Set quantity:

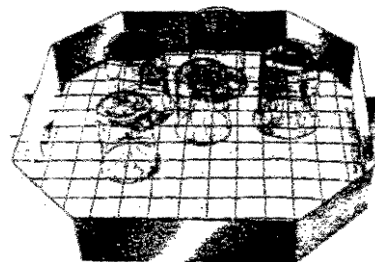
Round-bottom flask	(50ml) Approx. 68 pcs.
	(100ml) Approx. 48 pcs.
	(200ml) Approx. 28 pcs.
	(300ml) Approx. 20 pcs.
	(500ml) Approx. 14 pcs.

(2) Beaker rack (material: SUS304)

Put beakers with their openings facing down on the beaker rack for washing.

Set quantity:

Beaker (50 ml)	approx. 85 pcs
Beaker (100ml)	approx. 56 pcs
Beaker (200 ml)	approx. 37 pcs
Beaker (300ml)	approx. 29 pcs
Beaker (500ml)	approx. 21 pcs



Beaker rack

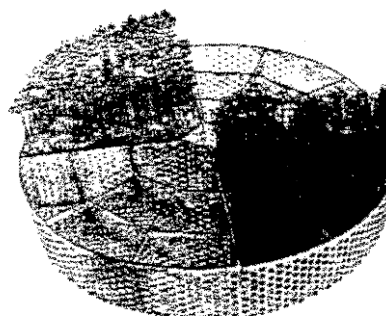
(3) Test tube rack (material: SUS 304)

When test tubes are to be washed, put the mouth of various test tubes upside down and set them as straight as possible. This rack is divided into 4 sections with respective middle partition plates so that test tubes can be set easily even when the number of test tubes are small.

In addition, as the rack can be separated into 4 sections, it can be used in combination with the flask rack to wash test tubes and flasks together.

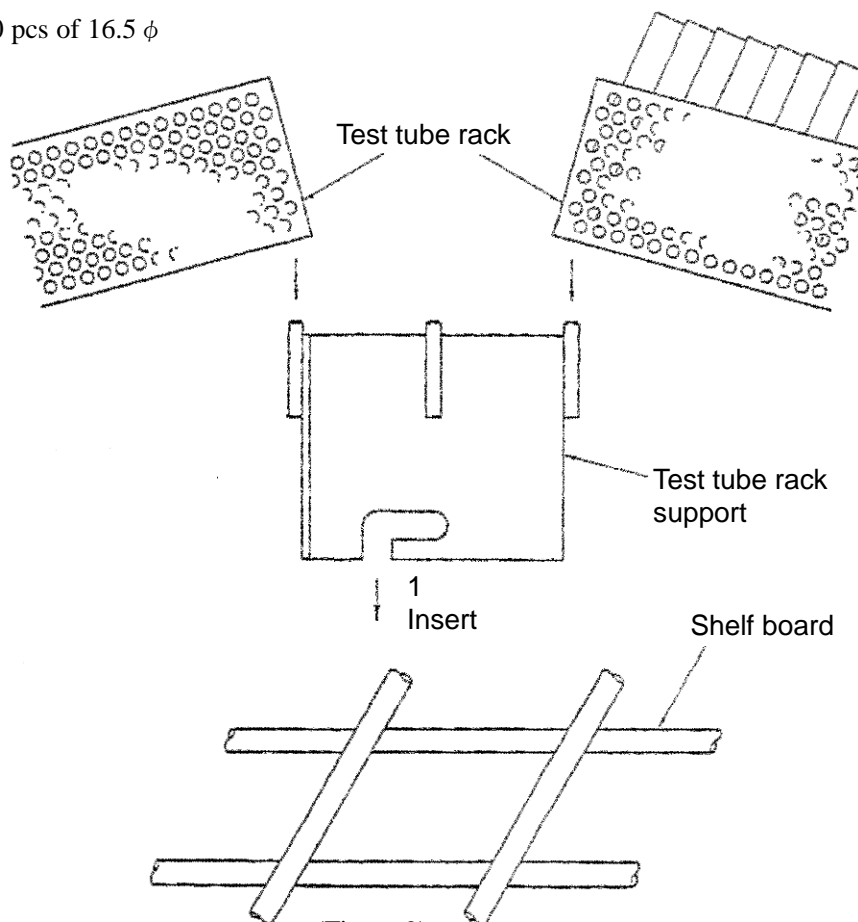
Moreover, it can be put in a small-size dryer as it is for drying.

Set quantity: Approx. 600 pcs of 16.5 ϕ test tube



Test tube rack

Since test tubes' openings are narrow compared with other glassware, internal surfaces many not be cleaned completely. When you use a test tube rack for this unit, we recommend using the test tube rack support included to assure sufficient washing result. (See figure 9.)

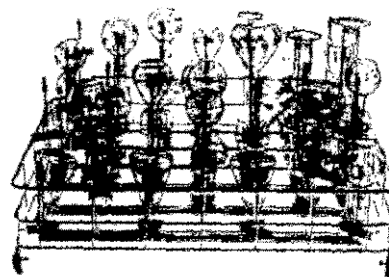


Caution: Set the support in the order of numbers in figure 9 to assure easy work.

(Figure 9)

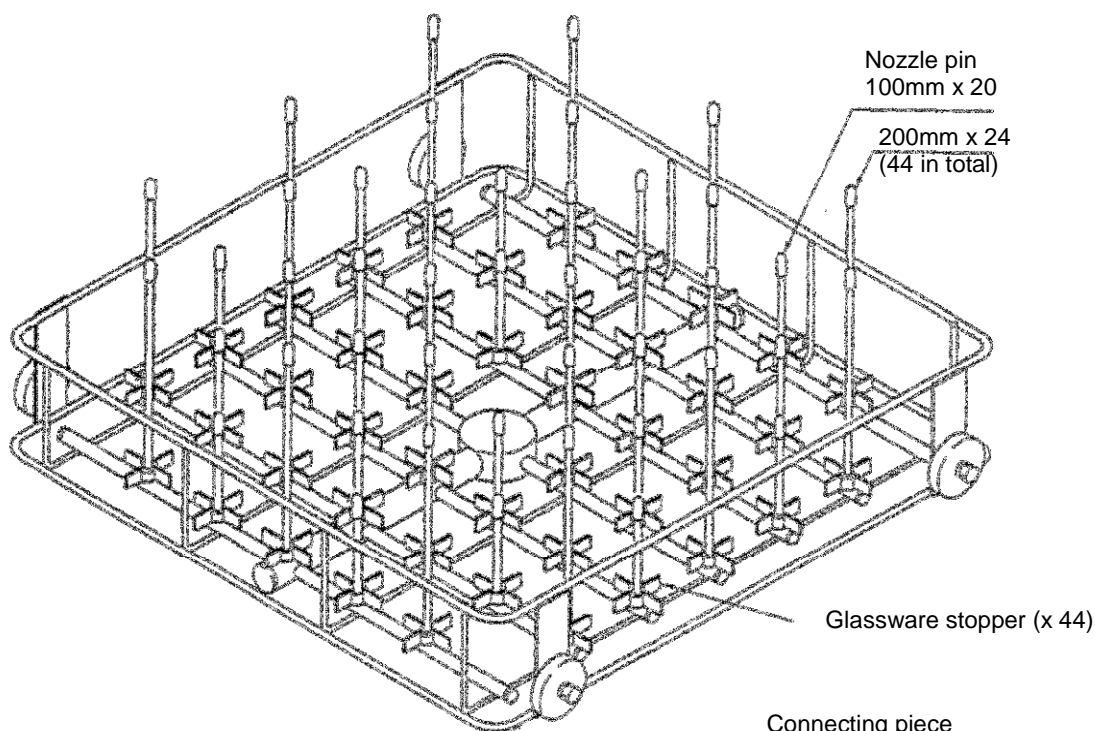
(4) Jet rack

This jet rack is quite effective for washing apparatuses such as measuring flasks with narrow openings or conical flasks that will tilt on the flask rack (described above).

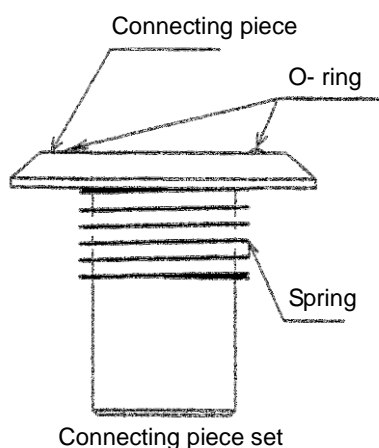


Jet rack

A. Structure of the jet rack



(Figure 10 Jet rack unit)



B. How to assemble and install (See figures 10 & 11.)

The jet rack connecting piece integrated with a connecting piece, O-ring, and a spring (at the time of shipping from the factory).

First remove the jet nozzle caps on the lower and the middle stage, remove the jet nozzles for the lower and the middle stages, and insert jet rack connecting piece sets into the nozzle couplers.

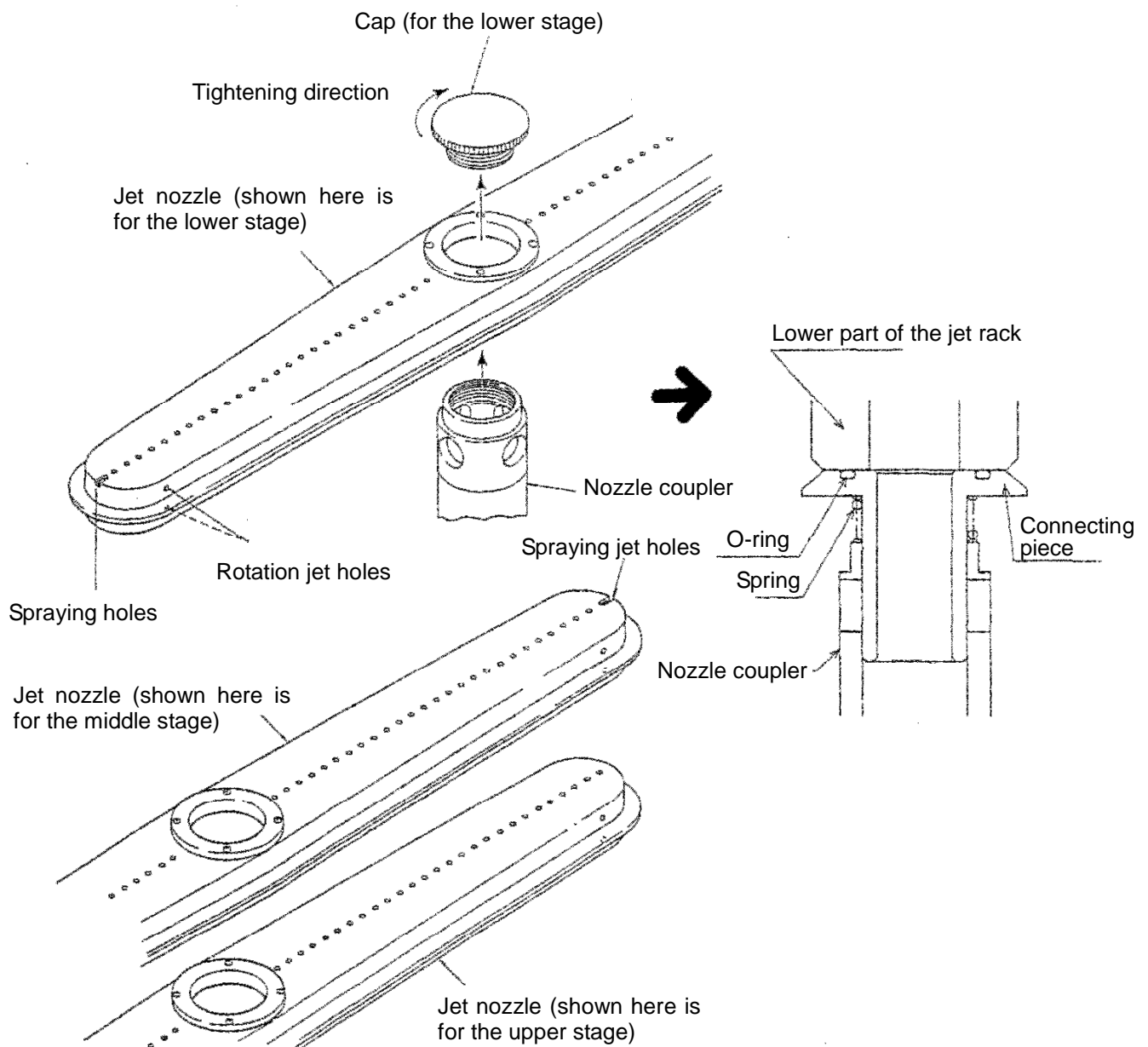


Figure 11

Cautions

1. The middle and lower jet nozzles rotate in the directions opposite to each other to avoid interference.

Lower stage: clockwise

Middle stage: Anticlockwise

After having used the jet rack, take enough care to attach the lower and middle jet nozzles correctly.

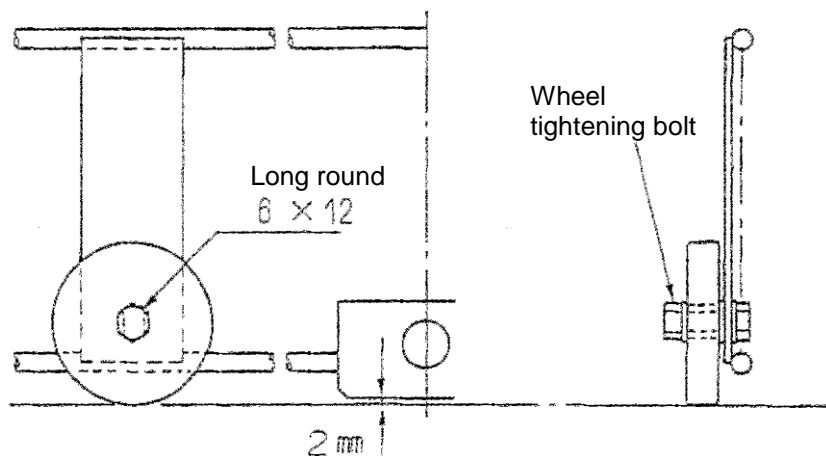
2. The tightening direction of the caps is the same as that of the nozzles in order to avoid loosening of the caps when the jet nozzles rotate.

The tightening direction for the lower cap, therefore, is clockwise, while the tightening direction of the cap for the middle stage is anticlockwise, in which direction the jet nozzle rotates.

C. Adjustment

1) Height adjustment of "Jet rack unit" (See figure 12.)

The height of the jet rack between the lower part of the rack and the wheel is adjusted to 2mm at the time of shipping from the factory. When readjustment is necessary, you can loosen the wheel tightening bolt to change the height. (Adjustment range is $\pm 3\text{mm}$.)



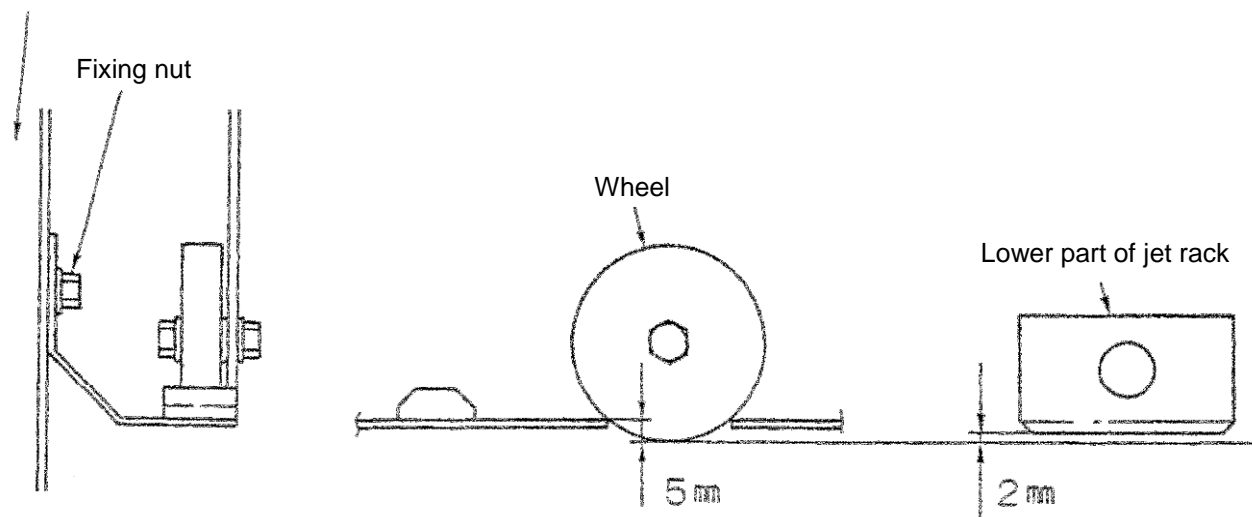
(Figure 12)

2) Height adjustment of "Rail" (See figure 13)

Shelf rail height has been adjusted when shipped from the factory.

When attaching the jet rack, the wheel drops by 5mm, the lower part of the jet rack is placed on the connecting piece to push the spring downward. When re-adjustment is necessary, you can loosen the fixing nut for the shelf rail and change the height. (Adjustment range is $\pm 3\text{mm}$.)

Rear of the main unit

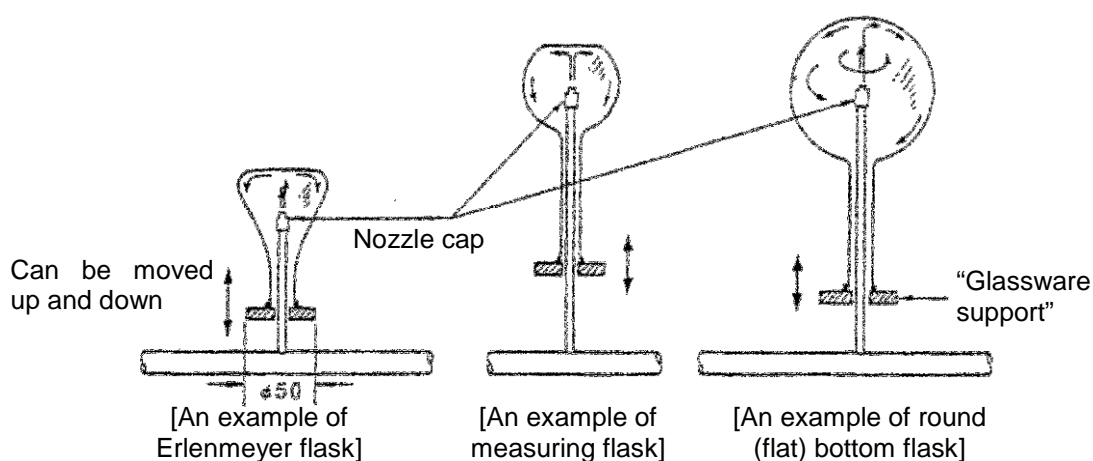


(Figure 13)

D) Set quantity:

Measuring flask (smaller than 500 ml)	44pcs
Measuring flask (smaller than 1000 ml)	20pcs

Move up and down “glassware support” attached to the nozzle pin to adjust and fix it at desired height according to kinds of glassware. When making adjustment, set a position of cap at desired adjustment, set a position of nozzle cap at the centroid or center of glassware as shown in the figure below.



8-2 Setting washing time (about washing effect)

A. About hot water

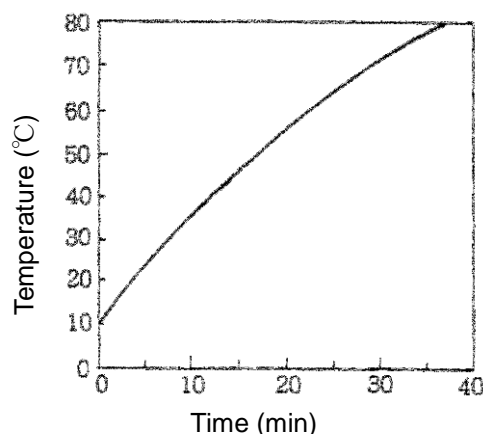
Since washing effect greatly depends on washing water temperature, set temperature according to the specific type of soil.

Set a temperature with the temperature setting knob on the front operation panel (Up to 80°C). The internal 6kW heater starts to heating on starting the pre-wash and wash process. Relationship between increase of temperature and time is shown in the graph in the right.

When the set temperature is above the feed water temperature, the process lamps (WASH lamps for the pre-wash and wash processes) of the unit illuminate and the heater turns ON, and the pre-wash timer and the wash timer start counting when the water temperature reaches the set temperature.

Thus, the washing pump operation time in the pre-wash and wash processes will be the total of “timer setting time” and “time required to reach the set temperature”.

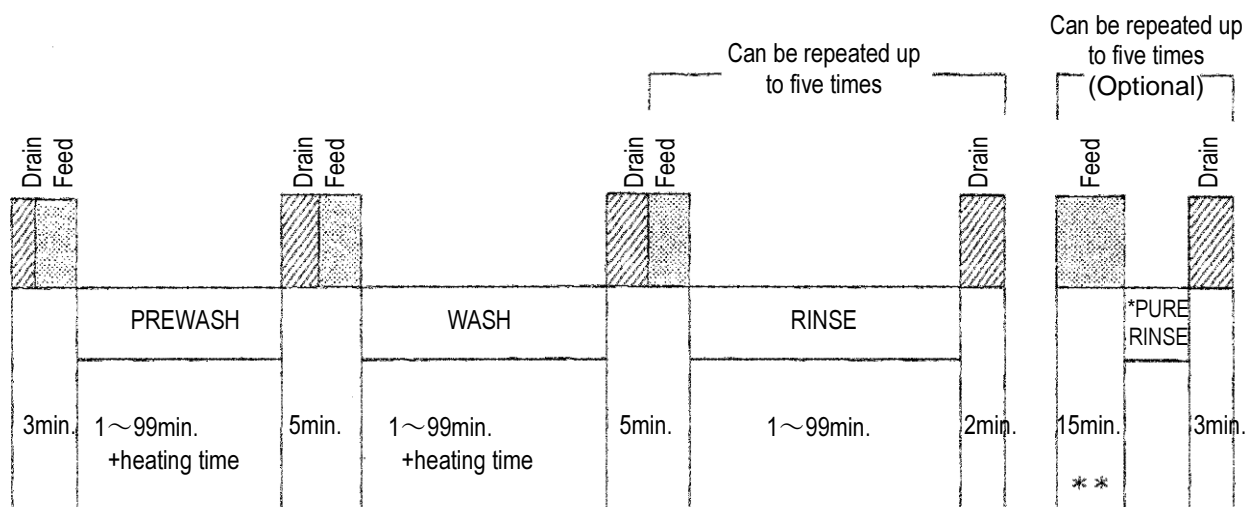
Washing water heating time with the heater
(When the initial temperature is 10°C)



B. About time setting

Example of washing time is shown below for reference.

■ Sequence • time table



* FINAL RINSE

** Feed to the pure water tank starts on starting rinse.

*** Draining is made intermittently during the drain process.
(Drain for 100sec→stop for 10sec→drain for 30sec)

■ Washing example

Dirt	Apparatus	Feed water temp.	Set temp.	Pre-wash	Wash	Rinse	Time	Wash pattern
5% starch	Test tube	10°C	50°C	5min + 17min of heating	15min + 17min of heating	3min x 3	88min	1
Egg white	Test tube	10°C	40°C	5min + 12min of heating	10min + 12min of heating	3min x 3	73min	1
Beef fat	Test tube	10°C	80°C	-	10min + 37min of heating	3min x 3	76min	2

Cautions

- Set temperature and required time may differ depending on type of dirt, adhesion status, or shape of the item to wash.
- Set time does not include heating time until the set temperature is reached.
- Use a brush to remove severe or stubborn solid soil before putting the item into the washer.
- Time shown is when feed amount of washing water is 10 liter/min.
- Immerse the item with organic soil in alcohol or other appropriate solvent first.
- Set washing water temperature to around 40~60°C in order to prevent transformation of protein when washing protein-containing material.

Note that this washer does not support washing with organic detergent because of its mechanism and material.

8-3 Operation (See “3. Description of the operation & display panel”)

Open the feed water side faucet.

Turn the power breaker ON. On turning power ON, the power lamp and the washing pattern lamps 1, 2, and 3 come on.

Then select a washing pattern. Available washing patterns are as follows:

- Pattern 1: Initial drain-wash process-wash process-rinse process
- Pattern 2: Initial drain-wash process-rinse process
- Pattern 3: Initial drain-rinse process

Press the washing pattern switch you want. Pattern lamps other than the one that corresponds to the switch you have pressed will go off and the sequence lamp for the washing pattern selected comes on.

Set time for each of washing pattern processes with the digital switch. Time may be set in the range from one minute to 99 minutes. Note, that if you set time to zero here, the washer regards this as one minute and proceeds process.

Then, set the number of repetitions for the rinse process with the digital switch. You can set up to five times.

When washing with hot water, you can select heating with the internal heater and feeding directly from feeding piping.

When heating with the internal heater for hot water washing, set to the target temperature you want with the temperature setting knob. You can set up to 80°C.

Note that heating with the internal heater is performed during pre-wash and wash processes only. No heating is made during rinse process.

Caution: Set temperature for pre-washing and washing will be the same. You can not set different temperatures for them.

When water is fed directly from the feeding piping, set the temperature at or below the feed water temperature or to OFF.

When you have selected a washing pattern, set time for each process, number of repetitions of rinse processes, and temperature, press the start switch. On pressing the switch, the start lamp comes on and operation starts. Also, once operation has started the sequence lamp indicates a process currently in session.

Press the stop/reset switch if you want to stop operation in the middle of it.

When all processes have finished, the buzzer sounds to indicate it.

Cautions

1. Note that opening the door during operation will pause all operations, including counting on the timer. You can resume operation by closing the door.
2. When you press the start switch while the door is open, the unit pauses in the operation ready status.
The unit starts when you close the door.
3. The washer will not start until you select a washing pattern.
4. When you start initial operation after delivery, select the pattern 3 and set rinse time to three minutes, its repetition times to three, and operate without putting any items in the washer in order to purge air in the pump. Any air remaining in the pump will degrade washing efficiency.
5. When operation is stopped halfway, dirty washing water will remain in the bath since draining is not made. If you operate the washer as it is, dirty water will be used for washing degrading washing efficiency.

For this reason, when operation was stopped halfway, be sure to select the pattern 3 and set rinse time to one minute to assure complete draining.

<About CLEANSER EMPTY lamp>

When liquid detergent is used, the CLEANSER EMPTY lamp at the upper part of the operation panel comes on in red when remaining amount of detergent becomes low. Replenish detergent as necessary. Note that operation will continue even if the CLEANSER EMPTY lamp is lit.

Cautions:

1. The <CLEANSER EMPTY> lamp illuminates only when the detergent select switch in the liquid detergent compartment is set to LIQUID (upper).
2. When powder detergent is used, a portion of detergent is put into the pot and the <CLEANSER EMPTY> lamp is not used. The detergent select switch is used with set at POWDER (lower) and its lamp is not used.

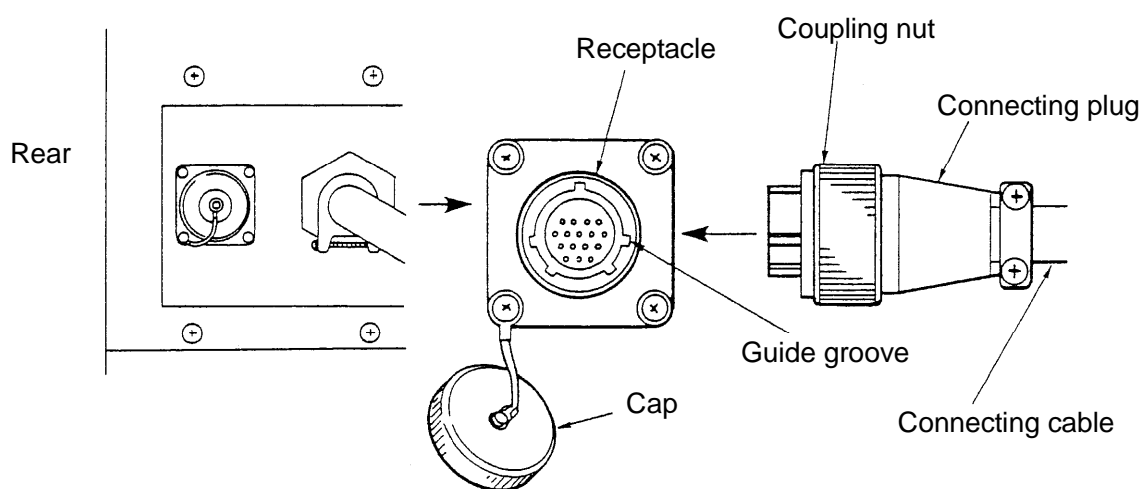
9 About the final rinse process

The optional pure water supplying unit is necessary to perform the final rinse process.

A. When the pure water supplying unit is used (See figures 14 & 15.)

<How to connect>

- 1) Turn off the washer side power.
- 2) Turn the connecting receptacle cap on the rear of the washer (pure water supplying unit) to remove. Remove the connecting receptacle cap on the pure water supplying unit (rear) in the same manner.



(Figure 14)

- 3) Insert the plug at one side of the connecting cable included in the pure water supplying unit into the connecting receptacle cap on the rear of the washer (pure water supplying unit) while aligning it in the guide groove and turn the coupling nut clockwise to securely fix it. Similarly, insert the plug at the other side of the connecting cable of the pure water supplying unit into the connecting receptacle cap while aligning it in the guide groove and turn the coupling nut clockwise to securely fix it.

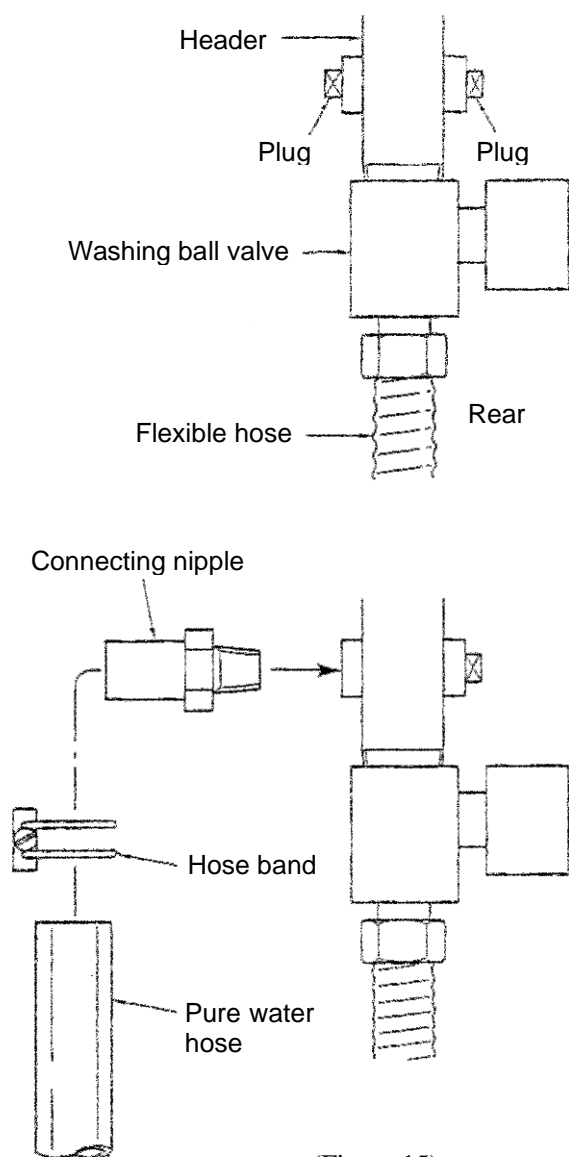
Caution: Do not perform the task here with wet hands. An electrical shock may result if you should forget to turn power off.

- 4) Then remove the lower rear cover at the lower part on the rear of the unit.

As shown in figure 15, there is a header, which has plugs at its right and left sides at the lower part of the unit. Remove the plug on the left facing the front (this is because the feed and drain ports are on the right side as standard when shipped from the factory.)

Caution: There are plugs on right and left sides to support use of either one set of right or left feed and drain ports.

- 5) Twist the connecting nipple (after wrapping seal tape included by 4~5 rounds) into the plug, which nipple is included in the pure water supplying unit.
- 6) After having cut a hose from the pure water supplying unit into an appropriate length, insert into the connecting nipple, and then securely tighten it using the attached hose band. Similarly, insert the other end of the pure water hose into the pure water hose nipple on the pure water supplying unit and then securely tighten it with the hose band.



(Figure 15)

Caution: Too long a pure water hose may trap air in the middle of it hampering smooth rotation of the jet nozzle.

Cut pure water hose as short as possible.

<How to operate>

- 1) Turn the power breaker ON. Make sure that the sequence lamps "FINAL RINSE" and "DRAIN" are lit. If not, turn power off once, remove the connecting cable and then reconnect it.
- 2) The pure water rinse process with the pure water supplying unit is completed after having sprayed 50 lit. tank-full of water for approx. 20 seconds. Set the number of pure water rinse processes according to the level of rinse. (Up to five times)
- 3) When the pure water supplying unit is connected to the washer, the process will automatically proceed to the pure water rinse process after the washing process of the selected pattern has finished.
- 4) Remove the connecting cable whenever pure water rinse is not performed. Never forget to put cap over the receptacle.
- 5) When you add and select final rinse and press start, feeding water starts for the rinse process and feeding of water to the pure water supplying unit starts, and pure water from the ion exchange resin is stored in the tank in the pure water supplying unit.

When rinse process set time is short, note that the pure water tank may not be full after draining in the rinse process and the final rinse process may not start immediately.

The final rinse process starts when the pure water tank becomes full.

About ion exchange resin

The ion exchange resin in the pure water supplying unit housing may be used approximately 30 final rinse processes.

When I. E. Resin yellow lamp comes on, which means the resin needs to be replaced, contact the nearest sales office and dealer to ask for replacement.

The yellow lamp can be reset by opening the front door of the pure water unit and press the reset switch inside.

10 Daily maintenance and inspection

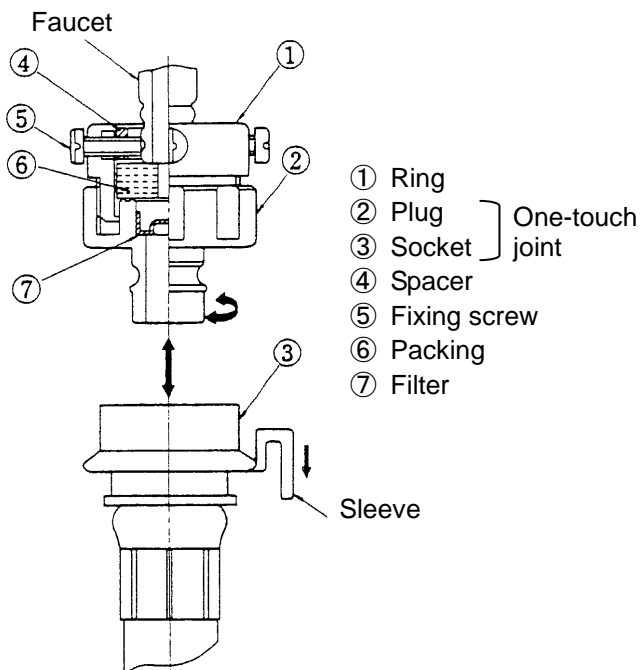
10-1 Inspection of the leak breaker

Check operation of the power breaker (leak breaker) on the operation panel about once a month. Press the red test button beside the power breaker with power on. It is normal if power is turned off and the yellow button protrudes. To recover, return the breaker level to OFF and then set it to ON again.

10-2 Cleaning of the water feed hose filter

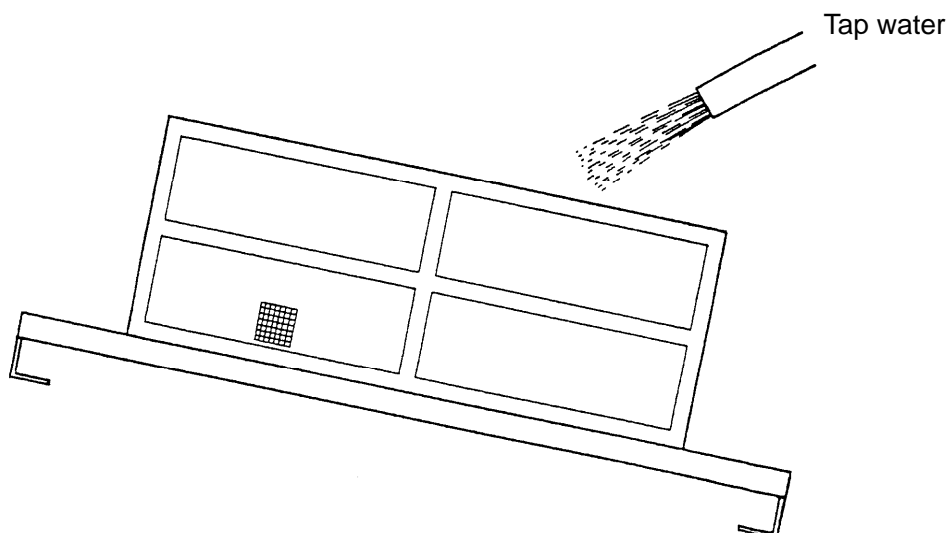
After closing the faucet, separate the connecting port and the hose with the one-touch joint. Remove the plug ② from the ring ①, and then wash the filter ⑦ inserted in the plug in tap water. If clogging is severe, remove the filter with a flat part of a pencil and clean it using a brush. (See the figure in the right.)

Caution: Perform this cleaning at least every six months. Shorten this interval when supply water quality is low.



10-3 Cleaning of the strainer

When dusts have accumulated in the strainer, remove it and clean the dusts off, then wash the strainer clean. Even if any dusts are not visible, regularly clean it with a brush depending on use conditions to avoid clogging. Take care not to spill dusts when removing the strainer.



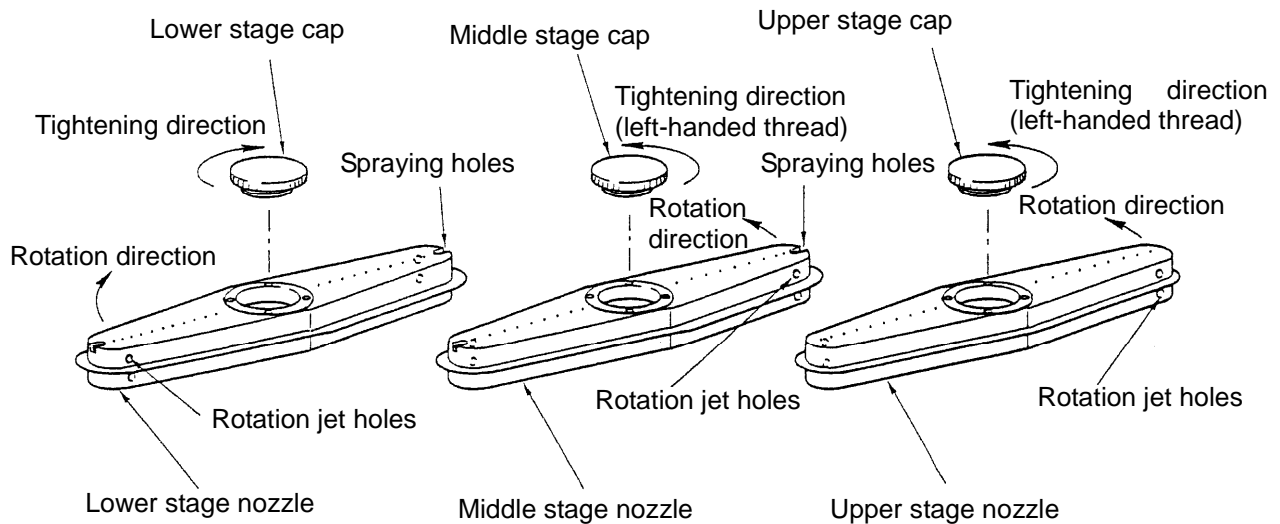
(Figure 16)

10-4 Cleaning of the jet nozzle

As in the case of the strainer, clean the jet nozzle with a brush depending on use conditions to avoid clogging.

Cautions:

1. Take care not to attach in the wrong direction when re-attaching the jet nozzle, the positions of it and its cap are specified according to the rotation direction.



(Figure 17)

2. Spraying holes are on the lower and middle stages only, and not on the upper stage.
3. The rotation jet holes are on the same side of the middle and the upper stages and on the opposite side for the lower nozzle.
4. The tightening direction for the lower stage cap is clockwise and that for the upper and middle stages is anticlockwise.

10-5 Cleaning of the door rail

After work, wipe the rails for the upper and lower doors with a duster. If they are left without wiping them, dirt or detergent may harden and the doors may become hard to open.

11. Cautions

- (1) Connect the system to a city water pipe or hot water pipeline of 98 to 294 (1 to 3 kg/cm²) feed water pressure (including nighttime) and about 10 lit./min. feed water quantity. Note that when a feed water pressure is too low, the solenoid valve does not open, and when the feed water pressure is too high, the pipeline in the washer may be damaged. When the feed water quantity is too small, the water feeding time of each process is lengthened.
- (2) A washing water temperature should be set to about 40 to 60°C in the case of contamination with protein and lower than 60°C in the case of thermo-softening plasticware. Higher the washing water temperature, better washing effect can be obtained, but if a heater is used for heating, it takes longer time to raise temperature. Set the temperature according to contamination type and its degree. In either case, the temperature should be lower than 80°C
- (3) Remove solid matter adhering to glassware with a brush or the like, before washing.
- (4) Do not use a foaming type detergent or detergent containing insoluble matter and organic solvent. It is recommended that the detergent described below be used for washing.
The detergent is alkaline. When it contacts the skin, therefore, wash the skin with water.
Extran AP-15 (liquid detergent recommended by us) contains 7% sodium hydroxide and designated as non-pharmaceutical hazardous substance. When handling, be sure to wear rubber gloves, etc.
Also, do not use tools made of aluminum because it deteriorates by alkaline.
- (5) When injection ports of injection nozzles are clogged, satisfactory washing cannot be performed. In such case, remove the injection nozzles and clean them as described in “10-4 Cleaning of the jet nozzle” of “10 Daily maintenance and inspection”
- (6) Silicon rubber and black synthetic rubber are used for piping in the main body. The rubber tubes are aged after the lapse of time to cause cracks on the surface, causing danger of water leak. Therefore, replace them with new ones about 2 years after purchasing of the washer.
- (7) Three-phase, 200V power is used as power source for this equipment. Though the overcurrent and leak prevention device is built-in, be sure to inspect the equipment once a month at least in accordance with “10-1 Inspection of the leak breaker” of “10 Daily maintenance and inspection” to confirm that the overcurrent and leak prevention device is working satisfactorily.
- (8) Do not put an item of 254N (25kg) or over in weight on the shelf board. Also avoid putting items one-sided.
- (9) Although the washer stops all operations if the door is opened during operation, take extreme care since water or boiling water may splash due to remaining pressure from the pump is the door is suddenly opened. Also, take extreme care hot steam may spew out to your face if you open the door when the set temperature is 60°C or more and heated to that point.
- (10) When the equipment is not to be operated at nighttime or on a holiday, be sure to close the stopcock.
- (11) Make sure to use the feed water hose, drain hose and other parts specified by Yamato.
- (12) Connect the stopcock (faucet) and feed water hose in a place provided with drainage
- (13) Connect the drain hose securely taking care not to warp in a small circle.
- (14) Never fail to connect the ground to avoid dangers.
- (15) Take enough care since inside the bath become extremely hot.
- (16) Liquid detergent may dry off when left contact with air for a longer period of time. Tighten caps of bottles or containers securely.

- (17) Be sure to hang the caution card attached to the power cord on the main unit.
- (18) Take care when placing or removing jet racks.
Since the directions of nozzle rotation and tightening of caps differ between the lower and the middle stage nozzles, take sufficient care when attaching or removing jet racks or attaching jet nozzles referring to “8-1 Preparation for operation (4) Jet rack B. How to assemble and install (p.20)”.
- (19) The pH of drain water after washing is about 11~13 and may not be discharged into rivers or public sewage systems. (To make it dischargeable to public sewage systems, pH must be 5.8~8.6.) If there is not processing facility available, drain water needs to be stored in a tank for neutralization or other measures are necessary.
- (20) Float switches are installed on the upper front inside the bath and at the lower right back in the internal bath. Take care not to touch them during cleaning. The float may turn and a wrong signal may be generated.

12 Troubleshooting

When a trouble occurs to this unit, check the symptom as in detail as possible and contact the nearest dealer or Yamato Scientific sales office. Proper explanation will enable early and appropriate solutions.

12-1 Malfunctions displayed on the operation panel

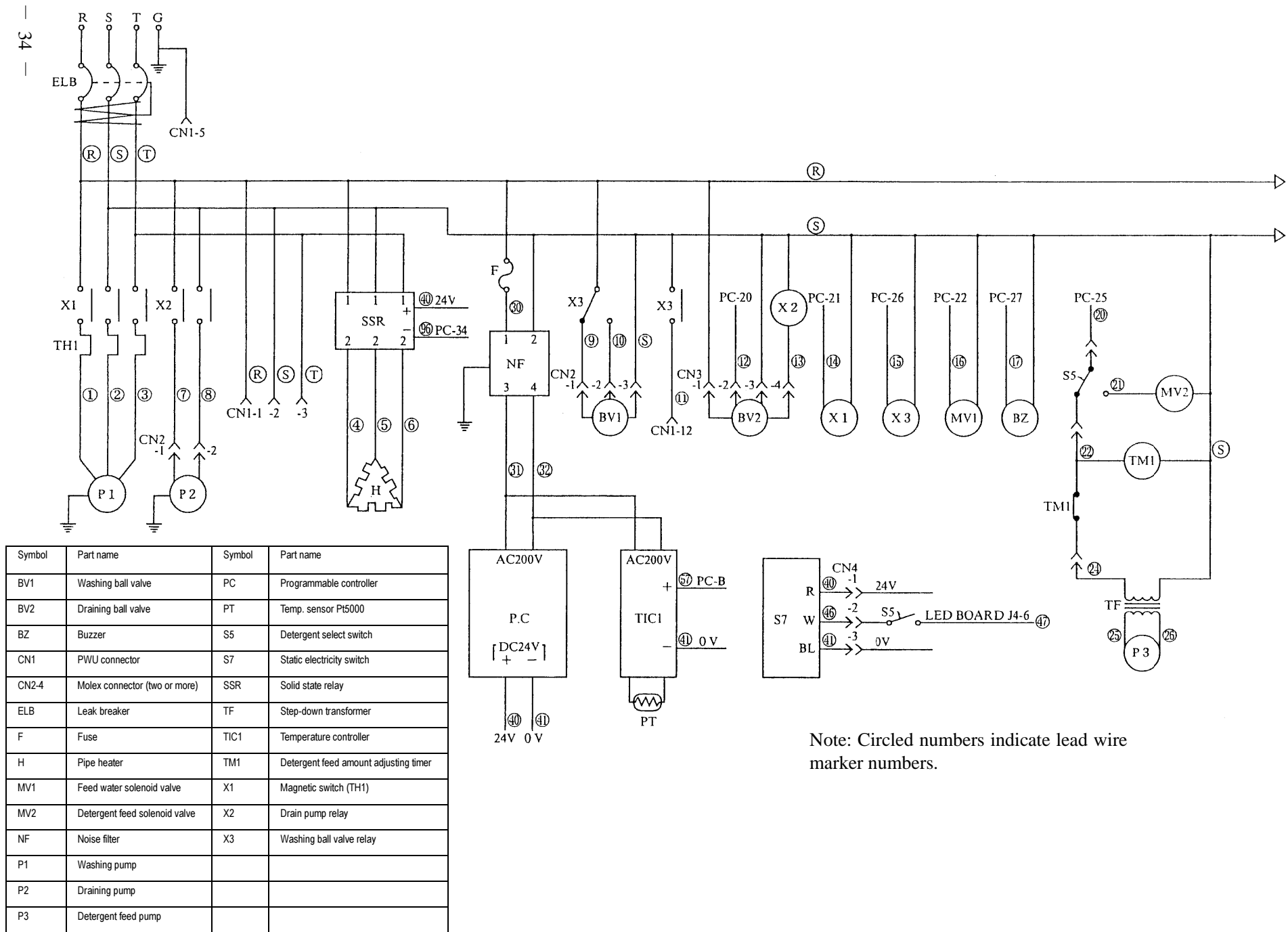
Symptom	Description	Cause	Solution
The OVER LOAD lamp comes on, the continuous buzzer sounds and the washer stops.	Overload of the pump	<ul style="list-style-type: none"> Malfunction of the pump See Note. 	<ul style="list-style-type: none"> Replace the pump “Contact the dealer.”
The WATER LEVEL lamp comes on, the continuous buzzer sounds and the washer stops.	The heater heats with no-liquid due to insufficient water.	<ul style="list-style-type: none"> The float switch position is wrong. The float switch (main) is operating wrong. 	<ul style="list-style-type: none"> Return the float to the normal position (turn half-round.) Maintain and replace the float switch (main).
CLEANSER EMPTY lamp comes on.		<ul style="list-style-type: none"> Remaining amount of detergent is low in the liquid detergent tank. 	<ul style="list-style-type: none"> Replenish liquid detergent. Use powder detergent.

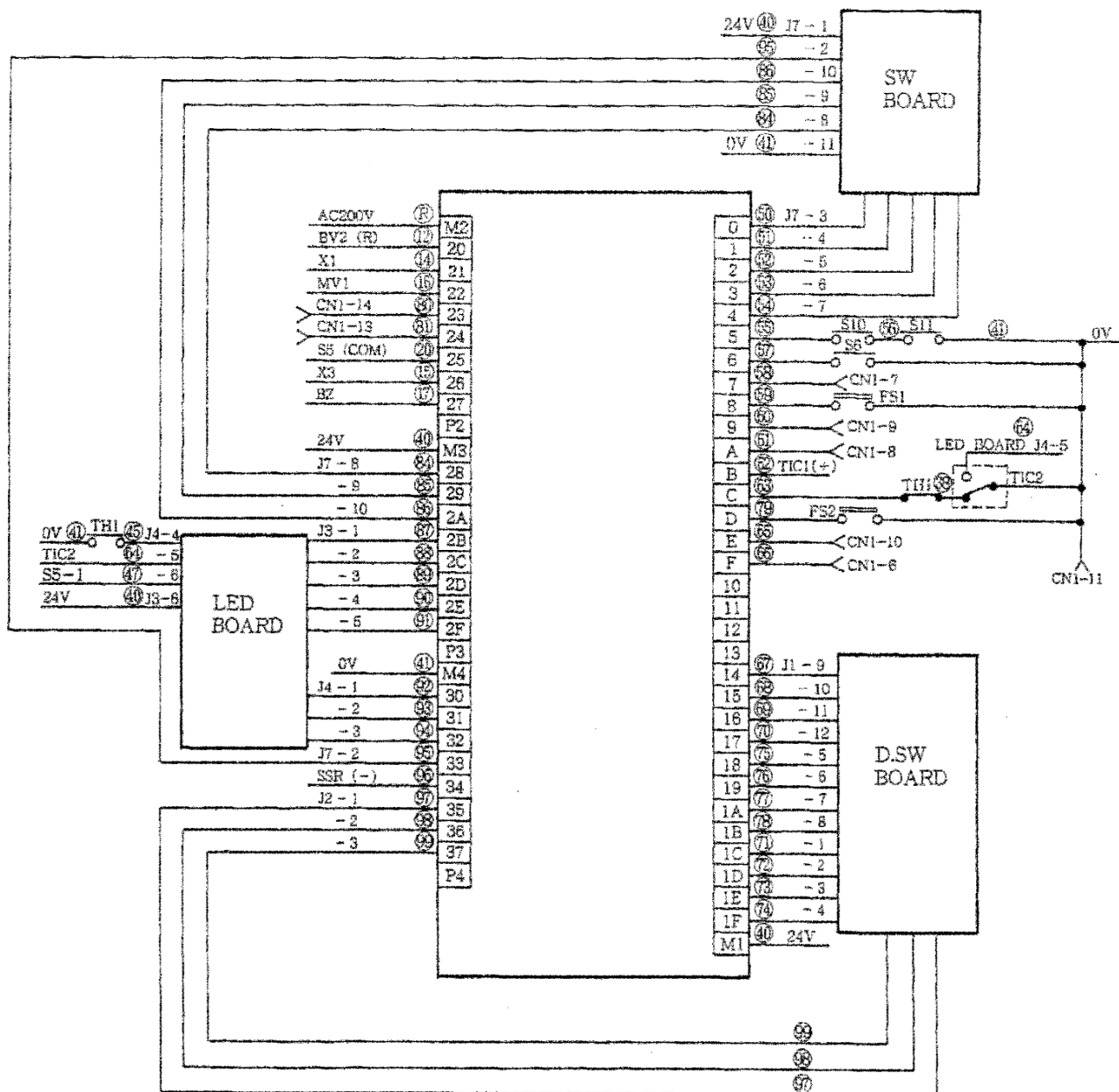
Note: When piping is clogged with dusts, flow will decrease and pump axis power will also small accordingly, pump overload will not occur.

12-2 Other malfunctions

Symptom	Description	Cause	Solution
The continuous buzzer sounds during water feed and the washer stops.	Feed water overflow	<ul style="list-style-type: none"> The float switch (main) is operating wrong. 	<ul style="list-style-type: none"> Maintain and replace the float switch (main). (Turn the power breaker off) and “Contact the dealer.”
Drain water will not be drained completely.		<ul style="list-style-type: none"> Clogging of piping. Malfunction of the drain valve. Malfunction of the drain pump. 	<ul style="list-style-type: none"> Clean out the pipe. Repair or maintenance of the drain valve. Repair or maintenance of the drain pump. “Contact the dealer.”
Improper washing		<ul style="list-style-type: none"> Clogging of the jet nozzle. The nozzle does not rotate. Improper amount of detergent. Improper water temperature. Malfunction of the pump 	<ul style="list-style-type: none"> Clean the jet nozzle. Worn-out of the bearing →replace. Adjust detergent amount. Change water temperature. Repair or maintenance of the drain pump. “Contact the dealer.”
The operation does not start.		<ul style="list-style-type: none"> The door is open. Malfunction of the door micro switch. 	<ul style="list-style-type: none"> Securely close the door. Repair or maintenance of the door.

13 Wiring diagram





Note: Circled numbers indicate lead wire marker numbers.

14 Table of replacement parts

Part name	Part number	Specifications	Maker
Ball valve (for washing)	3-15-001-6007	EAL200-UTE11/4B	KITZ
Molex (3P)	2-08-004-0010	3P miniature	Molex
Flange packing	AW83S-40650	t2, hardness 50°	Yamato
Seal washer	4-04-001-0001	SM-10	Yamato
Nozzle hose	3-04-001-0006	Silicon + tetron bladed, φ 32x φ 42	Yamato
Timer	1-06-002-0009	MY2V 200V 1min	Omron
Timer socket	1-07-013-0006	PY-14	Omron
Molex (4P)	2-08-004-6010	4P miniature	Molex
Thumb rotary switch (A)	2-02-007-0002	A7PS-206	Omron
Thumb rotary switch (B)	2-02-007-0003	A7PS-206-S15	Omron
Thumb rotary switch attachment plate	2-02-007-0004	A7P-M	Omron
Switch board	AW83S-30350		Yamato
Digital switch board	AW83S-30360		Yamato
LED board	AW83S-30370		Yamato
Harness	AW83S-41260	J1, 2, 3, 4, 5 (5 pcs)	Yamato
Leak breaker	2-06-011-0002	DG33A/30-30	Fuji
Receptacle	2-08-0007-0004	SRCN2A25-16S	Kokudenshi
Receptacle cap	LT00038713	JRC25RC(71)	Hirose
Bearing *	AW83S-41150	Nichias EXCELIDE W	Yamato
Pump (1)	LT00038510	CM10-1-DR1-V-A	Yamato
Flexible hose	3-04-004-0002	RANCHO-32 1001W-3059WJ350	Yokohama rubber HANBAI
Feed water hose	3-04-001-0007	φ 44.5x2Bx φ 58	Yamato
Pump (2)	2-15-008-0002	[For draining]MD-30RN AC200V	Iwaki
Hose	3-04-009-0001	φ 18x φ 24 EPT	Yamato
Draining L pipe	291014-170	P.V.C	Yamato
Toggle switch (A)	2-02-004-0004	AJ22111	Matsushita
Liquid sensor	1-26-002-0002	E2K-F10MC2	Omron
Pump (3)	2-15-009-0001	[For detergent]BPL-412E	Yamato

Products marked with * are consumables.

Part name	Part number	Specifications	Maker
Bottle	AW83S-30130	Sanplatec 2134B0 Additional machining 2 liters	Yamato
TYGON tube	3-04-004-0004	5/6" x 7/16"	Yamato
Water feed solenoid valve	3-02-003-0004	J243-031	Nanboku
Solenoid valve packing	291013-218		Yamato
Hose	3-04-011-6005	(Steam hose) ϕ 27.5x ϕ 12.7	Yamato
Drain power valve	3-02-001-0002	ECR200-TKE3/4B	KITZ
Packing (1)	AW83S-40690	For sash EPT	Yamato
Packing (2)	AW83S-40740	Chloroprene	Yamato
Packing (3)	AW83S-40800	Silicon t1.0 (for lower door)	Yamato
Packing (4)	AW83S-40820	Silicon t1.0 (for upper door)	Yamato
Seal washer	4-04-002-0001	SM-4	Yamato
Delrin bearing	4-18-008-0001	DU-26H	Sugatune
Packing (5)	AW83S-40950	Silicon	Yamato
Packing (6)	AW83S-40980	Chloroprene t1.0	Yamato
Packing (7)	AW83S-40990	Chloroprene t1.0	Yamato
Micro switch	2-02-001-0001	Z-15GQ-B	Omron
Toggle switch (B)	2-02-004-0002	AJ21101	Matsushita
Magnetic switch	2-06-011-0003	SW-03 2.2-3.4A	Fuji
Relay	2-05-013-0001	MY2 200V	Omron
Relay terminal block	2-07-013-0005	PYF-08A	Omron
Relay holder	2-34-002-0001	PYC-A1	Omron
SSR 3-phase cutting set	2-16-003-0002	G3PA-220B-2S	Omron
Temp. controller	1-03-008-0001	NSY-711-BRR 0 - 80°C Yao	Yamato
Volume (for temp. setting)		Included in the temp. controller	Yamato
Program controller	1-28-001-0001	FPB56R - A10	Fuji
ROM		(Programmed)	Yamato
Noise filter	2-30-001-0007	ZAC2205-00U	TDK
Step-down transformer	2-18-002-0001	SD21-010A	Toyoden
Fuse	2-10-001-0003	ϕ 6.4 x 30 5A	Nagano
Fuse holder	2-10-002-0002	F7111 1P	Sato

Part name	Part number	Specifications	Maker
Buzzer	2-11-001-0002	EA4202 200V	Matsushita
Terminal block (A)	2-07-001-0007	ML-11 8P	Sato
Terminal block (B)	2-07-001-0048	MM9-0AX 20P	Toyo
Terminal block (C)	2-07-001-0049	MM9-0AX 9P	Toyo
Terminal block (D)	2-07-001-0050	MM9-0AX 7P	Toyo
Packing for powder detergent pot	AW83S-41230	Chloroprene	Yamato
Adjuster	4-28-002-0004	TM-73 No.4 CodeNo.5200	Tochigiya
Heater	29103-150-2	AC200v 2kW	Hakko
Sensor	1-26-003-0001	ST2189-3 Yao	Yamato
No-liquid heating sensor	1-03-002-0004	EGO 55.132622.060 (with sensor) Yao	Yamato
Float switch	2-04-003-0002	Nihon Alf ESL-063	Yamato
O-ring	4-21-002-0001	JIS P-20 silicon	Yamato
Packing (8)	AW83S-40280	Hardness:50°	Yamato
Liquid detergent *	8-19-000-0016	Extran AP-15	Kanto Kagaku
Murinluster *	8-19-002-6001	(powder detergent)	Labosco

Products marked with * are consumables.

Instruction Manual
Laboratory Washer
AW83
First Version
Revised December 27, 2016

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