THE DISHDRAWER BOOK
DD603(I)/DS603(I)

Contents Page

Benefits of the DishDrawer®

Independent Operation

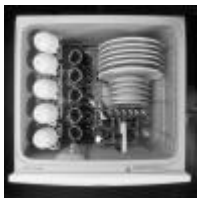
DishDrawer® is totally two totally separate, independently operated wash units. The DishDrawer® delivers two dishwashers in one

Ergonomically Superior

DishDrawer® is ergonomically superior. It incorporates the kitchen sliding drawer concept into the dishwasher, giving the user easier access, improved visibility and less movement to open and close.

Better care for your dishes

DishDrawer® allows you to wash everyday items in one drawer with a normal programme, while the other drawer could be used for heavy duty items like pots and pans.



Environmentally Outstanding

DishDrawer® is kind on the environment, minimising water, energy and detergent use, so it costs less to run. . It introduces the economical, guilt free small load, by using as little as 7.5l per drawer. A single drawer or half a load, means you save half the energy, water and detergent of a conventional dishwasher.

Easy to Use

The DishDrawer® automatically remembers the last wash program used, so by pressing the Start/Pause button you can activate the last programme without having to reprogramme it.

Dimensions and Specifications

	Product Size (mm)	Product Size (inches)	Minimum Cavity Size	Minimum Cavity Size
Height (double)	817.5-867.5mm	32 $^{3}/_{16}$ inch	820-870mm	32 $^{5}/_{16}$ inch
Height (single)	407mm	16 inch	410mm	16 $^{1}/_{8}$ inch
Width	595mm	23 $^{7}/_{16}$ inch	600mm	23 $^{5}/_{8}$ inch
Depth	570mm	22 $^{7}/_{16}$ inch	580mm	22 $^{7}/_{8}$ inch
Drawer Open (incl cab)	1080mm	42 ½ inch		

Electrical 230-240V AC 50Hz 10amp max. NZ/UK/AUS
110-120V AC 60Hz 12.5amp max USA.

SPECIFICATIONS

Water Inlet Valves 24Volt dc
P/N525113 Dual 70 ± 5 Ohms
P/N525842 Single 5 l/min
(1.3 US gal/min)

Chassis PCB
P/N 525958 240Volt AC
P/N 525959 120Volt AC

Motor 80 Volt DC 3 Phase
Drain 4200rpm
Wash 2300-2850rpm

Stator 8.0 ± 1 Ohm
P/N 526530 per winding

Temperature Sensor 962-Ohms @ 20°C (68°F)
(Part of Heater Plate)
1000-Ohms@ 30°C (86°F)
1202-Ohms @ 60°C (140°F)

Inlet Hose
P/N 521349 1.7m (66 inches)
P/N 525970 USA 960Kpa / 139p.s.i.

Drain Hose
2.0m (78 inches) from rear of cabinet
P/N 525966
2.5m (98 inches) bottom tub
P/N 525967 2.9m (114 inches) top tub

Detergent Dispenser 24 volt dc
P/N526536 70 ± 5 Ohms
10 grams /2tsp
20 grams /4tsp
30 grams /6tsp
5 gram pre-rinse
10 gram pre-rinse

Rinse Aid Dispenser 24 Volt DC
70 ± 5 Ohms
50 ml / 1.7fl oz
25 reg. Washes approx

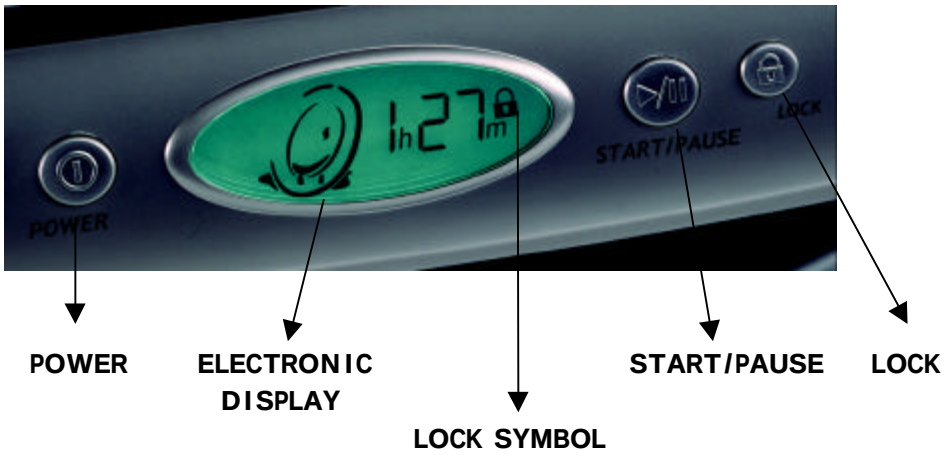
Standby Power
DD603 3w(NZ) / 2w(USA)
DS603 1.5w(NZ)/1w(USA)

Heater Plate
P/N 526443 240 Volt ac
Heater Track 60Ω ± 5%
Dropper Resistor 130Ω ± 5%

120 Volt ac
P/N 526444 30Ω ± 5%
Heater Track 30Ω ± 5%
Dropper Resistor

Control Panel

PRIMARY CONTROL PANEL (PREFINISHED)



Power Button
Press the POWER button to turn the DishDrawer® on or off. To end the wash programme in mid cycle, press the POWER button. Any water in the DishDrawer® will be pumped out.

Start/Pause Button
The START/PAUSE button starts and pauses the dishwasher. Always press the START/PAUSE button and wait for three beeps before opening the DishDrawer®.

If the DishDrawer® is in pause mode for more than 7minutes the machine will beep every 90 seconds to remind someone that the machine is in pause mode. Press the Start/Pause button to restart it.

Lock Button
This button activates keylock or childlock. When the LOCK symbol is displayed it indicates that this feature is on.

Keylock disables all the buttons on the DishDrawer®. To activate press and hold the lock button for 3 seconds until you hear one beep

Childlock disables all the buttons on the DishDrawer® in addition to locking the drawer. To activate, press the lock button for 5 seconds until you hear two beeps.

To deactivate the LOCK function, press and hold the lock button until you hear one beep

Electronic Display
The Electronic Display shows progress through the wash programme and time remaining. It also shows fault codes as they occur, delay start & lock.

Delay Start Mode
The start time of the DishDrawer® can be delayed by **1-12 hours**.

To activate the delay start mode, press and hold the START/PAUSE button until the delay symbol appears on the electronic display. Continue to hold the button until the desired time has been reached. The DishDrawer® will start when the time has elapsed.

To cancel Delay Start, press the POWER button or hold the START/PAUSE button until the delay symbol disappears.

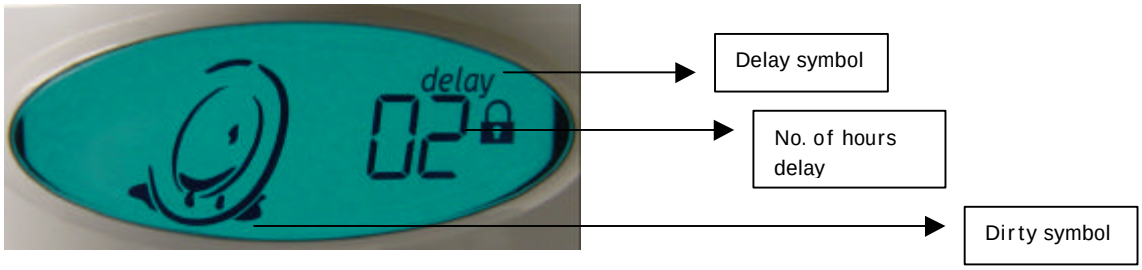
ELECTRONIC DISPLAY

The Electronic Display has a number of functions:

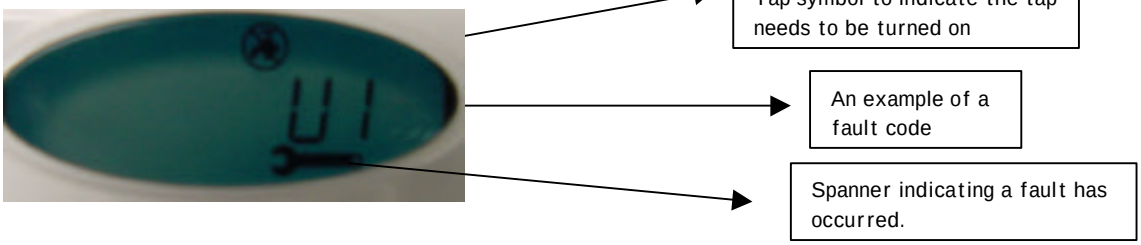
1. It shows the approximate time remaining in the wash programme in hours and minutes.

2. It shows progress through the wash programme

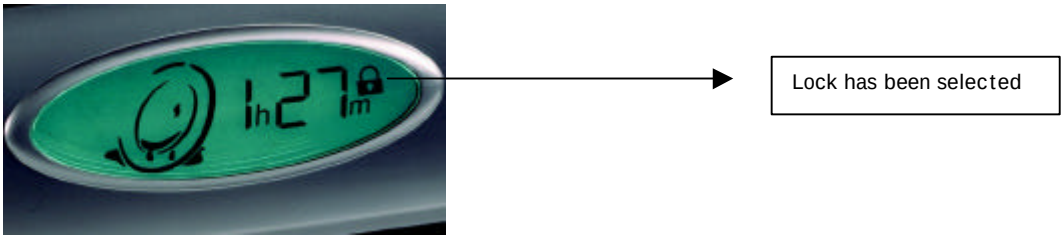
3. Indicates when DELAY START has been chosen.



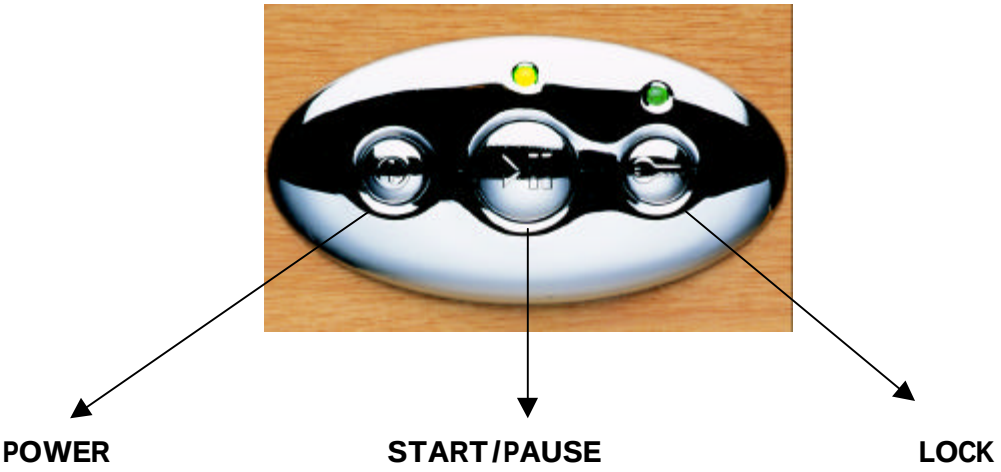
4. Shows when a Fault has occurred



5. Shows when lock has been selected.



PRIMARY CONTROL PANEL (INTEGRATED)



POWER BUTTON

Press the POWER button to turn the DishDrawer® on or off. To end the wash programme in mid cycle, press the POWER button. Any water in the DishDrawer® will be pumped out.

Start/Pause Button

The START/PAUSE button starts and pauses the dishwasher. Always press the START/PAUSE button and wait for three beeps before opening the DishDrawer®. The green light above the Start/Pause button indicates the DishDrawer® is operating.

If the DishDrawer® is in pause mode for more than 7minutes the machine will beep every 90 seconds to remind someone that the machine is in pause mode. Press the Start/Pause button to restart it.

Lock Button

This button activates keylock or childlock. When the light above the LOCK button is green, it indicates that this feature is on.

Keylock disables all the buttons on the DishDrawer®. To activate, press and hold the lock button for 3 seconds until you hear one beep

Childlock disables all the buttons on the DishDrawer® in addition to locking the drawer. To activate, press the lock button for 5 seconds until you hear two beeps.

To deactivate the LOCK function, press and hold the lock button until you hear one beep

Delay Start Mode

The start time of the DishDrawer® can be delayed by **1-12 hours**.

To activate the delay start mode, press and hold the START/PAUSE button until the orange light appears above the START/PAUSE button. The DishDrawer® will beep to indicate another hour delay. Continue to hold the button until the desired time has been reached. The DishDrawer® will start when the time has elapsed.

To cancel Delay Start, press the POWER button or hold the START/PAUSE button until the delay symbol disappears.

SECONDARY CONTROL PANEL

PROGRAMME Button
Press this button to select the wash programme.

ECO button
reduces time, temperature and energy on most wash cycles. The red light is lit when this option has been selected

This red light indicates the wash cycle that has been selected

DishDrawer's Wash Programmes

WASH PROGRAMMES

There are nine wash programmes available.
Heavy, Heavy Eco, Normal, Normal Eco, Delicate, Delicate Eco, Fast, Fast Eco and Rinse Option.

The following table shows what the wash programmes are designed for

WASH PROGRAMMES	WHEN TO USE
Heavy	Heavily soiled dishes like for pots and pans, baking dishes
Heavy Eco	Heavily soiled everyday dishes
Normal	This programme has been optimised for wash and dry performance
Normal Eco	This programme has been optimised for energy usage. It can be used for normal to lightly soiled dishes
Fast	Lightly soiled dishes – glasses, mugs, saucers
Fast Eco	Lightly soiled, non greasy dishes
Delicate	Lightly soiled heat sensitive crockery
Delicate Eco	Non greasy, lightly soiled and heat sensitive crockery
Rinse	To prevent soils drying and odours forming.

NOTES:

ECO PROGRAMMES

Eco cycles reduce temperature, water usage and time in some programmes. The exception to the rule is NORMAL ECO for the European market, this programme is much longer.
The Eco programmes have a reduced final rinse, and reduced drying time, which means dry performance is reduced.

FAST PROGRAMME

In order to meet customer requirements for a fast wash, this programme just washes dishes, there is a negligible drying phase, which does not dry the dishes adequately.

NORMAL PROGRAMMES

All NORMAL & NORMAL ECO programmes have been maximised to meet standard requirements.

One of the biggest problems we have in development of wash programmes is meeting both the consumer and standards needs. In some standards it requires a minimum percentage pass mark for both wash and dry, while another standard requires the best performance with negligible resources to be used. This presents problems, as some of the standard soils are particularly hard to remove eg microwaved milk plus a 2 hour @ 80°C bake. The standards will be discussed later.

SANI WASH – USA only

The Sani wash is the **Heavy programme**. The final rinse temperature reaches 74°C/165°F.

TIME REMAINING DISPLAY – DD603 and DS603 Prefinished Models Only

This is only an **estimate** of time remaining. The display is dependant on a number of factors eg, incoming wash temperatures, ambient room temperatures and whether the drawer has been opened during mid cycle etc.

WASH PROFILES – AUSTRALIA AND NEW ZEALAND

@ 20°C incoming water

Wash cycle	D	F	Pre 1	D	F	Pre 2	D	F	Wash	D	F	Post 1	D	F	Post 2	D	Dry	Status	Time*	Fills
Heavy @2800rpm	1	1	45°C 15m	1	1	5m	1	1	70°C + 10m 40m	1	1	3m	1	1	65°C 15m	1	30m	User	119m	3L
Heavy /Eco @2800 rpm	1	1	35°C 10m	1	1	5m	1	1	60°C+15m 30m	1	1	3m	1	1	55°C 10m	1	45m	User	114m	2.5L
Normal @2650 rpm	1				1	10m	1	1	65°C+10m 35m	1	1	3m	1	1	65°C 15m	1	30m	%	102m	3.0L
Normal / Eco @2500 rpm	1				1	15m	1	1	45°C+20 30m	1	1	3m	1	1	45°C 11m	1	30m	*****	98m	2.7L
Delicate @2300 rpm	1				1	5m	1	1	50°C 25m	1	1	3m	1	1	60°C 15m	1	30m	User	87m	2.5L
Delicate/Eco @2300 rpm	1				1	10m	1	1	45°C+10m 20m	1	1	3m	1	1	50°C 10m	1	30m	User	82m	2.5L
Fast @2500 rpm	1							1	55°C+5m 25m	1	1	2m	1	1	50°C 10m	1	5m	User	49m	2.5L
Fast / Eco @2500 rpm	1							1	45°C 15m	1	1	2m	1	1	45°C 10m	1	1m	User	35m	2.5L

Phase 3 at production Feb 2001 (ee103-5.log)

* Approximate time on the display

Version ee104 was changed for touch switch sensitivity and ee105 changes included timeout for U1. The wash profiles have not changed.

WASH PROFILES – UNITED KINGDOM

@ 15°C incoming water

Wash cycle	D	F	Pre 1	D	F	Pre 2	D	F	Wash	D	F	Post 1	D	F	Post 2	D	Dry	Status	Time*	Fills
Heavy @2800rpm	1	1	45°C 15m	1	1	5m	1	1	70°C + 10m 40m	1	1	3m	1	1	65°C 15m	1	30m	User	119m	3L
Heavy /Eco @2800rpm	1	1	35°C 10m	1	1	5m	1	1	60°C+15m 30m	1	1	3m	1	1	55°C 10m	1	45m	User	114m	2.5L
Normal @2650rpm	1				1	10m	1	1	65°C+10m 35m	1	1	3m	1	1	65°C 15m	1	30m	%	102m	3.0L
Normal / Eco @2500rpm	1				1	10m	1	1	50°C 80m	1	1	2m	1	1	54°C 10m	1	60m	*****	171m	2.5L
Delicate @2300rpm	1				1	5m	1	1	50°C 25m	1	1	3m	1	1	60°C 15m	1	30m	User	87m	2.5L
Delicate/Eco @2300rpm	1				1	10m	1	1	45°C+10m 20m	1	1	3m	1	1	50°C 10m	1	30m	User	82m	2.5L
Fast @2500rpm	1							1	55°C+5m 25m	1	1	2m	1	1	50°C 10m	1	5m	User	49m	2.5L
Fast / Eco @2500rpm	1							1	45°C 15m	1	1	2m	1	1	45°C 10m	1	1m	User	35m	2.5L

Phase 3 at production Feb 2001 (ee003-5.log)

* Approximate time on the display

Version ee104 was changed for touch switch sensitivity and ee105 changes included timeout for U1. The wash profiles have not changed.

WASH PROFILES – UNITED STATES OF AMERICA

@ 50 C incoming

Wash Program	Pre rinse 1	Pre rinse 2	Pre rinse 3	Main wash	Post rinse 1	Post rinse 2	Post Rinse 3	Dry	Total Times* (min)	Water Usage (L)	Motor Speed rpm	Water Per fill (L)
Heavy		12	5	35m / 65°C	3	3	20m / 74°C	28	119	32	2800	3 & 2.5
Heavy Eco		5	5	30m / 65°C	3	3	15m / 65°C	25	99	30	2800	2.5
Normal		8	3	45m / 62°C	2		10m / 60°C	25	104	30	2800	3
Normal Eco			5	30m / 55°C	3		10m / 55°C	22	79	20	2500	2.5
Fast				25m / 55°C	2		10m / 55°C	5	49	15	2500	2.5
Fast Eco				10m / 45°C	3		9m / 45°C	1	30	15	2500	2.5
Delicate			5	20m / 50°C	3		15m / 55°C	25	77	20	2300	2.5
Delicate Eco			5	18m / 45°C	3		12m / 50°C	16	63	20	2300	2.5
Rinse	7								10	2.5	2300	2.5

Phase3 at production Feb 2001 (ee203-5.log)

@ 122°F incoming water

Wash Program	Pre rinse 1	Pre rinse 2	Pre rinse 3	Main wash	Post rinse 1	Post rinse 2	Post Rinse 3	Dry	Total Times* (min)	Water Usage (Gal)	Motor Speed rpm	Water Per fill (Gal)
Heavy		12	5	35m / 149°F	3	3	20m / 165°F	28	119	8.45	2800	.79 &.66
Heavy Eco		5	5	30m / 149°F	3	3	15m / 149°F	25	99	7.95	2800	0.66
Normal		8	3	45m / 144°F	2		10m / 140°F	25	104	7.95	2800	0.79
Normal Eco			5	30m / 131°F	3		10m / 131°F	22	79	5.28	2500	0.66
Fast				25m / 131°F	2		10m / 131°F	5	49	3.96	2500	0.66
Fast Eco				10m / 113°F	3		9m / 113°F	1	30	3.96	2500	0.66
Delicate			5	20m / 122°F	3		15m / 131°F	25	77	5.28	2300	0.66
Delicate Eco			5	18m / 113°F	3		12m / 122°F	16	63	5.28	2300	0.66
Rinse	7								10	0.66	2300	0.66

* Approximate time on the display, excludes drain and fill times.

Version ee104 was changed for touch switch sensitivity and ee105 changes included timeout for U1. The wash profiles have not changed.

Summaries for Global Wash Profiles

UK Wash Profiles

Summary of Details for Phase 3 Wash Profiles		
Programme	**Approx. Power(kWh)**	**Approx. Water (l)**
Heavy	1.94	27.7
Heavy Eco	1.475	22.5
Normal	1.566	21.6
Normal Eco	1.19	20.0
Delicate	1.222	17.9
Delicate Eco	0.893	18.9
Fast	0.890	14.3
Fast Eco	0.6577	13.1

- Based on 15° C incoming water supply
- 12 place setting used as per EN50242

Australian/New Zealand Wash Summaries

Summary of Details for Phase 3 Wash Profiles		
Programme	**Approx Power(kWh)**	**Approx Water (l)**
Heavy	2.1	29
Heavy Eco	1.31	25
Normal	**1.5**	**20**
Normal Eco	**0.87**	**20**
Delicate	1.11	21
Delicate Eco	0.87	21
Fast	1.01	17
Fast Eco	0.71	16

- Based on 20° C incoming water
- 14 place setting used as per AS2007.1

USA Wash Summaries

Summary of Details for Phase 3 Wash Profiles		
Programme	**Approx Power(kWh)**	**Approx Water (l & gal)**
Heavy	2.477	31.38 / 8.29
Heavy Eco	2.09	28.62 / 7.56
Normal	1.971	29.81 / 7.87
Normal Eco (ITS)	1.386	18.73 / 4.95
Delicate	1.289	18.21 / 4.816
Delicate Eco	1.113	18.54 / 4.897
Fast	1.142	14.03 / 3.71
Fast Eco	0.823	13.21 / 3.49

- Based on 50° C / 122° F incoming water
- 8 place setting used as described by AHAM
- Water energy (kWh) = gallon * 70*0.0024

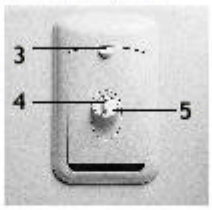
Detergent and Rinse Aid/Agent Dispenser

Detergent Dispenser

The detergent and rinse aid/agent dispenser is located on the inside of the DishDrawer®. The detergent dispenser has two compartments, pre wash and main wash compartment. The pre wash and main wash compartments both have markings on the inside. The pre wash compartment has one marking which represents 1tsp/5g and when full 2tsp/10g. The main wash compartment has two markings the lowest mark indicates 2tsp/10g, the middle mark 4tsp/20g, and when full it holds 6tsp/30g. Do not use tablets or gels in the DishDrawer® as they are not suitable.

Open Detergent Dispenser

Closed Detergent & Rinse Aid Dispenser



1. Pre Wash Compartment
2. Main Wash Compartment
3. Detergent Dispenser Latch
4. Rinse Aid Indicator Light
5. Rinse Aid Plug

FILLING THE DETERGENT DISPENSER

1. Press the latch down and the door will open.
2. Pour in detergent. No detergent is needed for the Rinse programme.
3. After filling the compartment(s), close the dispenser door until it clicks shut. The detergent will automatically be released into the DishDrawer during the wash programme.

Rinse Aid/Agent Dispenser

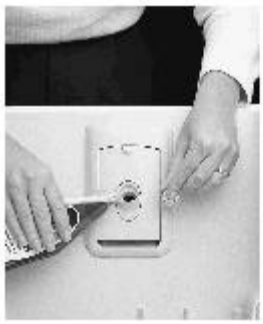
We highly recommend the regular use of liquid rinse aid to give the best drying results. Rinse aid gives a streak free, sparkling clean look to glass and chinaware, in addition prevents metal from tarnishing. The rinse aid dispenser is on the inside of the drawer, located underneath the detergent dispenser. The dispenser holds approximately 50ml of rinse aid.

How Much Rinse Aid to Use

The regulator may need adjusting to suit your water conditions. The lowest setting is '1' and the highest is '5'. Refer to Option Adjustment Mode section to adjust the rinse aid setting. If there is excessive foam at the end of the wash, reduce the setting. If dishes are wet or streaky after drying, increase the setting.

Rinse Aid Indicator Light

If the rinse aid indicator light is red, refill the dispenser If the rinse aid window is black, there is enough rinse aid for the wash.



FILLING THE RINSE AID DISPENSER

1. Turn the plug anti-clockwise and remove.
2. Pour the rinse aid into the circular opening.
3. Take care not to spill rinse aid into the DishDrawer. Wipe away any overflow to prevent excess foaming.
4. Fit the plug back into the original position.

It is important to wipe any rinse aid spillages. Failure to do will result in excessive foaming which can cause an F1 fault. It has been found in very cold water ie <15ºC that foaming is worse, especially in situations where there is a long pre rinse or fast wash programmes have been used.

Automatic Dishwasher Detergents (ADWD)

Requirements of Dishwashing Detergent

1. Readily soluble in water
2. Non corrosive on equipment and dishware
3. Non irritating
4. Biodegradable
5. Economical in use
6. Readily rinseable
7. Stable during storage
8. Effective cleaner
    - Wet the surface of the soil, decrease the surface tension, so water can penetrate the soil more readily
    - Disperse the insoluble materials that may form aggregates and hold them in suspension
    - Dissolve soluble soils both inorganic and organic the more rapid the solution, the better the detergent
    - Emulsify fats and oils ie break up fats and oils into smaller globules so they remain in suspension
    - Sequester (remove or inactivate) Calcium (Ca) and Magnesium (Mg) salts in hard water so their precipitation is prevented and cleaning efficiency not impaired.

Old Generation Detergents

Detergents from the old generation achieved their wash performance by their high alkalinity. This class of detergent is very corrosive and is very toxic if swallowed. Due the nature of the old generation detergents they are classified as CORROSIVE. This type of detergent is still available on the market eg. ACTIVE.

New Generation Detergents

The new generation detergents are less alkaline and no longer have the corrosive properties of their old counterparts. Due to the weak alkaline properties these detergents are now labelled as an IRRITANT. Examples of detergent brands are SUN, FINISH, ELECTROSOL and CASCADE COMPLETE and CASCADE PURE RINSE FORMULA.

DISHWASHER DETERGENT INGREDIENTS

DIFFERENCES BETWEEN THE OLD AND NEW GENERATION DETERGENTS

The following table shows the difference between the old and new generation detergents

Dishwashing

Automatic Dishwashing Detergents - Composition

"old" generation (traditional) "corrosive"	Composition of ADWD	"new" generation "non corrosive"
Metasilicate, Soda	Alkalies	Disilicate, Soda
Phosphate	Builder	Citrate, Polycarboxylate; Phosphate
Active chlorine	Bleach (..+Activator)	Active Oxygen; Activator (TAED)
----------	Biosubstances	Enzymes
Non ionic surfactants	Wetting Agents	Non ionic surfactants
----------	Auxiliaries	Silver Corrosion Inhibitor
12-13	pH value; 1% solution	9-11

ABOUT THE DETERGENT INGREDIENTS

Alkalies

The alkalinity of detergent is very important for the removal of fat residues from dishes. To obtain an alkaline solution the detergent formulations contain silicate and soda. In the old generation detergents many contained metasilicates which are very alkaline and why it was corrosive. The new generation detergents contain disilicates and soda.

The *silicates* soak the food remains on dishes. Silicates are able to transfer a negative charge onto food soils as well as the dishware, which leads to repulsion of food residues because of equal charges.

Soda is added to detergents because it precipitates water hardness ions ie Ca^{2+} and Mg^{2+}, making the water softer for the detergent.

Builders

Phosphates are important because the emulsify fats and oils ie break up fats and oils into smaller globules so they remain in suspension and have the ability to hold soils in suspension. Phosphates are able to convert water hardness ions into soluble complexes. The higher the phosphate contents the better the ability for the detergent to bind with the water hardness ions, making it able to work effectively.

Polycarboxylates are polymers, which disperse developing lime scale crystals, and prevents the coagulation of visible crystals. Polycarboxylates help the phosphate by binding onto the water hardness ions and ensuring the phosphates are available for cleaning.

Citrates are in the form of citric acid crystals, which bind with the Calcium ions therefore reducing water hardness.

Bleaching Agents and Activators

Bleaching agents decolourise soils like tea, coffee, lipstick and red wine. Modern dishwashing detergents no longer contain active chlorine as a bleaching agent but active oxygen (sodium perborate). Active oxygen is less toxic and less aggressive than active chlorine. Under normal conditions the active oxygen works at higher temperatures but an activator (TAED) is added to start the bleach at lower temperatures.

Enzymes

Enzymes are special proteins, which are highly specific. There are two types in the modern dishwashing detergent amylase and protease. *Amylase* eliminates starch soils like potato and *protease* removes protein stains like meat and egg. The activity of the enzymes is temperature dependent. Most of have an optimum temperature of 50-60ºC after that temperature the enzymes are inactive. In the old generation of detergents there were no enzymes but it relied on the alkaline properties and the chlorine to remove these stains.

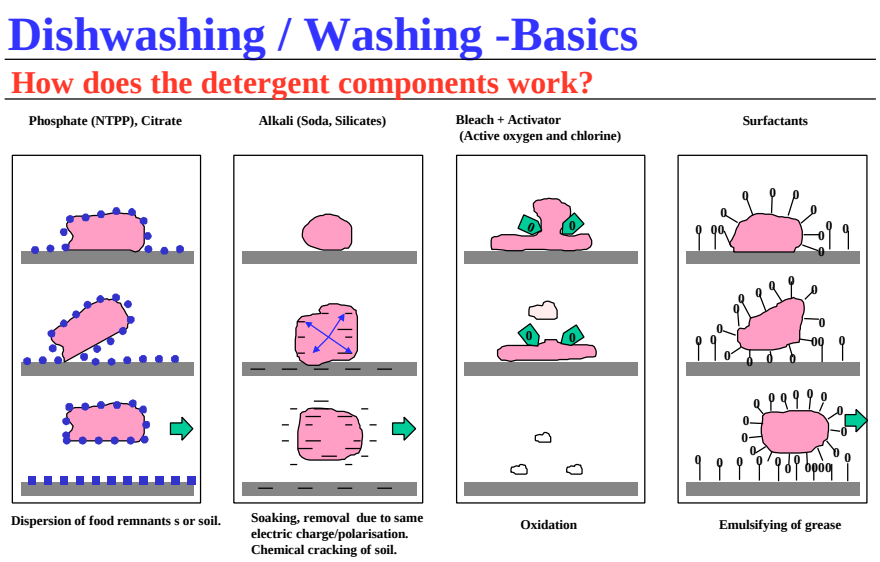
Surfactants

Surfactants reduce water tension of the water and therefore make the dishes wetter. Surfactants are organic molecules, which contain hydrophilic end (water loving) and a hydrophobic end (water hating). During the cleaning process fats become covered with the hydrophobic end of the surfactant while the hydrophilic end orientate themselves in the washing solution. The fats and oils can be detached from the dish surface then emulsified in the water and finally rinsed away in the wash solution.

Silverware Corrosion Inhibitors

Silverware corrosion inhibitors are added to prevent silverware from developing a black tarnish.

Function of the most important detergent ingredients



RINSE AID

PURPOSE OF RINSE AID/AGENT

Rinse aid/agent is required to accelerate the drying period and increase the shine of dishes at the end of the wash programme.

Rinse aid is an integral part of the dishwashing process. It performs an equally important function as the dishwasher detergent itself. Rinse aid breaks down the surface tension of the final rinse water. It allows the water to sheet off evenly and quickly to prevent water clinging in droplets and drying up as water spots. The sheeting action of the rinse aid minimises spotting, filming and helps with the drying process. It is particularly useful if you want dry dishes when the Eco programs are used.

Rinse aid/agent contains non ionic surfactants that decrease the surface tension of water. The water will run off in a thin film off the dishes without streaks. The more water that runs off the dishes the better the rinse effect. When water is left to dry naturally on dishware and particularly glasses it leaves behind water soluble minerals and lime scale on the surface producing streaks. An example of this when you wash a glass by hand leave it drip dry, streaks are formed and are removed by a tea towel. Rinse Aid/Agent is in effect like a clean tea towel, it dries the glass and removes streaks/marks.

Rinse aid/agent also contains organic fruit acids eg citric acid, which dissolve mineral salts and lime scale. The rinse aid/agent also neutralises the alkalinity of detergent that may remain in the final rinse.

Other additives in the rinse aid/agent are preservatives, dissolving aids, stabilisers, foam regulators and perfumes.

Rinse Aid Settings

It is important to ensure that your rinse aid setting is correct, you may need to experiment to get to the best results. However if you are in a hard water area, you may want to increase the rinse aid setting to 4-5. If you are in a soft water area setting of 1-2 may be adequate. If your dishes are still wet, increase the rinse aid setting. If you notice a lot of foaming decrease the rinse aid setting.

Rinse Aid Spillages

It is very important when filling the rinse aid dispenser ensure you wipe any spillages immediately. Failure to do so may result in service call. What will happen is foam will find the vent hole at the back of the DishDrawer® and dribble onto the flood switch, hence causing a F1 fault.

DISHWASHING DETERGENT TABLETS

History

Dishwasher tablets were introduced into the American market in the 1960's. Unfortunately the tablets were not successful due to unsatisfactory disintegration and solubility properties; they disappeared from the market. The tablets were introduced again in the mid 1980s and since then have gained a big market share in the European market, both in automatic dishwashing detergent but also laundry and toilet cleaners.

Market Share of Dishwasher Tablets

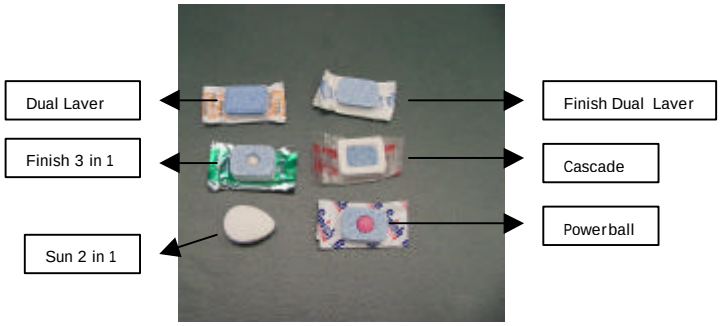
The market share in tablets is increasing particularly UK and Europe, in the year 2000 tablets had a market share of 63%. In New Zealand/Australia and the USA the market share for tablets is not as great, but is on the increase.

Reasons for Tablet Success

The reasons why the tablets are so successful

- Convenient
- Easy to handle
- Simple to dose
- Efficiency i.e. more precisely dosed, less wastage
- Small volume and high performance per unit weight.

Dishwashing Tablets



Market Leaders

Currently the market leaders for tablets are Reckitt Benckiser who make Finish Products.
There are four types of tabs available on the global market. All tablets are enzymic based.

1 Dual Layer

The product comes in two layers. The blue is the detergent portion, while the white layer is the bleach.

2 Powerball

Finish has recently introduced the Powerball into Australia, UK and Europe. The "ball" is a presoaker, which dissolves and softens the food immediately, the blue layer breaks the down and lifts the dried on food residues and white layer contains the bleach.

3 Two in One Tablet

Also available is the Lever Rexona "Sun All in One" tablets includes the detergent and the salt to eliminate mineral hardness during the wash. This Sun product is available in Europe and the UK. Also available is the Finish '2 in 1', which contains the detergent and rinse aid.

4 Three in One Tablet

Finish "3 in 1" tablet, incorporates the detergent, rinse aid, and salt for water softening. This product works on a change in pH. When the pH reaches 8-9, the rinse aid portion of the tablet is released. This product is only available in Europe and the UK.

PROBLEMS WITH TABLETS

In the DishDrawer® the tablets will become a problem if the tablet is put into the detergent dispenser. Due to the nature of the detergent dispenser, the flow rate of 4L/min ± 25%, (dependent on the inlet valve) will not dissolve a complete tablet during one fill. See pictures below.

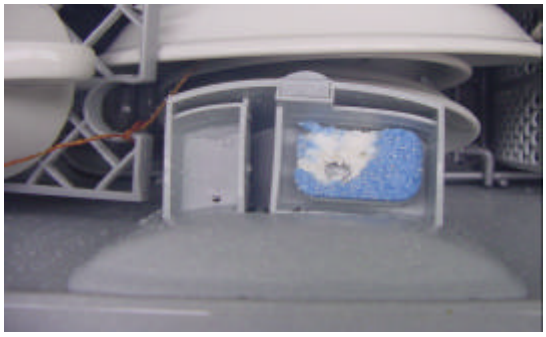


Fig 1: After filling for the main wash

Fig 2: After the post rinse 2

If the tab is put into the cutlery basket with the current wash programs, version EE103, most of the tablet dissolves in the pre wash before the main wash, rendering the wash ineffective.

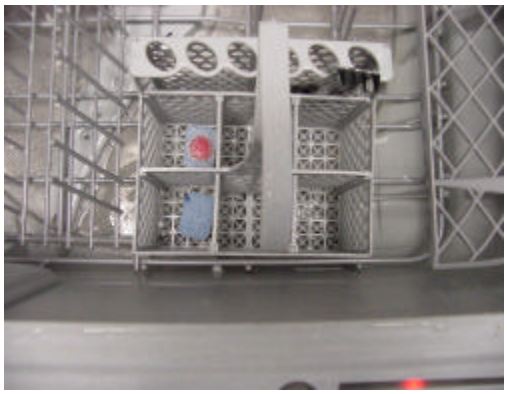


Fig 3:
1 minute in the pre rinse (cold connect)

Fig 4:
9 minute in the pre rinse (cold connect)

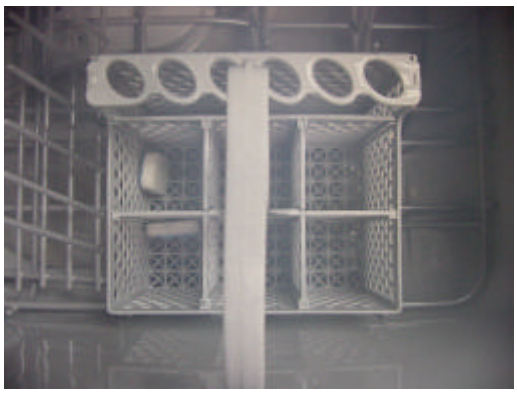


Fig 5:
1 minute in the pre rinse (50°C connect)

Fig 6:
6 minute in the pre rinse (50°C connect)

The tablets are normally used in conventional dishwasher situations in soft water situations.
In the case of soft water situations there may be a problem with over dosing. In situations like this, there may be problem with glasses going opaque, scratchy.

In hard water situations it **may** be beneficial for the DishDrawer® to have a tablet, with high phosphate content, to counteract the hardness minerals. This could be beneficial in hard water areas like America, particularly where there is no water softening device in the DishDrawer®.

At present we looking at suitable ways of introducing the tablet, but currently in the DishDrawer® Phase 3, they are not suitable to be placed in the cutlery basket or detergent dispenser.

After discussions with Reckitt Benckiser a problem that can occur with tablets are with low wash temperatures, which may cause foaming, especially in worse case situations ie the fast wash programmes and high protein load eg egg yolk.

CONCLUSIONS: WE DO NOT RECOMMEND THE TABLETS FOR THE DISHDRAWER

THE MAKEUP OF THE TABLET IS AS FOLLOWS:
The tablet weighs approximately 20-25g.

		Compact detergents Share in % by weight	
Ingredients	**Formula**	Phosphate	Non phosphate
Alkaline Carriers	Sodium carbonate	0 - 40	0 - 40
	Na bicarbonate		0 - 40
	Disilicates	0 - 40	0 - 40
Complexing agents	Triphosphates	> 30	
	Citrate		> 30
	Phosphonate	0 - 2	0 - 15
Bleaches + activator/accelerator	Active oxygen carrier	3 - 20	3 - 20
	TAED	0 - 6	0 - 6
	Mn accelerator		< 1
Wetting agents	Surfactants	0 - 4	0 - 4
Bio-agents	Enzymes	< 6	< 6
Auxiliaries	Perfumes	< 0.5	< 0.5
	Paraffin oil	< 1	< 1
	Silver protection agent	< 1	< 1
pH		< 11	< 11

The tablets are all enzyme based. They all have amylase – for starch and protease for protein. All now incorporate oxygen bleaches.

Tablet Brands that we are Currently Aware of in the Global Markets

New Zealand	Australia	UK	USA
Finish Dual Layer	Finish – Powerball / Dual Layer	Finish	Electrasol
Cussons	Cussons	Sun All in 1	Cascade
		Supermarket brands	Palmolive
		ECOVER	Sun

DO YOU STILL SEE TEA STAINS OR DOES YOU DISHWASHER SMELL AFTER WASH? YES

HERE IS THE REASON WHY

We have a number of inquiries from our Customer Care Centre in regard to smells from dishwashers and tea stains not being removed after using enzymic based detergents like Finish. There are number of reasons why this might occur. Automatic dishwashing detergents contain bleaches, whose function is to remove stains and odours. Detergents will contain one of the following bleaches but NOT both, either chlorine or oxygen. Enzymic based detergents no longer have chlorine bleaches in them; instead they have oxygen bleaches which are compatible with enzymes. There has been a global shift for automatic dishwashing detergents to move away from chlorine based detergent as they are more toxic and therefore problems arise with transportation and storage. Unfortunately due to the nature of the oxygen bleaches they are not as effective as chlorine bleaches at removing stains. It is therefore important that we try to preserve the detergents as best we can to make the product work best for us. Detergents must be stored in cool, dry conditions, under the sink may **not** always be the most appropriate place. Decay occurs when the detergent has been opened, as it is exposed to air, oxygen and moisture/humidity. If detergent has been stored for a long period of time or nearing the end of the container, one may experience a loss of the bleaching ability and hence maybe odours in their dishwashers. Our advice to you is buy detergent from shops that have a high turnover, do not buy in bulk and if possible, buy it in plastic containers.

Remember **all** automatic dishwashing detergents and rinse aids are poisonous and must be kept out of children's reach.

WATER HARDNESS

WHAT IS WATER HARDNESS?

Hard water is water that contains dissolved chalk, lime and other minerals. Rainwater is naturally soft, but when the water filters through the chalk and limestone, present in the ground. It can dissolve some of the minerals and remains in solution. The solution contains salts of calcium and magnesium like bicarbonates, chlorides and sulphates. The hardness of your water is dependant on where you live and the source (river or ground water) of your main water supply.

Types Water Hardness

Hardness can be classified in two ways

1 With respect to the metallic ion
ie Calcium and Magnesium hardness.
Total Hardness = Calcium hardness + Magnesium Hardness

2 With respect to anions associated with the metallic ion.
The hardness can be either temporary or permanent hardness.
Temporary hardness can be removed by boiling the water. Permanent hardness cannot be removed by boiling but by chemical treatment only.
Total Hardness = Non carbonate hardness + carbonate hardness

$H_2O(l) + CO_2(g) + CaCo_3(s) \longrightarrow Ca(HCO_3)_2$

$H_2O(l) + CO_2(g) + MgCo_3(s) \longrightarrow Mg(HCO_3)_2$

Permanent Hardness is caused by Calcium and/or Magnesium sulphate.

$Aq. + CaSO_4(s) \longrightarrow Ca^{2+}(aq) + SO_4^{2-}(aq)$

$Aq. + MgSO_4(s) \longrightarrow Mg^{2+}(aq) + SO_4^{2-}(aq)$

UNITS OF WATER HARDNESS

There are a number of ways of expressing water hardness.

Water hardness can be measured in part per million (ppm) or in milligrams per litre (mg/l). Both these units are exactly the same. Other ways of measuring water hardness are shown in the following table.

Mg/l or ppm as Calcium Carbonate	Degrees Clark or English hardness (°E)	Degrees German (°d)	Degrees French (°F)	Grains/ Gallon (gpg)
100	7	5.6	10	5.83
200	14	11.2	20	11.66
300	21	16.8	30	17.49
400	28	22.4	40	23.32

WHAT CONSTITUTES HARD AND SOFT WATER?

Depending on who you talk to and what you read, there is no magical number that says this unit of water hardness constitutes soft, medium or hard water. The table below illustrates what we believe to be soft, medium and hard water. (see below for Europe's classification for water hardness).

WATER TYPE		
SOFT	**MEDIUM**	**HARD**
< 80ppm	80 – 150ppm	150 - 200ppm
< 80mg/l	80 - 150mg/l	150 - 200mg/l
< 4.7gpg (US)	4.7- 8.8gpg (US)	8.8 - 11.7gpg (US)
< 8° f	8 - 15° f	15 - 20° f
< 5.6° e	5.6 - 10.5° e	10.5 - 14° e
< 4.5° dH	4.48 - 8.4° dH	8.4 - 11.2° dH

PROBLEMS WITH SOFTENED WATER

It is very important that if you are in a soft water supply you do not use too much detergent in your dishwasher, as it may cause irreversible etching.

Etching is a chemical deterioration that occurs on the surface of glassware when it is subjected to high temperatures, too much detergent and/or soft water situations. Etching is caused by a combination of very hot water, which causes the detergent to become very aggressive but because the water is soft, there are no water hardness mineral ions for the detergent to bind to so it extracts mineral ions directly from the glass.

Etching initially looks like rainbow coloured film, as the glass is subjected to further washing the surface will eventually appear opaque. This type of etching is irreversible.

To prevent etching from occurring on glassware use less detergent (follow the recommended detergent quantities in the user guide for soft water situations), use the normal wash programme and ensure the dishwasher is not overloaded, so rinse water can reach all the dishes during the wash.

PROBLEMS WITH HARD WATER

It is very important to know the water hardness of your water supply. In hard water areas a higher dosage of detergent is required. Hard water causes problems with the cleaning process. The mineral salts in the hard water will bind with the detergent and makes the detergent less effective. If you live in a hard water situation you may have noticed the following.

- Dishes and glassware washed in the dishwasher becomes spotted or has a white film on it when dry.
- Gradual decline in wash performance in your dishwasher or clothes washing machine.
- Build up of scale/calcium/white film around heating elements on appliances like the kettle, which reduces the efficiency of the appliance.
- White clothes after numerous washing gradually turns gray.
- After washing your hair, it may feel sticky or look dull.
- Unsightly marks stains and scale on sinks, baths, toilet bowls and around the base of taps.
- Difficult to get a good lather, so extra soap is required.

RECOMMENDED DETERGENT QUANTITIES FOR WATER HARDNESS

WATER TYPE	WASH PROGRAMMES	DETERGENT QUANTITIES	
		Pre wash (g)	Main Wash (g)
Hard	ALL**	10	30
Medium	ALL**	10	20
Soft	Heavy Normal Delicate Fast	5 5	15 10 5 5

NOTE: For water hardness over <200ppm or 200mg/l we recommend the use of a water softener

HARD WATER SITUATIONS (=200PPM OR 200MG/L)

If the water hardness is above 200ppm or 200mg/l, then the water is **very** hard. If the water hardness is =200ppm or 200mg/l, a water softener MUST be used in conjunction with the DishDrawer®. **Without** a water softener, hard water will be detrimental to the overall performance of the DishDrawer®.

If a DishDrawer® is installed in a very hard water (>200ppm or >200mg/l) situation without a water softener, the warranty null and void.

IN HARD WATER AREAS, ALWAYS CHECK THE WATER HARDNESS BEFORE INSTALLING THE DISHDRAWER AS IT MAY NOT BE SUITABLE.

DISHWASHER CLEANER/DESCALER

Whenever you notice scale /calcium/white film build up in the dishwasher, we thoroughly recommend a dishwasher cleaner/descaler be used. This must be done a regular basis to enhance the performance of your dishwasher.

An alternative to using a dishwasher cleaner/descaler is citric acid crystals. Fill both the pre wash and main wash detergent dispenser with citric acid crystals. Ensure there are no metal dishware items in the DishDrawer®. Select the NORMAL wash programme and press START/PAUSE button. If citric acid crystals are used in Phase 1 or Phase 2 products then a detergent wash must follow immediately otherwise it may damage parts in the DishDrawer®.

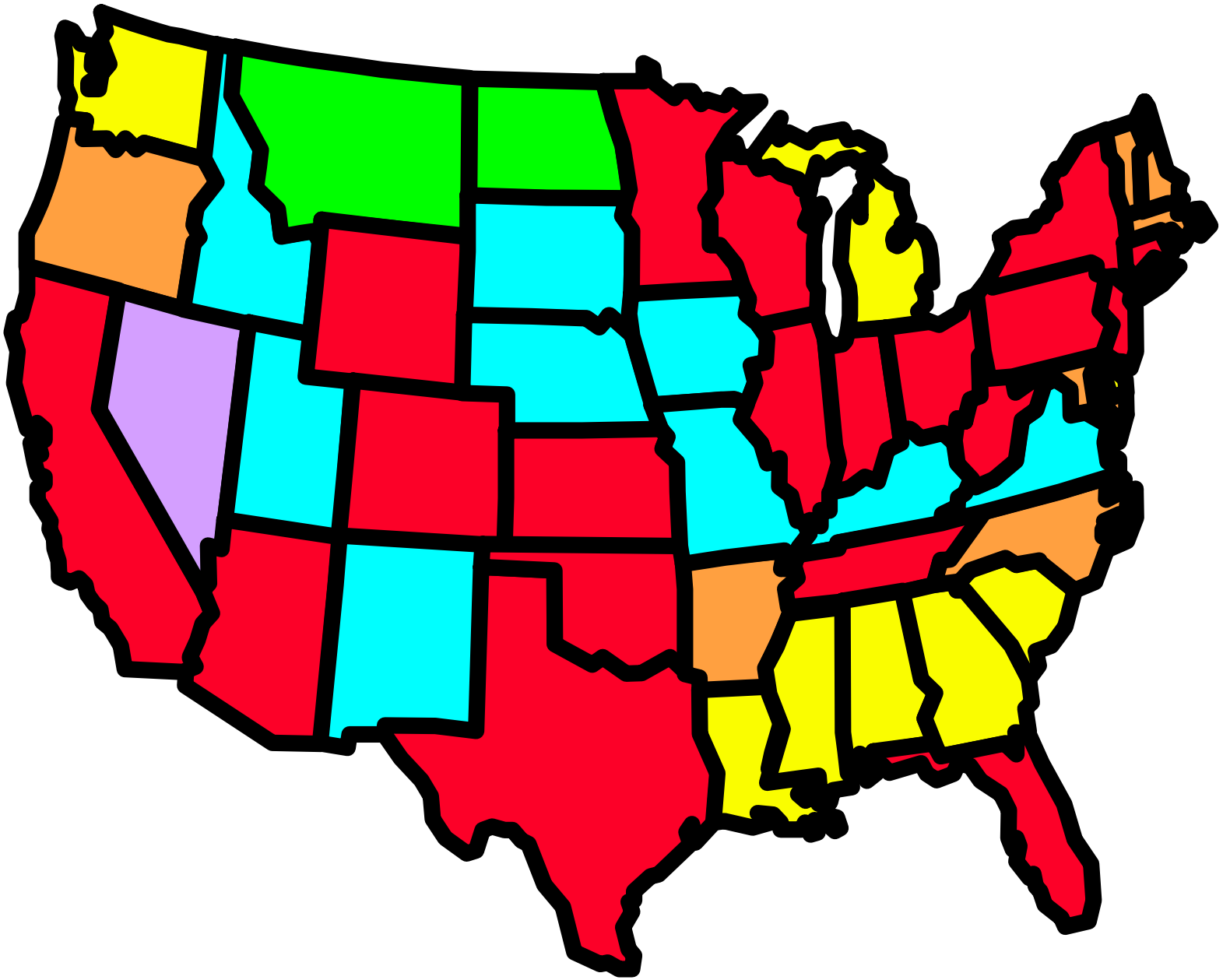
CITRIC ACID CRYSTALS ARE ONLY SUITABLE FOR PHASE 3 PRODUCTS ONLY.

CONVERSION FACTORS FOR DIFFERENT CONCENTRATION UNITS OF WATER HARDNESS

Conversion Factors for Different Concentration Units of Water Hardness					
UNITS	**ppm or mg/l**	**gpg (US)**	**gpg (UK) or °e**	**°f**	**°d**
ppm or mg/l	1.0	0.0583	0.07	0.10	0.056
gpg (US)	17.1	1.0	1.2	1.71	0.958
gpg(UK) or °e	14.3	0.829	1.0	1.43	0.80
°f	10	0.583	0.70	1.0	0.560
°d	17.8	1.044	1.24	1.78	1.0

To change concentration from unit in left hand column to unit in top horizontal line multiply by figure in table.
Eg: To change 5ppm to gpg (US) multiply by 5 by 0.0583

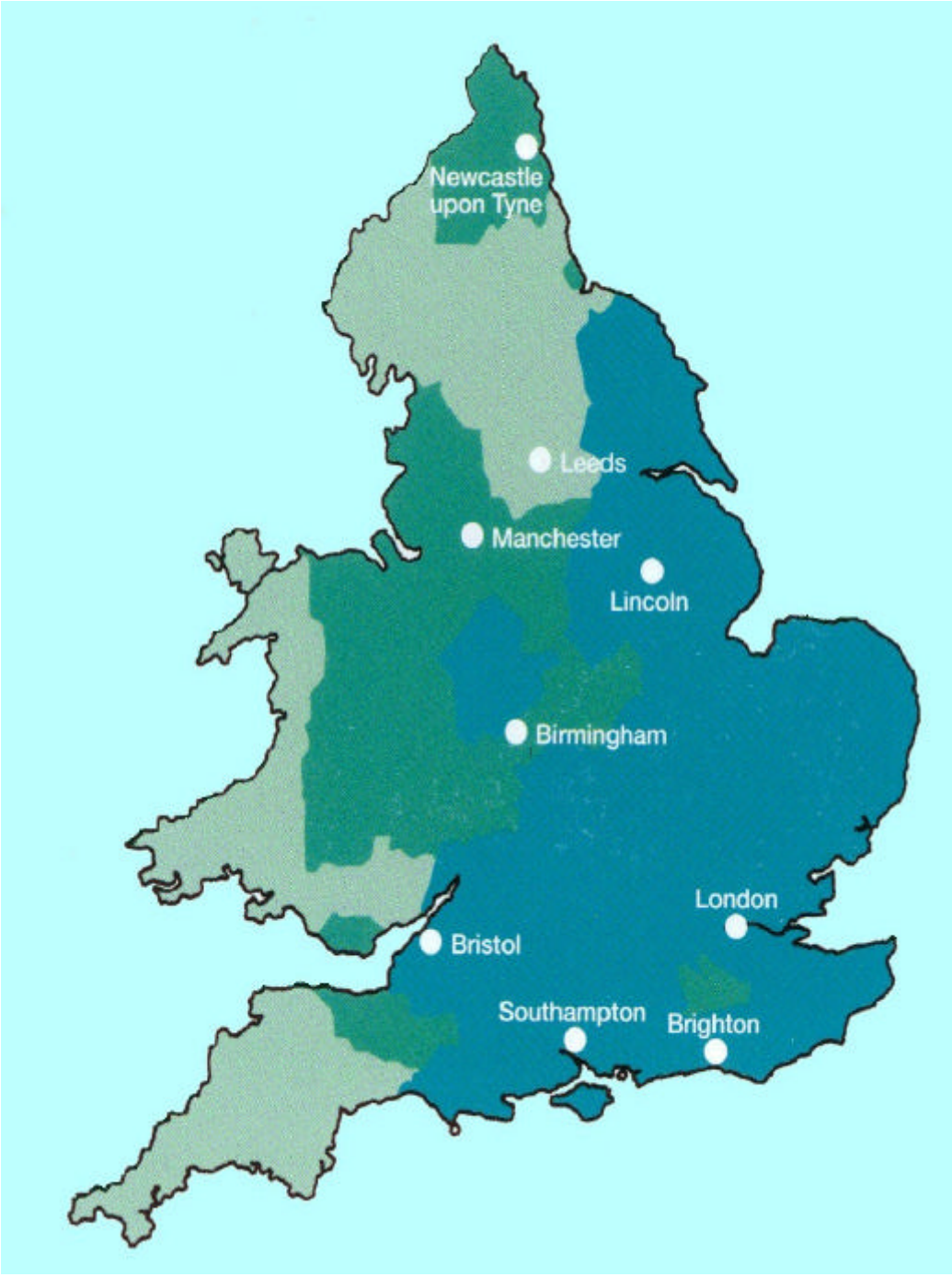
WATER HARDNESS - USA



Colour Key

Red = Med. Hard & Soft
Blue = Med. & Hard
Yellow = Med. & Soft
Orange = Soft
Green = Med.
Purple = Soft & Hard

WATER HARDNESS - ENGLAND



Soft to moderately soft: 0-100mg/l as calcium carbonate equivalent

Slightly to moderately hard: 100-200mg/l as calcium carbonate equivalent

Hard to very hard above 200mg/l as calcium carbonate equivalent

WHICH AREAS OF THE UK HAVE HARD WATER?

England

Generally speaking, hard water is present in 60% of the country especially in the Eastern, Central and Southern areas of England and varying degrees in the rest of the UK. The water for some northern cities is from naturally soft water supplies in Wales and the Lake District.

Scotland

Water supplies range from soft to various levels of hardness in all areas except for the Strathclyde Region and the area served by the Central Scotland Water Development Board, both of which are soft water areas.

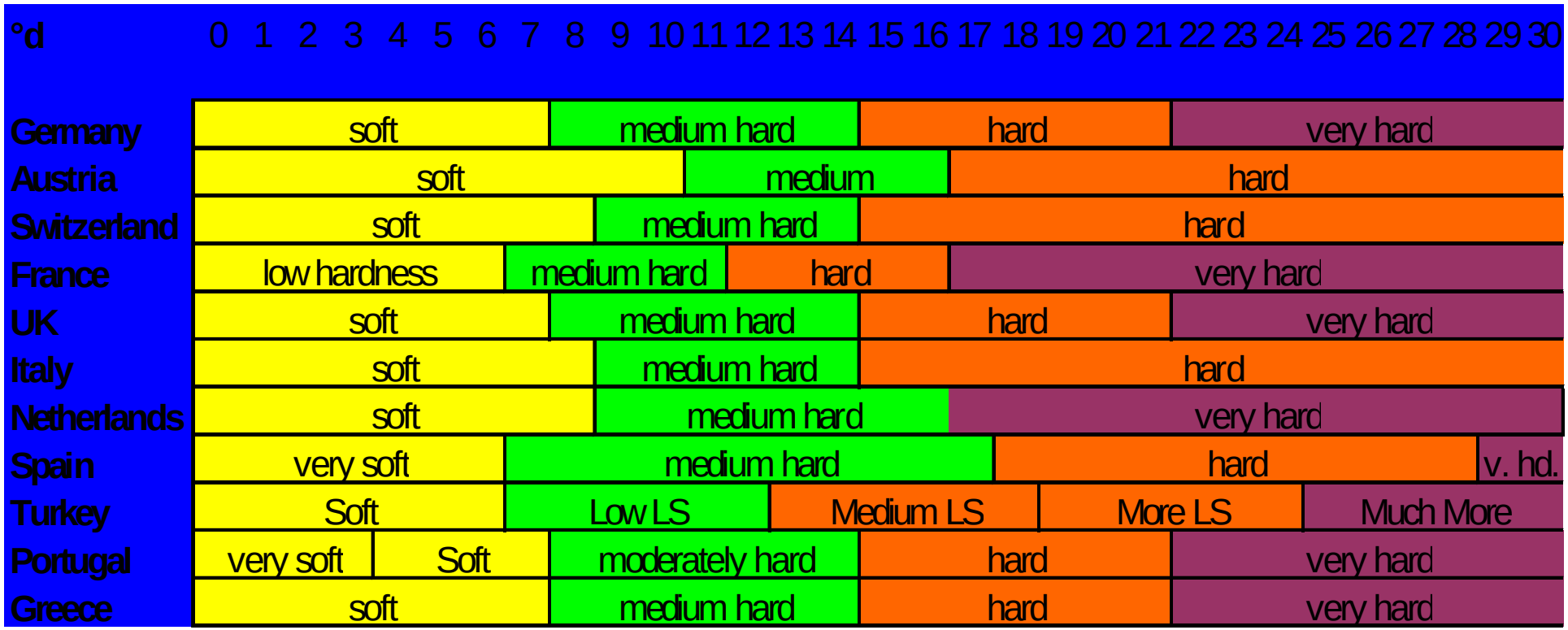
Ireland

In the Republic of Ireland each County Council is responsible for the provision of water services in its area, so please contact your local Council or our Customer Care Consultants directly for information on water hardness.

Northern Ireland

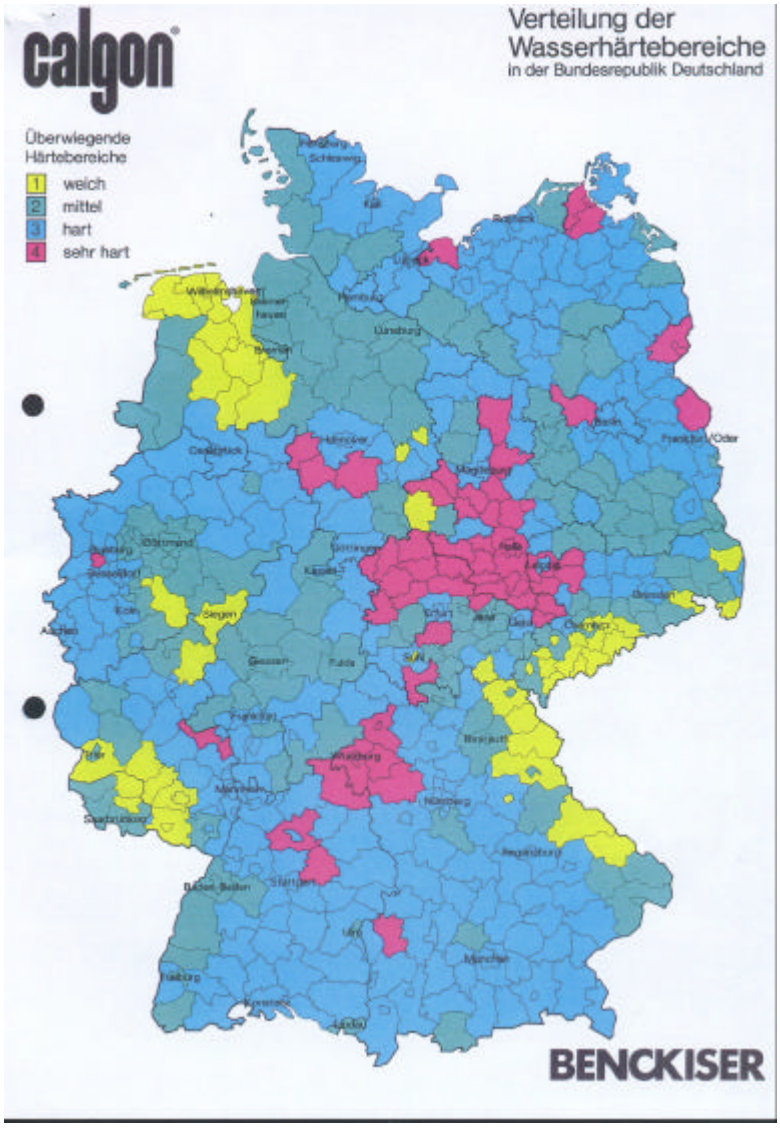
Northern Division - soft to medium
Eastern Division - soft to hard
Southern Division - soft to very hard
Western Division - soft to hard

Definition of Water Hardness Classification by Country



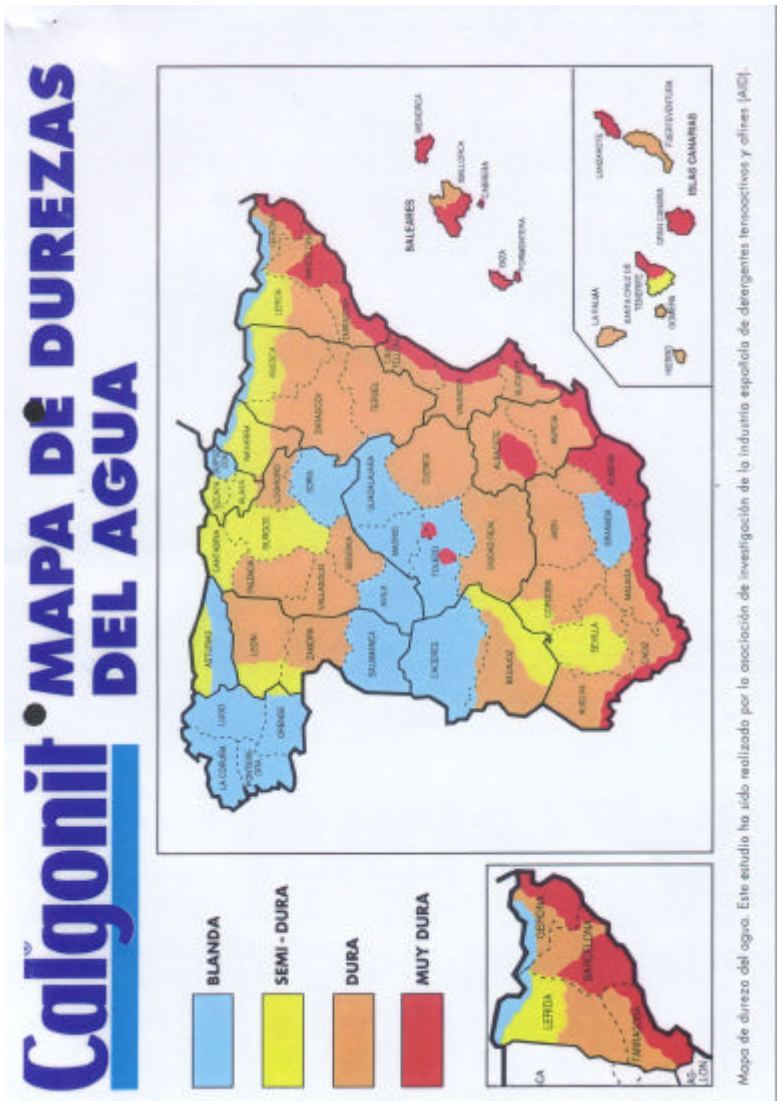
To convert ºd to ppm, multiply ºd by 17.8

WATER HARDNESS IN GERMANY



Key:	
Weich	- Soft
Mittel	- Medium hardness
Hard	- Hard
Sehr Hart	- Very Hard

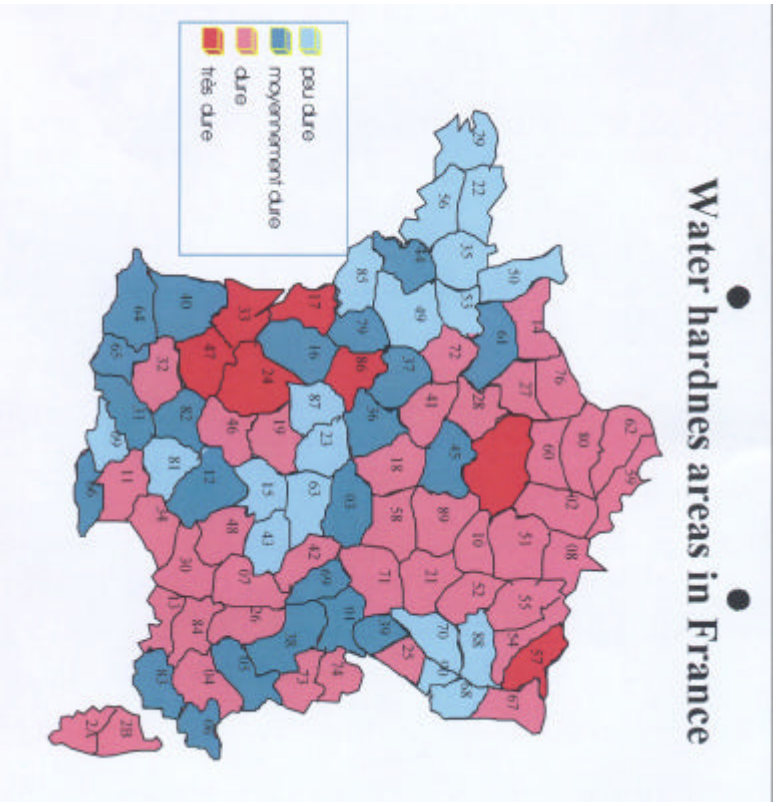
WATER HARDNESS - SPAIN



Key:

Blanda	- Soft
Semi Dura	– Medium Hardness
Dura	– Hard
Muy Dura	– Very Hard

WATER HARDNESS - FRANCE



Key	
Peu Dure	– Soft
Moyennement Dure	– Medium Hardness
Dure	- Hard
Trés Dure	- Very Hard

PERFORMANCE ISSUES

All dishwashers are tested to different standards depending on their markets.

AUSTRALIAN STANDARD TESTING AS2007.1

This standard is used for the Australian/New Zealand markets.
It consists of 14 place setting for a DD603 and 7 place setting for DS603.
Six soil types are used.

Wash Testing

Soils	Reason	Dishware Items these Soils Applied
Tea	Staining/Original soil removal	Cups
Tomato Juice	Staining/Original soil removal	Glass
Spinach	Redeposition	Dinner, Bread & butter, soup bowl
Egg	Foam/Protein removal	Dinner, Bread & butter, soup bowl and forks
Farex	Starch/Original soil removal	Dinner, Bread & butter, soup bowl & spoons
Margarine	Fat/oil removal	Saucers
Clean	-	Knife, dessert spoon & teaspoon

The soils are applied and then left for 2 hours to air dry
The tea and tomato juice are soiled first then drained after 30 minutes before drying.

All the dishes are then loaded in a prescribed manner into the dishwashers to be tested. A reference machine is required for this standard but Standards Australia is having difficulty in obtaining consistent results so it has been omitted in current testing procedure until a satisfactory solution has been found. When the wash programme has finished the drawer is opened with a maximum gap of 50mm for not less than one hour or greater than 18 hours. After this time all the dishes are evaluated under a light box, checking for any remaining soil on the dishware.

Dry Testing

Dishwashers are loaded in a prescribed manner with clean dishes and run on the wash programme that we wish to test at the time. When the dishwasher has finished the door is left closed for 30 minutes then evaluated using the light box to see if any water spots or streaks remain.

Standard Requirements

Ambient Temperature	20°C ± 2°C
Ambient Humidity	50 ± 5%
Incoming Water Temperature	20°C
Wash Programmes Optimised	Normal/Normal Eco
Detergent Quantities	5/10 grams
Rinse Aid Setting	4
Voltage	240v, this voltage may change to 230v
Water Hardness	45 ± 5 ppm

AS2007.1 standard is currently being upgraded.

CENELEC EUROPEAN STANDARD TESTING EN50242

For the European and UK market only.
It consists of 12 place settings including a platter and three different sized bowls for DD603
6 place settings for DD603 including a small platter and two bowls. There are 6 main food soils

Wash Testing

Soils	Reasons	Dishware Items
Tea	Staining	Tea cups
Milk	Original soil removal	Glasses
Spinach	Redeposition	Soup bowls
Meat	Original soil removal	Dinner plate & Bowl
Egg	Foam/Protein removal	B&B, dinner plate and fork
Porridge	Starch/Original soil removal	Soup bowls and soup, spoons
Margarine	Fat/oil removal	Platter
Clean	-	Serving pieces, knife, tsp, spoons.

The tea cups and saucers are soiled first with the tea then placed in the oven at 80° for 1 hour.
10ml milk is poured into the glasses and burnt on in a microwave for 12m 30sec.
All of the dishes/crockery are soiled and then placed in the oven after the tea has been drained.
The total drying period is 2 hours from when the oven reaches 80°C after this time the dishes are removed and left to cool for ½ hour before being loaded to the prescribed loading pattern and washed. The dishes are evaluated under a light box checking for any remaining soil.

Dry Testing

Dishwashers are loaded to the standard with clean dishes and run on the Normal Eco cycle. When the dishwasher has finished the door is left closed for 30 minutes then evaluated using the light box to see if any water spots or streaks remain.

Standard Requirements

Ambient Temperature	23°C ± 2°C
Ambient Humidity	55 ± 10%
Incoming Water Temperature	15°C
Wash Programme Optimised	Normal Eco
Detergent Quantities	2.5/12.5 grams
Rinse Aid Setting	4
Place Setting (DS603/DD603)	6/12
Voltage	230v
Water Hardness	90-300ppm

Detergent and Rinse Aid are imported from Europe and has a shelf life of 6 months from production date.

CONSUMER REPORTS PROCEDURES

(PLEASE NOTE THE INFORMATION PERTAINING TO THIS TEST IS CONFIDENTIAL)

Consumer Reports is equivalent to New Zealand's CONSUMER, Australia's CHOICE and UK's WHICH magazines. Their procedure for testing dishwashers is a little different from the AHAM standard, which is only used by manufacturers for advertising claims and any in house testing that they may perform.

Wash Testing

SOILS	DISHWARE	REASON
Coffee	Cups	Staining
	Saucers	
Tomatoes + Crumb	Bowls	Staining
Cornflakes, sugar, milk	Bowls	Original Soil
Chicken Noodle Soup	Bowls	Original Soil/ Redeposition
Oatmeal	Bowls	Original Soil
Cheese Spread	B&B Plates	Fats and oils
Egg Yolk + Crumb	B&B Plates	Original Soil
Peanut Butter	B&B Plates	Fats and oils
Butter	B&B Plates	Fats and oils
Jam + Grinds	B&B Plates	Redeposition
Chilli	Dinner Plate	Staining
Mashed Potato	Dinner Plate	Redeposition
Spaghetti	Dinner Plate	Original Soil/ Redeposition
Cream Corn	Dinner Plate	Original Soil
Spinach	Dinner Plate	Original Soil/ Redeposition
Egg yolk + Crumbs	Platter	Original Soil
Spaghetti	Platter	Original Soil/ Redeposition
Milk	Glass	Original Soil
Orange Juice	Glass	Original Soil
Tomato Juice	Glass	Original Soil/ Staining
Mashed Potato	Serving Bowl	Redeposition
Cream Corn	Serving Bowl	Original Soil

The soils are applied in the afternoon and then left to dry for one hour. After the drying period, the dinner plates and bread & butter plates are scraped six to eight times except for the raspberry jam, to remove food soils. The platters are scrapped 8-10 times with a knife and the serving bowls are scraped 8 –10 times with a teaspoon. The dishes are loaded in a prescribed manner into the dishwasher and left overnight to dry. The dishwasher is started the next morning on the Normal wash programme. When wash programme is completed the dishes are then evaluated under a light box. All items in the dishwasher are scored on three wash parameters: Visible water spots, visible soil and invisible grit.

Dry Testing

The dry test in this procedure is quite simple. Four random dinner plates, knives, all cups and glasses are examined for water spots/streaks.

Standard Requirements

Lab Temperature	21°C ± 2°C
Lab Humidity	25% - 60%
Incoming Water Temperature	50° ± 1°C
Wash Programme Optimised	Normal
Detergent Quantities	7.5/7.5grams
Rinse Aid Setting	4
Place Setting	10
Voltage	110v
Water Hardness	0 – 85ppm

Cascade Pure Rinse Detergent and Jet Dri Rinse Aid are used in this test

Consumer Reports has provided the test procedure but not all the details that pertain to the allocation of the scores.

JAPANESE (HARMON) TESTING

The Japanese have a dishwasher standard. There are no legal requirements to meet any wash or dry performance standards. However our distributor have criteria that must be met. There are no lab requirements except the incoming water is at 60ºC. Wash and dry testing are combined in the one test. After the dishes are soiled they are air dried for one hour at room temperature, before placing them into the dishwasher. The dishes are evaluated 2 minutes after the end of the programme. Harmon have provided detergent and rinse aid. The Japanese distributors require a 7-14 place setting machine.

The soils used for the Japanese wash test is as follows:

ITEM	FOOD SOIL	QUANTITY
Dinner Plate	10 Rice grain, fresh egg and curry	7
Medium Plate	Pork Cutlet + sauce	7
Small Plate	Bacon and Eggs	7
Miso Soup Bowl	Miso Soup/10mm seaweed/3 spring onion	7
Rice Bowl	3 Rice grains	7
Tea Cups	Green Tea with leaves	7
Glasses	Milk	3
Glass	Tomato Juice	4
Chopstick	Rice – one grain	7
Knife	Pork Cutlet/Sauce & Bacon egg	7
Fork	Pork Cutlet/Sauce & Bacon egg	7
Spoon	1 Rice grain, fresh egg and curry	7

Please note the racks have been modified for the Japanese market. There are lots of small items like rice and miso soup bowls, which need a special racking system. At the time of writing the racks and wash profiles are still under development.

PLACE SETTINGS (PS):

We have many questions as to why different countries have different place settings. Our definition of place setting comes from the respective standards that we test to for the specific country.

In **New Zealand/Australia**, we can fit 7/14 ps into DS603 and DD603 respectively, the reason why the place settings are larger is because there are no serving pieces included in the AS2007.1 standard ie platter and serving bowls.

In the **UK and Europe**, we can only fit 6/12 place settings because the EN50242 standard includes a large platter and three serving bowls.

In the **USA**, when testing to the AHAM or DOE standard it only requires a 5/10 place setting for their tests, any more is detrimental to the wash or energy results. No extra marks are given if we use more place settings, so we have elected not to. In reality, the DishDrawer could comfortably hold 6/12 place settings. The US standard also contains serving bowls and a platter in their dish load.

TESTING HOUSES

Each country has its own consumer advocate magazine, which reports to its subscribers about consumer issues.

Consumer and Choice

Fisher and Paykel have found these testing houses will use part of the dishwasher standard but will not use it in its entirety. The latest example was the Consumer and Choice magazine, where they followed the AS2007.1 but did not use the prescribed detergent, instead they used commercial brand. Unfortunately in the lab we follow the standards completely and any changes to any part of the standard leads to different results. The AS2007.1 standard requires a caustic detergent and the type of detergent used was enzymic, so some soils will be better removed compared to others. In our lab we found that two different batches of the same commercial product gave two different results. It is hard to maximise wash performance if these testing houses do not follow the standards completely.

Consumer (NZ) use Choice (AS) as their testing facilities. Unfortunately for the very last Choice/Consumer magazine they only bought a DS603 and assumed the rest of the results for the double. This is very bad scientific practice.

Consumer Reports

In the US, there is a dishwasher standard but Consumer Reports choose not to use this standard. It is quite difficult to tailor wash programs that suit the consumer as well these test houses. In the USA, over 50% of the consumers scrape and pre rinse their dishes before placing them into the dishwasher, rendering the dishes semi clean. The problem with this test procedure is that the soils that are loaded into the dishwasher are unrealistic.

Published Results for Wash and Dry Performance

23-Aug-01

All wash programmes are not tested to every standard, as all these tests are very time consuming ie 5 hours to one week for one result. The EN testing requires five individual tests to make up one result, this is a weeks worth of testing. These cycles have been maximised for the respective standards testing.

AUSTRALIAN/NEW ZEALAND AS2007.1

DD603

Wash Programme	Wash (%)	Dry(%)	Energy (kWh)	Water (L)
Normal	82	94	1.49	22.5
Normal Eco	75	50	0.80	20.0

DS603

Wash Programme	Wash (%)	Dry(%)	Energy (kWh)	Water (L)
Normal	83	97	0.84	11.37
Normal Eco	75	55	0.47	10.28

For both wash and dry performance, the closer the scores are to 100% the better the result.

EN50242

DD603

Wash Programme	Wash	Dry	Energy (kWh)	Water (L)
Normal Eco	3.82	89%	1.17	20.32

DS603

Wash Programme	Wash	Dry	Energy (kWh)	Water (L)
Normal Eco	3.82	89%	0.615	10.63

For wash performance the closer the score is to 5 the better the result
The closer the dry score to 100% the better the result.

CONSUMER UNION

DD603

Wash Programme	Wash	Dry	Energy (kWh)	Water (l)
Normal	84.5%	58.15%	2.13	30.79

* Please note you may find variation in the results, this is reality. DishDrawers will fluctuate and because we use different machines to test for testing and this is the outcome.

Energy Labelling

Each country has its own Energy Label pertinent to its special needs.

Australia/New Zealand (Refer to www.energyrating.com.au)

Requirements for Dishwashers - Energy Labelling

Dishwashers are regulated for energy labelling in Australia and currently being considered for New Zealand.
Product Definition: Electric dishwashers, which are intended for household or similar use.
Test Standards: Note that all energy labelling standards are published jointly by Standards Australia and Standards New Zealand.
AS/NZS2007: Performance of household electrical appliances- Dishwashers Part 1: Energy Consumption and Performance. Part 1 of the standard defines the test procedures for the determination of energy consumption and performance of dishwashers in Australia.
AS/NZS2007: Performance of household electrical appliances- Dishwashers Part 2: Energy labelling requirements. Part 2 of the standard sets out the requirements for energy labelling of dishwashers in Australia. An approved Energy Label for dishwashers must be displayed on all products, which are offered for sale in Australia.

Overview of the Test Procedure for Dishwashers

The standard is applicable to electric dishwashers, which are intended for household or similar use. Dishwashers during a test for energy consumption must meet a number of performance requirements. These include:

- Washing index - the washing index of the test machine must exceed the specified value measured on the reference machine, which is tested in parallel. The reference machine is a dishwasher, which specially constructed and calibrated for this purpose (Miele G590).
- Drying index - the drying index of the test machine must exceed 50% (this is conducted as a separate test)
- Rated capacity - all specified load items shall be fully supported.
- Water consumption - shall not exceed 110% of the value stated by the manufacturer.
- Water pressure - machine shall be capable of operating at the maximum and minimum water pressure stated by the manufacturer.

Energy consumption is determined on the programme recommended by the manufacturer for energy labelling that is capable of meeting the performance requirements specified above. From October 2001, all dishwashers are to be relabelled using the normal program. The ambient air temperature is 20^{o}C ± 2^{o}C and the humidity is 60% ± 5%. All tests are undertaken with a power supply at 240 Volts and 50 Hz.

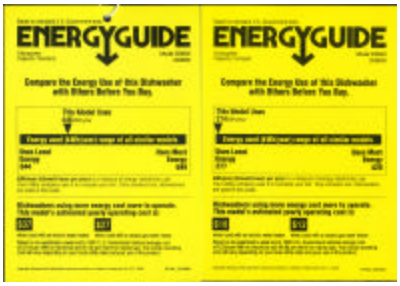
USA/CANADA

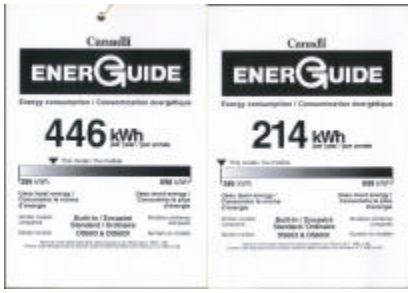
Energy Labelling requirements for the USA and Canada governed by the Department of Energy and the Office of Energy Efficiency respectively. The minimum required efficiency for dishwashers is an energy factor of 0.46.

Energy factor = 322/annual consumption of dishwasher measured in kWh/year.

Test Procedure

The dishwashers are loaded up with a prescribed number of place settings as determined by the AHAM standard. The plates are clean. The dishwasher is run through a Normal heated dry cycle and a normal no heated dry programme. Water plus machine energy is measured and the results are averaged. Total annual consumption is 322*average energy used for the programme. Incoming water temperature is 49ºC/120ºF.





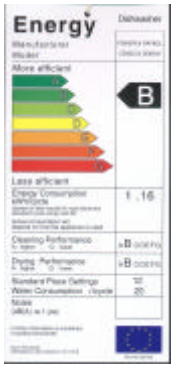
Energy Star

For dishwashers that have an energy factor of 0.52 or more, are permitted to display the energy star in/on/adjacent to the product. This recognises dishwashers that are more energy efficient again. The DD603/(I) has an energy factor of 0.72 while the DS603/(I) has an energy factor of 1.5.

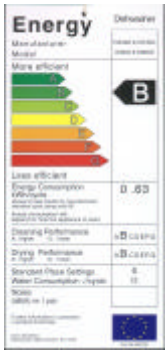
EN50242

Legislation requires the European Community Energy Label to be displayed on all new dishwashers displayed for sale. The manufacturers nominate the test wash programme they want to be labelled on. A-G indicators are based on the European Standards EN50242. A is the best performance and G is worst.

Fisher and Paykel have chosen the Normal Eco Programme as the test cycle to be labelled on. The ultimate goal for any manufacturer is to AAA. At present the DishDrawer manages



DD603



DS603

BBB.

Summary of the Energy Labelling Results

Australia

Model Number	Annual Power Consumption (kWh)	Wash Programme	Water Consumption	Place Settings	Stars	Connection
DD603	318	Normal Eco	21L	14	3.5	Cold
DS603	162	Normal Eco	10L	7	3.5	Cold

USA

Model Number	Annual Power Consumption (kWh)	Wash Programme	Electric Water Heater	Gas Water Heater	Connection	Energy Factor
DD603	446	Normal Eco	$37	$27	Hot	0.72
DS603	214	Normal Eco	$18	$13	Hot	1.5

Canadian

Model Number	Annual Power Consumption (kWh)	Wash Programme	Connection	Energy Factor
DD603	446	Normal Eco	Hot	0.72
DS603	214	Normal Eco	Hot	1.5

European (UK)

Model Number	Power Consumption (kWh)	Wash Programme	Water Consumption	Place Settings	Performance Ratings*	Connection
DD603	1.16	Normal Eco	20L	12	BBB	Cold
DS603	0.63	Normal Eco	11L	6	BBB	Cold

* BBB represents energy efficiency, cleaning and dry performance respectively

NOTE: The DishDrawer is tailored to the individual markets, hence the difference in results.

Noise Performance

These results are performed in-house, with an Australian 7/14 place setting load.

DishDrawer	Delicate (dBA)	Normal (dBA)
DD603	48.4	50
DS603	43	44.6

Caring for your Dinnerware

The forceful action, hot water and alkaline detergent in a dishwasher can be harmful to some items. Always check the dishware manufacturer's instructions about washing. Here are some items to be considered with caution:

PLASTIC

About Plastics

There are two kinds of plastic, thermoplastic and thermosetting. Examples of thermoplastics are acrylics, nylon, polyethylene, polystyrene and vinyl. Thermoplastics can be resoftened by heat, therefore are not recommended as being dishwasher safe. Thermoplastics have a wide range of uses tumblers, salad bowls, refrigerator dishes, ice cube trays etc, in a thin sheet form they are used for food wrap.

Nylon is a thermoplastic but does not have the same characteristics as others in the same category. Nylon is resistant to heat in dishwashing and chemicals that affect the some of the others. Kitchen items like funnels and measuring cups are made from nylon and are usually dishwasher safe.

Thermosetting plastics undergo a chemical change when being formed into a product. Once the product is hardened it can not be softened again. Thermosetting plastics include melamine, phenolics and resin. Most plastic dinnerware is melamine resin. Melamine is odourless, tasteless and non toxic. It is temperature resistant from 20°C to 134°C.

Melamine is hardest of all plastics and it is best cared for in the dishwasher.

Caring for Plastics

Some plastic may change shape or colour with hot water. Check manufacturer's instructions about washing plastic items. Washable plastic items should be weighed down so they do not flip over and full with water or fall through the basket during the wash. Always check to see if the plastic is "dishwasher safe". If you are unsure wash the item by hand.

CHINA

About Chinaware

Dishware items can be classified as pottery, earthenware and china.

Pottery is heavier than other types of dishware. It is thick and heavy to touch. Pottery is fired at low temperatures so the clay particles are not totally fused together. This produces a porous piece of dinnerware that chips and breaks more easily than other types. Due to the lower firing temperatures, the glaze is softer and scratches easily. Chips, cracks and scratches will absorb liquids and food stains.

Earthenware, called semi vitreous is lighter in weight than pottery. It is fired at higher temperatures than pottery, it still does not have the brittleness of china. Earthenware is opaque, chips easily, breaks easily and porous. The body is creamy white to resemble china. The same clays are used to make pottery and earthenware. When the body is exposed, as with chipping, it will absorb impurities causing discolouration, whereas the chip will remain white.

Stoneware is in between earthenware and china. It is made from fine white clay, kaolin as one of its base ingredients. Stoneware has the whiteness of china with some chip resistance. Because it is fired at higher temperatures than earthenware it is less porous.

Stoneware differs from china because it is not transluscent, but has the opacity of earthenware. It is somewhat heavier than porcelain china, resembling the weight of earthenware.

Porcelain China is usually creamy or white and is transluscent. When you hold the plate up, you can see the shadow of your hand. Bone china consists of ½ calcium phosphate. Small amounts of clay are used, so skill is required in manufacturing. Bone china is mostly made in the UK and has an excellent strength, translucency and colour.

There are many grades of china. China is made the same way as earthenware but extra care is taken to perfect each step. The clay used is much finer and whiter. The better the quality of the body the more durable, chip resistant and colourfast it will be.

Glaze

The glaze is hard, smooth and brilliant coating that is fired over the porcelain body. China may have up to three coats of glaze. The glaze is a layer of glass which gives a hard, non absorbent, protective surface that is easy to clean. There are differences in composition and methods of application of glazes, and in the firing of the glaze. Glazes fired at higher temperatures are harder. The composition of the glaze material determines the firing temperature and how hard or how soft the glaze. The softer the glaze the easier it scratches. A raw glaze contains insoluble raw materials, a fritted glaze contains some glass before firing and vapour glazes are deposited from the vapour state.

Crazing

Crazing is the term used to describe the fine cracks frequently seen in the glaze of earthenware or lower quality china. Crazing is caused by the difference in the coefficient of expansion of the glaze and the body of the dish. The heating of the dish often causes crazing. It is a complicated problem because of the different properties of the materials used in the body and in the glaze. Delayed crazing may occur on porous dishes after exposure to moisture for a considerable length of time. Partial dehydration and slight expansion of body under the glaze causes crazing.

Decoration

Colours under the glaze (under glaze patterns) are thoroughly protected and will withstand wear and the conditions of the automatic dishwasher better than patterns applied on the glaze (over glaze patterns). Gold, silver and platinum can be applied as over glaze decoration and fired into the glaze.

Care of China

Most of the fine china made for home use is over glaze, care should be taken in washing. Patterns can be affected by long exposures to alkaline solutions. We recommend the use of a delicate wash. Antique items ie those with a pattern painted over the glaze, gold rims, hand painted china or slightly raised pattern may be more sensitive to machine washing, we recommend these items are washed by hand.

ABOUT GLASSWARE

There are 4 types of glassware in the home

1 Soda Lime
2 Lead glass also known as crystal
3 Borosilicate
4 Ceramic

Soda Lime Glass
Soda lime glass is composed of pure silica glass, lime oxide, soda oxide and sometimes potash. This is the most widely used type of glass. It is inexpensive to make and commonly found in household items like drinking glass, bottles and window glass.

Lead Glass
Substituting lead oxide for lime oxide, the glass becomes soft at lower heating temperatures. Lead glass reflects more light than making it more desirable for cut glass pieces. This glass will not withstand high or sudden change in temperatures

Borosilicate Glass
A combination of pure silica glass, boric oxide and aluminium oxide. Borosilicate glass has about 1/3rd the thermal expansion of soda lime glass. Borosilicate is more resistant to heat expansion, it is used for cookware, bakeware and laboratory glassware

Ceramic Glass
Ceramic glass contains pure silica glass and aluminium oxide. Glass ceramics are made by what is essentially a process of controlled devitrification (Glass is heated and held at an intermediate temperature for an extended period, partial crystallisation can occur, if the glass is 50% or more crystallised then it is ceramic glass). When a glass ceramic object is made, it is formed as an ordinary glass article. Devitrificiation takes place after the article is formed which, makes a strong and opaque ceramic. Unlike ordinary ceramics, ceramic glass is non-porous has a greater strength and scratch resistance. Glass ceramics are 40% harder than borosilicate and resists expansion or contraction when subjected to heat or extreme cold.

Caring for Glassware
Washing Glasses in Hard Water.
If insufficient quantities of detergent are used it will not tie up the calcium and magnesium ions in the water, leaving white spots and film on glasses, as well as other dishware and inside the machine.

For effective cleaning to take place enough detergent must be added to tie up the hard water. Check the User Guide for the correct quantities.

Softened Hard Water.
Silica film, etching, streaking and filming from dissolved solids are problems common in softened hard water. In the softening process calcium and magnesium ions are replaced with sodium ions. In this exchange process the total dissolved solids content is increased. Due the high solids content glasses washed in the dishwasher may have streaks and film.

Silca filming usually precedes etching. It can be identified by its iridescence when the glass is held to the light. As silica film becomes heavier the glass becomes opaque. A number of variables like soft water, insufficient rinsing, drying temperatures and the components of glass cause silica film. Silica film cannot be removed.

White film that is insoluble in acid is silica film or etching. If the film can be removed by acid it is caused by hard water. Hard water filming can happen when the water softener requires regeneration.

Etching of soda lime glass is the removal of metal ions by alkaline wash solution. Once the ions are removed they cannot be replaced. Water that contains calcium or magnesium ions protect the glass. Etching only occurs in soft water situations. Etching first appears as scratches on the glass as the etching gets worse and appears to have a heavy irregular film

When soda lime glass is exposed to water, the water dissolves the sodium ions out of the surface of the glass to form an alkaline sodium hydroxide. This in turn attacks the silica in the glass, the added alkalinity of the dishwashing solution increases the probability of etching. High water temperatures further lowers the resistance of soda lime glass etching.

How to retard Silica filming and Etching in Softened Hardened Water
Silica film and etching can be retarded and prevented by using the minimum amount of dishwasher detergent, lower wash temperatures, ensuring wash water can reach all areas of the DishDrawer® and using rinse aid. Rinse aid will help sheet off water rapidly.

Streaking and filming from high dissolved solids content of water can also be prevented by using rinse aid.

Soft Water
Etching of glassware is the most common problem in naturally soft water. Etching is the removal of metal ions form glass by an alkaline wash. Once the metals have been removed they cannot be replaced. The first appearance of etching is fine scratches, this will increase until there is an irregular film. The factors that contribute to etching in softened water are the same for soft water.

Most naturally soft water have some calcium and magnesium, even though in small quantities these still protect the metal ions in soda lime glass.

Coloured and Decorated Glass
Adding various metals to molten glass makes coloured glass. When the colour is an integral part of the glass, it will not fade with automatic dishwashing.

Decorated glass is any glass that has colour applied to the outside after the glass object is made. The decoration could be a metallic rim or a pattern on the outside. Decorations cannot be fused onto the glass because the temperatures required would melt the glass base. Therefore the decoration will get washed away with time. Overglazing of decoration should always be washed by hand

STAINLESS STEEL

About Stainless Steel
The main constituents of stainless steel are iron, carbon, chromium, manganese and in some cases nickel. The iron, carbon and manganese are constituents of ordinary steel, but it is the chromium and nickel that make steel “stainless”.

When cutlery is made it is shaped, ground, polished and last of all passivated. The passivation process takes a small amount of chromium and nickel if present from the steel and forms a thin film of chromium oxide and nickel oxide on the surface of the steel. It is this film that makes the steel “stainless”. When the thin film is removed rusting occurs.

Acidic foods, salt and dairy foods will remove the oxide layer from stainless steel. Almost any meal will contain some of these foods, so the stainless steel will be attacked. However in the passivation process, the surface is preconditioned in such a way that if the stainless is washed, rinsed and dried thoroughly and stored for a time, the oxygen will heal the breaks in the oxide film layer and return the stainless property to the steel.

If the food is not promptly washed off the stainless steel, conditioning of the surface as well as the oxide film may be removed. The air cannot heal the break and corrosion will take place every time the stainless is wet.

Other causes of corrosion are from polishing steel with an abrasive cleaner as it will wear both the oxide film and the conditioning of the surface.

Soaking stainless steel in bleaching solutions will lead to corrosion and with localised heating. Salts of water solids will stain stainless steel.

Pitting is caused by a pinpoint break over the protective surface area eg caused by a salt crystal. At the time of the break there is no apparent change in the surface but as the stainless get wet over a period of time the pit appears bigger

Discolouration, usually blue-black is caused by food covering an area. Since it is not concentrated in a point, the corrosion takes place over the area and becomes apparent sooner than a pit.

Caring for your Stainless Steel
Always use rinse aid to help with drying. Always ensure stainless steel is kept clean and in a dry state.

SILVERWARE

Almost all sterling and silverplated silver can be safely washed in a dishwasher. Common problems encountered with silverware

Common problems with silverware are
Silver sulphide
This is caused by a reaction with sulphide from eggs, seafood, and atmosphere. It is commonly known as tarnish and imparts a yellow- brown colour to silver. Silver should not remain in direct contact with foods containing sulphur. Silver sulphide can be removed by polishing with a silver polish.

Bronze Tarnish
This is a discoloration rather than tarnish. It is found on silver plated pieces where the silver plating has worn away. It can be easily removed by soaking the silver in vinegar for 10 minutes. This treatment is only temporary and should be replated by a jeweller to correct the problem.

Black Spots
This caused by the reaction with silver with oxidising agents. For example when hypochlorites come into contact with silver, silver chloride is formed, after further exposure to air and moisture a black colloidal silver results. This can be removed by hand polishing.

Care of Silverware
Do not sprinkle detergent directly onto silverware. Ensure that all silverware not overcrowded in the cutlery basket. Ensure stainless steel and silverware do not touching each other when washing. Wash silverware immediately after use do not let it stand overnight.

ALUMINIUM (AL)

Aluminium is a soft metal. To stiffen or harden Aluminium, other metals such as copper, manganese, magnesium or zinc are used to form alloys. These alloys are used for baking products etc.

Al has amphoteric properties ie it will be affected by acid or alkali. Fortunately detergent manufacturers have considered Aluminium and have included in their ingredient corrosion inhibitors in the form of silicates to protect damage to the Aluminium products.

Caring for your Aluminium

Never use less than 10g of detergent in wash to ensure adequate Al protection during the wash. Load utensils in the dishwasher so the rinse water can reach all surfaces to completely remove all wash solutions. Ensure the Al utensil is thoroughly dried before putting it away.

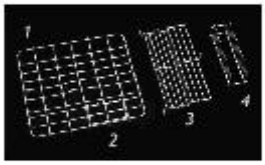
Do not store acidic foods in Al utensils for a very long time as it may cause pitting.

GLUED ITEMS

Do not wash glued items in the DishDrawer.

ACCESSORIES

The inserts and racks can be added or removed to suit your individual needs. If there are two DishDrawers, the accessories are interchangeable between the two drawers. For example one can combine two Mega racks into one drawer and wash all cups and glasses see the example below, leaving the other drawer for plates and larger items. All the parts listed below are available as spare parts. Other accessories that are available are the 12" (304mm) plate insert.



1. Basket
The basket holds some of the accessories in place and keeps the dishes above the spray arm. Without the inserts, large bowls and pots can be placed flat.

2. Drain Filter Access Panel
The drain filter access panel is designed to snap onto the basket over the drain filter. This prevents objects from touching the base of the DishDrawer and stopping the rotation of the spray arm, while still giving access to the drain filter.

3. Mega Rack
The Mega rack is designed to hold glasses, cups and small plates.

4. Plate Insert
The plate insert supports plates and bowls.

How to install the Mega Rack
To install the Mega rack, place the outer legs of the rack on top of the basket, and clip the Mega rack to the side of the basket. When the Mega rack is correctly installed it should not feel loose in the basket.

Combining two mega racks and cups racks together to wash glasses.

Cup Racks
Cups, glasses and kitchen utensils can be placed on the left and right hand side of the cup racks. For best performance ensure there are no large items below, blocking the wash water from reaching the cup racks. Wine glasses can be supported on the cup racks if used in conjunction with the Mega Rack. There are stops on the cup rack to prevent cups from touching the DishDrawer wall. Keeping cups away from the wall will help with the dry and wash performance.

Cutlery Basket
Cutlery, small kitchen utensils and some plastic lids are best placed into the cutlery basket. For best wash performance, we recommend loading cutlery with handles pointing down and sharp utensils with their handles facing up, to reduce the risk of injury. Mix spoons, knives and forks within each section, to stop cutlery nesting together and to ensure the water circulates freely. Keep stainless steel from touching silver cutlery to avoid staining. Use the oval slots (spoon rack) for spoons and teaspoons. Small items, like plastic lids, can be placed under the spoon rack, this will prevent them from being displaced by wash water and falling to the bottom, where they may stop the spray arm rotation.

NOTE:
It is important not to lean on the cup racks, as these are not strong enough to support body weight. If you lean on them, the cup racks will break or cause damage to the DishDrawer.

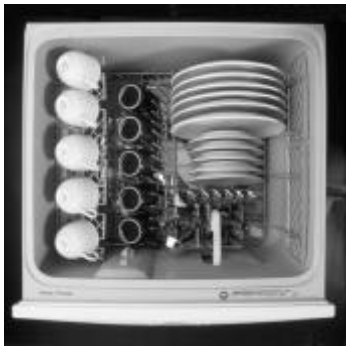
Loading the DishDrawer®

The wash water for the DishDrawer® comes from the spray arm, which is situated at the bottom of the DishDrawer®. Care must be taken to ensure that dishware items are stacked correctly to ensure that wash water can reach all items in the DishDrawer®. Items must not block the spray arm path, otherwise it cannot go around preventing wash water reaching areas in the DishDrawer®.

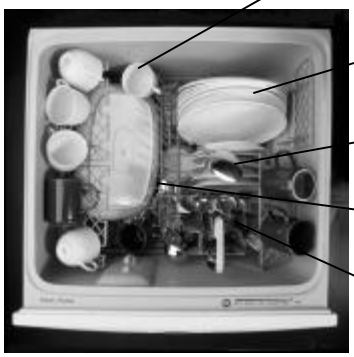
CHECK LIST FOR LOADING THE DISHDRAWER®

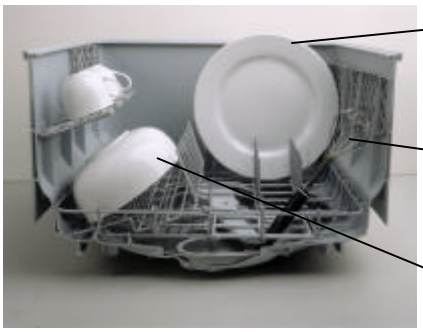
- Ensure the DishDrawer® is not overcrowded. Ensure dishware items are not stacked on top of each other so wash water cannot reach the insides of the items.
- Check there are no items blocking the spray arm path.
- Dishware items including cutlery must not be nesting together, otherwise wash water will not get in between the dishes.
- Sharp knives and such like should have their sharp end facing down to prevent injury to the user.
- Ensure cups and bowls have their openings facing down otherwise wash water will collect inside.

RECOMMENDED WAYS TO LOAD THE DISHDRAWER®



How Not to Load Your DishDrawer®

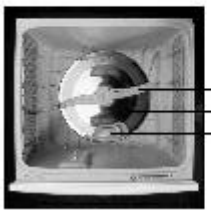




Faults	Result
This dishwasher is overcrowded	Bad wash
Ensure mugs/cups have their openings facing downward, the insides will not get washed	Bad wash
Bowls/cups must have their openings facing downwards, otherwise water will collect.	Bad wash
Plates are nesting, wash water cannot get through	Bad wash
Kitchen utensil blocking spray arm path.	Bad wash
Platter blocking wash water reaching the cup rack	Bad wash
Ensure cutlery is not nesting, wash water will not get through.	Bad wash
Ensure dishware items do not protrude above the drawer	Service call F1
Knives must not protrude above the drawer as it may damage the lid seal and may cause injury to the user.	Service call to fix the seal, F1, & injury.
Ensure dishware items are not forced into the drawer as these items may prevent the lid from sealing causing an F1 fault	Service call F1
Kitchen utensil blocking spray arm rotation	Bad wash
Large bowl blocking wash water reaching the cups	Bad wash

User Maintenance Instruction

CLEANING THE DISHDRAWER
The DishDrawer may need wiping down from time to time. We recommend a clean damp cloth.



Internal Parts of the DishDrawer

1. Spray Arm
2. Filter Plate
3. Drain Filter

CLEANING THE DRAIN FILTER, SPRAY ARM AND FILTER PLATE
We recommend the drain filter to be cleaned whenever there is evidence of food particles. The filter plate is designed to be self cleaning, but food scraps may accumulate. The spray arm and filter plate may need cleaning about once a month in normal use or more often, should the need arise.

CLEANING THE DRAIN FILTER
1. Lift up the drain filter access panel, if fitted on the basket.

2. Lift and remove the drain filter out of the DishDrawer.

3. Empty, rinse under clean running water and replace back into the allocated space.

4. Ensure the drain filter is flush with the filter plate.

CLEANING THE SPRAY ARM
1. Remove the basket carefully. Lift from the back end first so that you do not knock the detergent and rinse aid dispenser.

2. Lift the spray arm and shake any foreign material out.

3. Rinse the spray arm under water and wipe the spray arm with a damp cloth.

4. Replace the spray arm back onto the impeller.

WARNING - The DishDrawer must be used with the filter plate, drain filter and spray arm correctly in place.

CLEANING THE FILTER PLATE
1. Ensure the DishDrawer is cool before you start cleaning and follow the instructions for removing the drain filter and spray arm.

2. In the centre of the filter plate, there are two rings. Hold the centre ring still and turn the outer ring anti-clockwise, about a 1/8 turn. This will release the filter plate.

3. When cleaning the underside of the filter plate, care must be taken on the sharp outer edge to avoid the risk of cut type injuries.

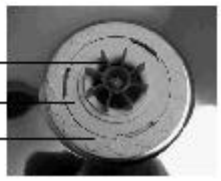
4. Remove any soil, wash in hot soapy water and rinse thoroughly in clean water. The heater plate can be wiped with a damp cloth.

5. Replace the filter plate so it lies flat in the base of the DishDrawer ensuring the filter plate is fully locked into position with the outer ring.

6. To lock the filter plate into position, ensure the triangles align with each other (refer to the diagram for the correct position). The filter plate must not be able to move about freely.

Correct Locking Position of Filter Plate with Motor Assembly

1. Impeller
2. Centre Ring
3. Outer Ring



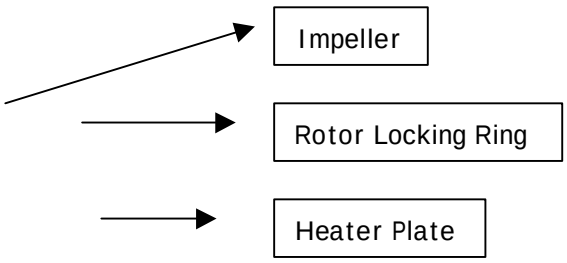
Cleaning the Motor Assembly

This area only needs to be cleaned under certain fault conditions ie F2. If you have an integrated product the fault code will appear on the secondary control panel, refer to the section on Fault Codes, it will explain under which conditions to clean the motor assembly.

1 Follow the above instructions for the removal of the drain filter, spray arm and filter plate.

2 Turn the rotor-locking ring counter clockwise and lift out. Once the motor assembly is lifted up, check the cavity for any foreign matter like bones or seeds and remove.

3 Replace the motor assembly back into the small cavity in the DishDrawer®. Turn the motor assembly clockwise about $^{1}/_{8}$ of a turn to lock into position. The arrows (>) on the rotor locking ring and the motor housing must align with each other The motor assembly should not be able to be lifted up freely. Carefully replace all the other parts back into the DishDrawer®.



Bacteria, Viruses and other Microbes.

Microorganisms like bacteria and viruses are ubiquitous. This is a fact of life. Some microorganisms are harmless, while others are useful and others are pathogenic/ harmful. To totally get rid of all pathogenic microorganisms one would have to sterilise in an autoclave at 30psi, @ 134^{o} C for 3 minutes. This would be highly detrimental to most everyday items, including the DishDrawer.

There has been concern with bacteria and viruses invading the kitchen situations. Unfortunately bringing food home from the supermarket can introduce the unwanted microorganisms eg Salmonella or Campylobacter on chicken or meat. Hepatitis A and some other viral diseases may be transmitted through foods. The virus is passed from the intestines of infected persons onto the hands of food handlers or into sewage. Any food subject to faecal contamination may cause hepatitis A or other food borne viral illnesses. Failure for a food handler to wash hands thoroughly after using the toilet and not adequately cooking shellfish and other foods, which have been exposed to sewage-contaminated water can lead to the transmission of viral diseases through food.

The best prevention of food poisoning and such like is safe food hygiene practices and good personal hygiene. This is your best safeguard!

Dishwashers help remove food poisoning organisms due to the

- High wash and rinse temperatures used (temperatures above 65C/149F will kill most food poisoning organisms),
- Long wash times
- Alkaline detergent. Alkalinity is a limiting factor in the growth of microbes. pH of 9-12 for enzymic detergents and pH 12-13 for chlorine based detergents.
- If the detergent contains chlorine bleach. This will kill microbes.

These are important parameters in removing harmful pathogens. If the household has poor personal hygiene and bad food handling practices, no dishwasher will save them from the pathogenic microbes.

It is important to remember that as soon as you remove the dishes out of the DishDrawer you are reintroducing microorganisms back onto the dishware by touching them with your hands. It is therefore important when removing dinnerware, to ensure you have clean dry hands to prevent the introduction of even more unnecessary microorganisms.

Inertness of DishDrawer Materials vs Stainless Steel

Plastic/Polypropylene vs Stainless steel, both materials will not support microbial growth.

Stainless steel is no different from polypropylene; it might be worse particularly where there are weld and crevices in the product where food soils remain.

All dishwashers would suffer from odour, if they were left with food particles in there and left for a very long time in a warm environment.

If you are not using the DishDrawer for some time, it is important to

- Ensure all the baskets are empty
- Ensure the dishwasher is left clean inside. (Clean the drain filter and ensure there are no food particles left on the filter plate)
- Leave the drawer(s) ajar.

Cleaners for the DishDrawer®

Care needs to be taken when cleaning the inside and outside of theDishDrawer®.

PROBLEMS

1. Foaming

If using cleaners on the inside of the DishDrawer®, care needs to taken to ensure there is no foaming, as this can lead to a service call. The foam will run all the way to the back of the vent hole and dribble onto the flood switch causing an F1 fault.

2. Acidic Attack

In both the DD601 and DD601v2 or DD602, some parts were susceptible to acidic attack. When cleaners were used they caused some of the parts of the DishDrawer® like the motor housing to crack.

DishDrawer® Phase 3 parts are now less susceptible to acidic attack. The only area now that is susceptible is the cup rack, but water does not pool here, so we do not believe it to be of concern.

3. Stress and cracking on the DishDrawer® handle (prefinished models only)

DISHWASHER CLEANERS

Dishwasher Cleaners claim to clean hard water deposits, iron, grease and food particles off dishwashers. These products are acidic based.

There are dishwasher cleaners available on the market. Brands that are available include Finish Dishwasher cleaner, Dishwasher Magic, Glisten and Dylon Oust, only to name a few. Some of these products are suitable for the DishDrawer®. Finish Dishwasher cleaner and Dishwasher Magic comes in a bottle, ideally suited for a conventional machine.

Particularly in hard water areas, we would thoroughly recommend using a dishwasher cleaner once a month to remove lime scale/hard water deposits that may build up around the heater and filter plate.

An alternative is the use of citric acid crystals. Fill both the detergent dispensers with citric acid and run a NORMAL wash programme. If Citric Acid crystals are used in DD601 or DD601v2/DD602, a detergent wash MUST be run immediately afterwards or else damage may occur.

CLEANING THE OUTSIDE OF THE DISHDRAWER®

We recommend the use of a damp cloth to clean the outside of the DishDrawer® and dried off with a clean towel.

Some cleaning agents are not suitable on the DishDrawer® handle. If cleaning agents are used they cause the plastic handle to crack and stress.

We strongly recommend spraying a cloth first with the cleaning agent and then wiping the area.
Here are the cleaning agents that we consider satisfactory, BUT they must be used with care.

- Ajax Spray and Wipe
- 3% Household Bleach (ie 30ml in 1 litre of water)
- Handy Andy

We are still testing cleaning products as we find they are suitable we will add to this list.

STAINLESS STEEL DOOR FRONTS

We do not recommend antibacterial products on Stainless Steel for a number if reasons:
Antibacterial products can contain chloride compounds eg quaternary ammonium chloride, which attacks the stainless steel causing it to rust. Other antibacterial products may contain triclosan, which is an antibiotic. Over use of these products can create bacteria, which are resistant to antibiotics.

Stainless steel cleaners like 3M Stainless Steel Cleaner and Tonizone are satisfactory for cleaning stainless steel door, but they can crack the plastic handle. So care must be taken to avoid getting the stainless steel polish onto the handle.

Removing Adhesive off Stainless Steel

Products found to be suitable for cleaning adhesive off stainless steel are as follows:
Jiff, Finish Liquid, Finish powder dissolved in hot water, Tonizone, 3M stainless steel cleaner, Silvo, Methylated spirits. All these products MUST be applied with care do NOT apply on the handle.

IN SUMMARY

DO NOT USE THE FOLLOWING PRODUCTS INSIDE OR OUTSIDE YOUR DISHDRAWER®.
Plastic and stainless steel scouring pads
Abrasive, solvent, household cleaners, acid or alkaline cleaners.
Hand washing liquids, soap, laundry detergents or disinfectants.
Antibacterial products

Option Adjustment Mode

HOW TO ENTER OPTION ADJUSTMENT MODE

After using the DishDrawer you may want to change some of the preset options to suit your needs. The settings for Rinse Aid, Auto Power, End of Wash Programme Beeps, Closed Drawer and Clean Dish Indicator options can be changed.

PREFINISHED & INTEGRATED

1. Press the POWER button to turn the DishDrawer to the Normal Operating Mode.
2. Press and hold the ECO and then the LOCK buttons for 5 seconds.
When the buttons have been correctly pressed, one long beep is emitted.
3. Release the LOCK and ECO buttons.
4. Use the appropriate buttons on the control panel to make the necessary adjustments. These are explained below.
5. Once the changes have been made, press the POWER button to return to the Normal Operating Mode.
The DishDrawer will save these changes automatically.

HOW TO ADJUST THE RINSE AID SETTING

If the customer finds that the dishes are wet or streaky then they may want to turn up the rinse aid setting. If there is too much foam at the end of the wash program, the rinse aid setting should be turned down.

PREFINISHED

1. Enter the Option Adjustment Mode as explained previously. The letters "rA" will be shown on the Electronic Display.
2. The current rinse aid setting is shown on the wash programme indicator in red lights. If 2 red lights are lit on the wash programme indicator then the rinse aid setting is at 2.
5. Press the LOCK button to increase or decrease the rinse aid setting, the red lights will scroll up to 5 and then start from 1 again
3. Once you have selected the desired rinse aid setting, press the POWER button to return to the Normal Operating Mode.

Electronic Display


Example of Rinse Aid set to '4'

INTEGRATED

1. Enter the Option Adjustment Mode as explained previously.
2. The light above the START/PAUSE button is red to indicate this setting has been chosen.
3. The current rinse aid setting is shown on the wash programme indicator in red lights. If 2 red lights are lit on the wash programme indicator then the rinse aid setting is at 2. The options that are available are from 1 to 5. Press the LOCK button to increase or decrease the rinse aid setting, the red lights will scroll up to 5 and then start from 1 again
4. Once you have selected the desired rinse aid setting, press the POWER button to return to the Normal Operating Mode.


Example of Rinse Aid set to '4'

HOW TO CHANGE THE AUTO POWER OPTION

When the DishDrawer leaves the factory, it is programmed to automatically turn itself on whenever the drawer is opened. The DishDrawer will not start washing until the drawer is closed and the START/PAUSE button has been pressed. If you do not want the DishDrawer to turn itself on automatically, this feature can be turned off.

PREFINISHED

1. Enter the Option Adjustment Mode as explained previously.
2. Press the START/PAUSE button until the letters "AP" appear on the Electronic Display.
3. Press the LOCK button to turn the Auto Power feature on or off. The brush symbol is not present on the Electronic Display when the Auto Power feature has been turned off.
4. Press the POWER button to return the Normal Operating Mode.

Electronic Display

Auto Power On

Auto Power Off

INTEGRATED

1. Enter the Option Adjustment Mode as explained previously.
2. Press the START/PAUSE button once. The light above the START/PAUSE button will be orange.
If the light is not orange, press the POWER button to return to the Normal Operating Mode and start again.
3. Press the LOCK button to turn the Auto Power feature on or off. If all the red lights on the wash programme indicator are off then the Auto Power feature is off.
4. Press the POWER button to return the Normal Operating Mode.


Auto Power On


Auto Power Off

Option Adjustment Mode ……. Continued

HOW TO CHANGE THE END OF WASH PROGRAMME BEEPS

The factory has programmed the DishDrawer to beep six times at the end of the wash programme. This feature can be turned off as desired.

PREFINISHED

1. Enter the Option Adjustment Mode as explained previously.
2. Press the START/PAUSE button until letters "EC" appear on the Electronic Display.
3. Press the LOCK button to turn the End of Wash Programme Beeps on or off as desired. The brush symbol is not present on the Electronic Display when the End of Wash Programme Beeps have been turned off.
4. Press the POWER button to return to the Normal Operating Mode.

Electronic Display

Beeps On

Beeps Off

INTEGRATED

1. Enter the Option Adjustment Mode as explained previously.
2. Press the START/PAUSE button twice. The light above the START/PAUSE button will be green and the light above the LOCK button will be red. If it is not, press the POWER button and start again.
3. Press the LOCK button to turn the End of Wash Programme Beeps on or off. If all the red lights on the wash programme indicator are off then the End of Wash Programme Beeps are off.
4. Press the POWER button to return to the Normal Operating Mode.


Beeps On


Beeps Off

HOW TO CHANGE THE CLOSED DRAWER OPTION

When the Closed Drawer Option has been selected it will keep the DishDrawer locked at all times. When you wish to open the DishDrawer press the POWER button. When the DishDrawer is fully closed again, the lid will automatically come down after 30 seconds and lock the DishDrawer. **NOTE: If the Lock feature is used in conjunction with the Closed Drawer Option, pressing the POWER button will not open the DishDrawer. The Lock feature must be turned off to enable the DishDrawer to be opened.**

PREFINISHED

1. Enter the Option Adjustment Mode as explained previously.
2. Press the START/PAUSE button until the letters "Ld" appears on the Electronic Display.
3. Press the LOCK button to turn the Closed Drawer Option on or off. The brush symbol indicates the closed DishDrawer option is selected.
4. Press the POWER button to return to the Normal Operating Mode.

Electronic Display

Close Drawer On

Close Drawer Off

INTEGRATED

1. Enter in the Option Adjustment Mode as explained previously.
2. Press the START/PAUSE button three times. The light above the START/PAUSE button and the LOCK button will be red. If the light is not red, press the POWER button to return to the Normal Operating Mode and start again.
3. Press the LOCK button to turn the Closed Drawer feature on or off. If all the red lights on the wash programme indicator are on then the Closed Drawer feature is on.
4. Press the POWER button to return the Normal Operating Mode.


Close Drawer On


Close Drawer Off

HOW TO CHANGE THE CLEAN DISH INDICATOR

Examples of where this feature might be beneficial are when dishes have been left in the DishDrawer and you cannot remember if they have been washed or in situations where household members regularly remove a few clean dishes without emptying the remaining Drawer.

When the DishDrawer leaves the factory it is programmed with the Clean Dish Indicator off. When the wash programme has finished, the "End of Programme" symbol will remain on until the DishDrawer is opened. Once the DishDrawer is opened, it will return to the Normal Operating Mode.

If the Clean Dish Indicator is chosen, the "End of Programme" symbol will remain on to indicate the dishes are clean. When you have unloaded the clean dishes or putting in dirty dishes into the DishDrawer, press the POWER button. The DishDrawer will return to the Normal Operating Mode, this could be used to indicate that dirty dishes are in or can be loaded into the DishDrawer.

NOTE: We do not recommend the Clean Dish Indicator be used in conjunction with the Closed Drawer Option.

PREFINISHED

1. Enter the Option Adjustment Mode as explained previously.
2. Press the START/PAUSE button until letters "dS" appear on the Electronic Display.
3. Press the LOCK button to turn the Clean Dish Indicator on or off. When the Clean Dish Indicator has been turned on, the brush symbol is present on the Electronic Display.
4. Press the POWER button to return to the Normal Operating Mode.

Electronic Display

Clean Dish On

Clean Dish Off

INTEGRATED

This Option is not available on the Integrated Models.

If there are problems with condensation you may want to suggest the use of Closed Drawer Option. Also if the DishDrawe® is to be installed on a boat or mobile home, this option will stop the drawer from opening unnecessarily.

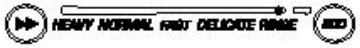
Customers Guide to Fault Codes

DISHDRAWER NEEDS ATTENTION - FAULT CODES

When a fault code is displayed, the DishDrawer will continuously beep every second until the POWER button is pressed.

For Prefinished Models
A fault code is indicated in the Electronic Display, with a spanner, letter and a number beside it, for example, "F1" or "U1".

For Integrated Models
A fault has occurred when the light above the START/PAUSE button is red. The lights on the wash programme indicator signal which fault code has occurred, for example, a "F1" fault code is



Each fault code is listed in the chart below for prefinished and integrated models.

HOW TO ATTEND TO A FAULT CODE
1. Press the POWER button to remove the fault code.

2. If the fault code and continuous beeps cannot be removed by pressing the POWER button, turn the power off at the power supply.

3. We recommend you check the chart below and correct the fault where possible.

4. After attending to the fault, turn the DishDrawer on at the power supply.

5. If the fault code and continuous beeps remain, turn the water and power supply off to the DishDrawer.

6. When calling your Fisher & Paykel Authorised Service Centre advise them of the fault code that has appeared on the DishDrawer. This information will help the Authorised Service Centre respond better to your request.

FAULT CODES PREFINISHED	FAULT CODES INTEGRATED	POSSIBLE CAUSES	WHAT TO DO
F1		*Flood switch has been activated.*	*Turn the water and power supply off to the DishDrawer and call your Fisher and Paykel Authorised Service Centre.*
F2		*Motor problem.*	*Call your Fisher & Paykel Authorised Service Centre.*
F3		*Temperature sensor failed.*	*Ensure water coming in through the inlet hose is not greater than 65°C. You may need to put a tempering valve on your water supply.*
F4		*Faulty temperature sensor or element.*	*Call your Fisher & Paykel Authorised Service Centre.*
F9		*Electronics malfunction.*	*Call your Fisher & Paykel Authorised Service Centre.*
U1		*Fill fault.*	*Turn the DishDrawer water supply on.* *Ensure the spray arm can rotate about the centre, and if the DishDrawer is full of water, the water will need to be manually removed.*

If you then have any questions about operating the product, please contact our Fisher and Paykel Customer Care Centre.

Service Persons Guide to Fault Codes

The faults are displayed in the LCD as one of 5 F (fatal) faults or 1 U (user) fault along with the symbol of a spanner. A fatal fault will usually require the assistance of a qualified service person, while a U1 user fault indicates the machine had failed to prime within a certain length of time usually because the tap has not been turned on. For this reason at the same time a U1 comes up in the display we also show the symbol of a tap. In the Integrated models, an LCD is not available, and the presence of a fault is indicated by a red light above the START/PAUSE button with the fault number indicated on the touch switch panel with Red LED's. (see Customers Guide to Fault Codes)

Once a fault is repaired it can be cleared by pressing the POWER button. If the fault is still present then it will not clear.

A fatal or user fault is accompanied by a continuous pulsating beep which can be turned off by pressing either the power, start/pause, or key lock button.

The last two faults are logged into EE memory.

Fault Code Descriptions
A = The answer
» = Advance to this question

(F1) The flood switch is activated for more than 6 seconds			
		Yes	**No**
1	Did a flood occur? (N.B. The flood may have dried up)	»2	»12
2	Is the lid sealing on the tub correctly?	»3	»A
3	Is there a high water level in the tub?	»4	»6
4	Is the water valve leaking?	»A	»5
5	Is the DishDrawer® priming correctly?	»11	»6
6	Is the spray arm split?	»A	»7
7	Is the spray arm running freely?	»8	»A
8	Is water leaking from a split inlet or drain hose?	»A	»9
9	Is water leaking around the heater plate O rings.	»A	»10
10	Carry out more testing to locate the source of the leak.	»A	»A
11	The drain hose may have been be blocked or partially blocked.	»A	»A
12	Is there condensation or foreign matter around the chassis flood switch PCB?	»A	»13
13	If power fails to the bottom tub it will cause the top tub to F1?	»A	»14
14	Substitute the Chassis PCB	»A	»A

(F2) The motor is not sensed to be rotating			
		Yes	**No**
1	Is the rotor jammed?	»2	»3
2	Free jammed rotor, check for damage to rotor and rotor housing.	»A	»A
3	Is the stator wiring from controller ok? Check stator windings for correct resistances are they ok?	»5	»4
4	Repair wiring or replace stator as required.	»A	»A
5	Is the rotor position sensor clipped into the stator correctly and plugged onto the controller with a good connection?	»6	»A
6	Substitute with a new rotor position sensor.	»A	»A

(F3) Water temperature sensed at greater than 85°C / 185°F			
		Yes	**No**
1	Is incoming water greater than 85°C / 185°F?	»2	»3
2	Adjust incoming water temperature.	»A	»A
3	Is the element on all the time?	»4	»5
4	Replace the electronic controller.	»A	»A
5	Are the wiring & connections from the controller to the element all ok?	»6	»A
6	Are there any signs of moisture around the temperature sensor?	»8	»7
7	Is the resistance of the temperature sensor ok? (see specs at front of manual)	»10	»9
8	Locate & repair source of leak.	»A	»A
9	Replace element	»A	»A
10	Run through test cycles to try & induce fault again	»A	»A

(F4) No temperature increase has been sensed while the element is on			
		Yes	**No**
1	Does the element heat in diagnostics?	»7	»2
2	Test the resistance of the element at the plug on the controller, is it ok?	»3	»5
3	Is the plug making a good connection onto the controller?	»4	»A
4	Replace the controller.	»A	»A
5	Is the wiring and the edge connections down on the element ok?	»6	»A
6	Test the resistance of the element and replace if necessary.	»A	»A
7	Is the resistance of the temperature sensor measuring from the plug on the controller ok? (see specs at front of manual)	»8	»9
8	Replace controller.	»A	»A
9	Is the wiring and the edge connections down to the temperature sensor ok?	»10	»A
10	Replace the element.	»A	»A

(F9) Electronics Failure (EEPROM access error)			
		Yes	**No**
1	Isolate the power to the DishDrawer® for 10 seconds then retry, does the fault clear?	»A	»2
2	Replace controller	»A	»A

(U1) Machine failed to prime with water within a given time			
		Yes	**No**
1	Is the tap turned on?	»2	»A
2	Is the spray arm in place? (spray arm my have been refitted since U1 fault occurred)	»3	»A
3	Activate the water inlet valve in diagnostics. Does any water enter the machine?	»4	»8
4	Is the impeller on the rotor slipping?	»13	»5
5	Is the supply water pressure above 30Kpa / 4.3p.s.i?	»6	»7
6	Check the water inlet hoses & valves for an obstruction.	»A	»A
7	Minimum incoming water pressure for correct DishDrawer® operation is 30Kpa / 4.3p.s.i	»A	»A
8	Is the resistance of the water valve measured at the plug on the controller ok?	»9	»11
9	Is there 24v dc coming from the controller during the water valve test?	»6	»10
10	Replace the controller	»A	»A
11	Is the wiring & edge connections down to the water valve ok?	»12	»A
12	Replace the water valve	»A	»A
13	Replace the rotor	»A	»A

Problem Solver

PROBLEM SOLVER

If the DishDrawer does not appear to be operating properly, check this chart below and correct where possible.

PROBLEM	POSSIBLE CAUSE	WHAT TO DO
DishDrawer will not start	○ Power supply not connected. ○ The drawer not closed properly. ○ Lock feature is on. ○ START/PAUSE button not pressed.	□ Connect the power supply. □ Ensure drawer is firmly closed. □ Turn Lock off. Hold down LOCK button until the "lock" symbol (Prefinished) or green light (Integrated) disappears. □ Press START/PAUSE button.
Excess water in DishDrawer	○ Drain hose(s) bent or kinked. ○ Blocked filters and/or drain hose(s).	□ Straighten the drain hose(s). □ Clean the filter plate/drain filter. Unblock the drain hose(s). Refer to User Maintenance section.
Water marks on the dishes	○ Insufficient rinse aid. ○ Rinse aid setting too low. ○ DishDrawer overloaded/incorrectly loaded.	□ Check if there is enough rinse aid in dispenser. □ Increase the rinse aid setting. □ Refer to section on Loading.
Unclean dishes	○ Wash programme unsuitable for the load. ○ Spray arm unable to rotate. ○ Overloading the DishDrawer. ○ Filter plate/drain filter incorrectly inserted. ○ Detergent put in wrong compartment. ○ Excessive food not removed off dinner ware. ○ Unsuitable detergent. ○ Not enough detergent. ○ Spray arm holes are blocked. ○ Filter plate/ drain filter blocked. ○ Mega rack incorrectly installed. ○ Hard water situation.	□ Refer to Wash Programmes section for suitable wash programme, or the soils were too heavily baked on & may need soaking. □ Ensure no items are blocking the spray arm path. □ Refer to the section on Loading. □ Refer to User Maintenance section. □ Detergent must be placed in the large compartment. □ Scrape all food scraps off dinner ware. □ Use recommended brands of dishwasher detergent. □ Refer to Wash Programmes section or the detergent manufacturer's instruction. □ Clean the spray arm. □ Clean filter plate and drain filter. □ Refer to Accessories section for correct installation. □ We recommend the installation of a water softener. Use detergents with a high phosphate content and increase the dosage.

Problem Solver ….. Continued

PROBLEM SOLVER

If the DishDrawer does not appear to be operating properly, check this chart below and correct where possible.

PROBLEM	POSSIBLE CAUSE	WHAT TO DO
DishDrawer will not start	☐ Power supply not connected. ☐ The drawer not closed properly. ☐ Lock feature is on. ☐ START/PAUSE button not pressed.	☐ Connect the power supply. ☐ Ensure drawer is firmly closed. ☐ Turn Lock off. Hold down LOCK button until the "lock" symbol (Prefinished) or green light (Integrated) disappears. ☐ Press START/PAUSE button.
Excess water in DishDrawer	☐ Drain hose(s) bent or kinked. ☐ Blocked filters and/or drain hose(s).	☐ Straighten the drain hose(s). ☐ Clean the filter plate/drain filter. Unblock the drain hose(s). Refer to User Maintenance section.
Water marks on the dishes	☐ Insufficient rinse aid. ☐ Rinse aid setting too low. ☐ DishDrawer overloaded/incorrectly loaded.	☐ Check if there is enough rinse aid in dispenser. ☐ Increase the rinse aid setting. ☐ Refer to section on Loading.
Unclean dishes	☐ Wash programme unsuitable for the load. ☐ Spray arm unable to rotate. ☐ Overloading the DishDrawer. ☐ Filter plate/drain filter incorrectly inserted. ☐ Detergent put in wrong compartment. ☐ Excessive food not removed off dinner ware. ☐ Unsuitable detergent. ☐ Not enough detergent. ☐ Spray arm holes are blocked. ☐ Filter plate/ drain filter blocked. ☐ Mega rack incorrectly installed. ☐ Hard water situation.	☐ Refer to Wash Programmes section for suitable wash programme, or the soils were too heavily baked on & may need soaking. ☐ Ensure no items are blocking the spray arm path. ☐ Refer to the section on Loading. ☐ Refer to User Maintenance section. ☐ Detergent must be placed in the large compartment. ☐ Scrape all food scraps off dinner ware. ☐ Use recommended brands of dishwasher detergent. ☐ Refer to Wash Programmes section or the detergent manufacturer's instruction. ☐ Clean the spray arm. ☐ Clean filter plate and drain filter. ☐ Refer to Accessories section for correct installation. ☐ We recommend the installation of a water softener. Use detergents with a high phosphate content and increase the dosage.

Problem Solver ….continued

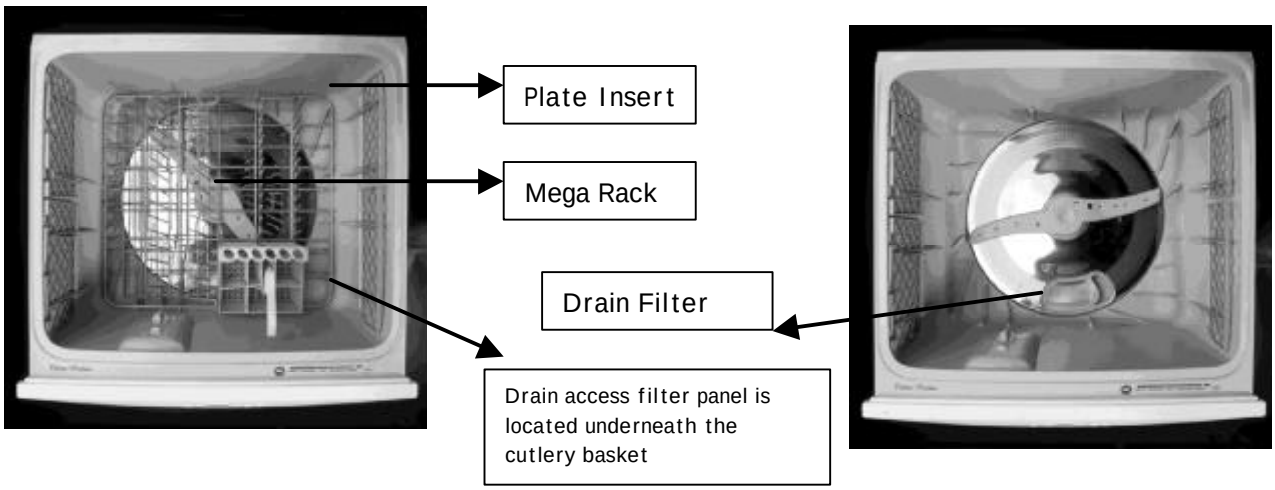
PROBLEM	POSSIBLE CAUSE	WHAT TO DO
Coffee/Tea Stains left in Cups	• Not enough detergent being used. To remove these stains requires a stronger concentration of detergent in the water. Extra detergent is also required in hard water areas as minerals in the hard water reduce the effectiveness of the detergent.	Fill the main-wash detergent cup to the top & for best results also fill the pre-wash detergent cup. Run on normal or heavy cycles not Eco.
	• The product is being over loaded which is preventing water reaching the cups on the upper cup racks.	• See section on recommended ways of loading.
	• Use good quality detergent	• Ensure detergent is stored in a cool dry place and do not buy large quantities.
	• Worn plastic and earthenware tend to stain more easily	• Try soaking the cups in dishwashing detergent
Dishes have blotchy marks on them that look like water stain marks not food	• Not enough rinse aid being used. The water is not soft enough during the final rinse and therefore hard water droplets containing impurities are drying on the dishes instead of running off during the dry cycle.	• Confirm that rinse aid is being used. • The rinse aid may need to be turned up to a higher setting (4 or 5 lights) and for optimum dry performance run the DishDrawer® on normal or heavy cycles not Eco.
Plastics not drying	• Compared to crockery and cutlery, plastics do not hold very much thermal mass. During the final rinse, dishes are raised to a hot temperature to increase their thermal mass, because plastics cannot do this they do not dry very well.	• Unfortunately increasing the temperature of the final rinse may warp or melt the plastic. Plastics will not dry very well in any dishwasher.

PROBLEM	POSSIBLE CAUSE	WHAT TO DO
Glasses & Cutlery have a Cloudy White film on them and/or Plates have a White Chalky film on them	Hard water & not enough detergent being used. Minerals from the water are building up on the dishes.	• Once this film forms on the dishes it cannot be removed in the dishwasher. The dishes will need to be cleaned by soaking them in an acidic solution such as white vinegar and water. • To prevent the build up reoccurring, fill both the main-wash & pre-wash detergent cups to the top with a powder detergent and we would recommend running on a normal cycle. • In problem areas with very hard water the customer may need to use a detergent additive designed for use in hard water areas or fit a water softener to the incoming water supply.
Glassware shows rainbow colours, milky appearance and / or scratches	Check glassware is dishwasher proof.	• If in soft water situation use less detergent (follow user guide) • Ensure there is rinse aid in the dispenser, • Do not overload the DishDrawer® • Use the Normal wash programme.
Items looks smeary, glassware and knife blades look bluish	• Too much rinse aid	• Reduce the rinse aid setting
Staining Silverware	• Bronze tarnish • Food soil tarnish • Contact with detergent	• Silver & stainless steel cutlery in contact during the wash • Clean the food soils before loading particularly acidic type foods • Ensure detergent does not come into contact with any items in the dishwasher.

Wash Performance Checklist – DishDrawer Phase 3

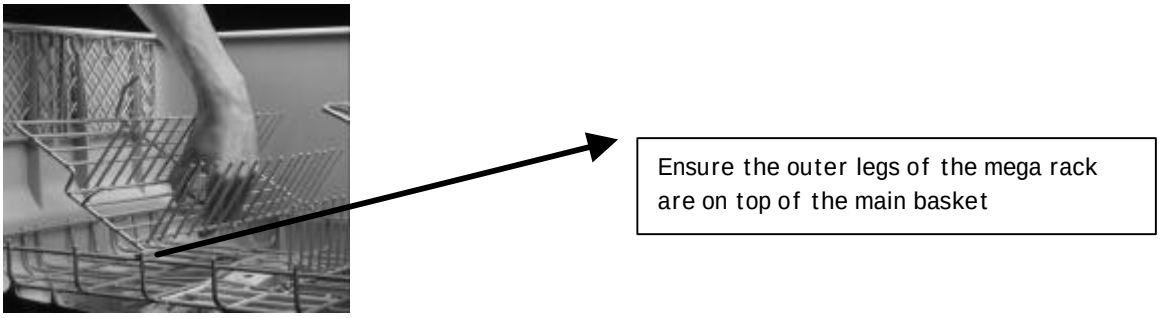
- **CHECK THE DRAIN FILTER IS CLEAN AND FREE OF ANY FOOD DEBRIS**

- **WHEN THE DISHDRAWER® IS EMPTY, CHECK THE SPRAY ARM CAN ROTATE FREELY**



If the spray arm cannot rotate freely then check the following:

- Mega Rack is correctly installed
- Plate insert is correctly installed
- Drain access panel is above the main basket
- Drain filter is flush with the main filter plate



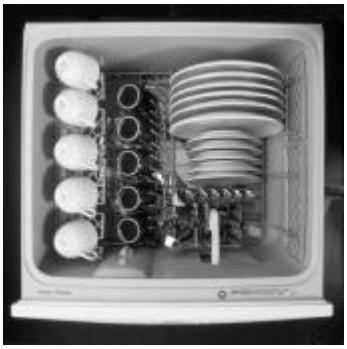
Correct Installation of Mega Rack

- **WHEN LOADING THE DISHDRAWER® ENSURE THE DISHES HAVE SCRAPPED TO REMOVE LARGE QUANTITIES OF FOOD SCRAPS**

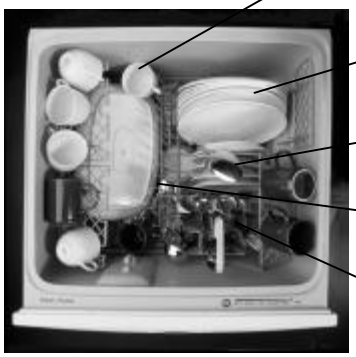
  If dishware has baked on soils then it will need to be soaked.

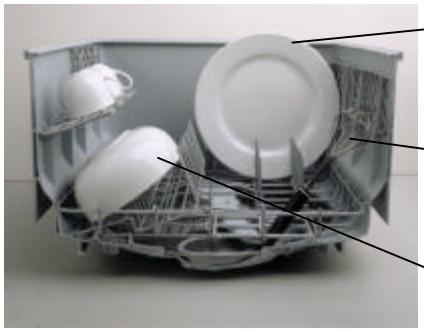
- **CORRECT LOADING OF THE DISHDRAWER®**

RECOMMENDED WAYS TO LOAD THE DISHDRAWER®



How Not to Load Your DishDrawer®





Faults	Result
This dishwasher is overcrowded	Bad wash
Ensure mugs/cups have their openings facing downward, the insides will not get washed	Bad wash
Bowls/cups must have their openings facing downwards, otherwise water will collect.	Bad wash
Plates are nesting, wash water cannot get through	Bad wash
Kitchen utensil blocking spray arm path.	Bad wash
Platter blocking wash water reaching the cup rack	Bad wash
Ensure cutlery is not nesting, wash water will not get through.	Bad wash
Ensure dishware items do not protrude above the drawer	Service call F1
Knives must not protrude above the drawer as it may damage the lid seal and may cause injury to the user.	Service call to fix the seal, F1, & injury.
Ensure dishware items are not forced into the drawer as these items may prevent the lid from sealing causing an F1 fault	Service call F1
Kitchen utensil blocking spray arm rotation	Bad wash
Large bowl blocking wash water reaching the cups	Bad wash

- **SELECTION OF WASH PROGRAMME**

Select the Normal wash programme for everyday dishes. Fast programmes are for very lighly soiled dishes.

- **DETERGENT**
- Use a good quality detergent.
- Ensure the detergent is free flowing and not lumpy, if it is lumpy then it should be discarded.
- Detergent has a shelf life of one year.
- Use the right quantity of detergent as recommended by the User Guide. If you are in a hard water area, the main wash compartment MUST be full.

- **RINSE AID**

Ensure rinse aid is used on a regular basis. It is important as it helps dry the dishes, prevents filming and streaking occurring on the dishware items.

DishDrawer® Awards

Institution	Country	Detail	Award	Year
Kitchen & Bath Business (KBB) Magazine	USA	http://www.kbbmagazine.com	First Place Best New Dishwasher / Third Place Overall Winner Category Product Innovator Award	1999
Home Magazine	USA	http://www.homesmag.com/	American Building Products Award	1999
Today's Homeowner	USA	http://www.todayshomeowner.com/	Best New Product for 1999	1999
Kitchen & Bathroom Industry Show (KBIS)	USA	http://www.kbis.com/	Overall Winner Best New Product	1999
Appliance Manufacturer Annual Design Competition USA	USA		Excellence in Design	1999
Best of What's New Award - Popular Science Magazine USA	USA			
Mingay's Annual Achievement Award	AUS		Most Innovative Product DD601 Dishwasher Australia	1998
Mingay's Annual Achievement Awards	AUS		Best Dishwasher - DD601 Dishwasher Australia	1998
Design Institute of New Zealand - Best of Discipline - Product Design New Zealand	NZ			
IPENZ in association with TRANZ RAIL - Manufacturing Award New Zealand	NZ			
Galaxy Energy Awards hosted by Energy Efficiency Victoria Australia	AUS		Galaxy Energy Innovation Award	1998
Business Week Industrial Design Excellence Awards (IDEA)	USA	http://www.idsa.org	Gold Award for Consumer Products	1999
ADEX Award	USA			1999