SEARS

Manual No: XXXX0903

CRAFTSMAN Kenmore

BOSCH DISHWASHERS

SOURCE NUMBER

SHI4302/4306/66A05/6802/6805/6806
SHU3002/3006/3012/3016
SHU3026/3032/3035/3036
SHU33A02/06, 3302/3305/3306/3307
SHU3322/3326/3336, 4322/4326
SHU4002/4006/4016/4022/4026/4036
SHU43C02/05/06/07, 43E02/05/06/07
SHU4302/4304/4306/4312/4314/4316
SHU53A02/05/06, 53E02/05/06
SHU5302/5304/5305/5306/5307
SHU5312/5314/5315/5316/5317
SHU66C02/05/06/07, 66E02/05/06/07
SHU6802/6805/6806
SHU8802/8805/8806/8812/8815/8816
SHU9902/9905/9906
SHU9912/9915/9916/9922/9925/9926
SHU9952/9955/9956
SHV4303/46C03/4803/66A03/6803/99A03
SHX33A02/05/06, 43E02/05/06
SHX46A02/05/06/07, 46B02/05/06/07
SHX56B02/05/06, 99B05/06
SHY56A02/05/06, 66C02/05/06, 99A02/05/06

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I. Safety Concerns

IA. Safety Symbol Explanation

⚠ = Warning symbol included in Installation Instructions and on this page. It includes serious warnings such as injury or death, electric shock & dishwasher damage.

IB. Identify Potential Hazards

There are few hazards associated with dishwashers. Two possible hazards are:

⚠ Electrical shock hazard (as with any electrical appliance).

⚠ Sharp edges – only on tank when sump is removed and on inner door when dispenser is removed.

IC. Warning Personal Injury

⚠ Danger of electric shock. Disconnect power before disassembling or working on dishwashers. Make sure dishwashers are electrically grounded. Use only copper conductors for all wiring or rewiring.

ID. Warning Property Damage

Only warning on property damage comes from improper water connections – overly tightened water connections could cause water to leak from water inlet valves. This only applies to older models with water inlet valves with vertical solenoids (coils). Newer models with water inlet valves with horizontal solenoids (coils) have water connections integrated with mounting brackets to eliminate possibility of damaging valves from overtightening water fittings.

IE. Electrostatic Sensitive Devices

None since all control modules have pc boards mounted in plastic housings – no pc boards are handled in repairing dishwashers.

II. Product Line Related

IIA. CFC Information

There are no CFC's or any other refrigerant used in dishwashers.

IIB. Emissions Related

There are no emissions related to dishwashers. Occasionally smells come from customer drains into dishwashers if dishwashers weren't properly connected to drains.

IIC. CO

No carbon monoxide is emitted by dishwashers.

IID. Government Compliance Issues

None.

IIE. Certification Requirements

All dishwashers are designed, tested and certified by UL for use in the U.S. and Canada. In addition, all dishwashers are Energy Star certified as energy savers. Many dishwashers have NSF sanitized wash cycles.

III. Product Specific

IIIA. Product Specification Chart

- Rated 120V, 60 Hz, 15A, 1450W (max.). Maximum amp draw when heaters running ~ 11A.
- Water connection 3/8" NPT female.
- Inlet water pressure range 5 - 120 psi (0.3 – 8.27 bars).
- Circulation pump motor rated 120V, 60 Hz, 160W, insulation class A. Motors are thermally protected and use a 10μF capacitor.
- Drain pump rated 120V, 60 Hz, 35W, 0.85A.

IIIB. Model Number Listing and Explanation

Model numbers were changed with the dishwashers introduced during the 4th quarter of 2002.

- Current model # listing – see below
- Older model # listing – see below

Current Model # Legend								
S	H	V	9	9	A	0	3	
Dishwasher	Tall Tub	Type	# Wash Programs	Control	Sold Through	Dummy #	Color	UC/#
1	2	3	4	5	6	7	8	9
S = Dishwasher	**H =** Tall Tub	**U =** Undercounter, standard	**9 =** Automatic	**0 =** Mechanical	**A =** Distribution	PLACE HOLDER	**2 =** White	CSI
		V = Fully integrated	**6 =** Six	**3 =** Electronic	**B =** Sears		**5 =** Stainless	
		X = Integra I	**5 =** Five	**6 =** Electronic + Options	**C =** Common		**6 =** Black	
		Y = Integra II	**4 =** Four	**9 =** Automatic	**D =** Builder		**7 =** Biscuit	
		I = Semi Integrated	**3 =** Three		**E =** Other		**3 =** N/A, Fully Integrated	

Old Model # Legend							
S	H	V	6	8	0	3	
Dishwasher	Tall Tub	Type	# Wash Programs	Control	Level	Color	UC/#
1	2	3	4	5	6	7	8
S = Dishwasher	**H =** Tall Tub	**U =** Undercounter, standard	**9 =** Integra I (four) or II (five)	**0 =** Mechanical	**0 =** Standard	**2 =** White	CSI
		V = Fully integrated	**6 =** Six	**3, 8** & **9 =** Electronic	**1, 2** & **3 =** Deluxe	**3 =** N/A, Fully Integrated	
		U88xx & **U99xx =** Integra I	**5 =** Five		**5 =** Integra II	**4 =** Almond	
		U995x = Integra II	**4 =** Four			**5 =** Stainless	
		I = Semi Integrated	**3** & **8 =** Three			**6 =** Black	
						7 = Biscuit	

III. Product Specific

IIIC. Model Number Location

Located on right edge of inner door. See below.

The serial label is fastened to the right edge of the inner door.

FD8303 00011

Understanding FD Serial # (used for warranty)

The FD # shows the Fabrication Date

- The first 2 #s represent the year: 83 = 2003 (add 20 to #; e.g. 20 + 83 = 103 → 2003)
- The next 2 #s represent the month: 03 = March
- The next 5 #s represent the unit made that month: 00011 = 11th SHY99A05UC made that month

This helps the factory investigate product problems.

10 3 03 0081344 00011 5 **Understanding Factory Serial #**

- The first 2 #'s represent a factory code: 10 = New Bern dishwasher, 82 = New Bern cooking
- The 3rd # represents the last digit of the year: 3 = 2003
- The next 2 #'s represent the month: 03 = March
- The next 7 #'s represent the model: 0081344 = SHY99S05UC
- The next 5 #'s represent the unit made that month: 00011 = 11th SHY99A05UC made that month
- The last # represents a check digit = 5 in this case (is dependent on all preceding #'s)

Please hold all warranty parts for (60) days for possible return for analysis.

III. Product Specific

IIID. Tech Sheet Location

Wiring and circuit diagram folded up and located in slot in front of dishwasher bases.

IIIE. Warranty Information

See below.

Bosch Dishwashers Limited Lifetime Warranty

Statement of Limited Warranty

The warranties provided by BSH Home Appliances ("Bosch") in this Statement of Warranties apply only to Bosch dishwashers sold to the first using purchaser by Bosch or its authorized dealers, retailers or service centers in the United States or Canada. The Warranties provided herein are not transferable, and take place from date of installation or ten business days after delivery date, whichever comes first.

1 Year Full Limited Warranty

Bosch will repair or replace, free of charge, any component part that proves defective under conditions of normal home use, labor and shipping costs included. Warranty repair service must be performed by an authorized Bosch Service Center. All cosmetic defects must be reported within 30 days of installation.

2 Year Limited Warranty

Bosch will provide replacement parts, free of charge, for any component part that proves defective under conditions of normal home use, shipping costs included, labor charges excluded.

5 Year Limited Warranty On Electronics

Bosch will repair or replace, free of charge, any microprocessor or printed circuit board that proves defective under conditions of normal home use during the second through fifth year from the date of original installation, labor charges excluded.

5 Year Limited Warranty On Racks

Bosch will repair or replace, free of charge, the upper or lower dish rack (excluding rack components) if the rack proves defective under conditions of normal home use during the second through fifth year from the date of original installation, labor charges excluded.

Lifetime Limited Warranty Against Stainless Steel Rust-Through

Bosch will replace your dishwasher, free of charge, with the same model or a current model that is equivalent or better in functionality if the inner liner should rust through under conditions of normal home use, labor charges excluded. Bosch will replace the stainless steel door of any dishwasher if the door should rust through under conditions of normal home use, labor charges excluded.

For location of nearest repair depot call 1-800-944-2904 from 5:00 AM - 5:00 PM M-F (Pacific time)

IV. Installation Issues

IVA. Location Requirements

See attached installation instructions.

IVB. Electrical Requirements

See attached installation instructions.

IVC. Water/Drain Requirements

See attached installation instructions.

IVD. Shipping/Packaging Removal

See attached installation instructions.

IVE. Installation Related Process

1. **Leveling cabinet –** See attached installation instructions.
2. **Leveling doors –** not required for steel doors. For wooden panels added to steel doors, see installation instructions.
3. **Installing handles –** See attached installation instructions.
4. **Door reversal –** not possible or necessary.
5. **Quick test procedure**

Top Ten Cosmetic/Customer Use/Installation Issues:

- Not cleaning sump filters….Customers often don't know they exist.
- Smelly dishwashers….Often occurs from filters not being cleaned, drain hose high loops missing or drain gases being present. If all else is OK, then problem can be preservative not purged from tank door gasket.
- Doors leaking or not latching….Usually an installation issue (dishwasher brackets installed before dishwashers are leveled front to back, tanks & doors out of square, wooden doors not drilled accurately). Can be blockage in condensation tubes or having condensation tubes connected to drain hose air gaps.
- Inner door damage….From upper rack during improper shipping and handling (dishwashers clamped on wrong sides or dropped).
- Doors hit toe kicks….Toe kick installation issue.
- Junction boxes….Comes from wires not being connected correctly during installation.
- Dispensers….Customers using too much detergent, not using rinse-aid & not knowing how to close the door.
- Drain hoses not installed properly….Often no air gap or high loop + pinched hoses -- causes poor draining & smelly dishwashers. Most drain pumps are mistakenly replaced for drain hose installation issues.
- Outer doors….Most are dinged during shipment.
- Damaged water valves….Primarily from fittings being overtightened. A damaged valve can allow some water onto kitchen floors.

IV. Installation Issues: Installation Instructions

English

VERY IMPORTANT INSTRUCTIONS - TO BE READ

WARNING - OBSERVE ALL WARNINGS AND CAUTIONS

These instructions are intended for use by qualified installers only.

In addition to these instructions, the dishwasher shall be installed:

- In accordance with all local codes or, in the absence of a local code,
- In the United States, with the National Electric Code.
- In Canada, with the Canadian Electric Code C22.1 -latest edition/Provincial and Municipal codes and/or local codes.

Read these installation instructions completely and follow them carefully. They will save you time and effort and help to ensure safety and optimum dishwasher performance.

CAUTION: If the dishwasher is installed in a location that experiences freezing temperatures (e.g., in a holiday home), you must drain all the water from the dishwasher's interior. Turn off the water supply, disconnect the drain hose, and allow your dishwasher to completely drain into an appropriate receptacle. Water system ruptures that occur as a result of freezing are not covered by warranty.

IMPORTANT

- The dishwasher drain hose must be installed with a portion of it at least 20" (508mm) off the cabinet floor; otherwise the dishwasher may not drain properly.
- Bosch dishwashers are intended for residential use only, and should not be used in commercial food service establishments.
- NEW INSTALLATION - If the dishwasher is a new installation, most of the work must be done before the dishwasher is moved into place.
- REPLACEMENT - If the dishwasher is replacing another dishwasher, check the existing dishwasher connections for compatibility with the new dishwasher, and replace parts as necessary.

Inspect the Dishwasher

After unpacking the dishwasher and prior to installation, thoroughly inspect the dishwasher for possible freight or cosmetic damage. Report any damage immediately. Cosmetic defects must be reported within 5 days of installation.

NOTE: Do not discard any bags or items that come with the original package until after the entire installation has been completed.

English

IV. Installation Issues: Installation Instructions

English

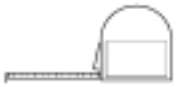
TOOLS NEEDED

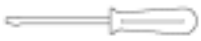

Hammer

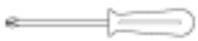

Hole Saw


Pipe Wrench


Adjustable Wrench


Tape Measure


Slot Screwdriver


Phillips Screwdriver


Torx Screwdriver


Wire Cutter


Wire Stripper


Drill


Level

MATERIALS NEEDED

(Additional materials may be required to comply with local codes.)


Electrical Supply Cable - Minimum #14 AWG, 2 conductor, 1 ground, insulated copper conductors.


Hot Water Supply Line - Minimum 3/8" O.D. copper tubing or metal braided dishwasher supply line.


Shut-off valve and fittings appropriate for hot water supply line (copper tubing/compression fitting, or braided hose).


90° elbow with 3/8" N.P.T. male threads on one leg, and sized to fit your water supply line (copper tubing/compression fitting, or braided hose) on the other leg.


Teflon tape or other pipe thread compound to seal plumbing connections.


UL listed conduit connector or strain relief.

English

IV. Installation Issues: Installation Instructions

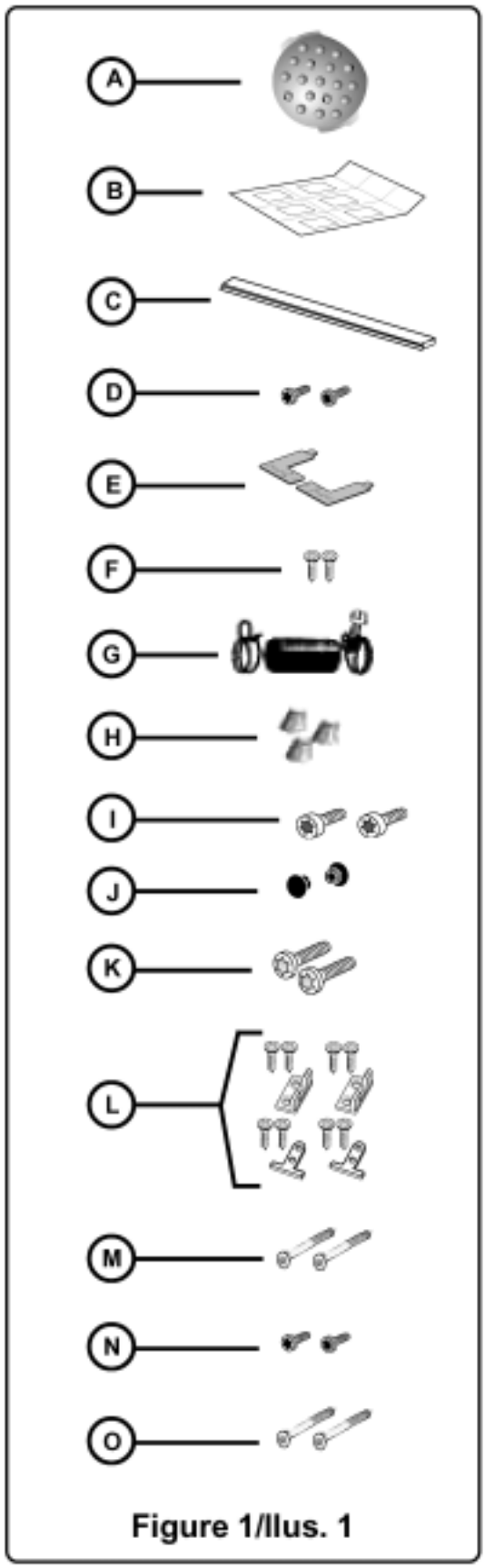


Figure 1/Illus. 1

English

MATERIALS SUPPLIED

Accessory Parts Supplied

Accessory Parts for your dishwasher will come in one or more plastic bags. Check to make sure that the parts shown in Figure 1 are included with your model (NOTE: Illustrations are not to scale). If any parts are missing, contact your dealer immediately.

Manual Set Bag

All Bosch dishwashers come with a Manual Set Bag containing:

- Use & Care Manual
- Installation Instructions
- Quick Reference Guide
- Extra Tall Item Sprinkler (Figure 1, letter A)

SHI and SHV models also have SHI/SHV Panel Installation Template Sheet (Figure 1, letter B).

SHY66 and SHX56 models also have a Cotton Insulation Strip (Figure 1, letter C).

Dishwasher Installation Kit (Clear Bag)

All Bosch dishwashers come with a Dishwasher Installation Kit containing:

D. Toe Panel Screws (2)
E. Mounting Brackets (2)
F. Mounting Bracket Screws (2)
G. Rubber Connection Hose (1) and Drain Hose Clamps (2)
H. Wire Nuts (3)
I. Junction Box Screws (2)

SHI and SHV Models

In addition to a Manual Set Bag and an Installation Kit Bag, SHI and SHV models also come with a Door Panel Installation Kit (Blue bag) containing:

J. Caps (2)
K. Spring Tension Screw (2)
L. Door Mounting Brackets (2 plastic) w/Screws (4); Mounting Door Brackets (2 metal) w/Screws (4)
M. Wood Screws (2)

SHY66 & SHX56 Models

In addition to a Manual Set Bag and an Installation Kit Bag, SHY66 and SHX56 models also come with a Toe Panel Installation Kit (Green Bag) containing:

N. Toe Panel Screws (2)
O. Base Part Screws (2)

IV. Installation Issues: Installation Instructions

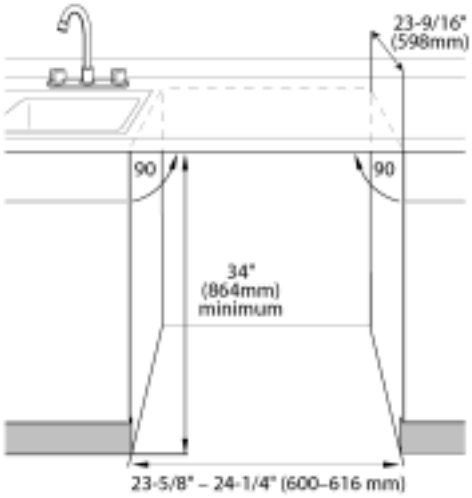


Figure 2/Ilus. 2

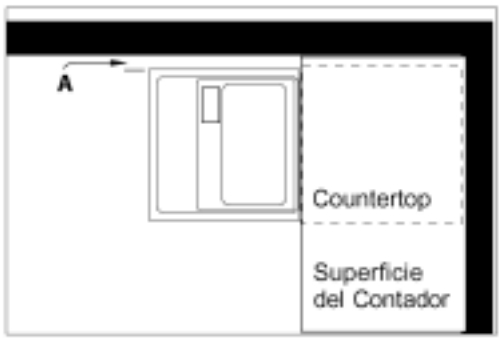


Figure 3/Ilus. 3

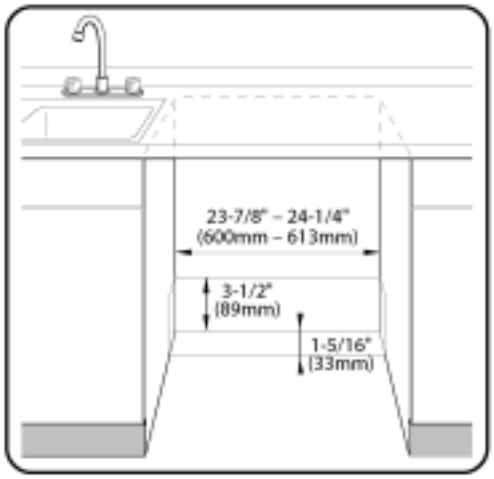


Figure 4/Ilus. 4

English

ENCLOSURE PREPARATION

⚠ WARNING: INJURY HAZARD - Serious injury could result if cabinet work is performed by unqualified persons. Only qualified carpenters or cabinetmakers should perform cabinet work.

NOTE: Bosch dishwashers are designed to be enclosed on the top and both sides by standard residential kitchen cabinetry.

Select a location as close to the sink as possible for easy access to water supply and drain lines.

For proper dishwasher operation and appearance, ensure that the enclosure is square and has the dimensions shown in Figure 2.

If the dishwasher is to be installed in a corner, make sure that there is adequate clearance to open the door, as shown in Figure 3, letter A.

⚠ WARNING: ELECTICAL SHOCK/ FIRE HAZARD - Heat from the hot water supply line can cause electrical cable's insulation to break down, presenting risk of electrical shock or fire. Do not run the electrical supply cable and the hot water supply line through the same enclosure opening.

If the enclosure requires openings for the electrical supply cable, hot water supply line, and dishwasher drain hose, place them within the dimensions shown by the shaded area of Figure 4 to avoid interference with the dishwasher frame or other components. Make the openings for the electrical supply cable and hot water supply line 1" (25.4mm) diameter. Make the opening for the dishwasher drain hose 1-1/4" (32mm) diameter. If the openings are made through wood, sand them smooth. If the openings are made through metal, make them large enough to accomodate grommets or other protective sheaths with inside diameters of 1" (25.4mm) for the electrical supply cable and the hot water supply line, and 1-1/4" (32mm) for the dishwasher drain hose.

IV. Installation Issues: Installation Instructions

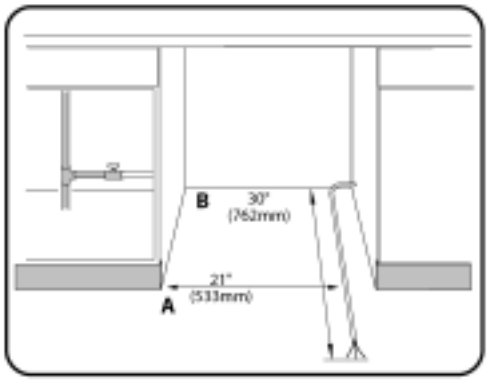


Figure 5/Ilus. 5

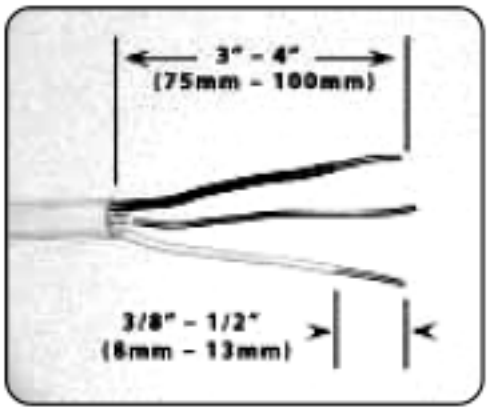


Figure 6/Ilus. 6

English

ELECTRICAL PREPARATION

⚠ WARNING: ELECTRICAL SHOCK HAZARD - Working on an energized circuit could result in serious injury or death. Only qualified electricians should perform electrical work. Do not attempt any work on the dishwasher electric supply circuit until you are certain the circuit is de-energized.

⚠ WARNING: FIRE HAZARD - Improper electrical work can cause fire. Only qualified electricians should perform electrical work.

Electrical Supply

The customer has the responsibility of ensuring that the dishwasher electrical installation is in compliance with all national and local electrical codes and ordinances. The dishwasher is designed for an electrical supply of 120V, 60 Hz, AC, connected to a dishwasher-dedicated, properly grounded electrical circuit with a fuse or breaker rated for 15 amps. If the dishwasher is connected with a food disposer, a 20 amp (and no higher) fuse or circuit breaker may be used. Electrical supply conductors shall be a minimum #14 AWG copper wire.

Regardless of where the electrical supply cable enters the enclosure (following the guidelines on page 8), position the cable 21" (533mm) from the enclosure's left side, as shown in Figure 5, letter A. Extend the cable 30" (762mm) from the enclosure's back, as shown in Figure 5, letter B.

Remove 3" - 4" (75mm - 100mm) of the cable's outer casing, as shown in Figure 6, letter C, then remove 3/8" - 1/2" (9 - 13mm) of insulation from each conductor, as shown in Figure 6, letter D.

Dishwasher Electrical Rating

Volts	Hertz	Amperes	Watts
120	60	15	1,450 (max)

IV. Installation Issues: Installation Instructions

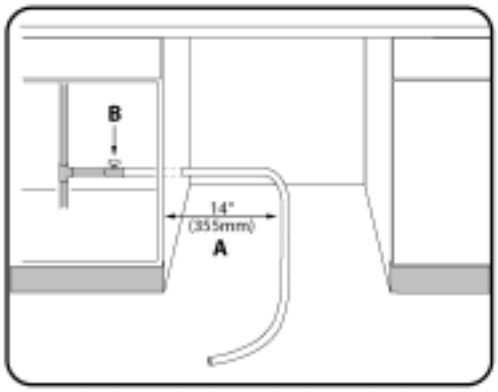


Figure 7/Ilus. 7

English

PLUMBING PREPARATION

⚠ **WARNING: SCALD HAZARD - Serious injury could result if work is performed on a charged hot water line. Only qualified plumbers should perform plumbing work. Do not attempt any work on the dishwasher hot water supply plumbing until you are certain the hot water supply is shut off.**

CAUTION: Temperatures required for soldering and sweating will damage the dishwasher's base and water inlet valve. If plumbing lines are to be soldered or sweated, keep the heat source at least 6 inches (152.4 mm) away from the dishwasher's base and water inlet valve.

Hot Water Supply
Bosh recommends that the hot water heater be set to deliver approximately 120° F (49° C) water to the dishwasher. Water that is too hot can cause some detergents to loose effectiveness. Lower water temperatures will increase run times.
The hot water supply pressure must be between 5 - 120 psi (0.3 - 8.27 bars).

Hot Water Supply Plumbing
NOTE: Regardless of where the hot water supply line enters the enclosure (following the guidelines on page 8), position the line 14" (355mm) from the enclosure's left side, as shown in Figure 7, letter A.
NOTE: Decide whether braided hose or copper tubing will be used for the hot water supply plumbing, and purchase the correct type of hot water supply shut-off valve, 90° elbow, and necessary fittings for the hot water supply plumbing.
Install an easily accessible shut-off valve (not supplied) in the hot water supply line, as shown in Figure 7, letter B.
All solder connections must be made before the water line is connected to the dishwasher's water inlet valve.
Water may also be supplied to the dishwasher by using a braided hose line. Check with your local plumbing supply sources for the proper hose and 90° elbow fitting.

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IV. Installation Issues: Installation Instructions

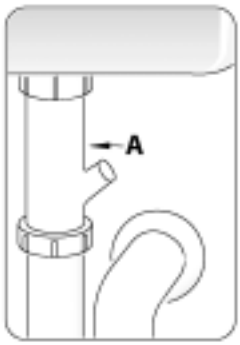


Figure 8
Ilus. 8

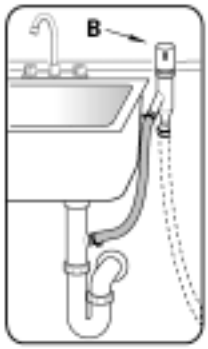


Figure 9
Ilus. 9

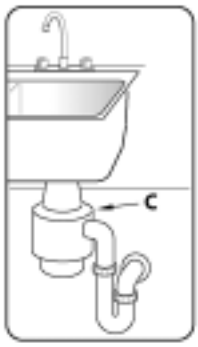


Figure 10/Ilus. 10

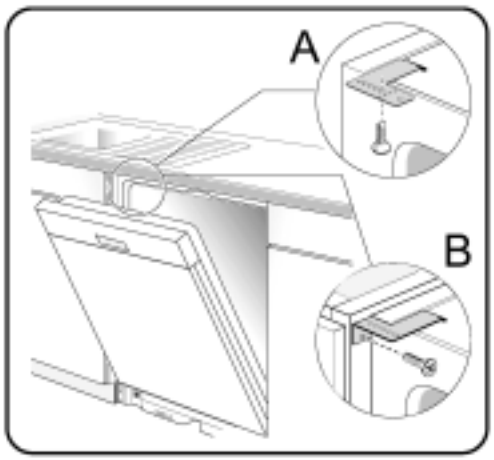


Figure 11/Ilus. 11

English

PLUMBING PREPARATION (continued)

Drain Plumbing

Dishwasher Connection Piece

If the dishwasher is to drain either directly into the household drain plumbing or through an air gap, install a dishwasher connection piece under the sink, as shown in Figure 8, letter A.

Installing an Air Gap

If local ordinances require an air gap, as shown in Figure 9, letter B, install it according to the manufacturer's instructions.

Disposer

If a disposer is to be installed, as shown in Figure 10, letter C, install it according to the manufacturer's instructions. Whether the disposer is newly installed or existing, remove the disposer's dishwasher drain connection plug.

DISHWASHER PREPARATION

Dishwasher preparation involves four tasks:

- Installing the Mounting Brackets
- Removing the Toe Panel
- Installing the 90° elbow fitting
- Junction Box Preparation

Installing the Mounting Brackets

CAUTION: Before installing the supplied mounting brackets (letter E in the Materials Supplied section of this manual), decide which method of securing the dishwasher into its enclosure will be used. Once the mounting brackets are installed on the dishwasher, removing them is difficult and will damage the mounting brackets and the dishwasher.

The dishwasher can be secured into its enclosure in two ways:

1) **Top Mount** is used for countertops made of wood or other materials that can easily drilled. Orient the mounting brackets as shown in Figure 11, letter A, and position the two small tabs on the mounting brackets over the two slots on the dishwasher's front corners. Push the mounting brackets down firmly to insert the tabs into the slots.

2) **Side Mount** is used for countertops made of marble, granite, or other very hard materials that cannot be easily drilled. Bend the mounting brackets along the small holes and in the same direction as the two small tabs. Orient the mounting brackets as shown in Figure 11, letter B, and position the two small tabs on the mounting brackets over the two slots on the dishwasher's front corners. Push the mounting brackets down firmly to insert the tabs into the slots.

(Continued on next page)

IV. Installation Issues: Installation Instructions

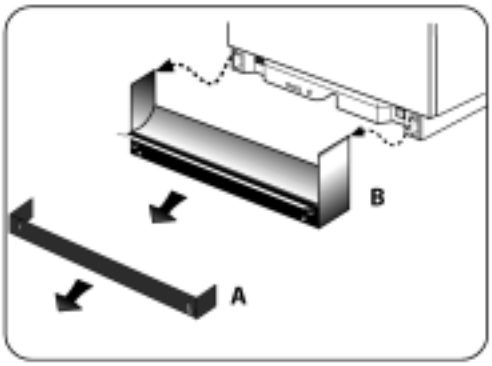


Figure 12/Ilus. 12

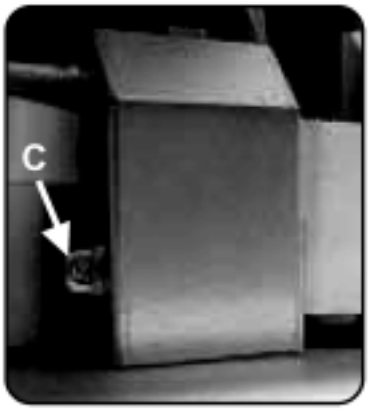


Figure 13/Ilus. 13

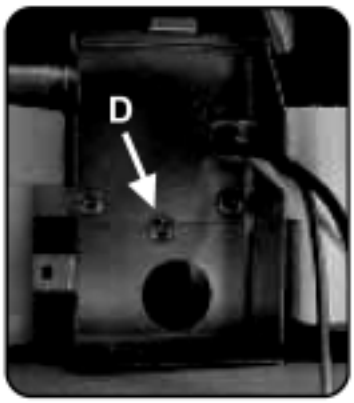


Figure 14/Ilus. 14

English

DISHWASHER PREPARATION (continued)

Removing the Toe Panel
Regular Toe Panel
The toe panel is loosely attached with tape. Remove the tape and pull the toe panel away from the dishwasher. Set the toe panel aside. It will be reinstalled later.
SHY66 and SHX56 Base and Toe Panel
The base and toe panel are in place on the dishwasher, but are not attached. Remove the toe panel first, as shown in Figure 12, letter A, then remove the base, as shown in Figure 12, letter B

Installing the 90° Elbow Fitting
NOTE: The 90° elbow fitting is not supplied with the dishwasher, and must be purchased separately. If the dishwasher's hot water supply line is to be copper tubing, make certain the elbow has a compression fitting.
Apply Teflon tape or other pipe sealant to all threaded connectors.
Orient the hot water supply connection leg of the elbow toward the channel opening in the dishwasher base.

Junction Box Preparation
1) Remove the junction box cover by removing the screw on the left side of the junction box, as shown in Figure 13, letter C, and lifting the junction box cover up and off.
2) Remove the strain relief plate by removing the screw at the back of the junction box, as shown in Figure 14, letter D and sliding the strain relief plate out.
3) Set the junction box cover, strain relief plate, and screws aside. They will be re-installed later.

IV. Installation Issues: Installation Instructions

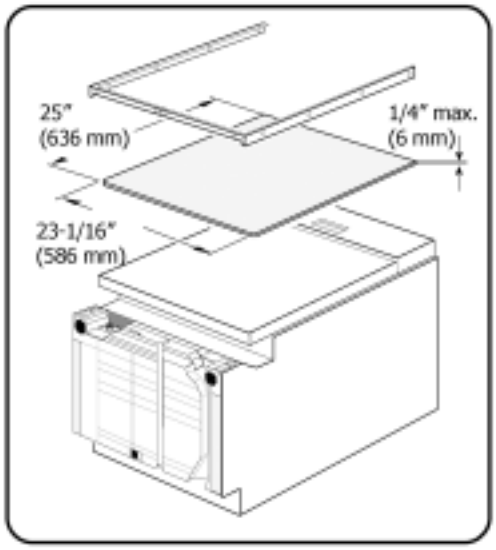


Figure 15/Ilus. 15

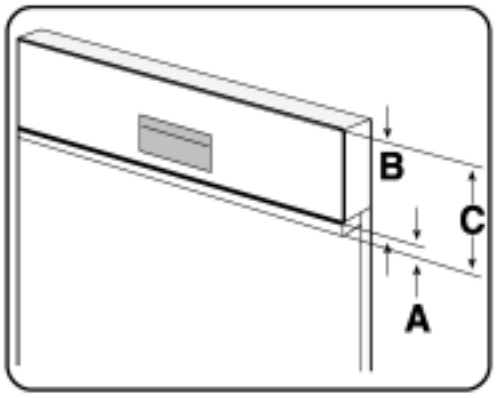


Figure 16/Ilus. 16

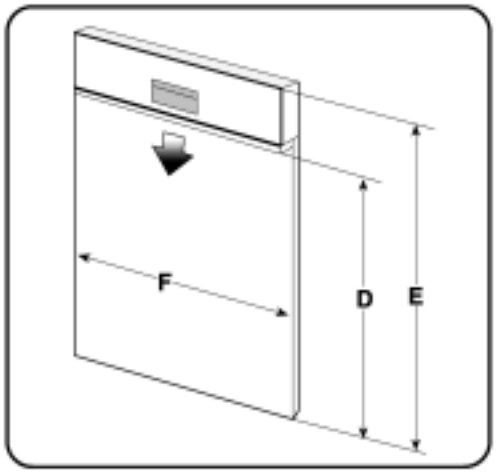


Figure 17/Ilus. 17

English

DOOR PANEL INSTALLATION

SHU Models - Accessory Panel Installation

If you have an SHU model and have ordered an accessory panel kit, install the panel prior to sliding the dishwasher into place. The panel dimensions are shown in Figure 15.

SHI Models - Panel Installation

SHI models come with additional mounting hardware and a template sheet with installation instructions. The stainless steel models of the SHI series also come with two extension pieces. The extension pieces are used to match the control panel height (Figure 16, "B" dimension) to the horizontal drawer line of the cabinets, and must be installed as shown in on the template sheet. The standard piece is used for drawer heights up to 6" (152mm); the long piece is used for drawer heights greater than 6" (152mm) but 6-7/16" (164mm) or less. If your drawers are taller than 6-7/16", you can either slide the extension piece in as far as it will go, or remove it and fit the door panel directly below the control panel.

SHI/SHV Models - Panel Installation

SHV models come with additional mounting hardware and a template sheet that will show you how to mount the panel. One side of the template shows how to mount a one piece panel; the other side shows how to mount a two piece panel. Decide which type of installation you want before proceeding with the installation.

Fig. 17 Dimension	Panel Dimension
D (SHI)	20 11/16" - 25" (526mm - 635mm)
E (SHI & SHV)	27 3/16" - 30 5/16" (690mm - 770mm)
F (SHI & SHV)	23 3/16" - 23 3/8" (589mm - 594mm)

IV. Installation Issues: Installation Instructions

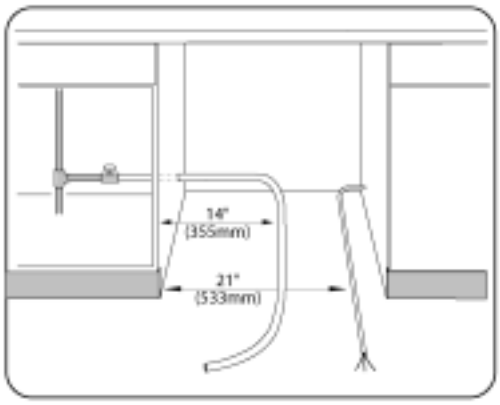


Figure 18/Ilus. 18

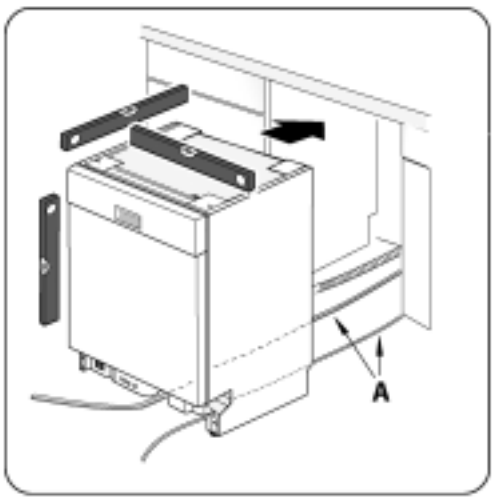


Figure 19/Ilus. 19

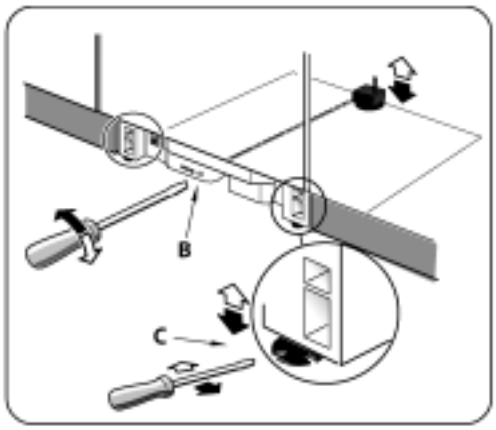


Figure 20/Ilus. 20

English

PLACING THE DISHWASHER

1) Straighten and position the hot water supply line and the electrical supply cable as shown in Figure 18 so that they will align with their channels under the dishwasher base.
2) Position the dishwasher close enough to the enclosure so that you can run the dishwasher drain hose to the under sink drain connection. Make certain that the hot water supply line and the electrical supply cable are in their channels under the dishwasher base, as shown in Figure 19, letter A.
3) Place the dishwasher directly in front of the enclosure.
4) Perform a level check as shown in Figure 19. Adjust the rear leveler by turning the center screw at the front of the dishwasher, as shown in Figure 20, letter B. Turning the screw clockwise raises the rear of the dishwasher. Adjust the front levelers by turning them with a screwdriver, as shown in Figure 20, letter C. Turning the levelers to the right raises the dishwasher. If additional height is needed, shims may be added under the leveler feet.
5) Push the dishwasher into the enclosure.

SECURING THE DISHWASHER

Drive the mounting screws through the holes in the mounting brackets, as shown in Figure 20, letter A for Top Mount, or as shown in Figure 21, letter B for Side mount.

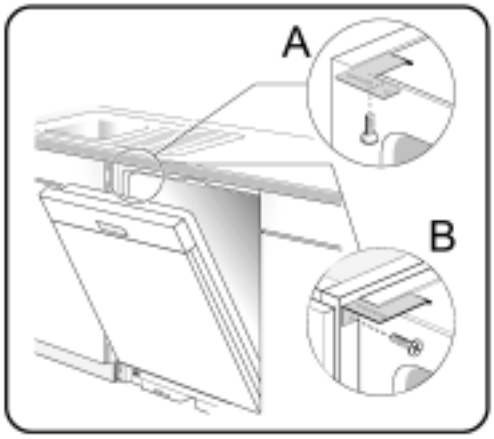


Figure 21/Ilus. 21

IV. Installation Issues: Installation Instructions

Figure 22
Ilus. 22

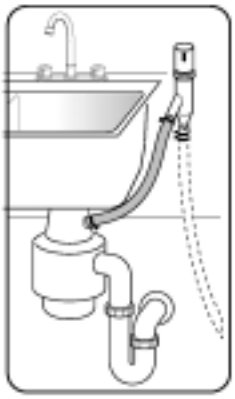


Figure 23
Ilus. 23

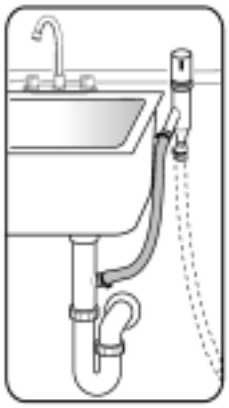


Figure 24
Ilus. 24

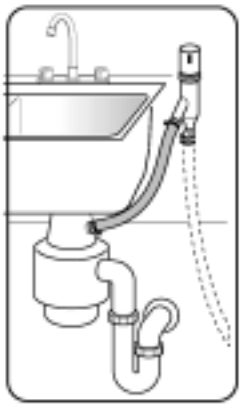


Figure 25
Ilus. 25

English

DRAIN HOSE CONNECTION

The dishwasher drain hose may be connected to the drain plumbing in one of four ways:
1) Directly to the undersink dishwasher drain connection, as shown in Figure 22.
2) Directly to a disposer dishwasher drain connection, as shown in Figure 23.
3) To the undersink dishwasher drain connection through an air gap, as shown in Figure 24.
4) To a disposer dishwasher drain connection through an air gap, as shown on Figure 25.

Information on installing air gaps and disposers can be found in the Plumbing Preparation section of this manual.

NOTE: If the dishwasher drain hose is to be connected to a disposer dishwasher drain connection, remove the plug from the disposer's dishwasher drain connection.
Use the supplied Rubber Connection Hose and Drain Hose Clamps (letter G in the Materials Supplied section of this manual) to connect the dishwasher drain hose to the plumbing drain connection. Use the spring clamp to secure the Rubber Connection Hose to the dishwasher drain hose. Use the screw clamp to secure the Rubber Connection Hose to the plumbing drain connection.
If the dishwasher drain hose is connected directly to either an undersink dishwasher drain connection, as shown in Figure 22, or to a disposer dishwasher drain connection, as shown in Figure 23, form a curve in the dishwasher drain hose and secure a portion of the curve at least 20" (508mm) above the cabinet floor.

22 Drain Hose Connection | Connexion du Tuyau Vindange | Conexión - Manguera de Desagüe

IV. Installation Issues: Installation Instructions

English

HOT WATER CONNECTION

⚠ WARNING: SCALD HAZARD - Working on a charged hot water line could result in serious injury or death. Do not attempt any work on the dishwasher hot water supply plumbing until you are certain the hot water supply is shut off.

NOTE: Make certain that the correct 90° elbow fitting (not supplied) for the hot water supply line has been purchased and installed on the dishwasher as described in the Dishwasher Preparation section of this manual.
The hot water supply line may be connected to the dishwasher in one of two ways:
1) With braided hose
2) With copper tubing

Braided Hose
Ensure that all threaded connections are sealed with teflon tape or pipe thread compound.

Copper Tubing
CAUTION: Temperatures required for soldering and sweating will damage the dishwasher's water inlet valve. If plumbing lines are to be soldered or sweated, keep the heat source at least 6 inches (152.4 mm) away from the dishwasher's water inlet valve.

- If using a solder joint instead of a compression fitting, be sure to make all solder connections before connecting the water line to the dishwasher.
- Make certain there are no sharp bends or kinks in the water line that might restrict water flow.
- When connecting threaded pipe use pipe thread compound or Teflon tape to seal the connection.
- Before connecting the copper hot water supply line to the dishwasher, flush it with hot water to clear any foreign material.
- Turn on the water supply to check for leaks after making connections.

24 Hot Water Connection | Connexion eau Chaude | Conexión de Agua Caliente

IV. Installation Issues: Installation Instructions

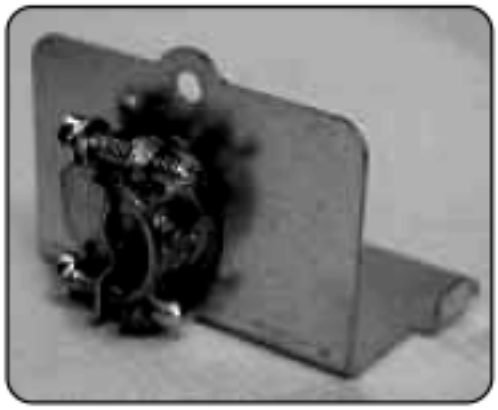


Figure 26/Ilus. 26

Figure 27/Ilus. 27

English

ELECTRICAL CONNECTION

⚠ WARNING: ELECTRICAL SHOCK HAZARD - Working on an energized circuit could result in serious injury or death. Only qualified electricians should perform electrical work. Do not attempt any work on the dishwasher electric supply circuit until you are certain the circuit is de-energized.

⚠ WARNING: FIRE HAZARD - Improper electrical work can cause fire. Only qualified electricians should perform electrical work.

Grounding Instructions

The dishwasher must be properly grounded before operating. This appliance must be connected to a grounded metal permanent wiring system, or an equipment grounding conductor must be run with the circuit conductors and connected to the equipment grounding terminal or lead on the dishwasher. Make sure that the dishwasher is connected to a suitable ground in compliance with all local codes or, in the absence of a local code, with the NATIONAL ELECTRICAL CODE in the United States or the CANADIAN ELECTRIC CODE C22.1-latest edition in Canada as well as any provincial/state or municipal or local codes that apply.

1) Retrieve the strain relief plate, and install a strain relief (not supplied) into the opening on the strain relief plate. NOTE: Orient the strain relief as shown in Figure 26.
2) Pass the electrical supply cable through the strain relief, as shown in Figure 27. Leave 3 - 4 inches of insulated wire extending through the strain relief plate.
3) Tighten the strain relief screws.
4) Slide the strain relief plate into the junction box, and secure it to the junction box with the supplied screw.

(Continued on next page)

IV. Installation Issues: Installation Instructions

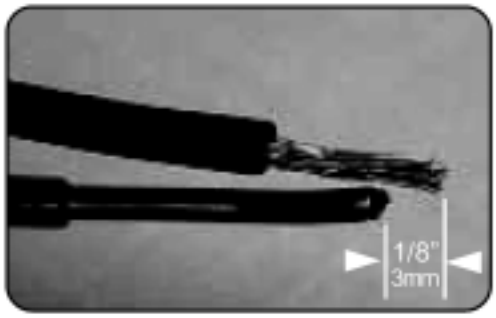


Figure 28/Ilus. 28

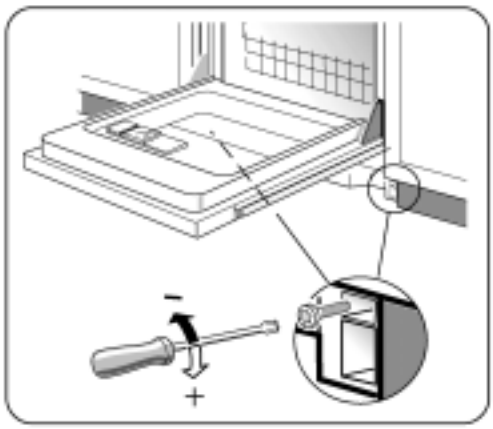


Figure 29/Ilus. 29

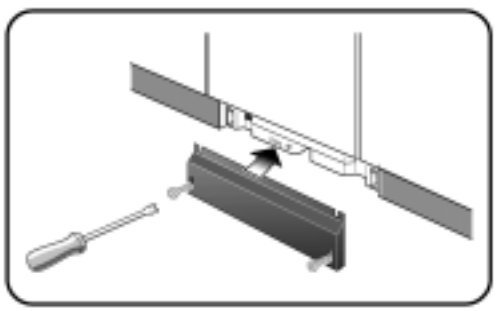


Figure 30/Ilus. 30

English

ELECTRICAL CONNECTION (continued)

⚠WARNING: FIRE HAZARD - LOOSE OR IMPROPER ELECTRICAL CONNECTIONS CAN CAUSE FIRE. MAKE CERTAIN THAT ALL ELECTRICAL CONNECTIONS ARE PROPERLY MADE.

• Do not pre-twist the wires before connecting them with wire nuts.
• Extend the dishwasher's stranded wires 1/8" (3mm) beyond the power supply cable's solid wires, as shown in Figure 28.
5) Using the supplied wire nuts, connect the electrical supply wires to the dishwasher's wires, black to black, white to white, and green or bare to green or bare. Make certain that the insulated wires show no bare wire from the bottoms of the wire nuts. Gently tug the wires to make certain they are securely connected.
6) Press the wires into the junction box. Make certain that the wire nuts do not loosen.
7) Place the cover on the juction box and secure it to the junction box with the supplied screw.

DOOR TENSION ADJUSTMENT (only on SHI and SHV models)

After the dishwasher is installed, open and close the door several times to make sure that it does so with ease. If the door closes too quickly or if the door falls open, the spring tension needs to be adjusted.
To Adjust the Spring Tension:
1) Obtain the provided Door Tension Screws (Figure 1, letter K) from the SHI/SHV parts bag.
2) Insert the screws as shown in Figure 29. Turning the screw clockwise increases the spring tension. Turning the screws counter-clockwise decreases the spring tension.

BASE AND TOE PANEL

Regular Toe Panel Installation

Use the toe panel screws (Figure 1, letter D) from the Dishwasher Installation Kit and a Torx screwdriver to install the toe panel as shown in Figure 30.
(Continued on next page)

IV. Installation Issues: Installation Instructions

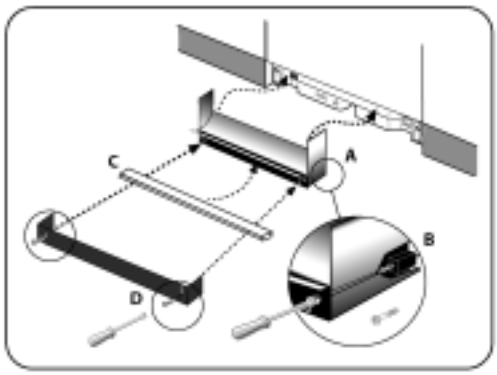


Figure 31/Ilus. 31

BASE AND TOE PANEL (Continued)

SHY66 & SHX56 Models Base and Toe Panel Installation

1) Place the Base Part under and up the front bottom panel of the dishwasher, as shown in Figure 31.
2) Insert the Base Part screws (Figure 1, letter O) into the Base Part, as shown in Figure 31, letter B. Tighten the Base Part Screws.
3) Place the Cotton Insulation Strip (Figure 1, letter C) under the unit, between the bottom of the Base Part and the floor, as shown in Figure 31, letter C.
4) Place the toe panel over the Cotton Insulation Strip, and use the toe panel screws (Figure 1, letter N) to secure the toe panel in place, as shown in Figure 31, letter D.

FINAL INSTRUCTIONS

1) Energize the dishwasher power supply circuit.
2) Consult the Bosch Dishwasher Use and Care Manual, and run the dishwasher through one complete cycle.
If the dishwasher does not operate properly, refer to the Self-Help section of the Use and Care Manual. If the dishwasher still does not operate properly, refer to the Customer Service Section of the Use and Care Manual.

CUSTOMER SERVICE

Your Bosch dishwasher requires no special care other than that described in the Care and Cleaning section of the Use and Care Manual. If you are having a problem with your dishwasher, before calling for service please refer to the Self-Help section of the Use and Care Manual. If service is necessary, contact your dealer or installer or an authorized service center. Do not attempt to repair the appliance yourself. Any work performed by unauthorized personnel may void the warranty.

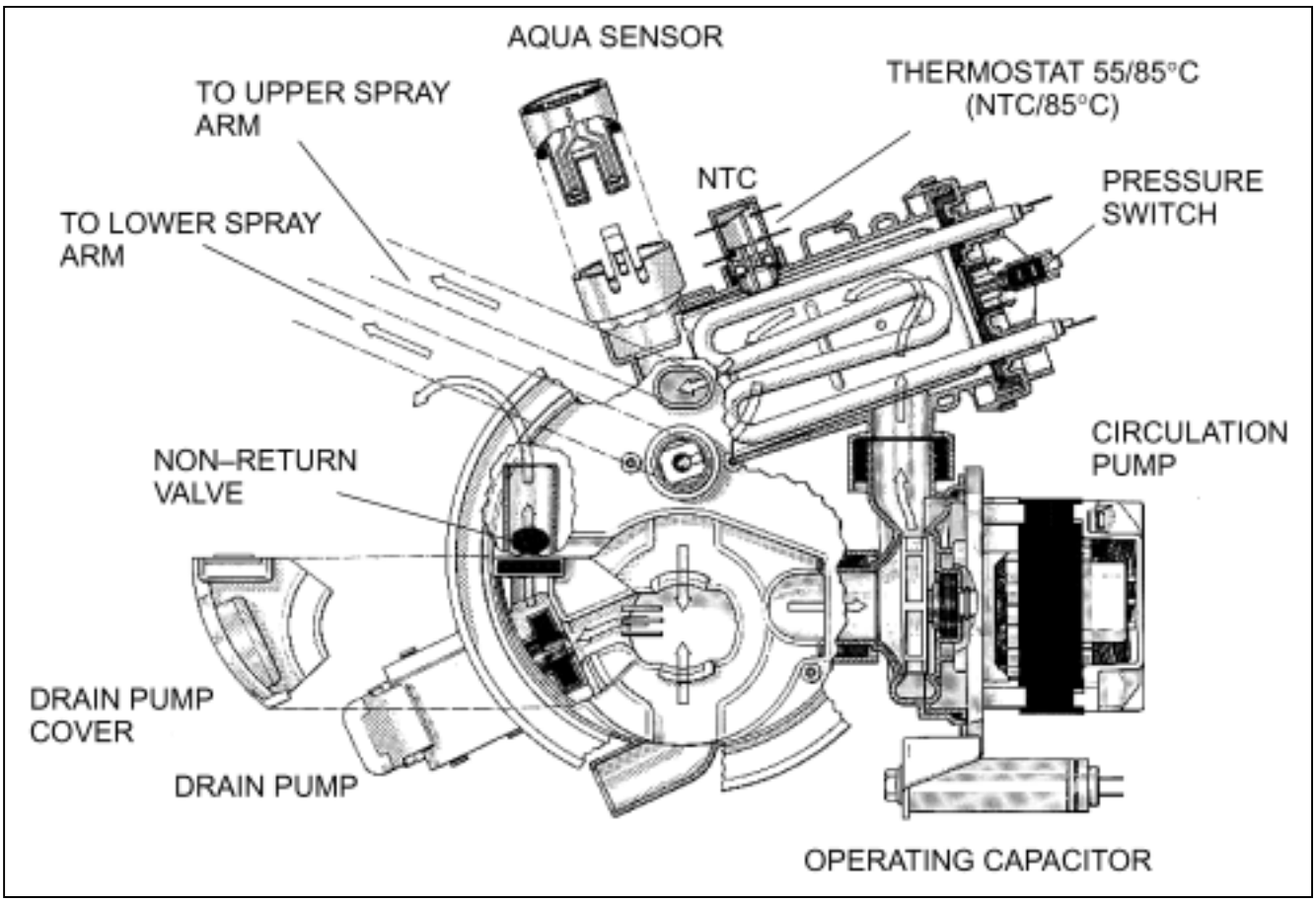
If you are having a problem with your Bosch dishwasher and are not pleased with the service
you have received, please take the following steps (in the order listed below) until the problem
is corrected to your satisfaction.

1. Contact your installer or the Bosch Authorized Service Contractor in your area.
2. E-mail us from the customer service section of our website, www.boschappliance.com.
3. Write us at the address below:
   BSH Home Appliances, Corp.
   5551 McFadden Avenue
   Huntington Beach, CA 92649
4. Call us at 1-800-944-2904.

V. Theory of Operation

VA. Description of Operation/Cycle

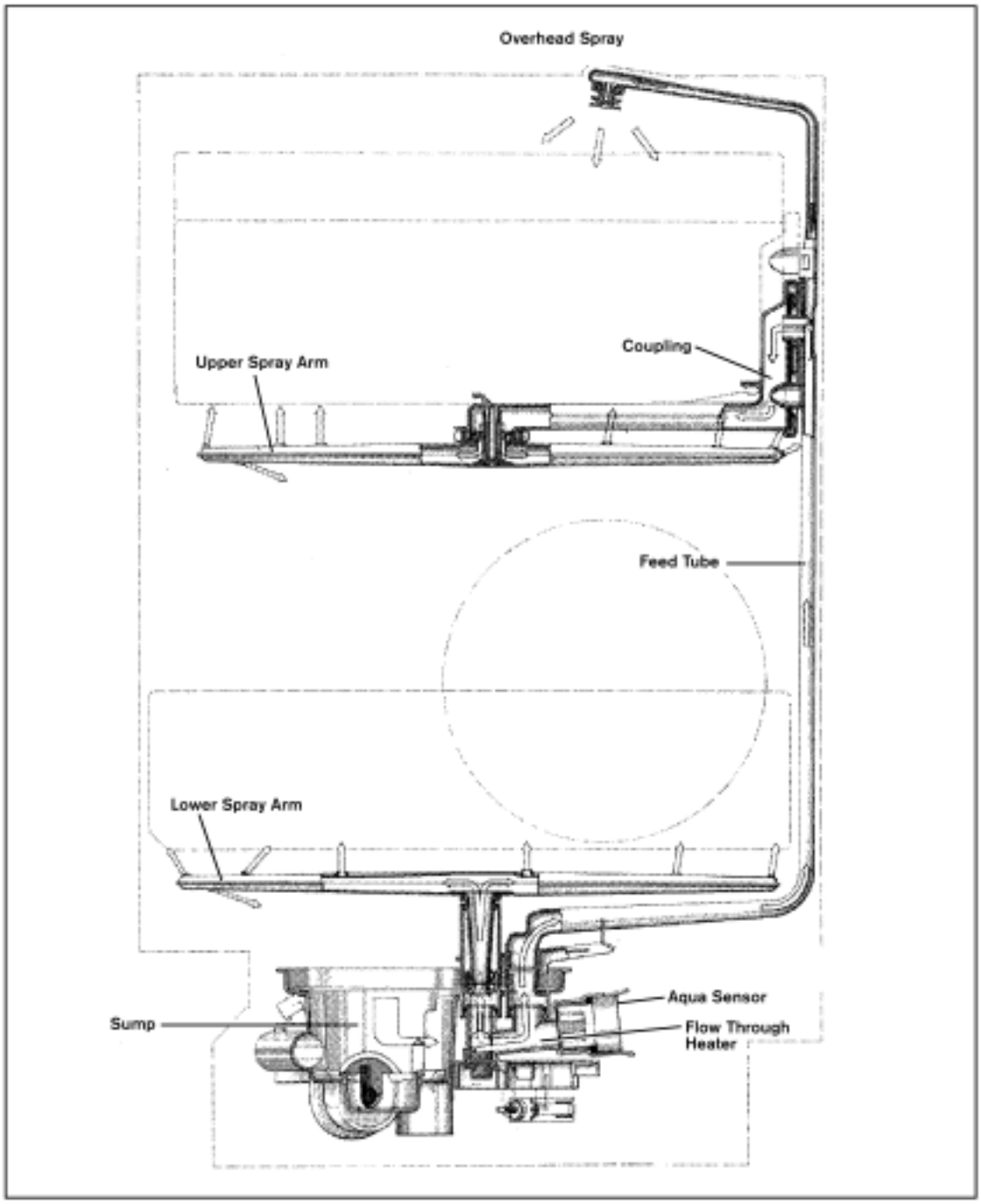
- Bosch dishwashers use separate circulation and drain pumps to reduce overall size, noise, vibration and energy consumption. This allows the use of tall tanks, increasing overall space inside dishwashers where full-sized plates can be placed in both upper and lower racks. Circulation pumps are suspended by rubber straps to further reduce noise and vibration.
- Bosch dishwashers use flow-through heaters instead of exposed elements used on most other dishwashers. Water from spray arms drops to the sump and flows through the circulation pump into the flow-through heater. Flow-through heaters prevent dishware damage from exposed elements and allow water to be continuously filtered and heated. Bosch flow-through heaters heat water by two degrees (ºF) per minute. All heaters are protected by a 185ºF Hi-limit (high temperature cutout) and by a flow switch which prevents heaters from operating when no water is flowing.
- Bosch dishwashers regulate water temperatures using NTC (Negative Temperature Coefficient) sensors and electronic controls. As water temperatures increase, NTC resistances decrease. Electronic control modules measure these resistance changes and hold wash and rinse cycles to tight preset temperatures. Older Bosch mechanical dishwashers use thermostats to regulate water temperatures.
- Bosch dishwashers use condensation drying instead of exposed heating elements. Tanks and inner doors are coated with bitumen (asphalt compound) which absorbs and retains heat from the heated wash and rinse water. A condensation tube is connected to a cold zone in the tank which isn't covered by bitumen (on right side tank wall for UC/12 & later models and at detergent dispenser on older UC/06 – UC/11 models). Since the cold zone doesn't retain heat and is cooler than the areas coated with bitumen, moisture condenses around it and exits the dishwasher through the condensation tube. For best results, doors should remain closed until dishwashers have completely finished drying.



V. Theory of Operation

VA. Description of Operation/Cycle (continued)

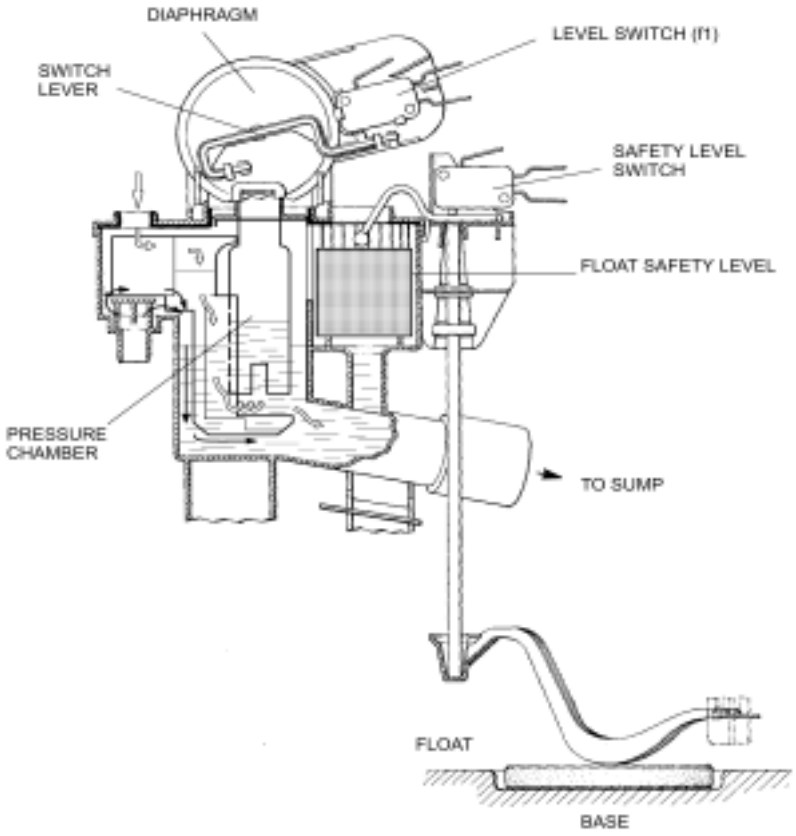
- Bosch dishwashers continuously filter all water using a triple filter method. A filter screen above the sump filters out larger particles. A two-stage microfilter in the sump filters out finer particles. This microfilter can easily be removed by customers for cleaning and should be cleaned regularly.
- All currently sold Bosch dishwashers use aqua sensors to save water and energy – many older models used them as well. These aqua sensors, located in the sump next to the flow-through heater, measure water cleanliness (using a light beam and sensor) and add a pre-wash and/or pre-rinse cycle only if water is dirty. Aqua sensors can save up to 20% of water and energy usage.
- Bosch dishwashers use a four-level water spray as shown below. Water sprays up from the lower spray arm, down from the overhead sprayer and both up and down from the upper spray arm.



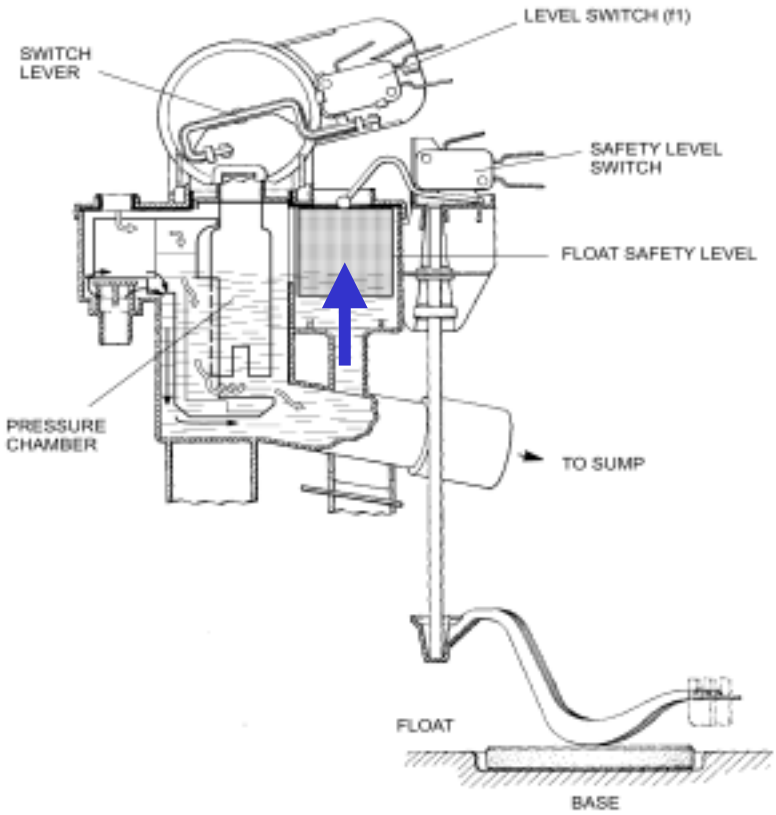
V. Theory of Operation

VA. Description of Operation/Cycle (continued)

- Bosch dishwashers fill with water as shown below.



Normal fill: Water rises to proper level, pushing air in pressure chamber which operates diaphragm.



Overfill: Water rises too high & operates float switch, causing drain pump to remove water from sump.

V. Theory of Operation

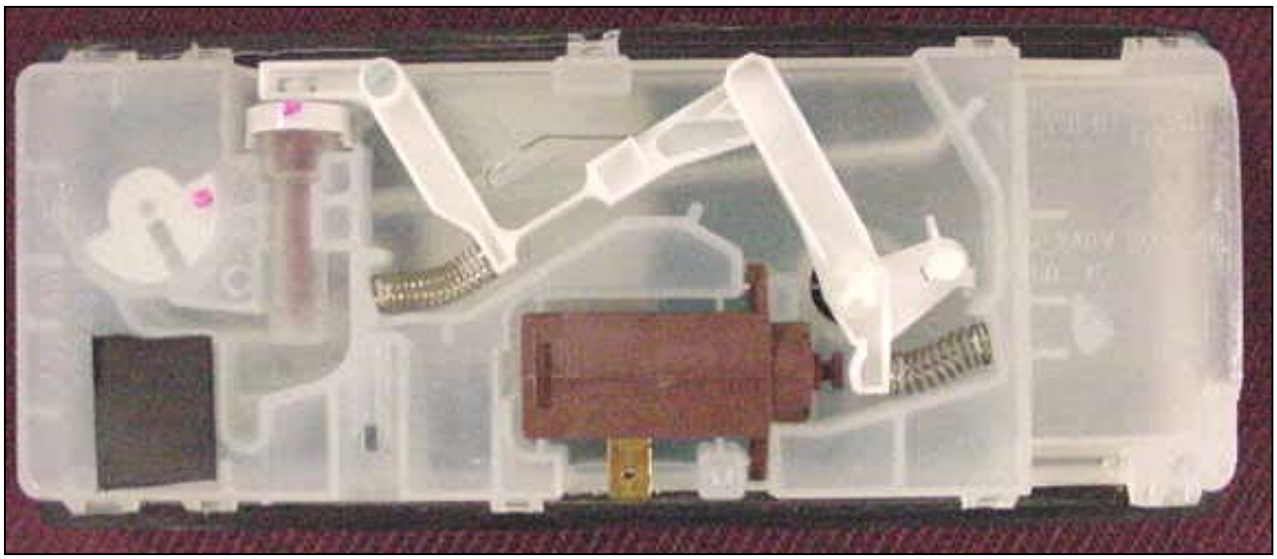
VB. Description of Components

- **Circulation pump --** Unlike many dishwashers, Bosch dishwashers use separate circulation and drain pumps to reduce noise, vibration, space and energy usage. The circulation pump circulates water from the sump into the spray arms.
- **Drain pump –** The drain pump drains water from the dishwasher. Being a separate pump, it is much smaller and uses much less energy than a single circulation/drain pump used on other dishwashers.
- **Impeller –** This part of the circulation pump is what drives water throughout the dishwasher. It uses a precisely manufactured ceramic disk to reduce friction, yet prevent water leaking. This is the part to replace in rarely used dishwashers if pumps don't turn.
- **Flow-through water heater –** Unlike most dishwashers, that rely on exposed heating elements in the bottom of tanks, Bosch dishwashers use flow-through water heaters (that heat ~ 2ºF/minute). This saves space and allows Tall Tubs (see below), where full-sized plates can be placed in both upper and lower racks.
- **NTC –** Stands for "Negative Temperature Coefficient". This temperature sensor in the water heater provides accurate water temperatures. Its called a "NTC" since its resistance goes down as the water temperature goes up.
- **Thermostat –** Temperature sensor (and switch) used on older mechanical dishwashers. They open when temperatures are reached.
- **Control module –** The brain of electronic dishwashers, it receives water temperature values and controls the entire wash process. It also contains the test program to help diagnose dishwasher issues.
- **Display module –** A separate electronic module with a digital display used on some models.
- **Water inlet valve –** Water valve which turns on and off to allow water into the dishwasher.
- **Water inlet system (with fill switch and diaphragm) --** It insures dishwashers fill properly at various incoming pressures. It uses a air pressure diaphragm and fill (micro) switch to alert the dishwasher control module when the proper amount of water has filled the dishwasher.
- **Float switch –** This safety feature shuts down the dishwasher and starts the drain pump if the dishwasher has gotten excessive water in the base or has overfilled. The drain pump empties out the sump and hoses, not the base (I.e. the drain pump isn't a base bilge pump).
- **Condensation drying –** This feature saves energy and enables Bosch dishwashers to have Tall Tubs – the tallest tubs in the industry, allowing full-sized plate to be placed in both upper and lower racks. Bitumen insulation around doors and tanks holds heat inside tanks, which forces water vapor out of tanks before it can condense onto dishes. The area around the condensation tube exit isn't coated with bitumen, providing a cold zone for water vapor to condense (instead of on dishes).
- **Condensation tube –** This is part of the genius of condensation drying. It carries moisture out of the tank while condensation drying is occuring.
- **Detergent & rinse-aid dispenser –** This dispenses detergent and rinse-aid at just the right times. In older dishwashers (service indexes UC/06 & UC/11), it attached to the condensation tube (in the door).
- **Aqua sensor *(Sensotronic)* –** This sends a beam of light through water in the heater and measures how clean the water is. Depending on water cleanliness, rinses are omitted, saving time & energy.
- **Microfilter and filter screen –** Unlike other dishwashers, the water in Bosch dishwashers is continuously filtered (100% of the time). The filter screen traps large food chunks while the two or three stage microfilter (depending on model) filters out small food particles.
- **Softer bearing –** Used to describe circulation pump mounting system using rubber straps to further reduce noise and vibration (on UC/11 & later models). Sumps and heaters were changed as well as circulation pumps. Older models (UC/06, UC/07 & UC/09) had pumps mounted on rubber bushings.
- **Tall tubs –** This distinctive feature allows full-sized plates (~ 10") to be placed in upper racks. The tallest tanks in the industry is made possible by separate pumps, condensation drying and good use of space in the dishwasher base.

V. Theory of Operation

Dispensers

During each wash program, the wax motor opens twice -- once to dispense detergent and again to dispense rinse-aid. The wax motor opens the same way -- the linkages make the separate compartments open.



NOTE: The white plastic linkage 1st opens the detergent dispenser door, then cocks in place to dispense rinse-aid when the wax motor operates the 2nd time. After the 2nd operation, the linkage resets itself so it will open the dispenser detergent door for the next wash program.

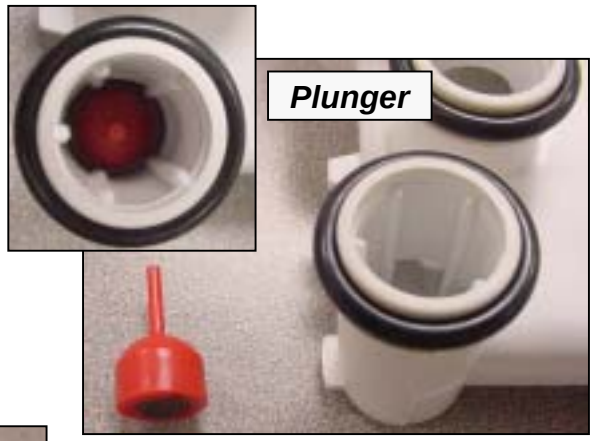
Condensation tube (for vented dispenser)

V. Theory of Operation

Top Rack Only

Models with the *Top Rack Only* feature have separate actuators mounted underneath heater assemblies. The actuator moves a magnetic plunger in the lower rack heater port, diverting water to the top rack.

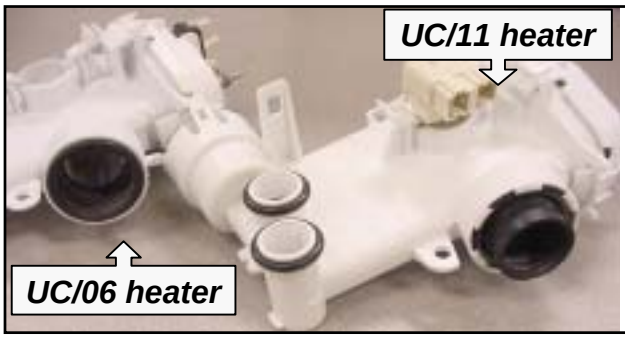
Heater with top rack actuator



Both racks

Top rack only

Where plunger engages sump



HINT: Do not use softer bearing heater assemblies (UC/11 & later) on older UC/06 models since the sump, circulation pump, base and heater clamps/gaskets have to be replaced as well for the heaters to fit.

HINT: Models with water switches and Top Rack Only have the Top Rack Only parts integrated with the water switches. No separate actuators are needed.

HINT: Models with water switches and Top Rack Only have the Top Rack Only parts integrated with the water switches. No separate actuators are needed.

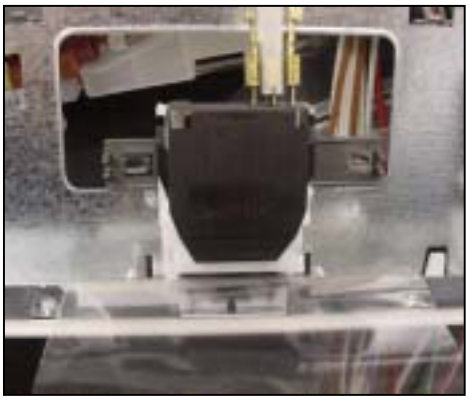
V. Theory of Operation

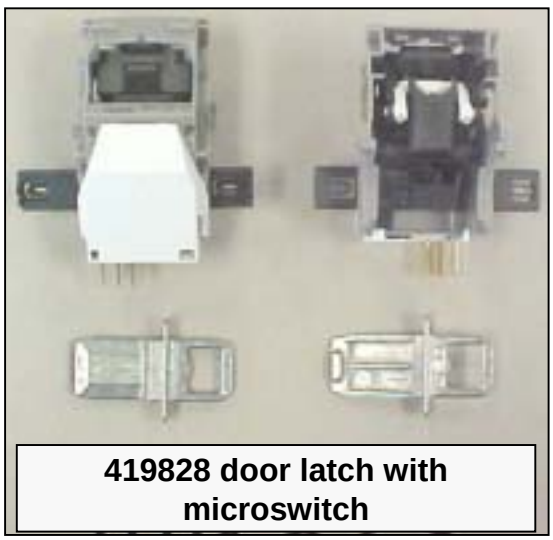
Door Latches

SHU & SHI dishwashers have door latches linked mechanically to door switches. All other dishwashers (SHV, SHX & SHY) use electronic door switches (microswitches activated by door latches).

187184 ball bearing door latch with microswitch

419827 door latch for SHI/SHU (for mechanical linking)



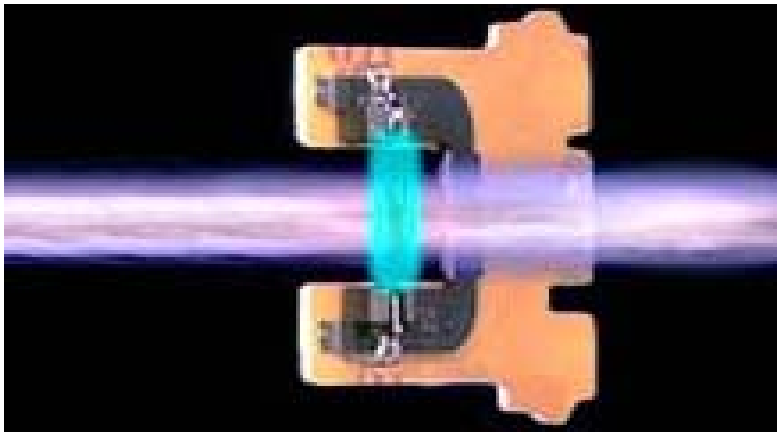


419828 door latch with microswitch

V. Theory of Operation

Aqua Sensors

The aqua sensor only affects energy usage, eliminating a pre-wash and/or pre-rinse cycle if water is clean. Most customers won't notice the difference if an aqua sensor fails.



NOTE: Aqua sensors provide ~ 20% energy savings.

HINT: Dishwashers still operate adequately when aqua sensors fail.

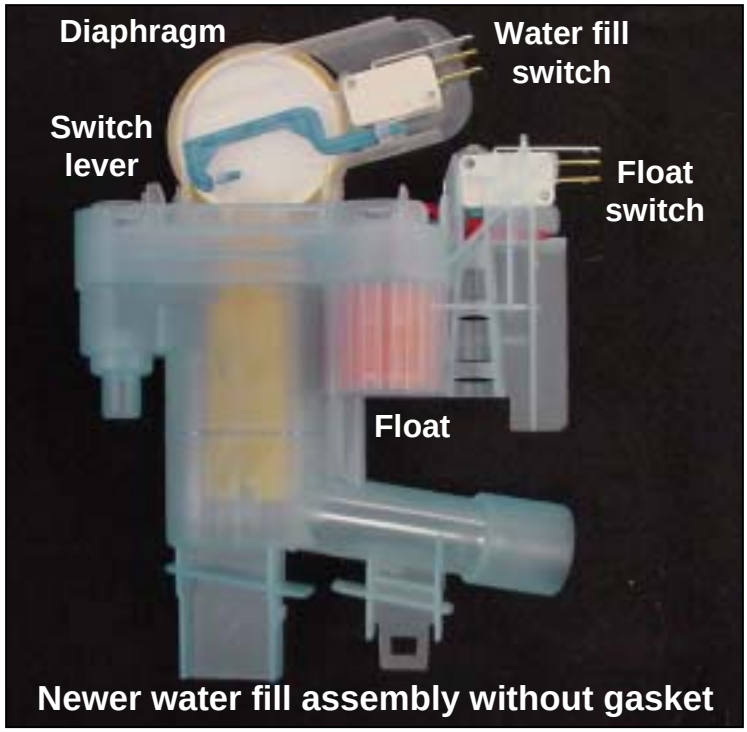
HINT: Customers will only notice aqua sensors failing if they see their dishwashers running slightly longer or their electric and water usage getting slightly higher.

NOTE: If water is clean enough, it will be kept for the wash cycle. If not, the aqua sensor directs the dishwasher to add an additional pre-rinse or pre-wash cycle.

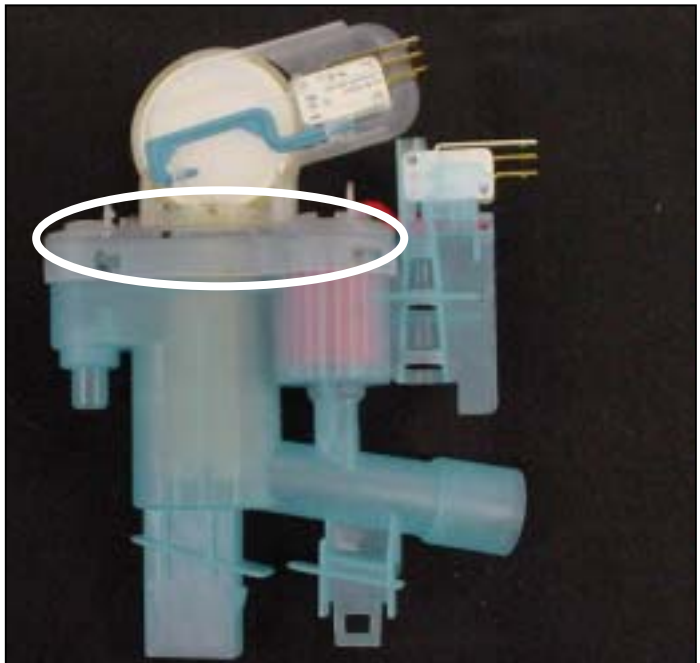
V. Theory of Operation

Water Fill Assemblies

Water fill assemblies insure dishwashers fill properly at various incoming pressures.



Newer water fill assembly without gasket

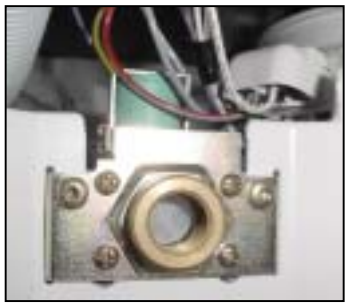

Older water fill assembly with gasket

NOTE: Older water fill assemblies required a gasket between the upper and lower housings. Newer ones do not require gaskets and are a drop-in replacement for older ones.

HINT: Floats should be checked and bases should be cleared of water & debris whenever water fill assemblies are worked on.

VI. Component Access/Replacement

Water Valves (1)

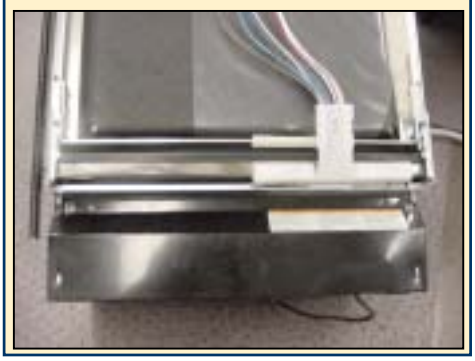


The water valve is accessed from the front of the dishwasher base by removing the toe kick.

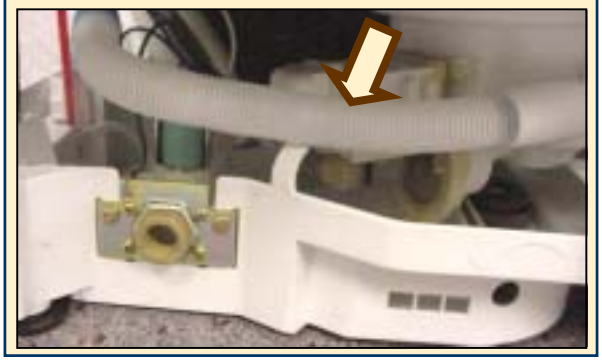
To remove water valve:

- Remove two (2) T-20 Torx screws from toe kick and tilt toe kick out from under dishwasher.
- Remove base insulation (on models with insulation).
- Move sump inlet hose away from water valve (without disconnecting it).
- Disconnect wires from water valve, including ground wire.
- Remove two (2) T-20 Torx screws from water valve.
- Pull valve out from dishwasher and disconnect water hose from rear of valve. Remove any water from sump & base.

Removing toe kick



Moving sump hose



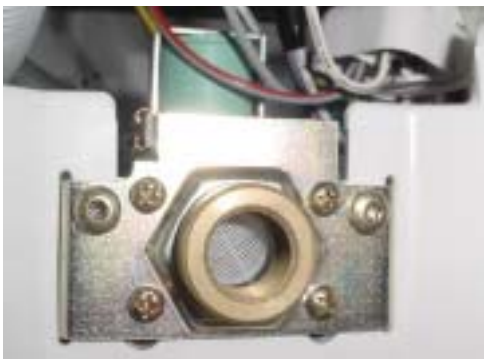
Removing hose clamp

VI. Component Access/Replacement

Water Valves (2)

NOTE: Water valves have been upgraded several times since 1st 1/4 of 1999. All valves with upgraded solenoids have yellow solenoid stems. All old valves have white solenoid stems.

- The newest valve (part # **189533**) has the solenoid mounted horizontally and the water fitting held in place by the metal mounting bracket. This is the only replacement valve available and it replaces all other valves.
- The previous valve (part # **580009**) had the solenoid mounted vertically, a yellow solenoid stem and a fine brown mesh filter screen. Use # **189533** horizontal valve whenever it needs to be replaced.
- The oldest valve, used March, 1999 and earlier (part # **167081**), had the solenoid mounted vertically, a white solenoid stem and a white mesh filter screen. Use # **189533** horizontal valve whenever it needs to be replaced.



HINTS:

- When reconnecting the water supply to the water valve, don't overtighten the fitting. On valves with vertical solenoids, the plastic can crack and cause leaking if excessive force is used.
- Using Teflon tape on water fittings can help prevent leaking.
- The water valve can be accessed without removing outer door or base cover. However, removing them will provide easier access.

VI. Component Access/Replacement

Circulation Pumps - Access (1)

The circulation pump & capacitor are accessed from the right side of the dishwasher by removing the right side panel and blocking the tank.

To remove outer door:

- Remove six T-20 Torx inner door screws below fascia panel -- three per side *(1)*.
- Carefully pull bottom of outer door out from dishwasher until top door tabs clear, then pull door down until it releases from dishwasher *(2)*. Take care to not scratch outer door.
- Remove two plastic door guards *(3)*. They occasionally fall out when the outer door is removed.

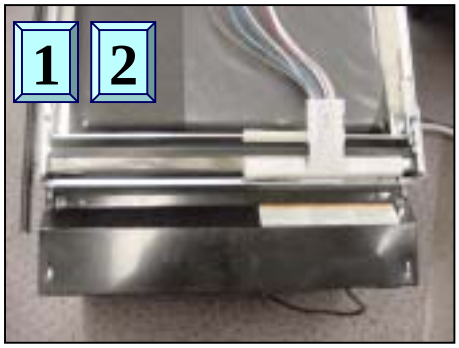
HINT: The fascia panel and door don't need to be removed to access the circulation pump. However, they must be removed to completely remove the tank.

VI. Component Access/Replacement

Circulation Pumps - Access (2)

To remove toe kick:

- Remove two T-20 Torx screws from toe kick *(1)*.
- Tilt toe kick out from under dishwasher *(2)*.



To remove right & left side panels:

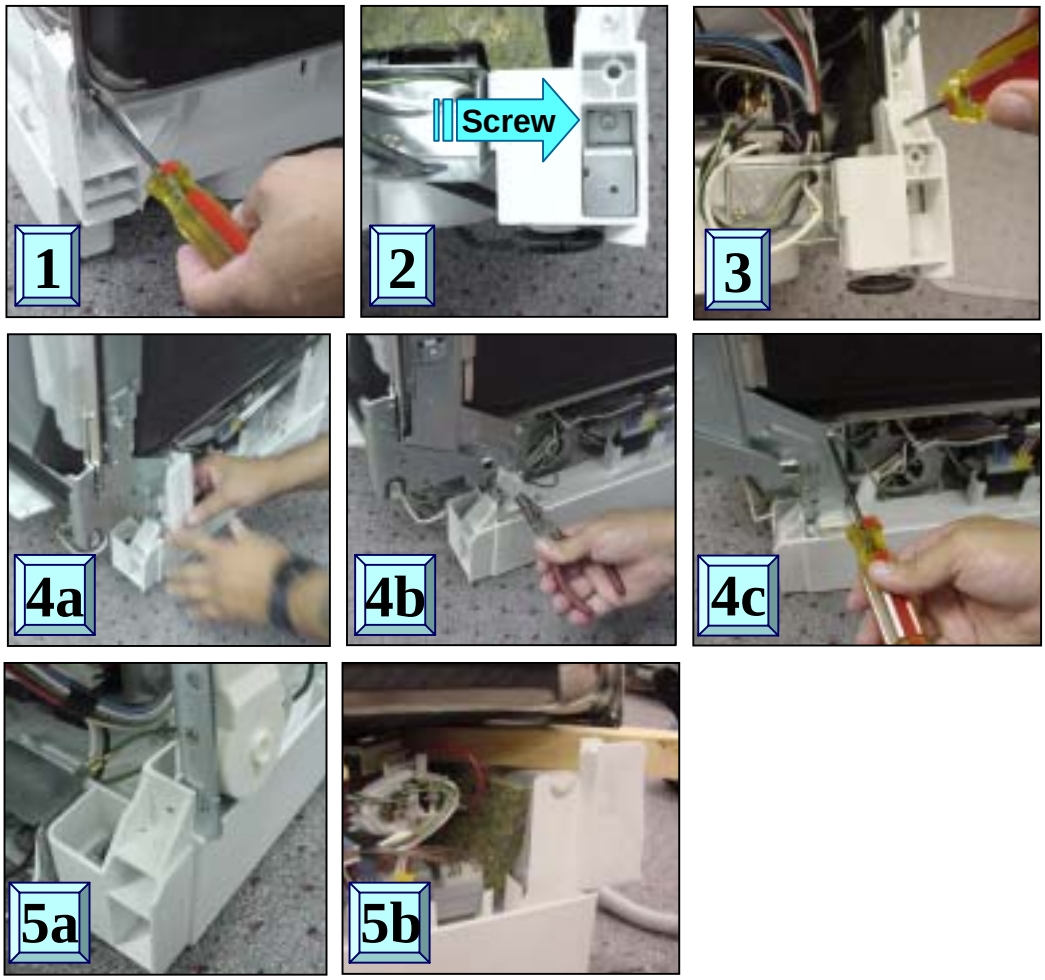
- Remove two T-20 Torx side panel screws through holes in left & right trim strips *(1)*.
- Carefully slide trim strips up and out of dishwasher *(2)*. If side panels are removed carefully to avoid damaging trim strips, then trim strips don't need to be removed.
- Lift side panels up and out from dishwasher *(3)*. Panels can be removed with trim strips. Although removing the left side panel isn't necessary for access, it does allow the right side of the tank to be blocked upward.

VI. Component Access/Replacement

Circulation Pumps - Access (3)

To raise right side of tank for circulation pump access:

- Remove one T-20 Torx screw from both rear corners holding tank to base *(1)* -- removing screw from both sides allows tank to be blocked upward.
- Remove right toe kick bracket by removing T-20 Torx screw *(2)*.
- Remove T-20 Torx screws from front right bottom corner holding tank to base *(3)*.
- Remove right hinge cover *(4a)*, release right door tension cord from hinge *(4b)* & remove ground wire *(4c)*.
- Raise and block up tank as shown with strut onto base *(5a)*, sliding a piece of wood or other solid material between the tank and base to keep tank from falling back onto base *(5b)*.



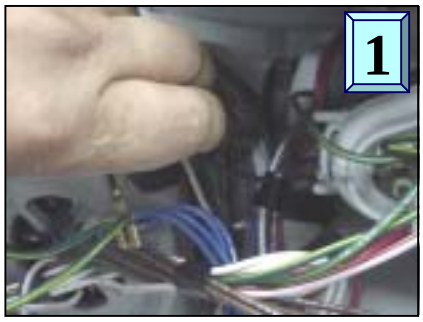
CAUTION: Its not recommended to turn dishwashers upside-down for tank access. When dishwashers are turned upside-down, water can flow into the diaphragm of the water fill assembly and cause water to not fill properly.

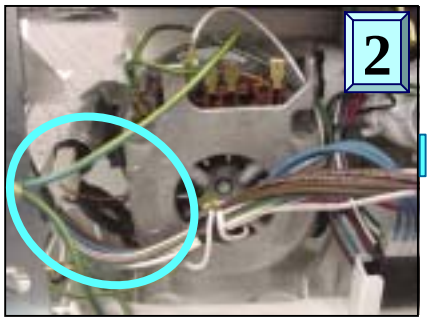
VI. Component Access/Replacement

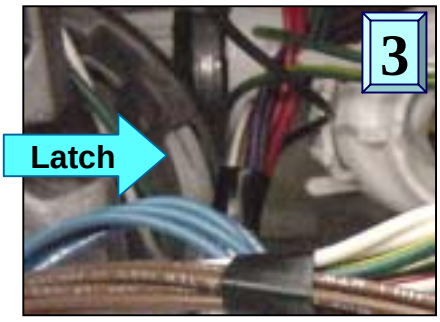
Circulation Pumps - Disassembly

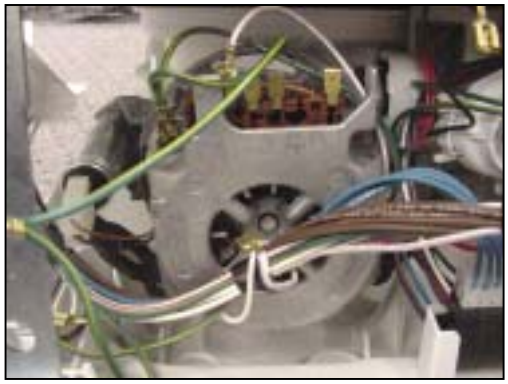
To remove motor to access impeller or change complete pump:

- Disconnect wire harness from motor after carefully noting connections *(1)*.
- For UC/11 & later models with softer bearing, lift up rubber straps from both sides of motor *(2)*. For older models, lift motor up from base.
- To release plastic latch on pump/motor housing, carefully push onto latch with screwdriver *(3)*.
- To release motor from pump housing, twist motor to the right (clockwise). Some force may be required. Capacitor should be ~ 11:00 position *(4)*. Pull motor out from pump housing.









CAUTION: Don't grab motor next to capacitor to avoid jamming your hand on the capacitor.

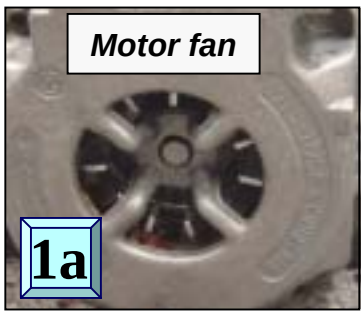
HINT: When replacing complete circulation pumps for softer bearing models (UC/11 & later), reusing existing front pump housings (& discarding replacement housings) can save time by not having to change hose clamps. If desired, order **# 172272** hose clamps & replace entire pumps.

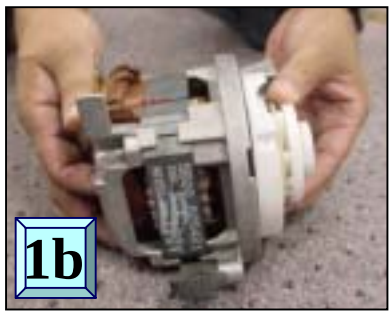
VI. Component Access/Replacement

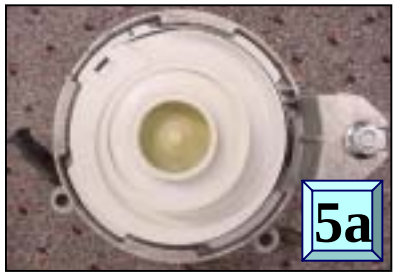
Circulation Pumps - Reassembly

To remove & install impeller (using kit # 167085):

- While holding motor fan so shaft won't spin *(1a)*, unscrew impeller counterclockwise *(1b)*.
- Rotate pump housing counterclockwise until tabs clear, then lift housing from motor *(2)*.
- Remove spring and O-ring from pump housing, then lift spacer up from motor shaft *(3)*.
- Place replacement spacer onto motor shaft *(4)*. Note larger end goes onto shaft 1st.
- Install replacement spring & O-ring onto pump housing, then line up housing-motor tabs to screw pump housing onto motor *(5a)*. Screw replacement impeller onto motor shaft *(5b)*.
- Align motor to pump housing with capacitor @ 11:00 position to facilitate reassembly.







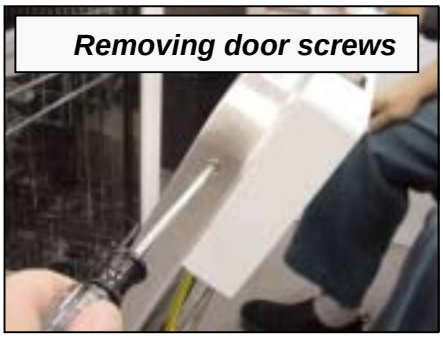
VI. Component Access/Replacement

Control Modules - Disassembly (1)

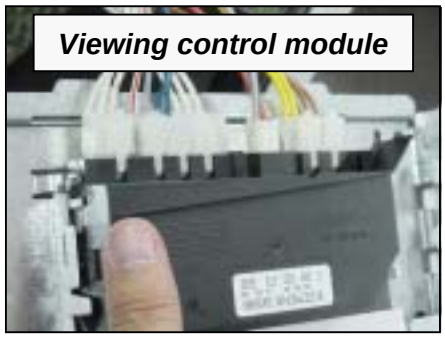
Control modules are easily removed from fascia panels by bending console tabs.

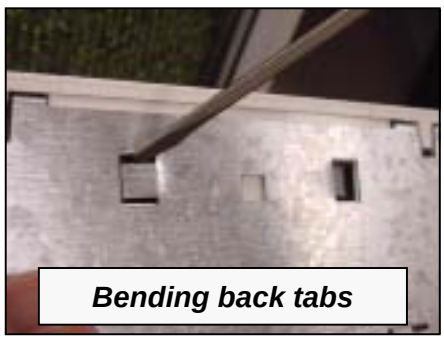
(SHU 9922 shown)

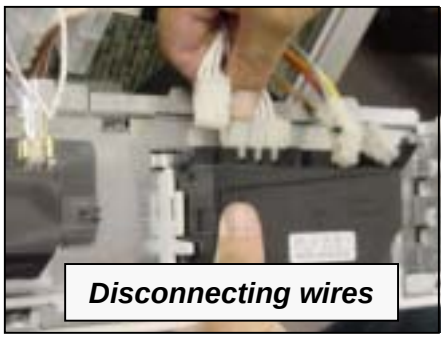
- **Remove fascia panel by removing T-20 Torx inner door screws.**
- **Disconnect wire harnesses from module after noting connector locations.**
- **Pry out metal console tabs holding module to console.**
- **Carefully pry back plastic tabs, then slide module from console.**

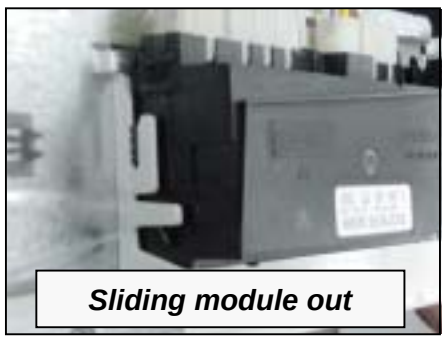

Removing door screws

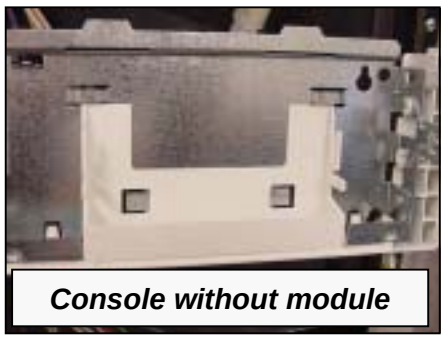

Removing fascia panel


Viewing control module


Bending back tabs


Disconnecting wires


Sliding module out


Console without module

<u>NOTE</u>: Control modules for non-integrated models look differently and have different tabs, but are removed using the same procedure.

NOTE: Control modules for non-integrated models look differently and have different tabs, but are removed using the same procedure.

VI. Component Access/Replacement

Control Modules - Disassembly (2)

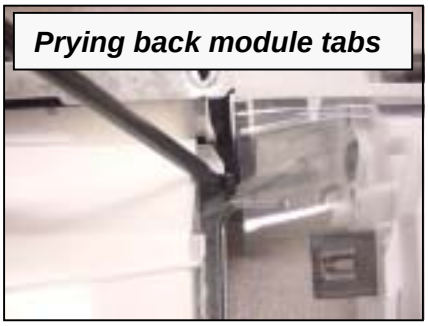
SHY56A/66C, **SHU 995x** & **SHV 68** control modules are different than other models and are removed differently.

- **Remove fascia panel by removing six (6)T-20 Torx inner door screws.**
- **Disconnect wire harnesses from module after noting connector locations.**
- **Remove fascia panel from console by removing four (4) T-20 Torx screws.**
- **Remove two (2) T-20 Torx screws holding module to console.**
- **Carefully pry back locking tabs on each front corner of module, then remove module from console. Remove button pad from module.**

(SHU 995x shown)

These instructions apply to SHY56A/66C, SHU 995x & SHV 68 models.

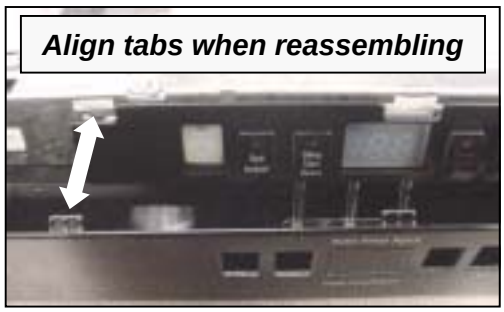
Removing door screws ***Removing fascia screws*** ***Removing module screws***



Prying back module tabs

Sliding module out

Removing button pad -- buttons can come off pad



Align tabs when reassembling

VI. Component Access/Replacement

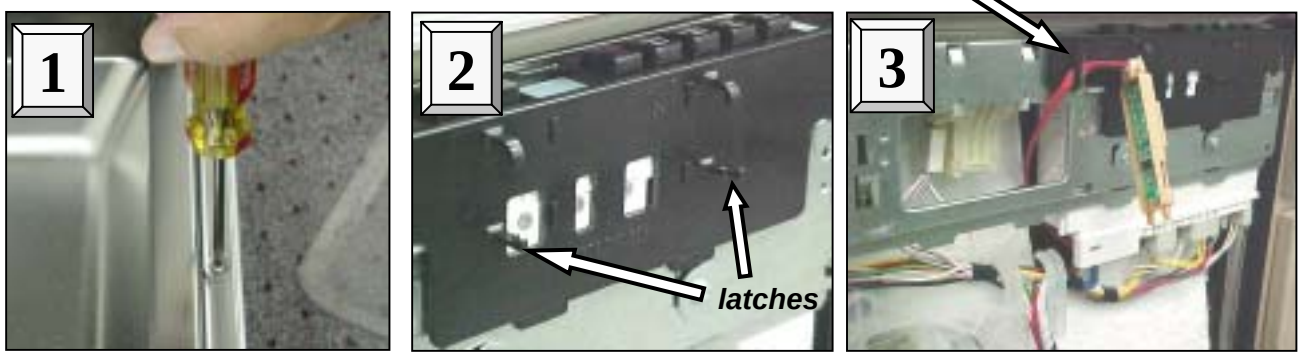
Control Modules - SHY56A/66C Control Modules with Displays

SHY56A/66C control modules have separate display modules mounted on the front of fascia panels.

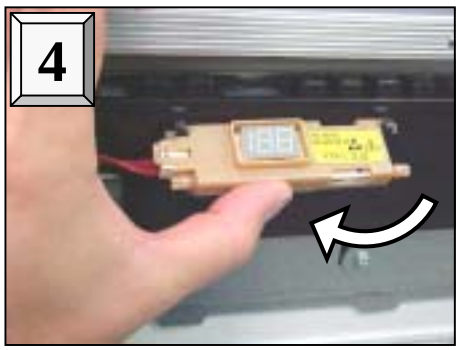
These instructions apply to SHY56A & SHY66C models.

To remove/install display module:

- **Remove outer door & fascia panel.**
- **Confirm the (4) pushbutton carrier display latches are intact.**
- **Route display wire harness through (door latch) console opening, press harness onto pushbutton carrier wire guide & connect terminal.**
- **Insert display into top latches (on pushbutton carrier), then push bottom of display up and rotate it into bottom latches.**



Removing door & fascia *Checking display latches* *Connecting wire harness*



Locking display in place

VI. Component Access/Replacement

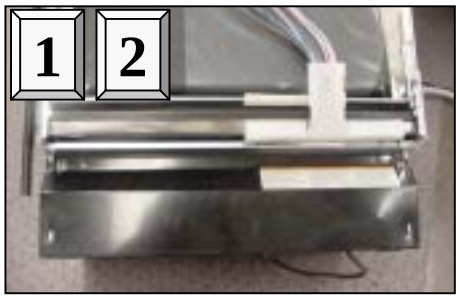
Control Modules – Apexx Control Module Disassembly (1)

These instructions apply to SHV/SHX/SHY99A models.

Apexx (**SHV99A/SHX99B/SHY99A**) control modules are different than other models and are removed differently. Modules are mounted on the **base** (where base wiring connectors were), not behind fascia panels. This means:

- ***Dishwashers must be pulled out to change control modules.***
- ***Dishwashers must be pulled out to measure voltages & resistances -- dishwashers cannot be diagnosed from the front.***

HINT: ***Its not necessary to remove outer doors to access Apexx control modules.***



To remove toe kick:

- Remove two (2) T-20 Torx screws from toe kick *(1)*.
- Tilt toe kick out from under dishwasher *(2)*.

HINT: ***Apexx control modules cannot be checked or have resistances measured from the front of dishwashers.***

HINT: ***It may be possible to reach behind modules without blocking up tanks. If not, then follow these instructions to block up tanks.***

NOTE: ***Modules were moved to the base to make room for the larger full text displays in the fascia panel.***

VI. Component Access/Replacement

Control Modules – Apexx Control Module Disassembly (2)

To remove right & left side panels (where necessary):

- Remove two T-20 Torx side panel screws through holes in left & right trim strips *(1)*.
- Carefully slide trim strips up and out of dishwasher *(2)*. If side panels are removed carefully to avoid damaging trim strips, then trim strips don't need to be removed.
- Lift side panels up and out from dishwasher *(3)*. Panels can be removed with trim strips. Although removing the left side panel isn't necessary for access, it does allow the right side of the tank to be blocked upward.

Removing trim strip screws ***Removing trim strips*** ***Removing side panels***

HINT: Apexx control modules cannot be checked or have resistances measured from the front of dishwashers.

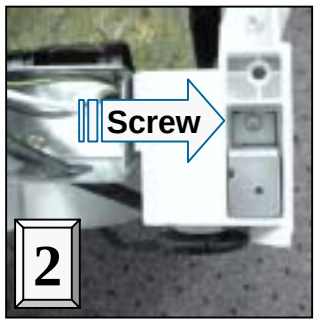
HINT: It may be possible to reach behind modules without blocking up tanks. If not, then follow these instructions to block up tanks.

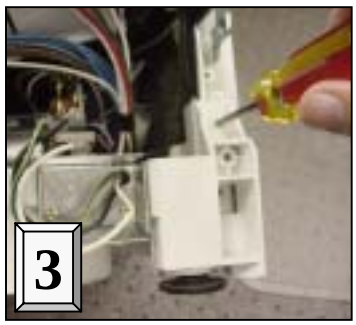
VI. Component Access/Replacement

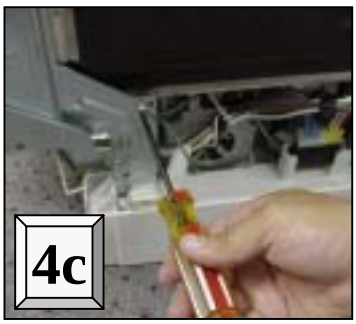
Control Modules – Apexx Control Module Disassembly (3)

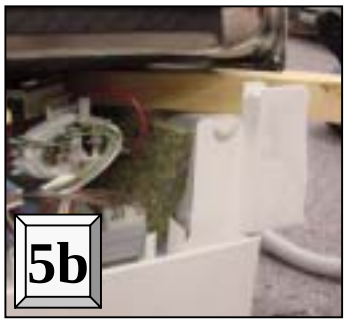
To raise right side of tank for Apexx module access (where necessary):

- Remove one T-20 Torx screw from both rear corners holding tank to base *(1)* -- removing screw from both sides allows tank to be blocked upward.
- Remove right toe kick bracket by removing T-20 Torx screw *(2)*.
- Remove T-20 Torx screws from front right bottom corner holding tank to base *(3)*.
- Remove right hinge cover *(4a)*, release right door tension cord from hinge *(4b)* & remove ground wire *(4c)*.
- Raise and block up tank as shown with strut onto base *(5a)*, sliding a piece of wood or other solid material between the tank and base to keep tank from falling back onto base *(5b)*.







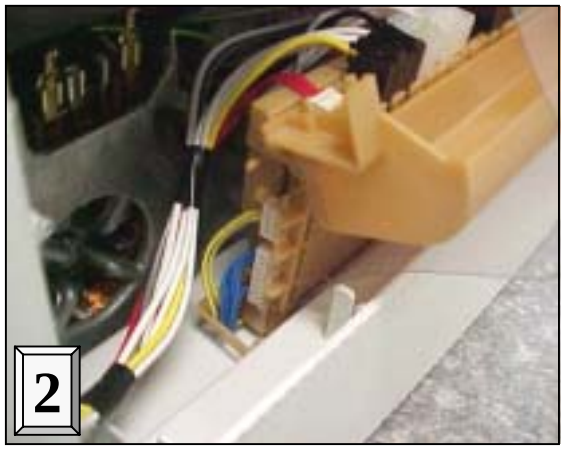


CAUTION: Its not recommended to turn dishwashers upside-down for tank access. When dishwashers are turned upside-down, water can flow into the diaphragm of the water fill assembly and cause water to not fill properly.

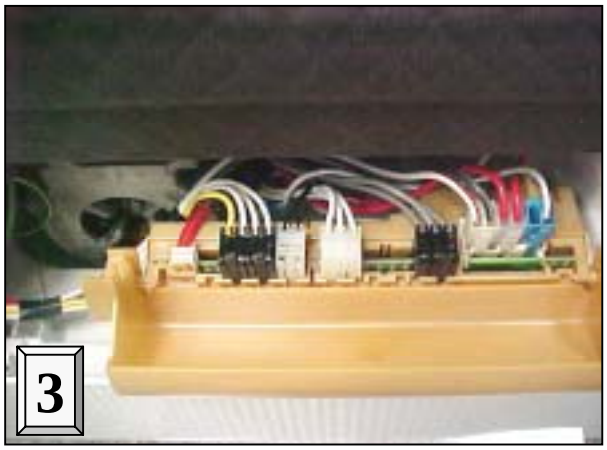
VI. Component Access/Replacement

Control Modules – Apexx Control Module Disassembly (4)

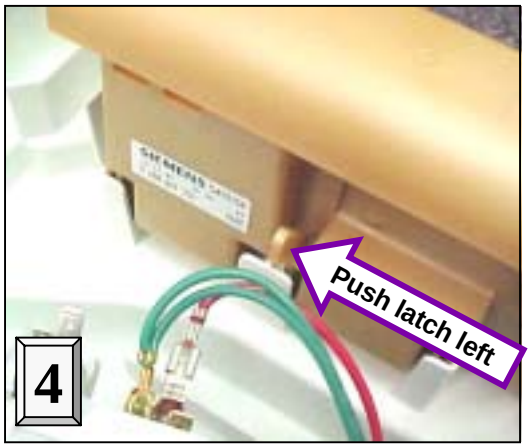
Locating module in base



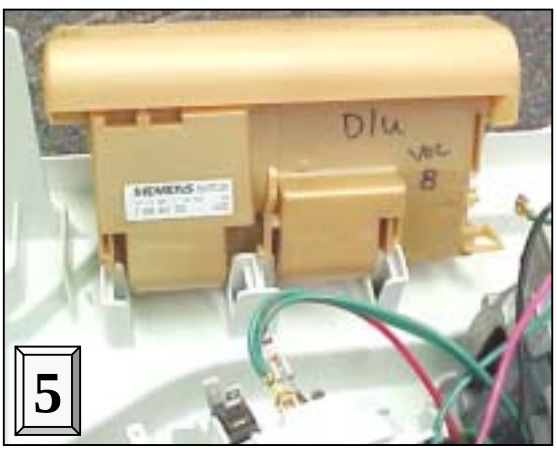
Opening module cover



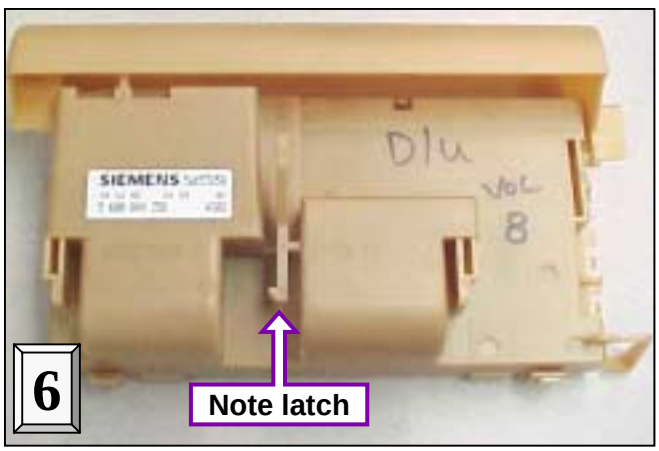
Disconnecting module terminals



Pushing back module latch



Sliding module out



Align module tabs when reassembling

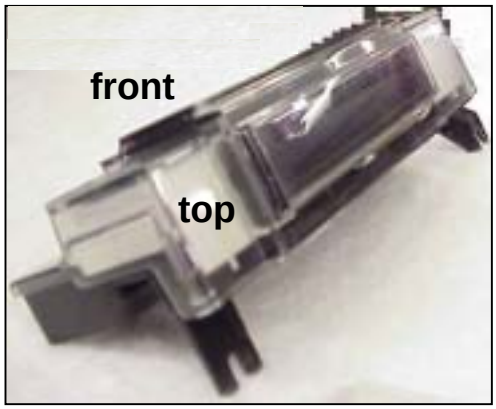
***HINT**: Apexx control modules cannot be checked or have resistances measured from the front of dishwashers.*

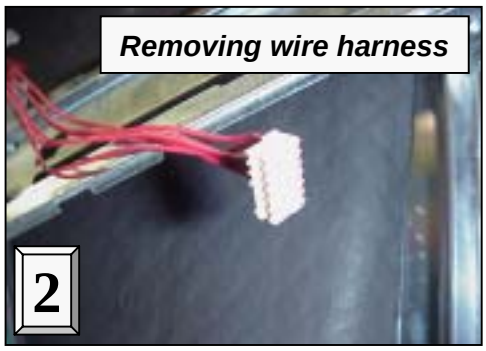
VI. Component Access/Replacement

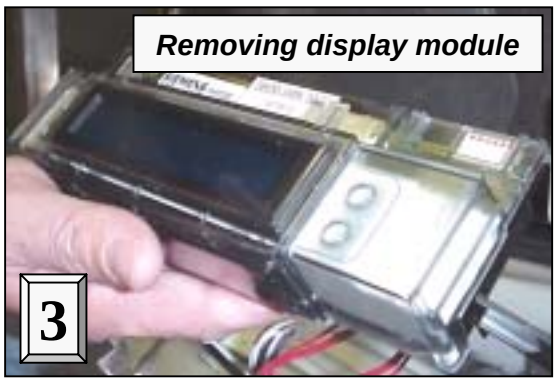
Control Modules – Apexx Display Module Disassembly

Apexx (**SHV99A/SHX99B/SHY99A**) display modules are mounted on fascia panels (where control modules are mounted on other models).

These instructions apply to SHV/SHX/SHY99A models.







<u>NOTE</u>: Control modules were moved to the base to make room for the larger full text displays in the fascia panel.

VI. Component Access/Replacement

Heater s & NTC's – Access (1)

The heater & NTC can be accessed or measured from the right side of the dishwasher, but can only be removed by dropping the entire base (by flipping the dishwasher on its back) since they are wedged underneath the tank.

To remove outer door:

- Remove six (6) T-20 Torx screws from inner door below fascia panel (three (3) per side).
- Carefully pull bottom of outer door out from dishwasher until top door tabs clear, then pull door down until it releases from dishwasher. Take care to not scratch outer door.
- Remove two (2) plastic door guards. They can fall out when the outer door is removed.

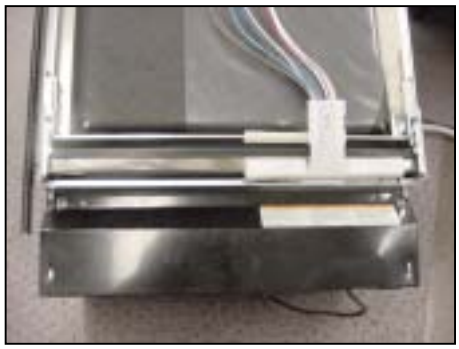
Remove inner door screws ***Slide out outer door*** ***Remove door guards***

HINT: Remove all water from the sump and hoses before accessing the heater -- when the dishwasher is flipped on its back, water can enter the water fill assembly diaphragm and cause the dishwasher to not fill properly.

VI. Component Access/Replacement

Heaters & NTC's – Access (2)

To remove toe kick:



- Remove two (2) T-20 Torx screws from toe kick.
- Tilt toe kick out from under dishwasher.

HINT: The fascia panel and door don't need to be removed to access the heater & NTC. However, the door must be removed to completely remove the tank.

To remove right & left side panels:

- Remove two (2) T-20 Torx side panel screws from each side (through holes in trim strip).
- Carefully slide trim strips up and out of dishwasher. If side panels are removed carefully to avoid damaging trim strips, then trim strips don't need to be removed.
- Lift side panels up and out from dishwasher. Panels can be removed with trim strips.

Remove panel screws	*Slide out trim strips*	*Lift panels up and out*

VI. Component Access/Replacement

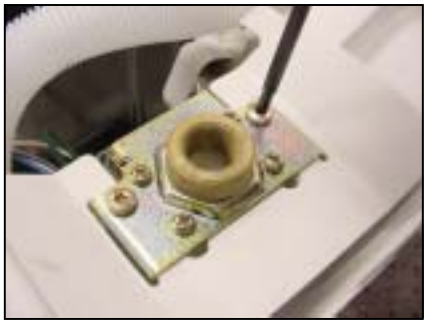
Heaters & NTC's – Access (3)

To separate base from tank (1):

- Carefully lay dishwasher on its back.
- Carefully pull door springs out from base.
- Remove terminal blocks from base.
- Separate water valve from base by removing two (2) T-20 Torx screws, then move water valve out of the way.

Place on back ***Pull out door springs from base & disconnect cords***

Disconnect door spring cords, then remove terminal blocks from base



Disconnect water valve from base

HINT: Remove water from sump and hoses before laying dishwasher on its back (to avoid water entering water fill assembly & causing faulty water filling).

VI. Component Access/Replacement

Heaters & NTC's – Access (4)

To separate base from tank (2):

- Disconnect J-box ground wire, then pull wires out of J-box.
- Pull out inlet hose from sump.
- Carefully pull base away from tank and sump.

HINT: Its simpler & quicker to remove the two water valve screws than to remove the hose clamp.

Pull wires from J-box ***Pull out sump inlet hose***

Carefully pull base away from tank & sump

HINT: Don't order duplicate parts when ordering parts below -- when these parts are replaced, others are included:

- **Heater assy.** -- includes NTC, Hi-Limit, flow switch (& aqua sensor where applicable).
- **NTC** -- includes Hi-Limit.

VI. Component Access/Replacement

Heaters & NTC's – Removal & Installation (1)

Removing & Installing Heater & NTC:

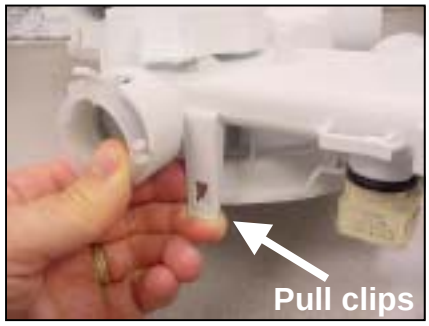
- Remove two (2) T-20 Torx screws holding heater assembly to sump.
- Disconnect wires from heater, flow switch, NTC & Hi-Limit after noting connections.
- Pull clips, then carefully pull heater assembly from sump & pump. Note heater comes as an assembly (with housing & gasket).

HINT: If needed, use rinse-aid to lubricate gaskets to make it easier to assemble heater to sump and pump.

NOTE: Softer bearing & non-softer bearing heater assemblies, circulation pumps and sumps **cannot** be mixed and matched. Softer bearing heaters don't fit in older models and older heaters don't fit in softer bearing models.

Heater assembly

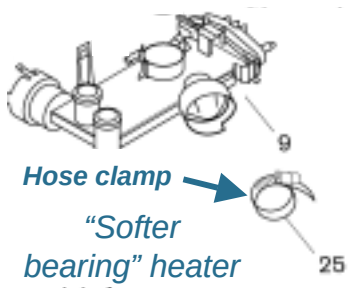
Remove heater screws



Remove heater

NOTE: Softer bearing & non-softer bearing heater assemblies are connected to circulation pumps differently:

- Softer bearing models (UC/11 & above) have gasket assembled to heater and have a separate hose clamp (order # **172272**).
- Older models (UC/06) have a separate gasket and do not have a hose clamp.



HINT: Heater assemblies contain NTC's, Hi-Limit's & flow switches (& aqua sensors where applicable). If heaters are replaced, these parts are replaced too.

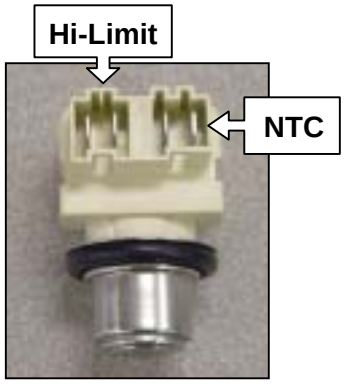
VI. Component Access/Replacement

Heaters & NTC's – Removal & Installation (1)

Removing & Installing NTC:

- Remove heater assembly -- NTC is located on top of heater assembly.
- Disconnect wires after noting connections (since NTC & Hi-Limit are included in the same part -- # 165281).
- Remove NTC cover, pull NTC holding tabs apart and pull NTC out of heater.

Disconnect wires ***Remove cover & pull tabs*** ***Remove NTC***



NTC w/ Hi-Limit

HINT: If needed, use rinse-aid to lubricate gaskets to make it easier to assemble heater to sump and pump.

NOTE: Softer bearing & non-softer bearing heater assemblies, circulation pumps and sumps **cannot** be mixed and matched. Softer bearing heaters don't fit in older models and older heaters don't fit in softer bearing models.

NOTE: To remove flow switch, carefully pry housing away from switch (until tabs clear switch), then snap switch out.

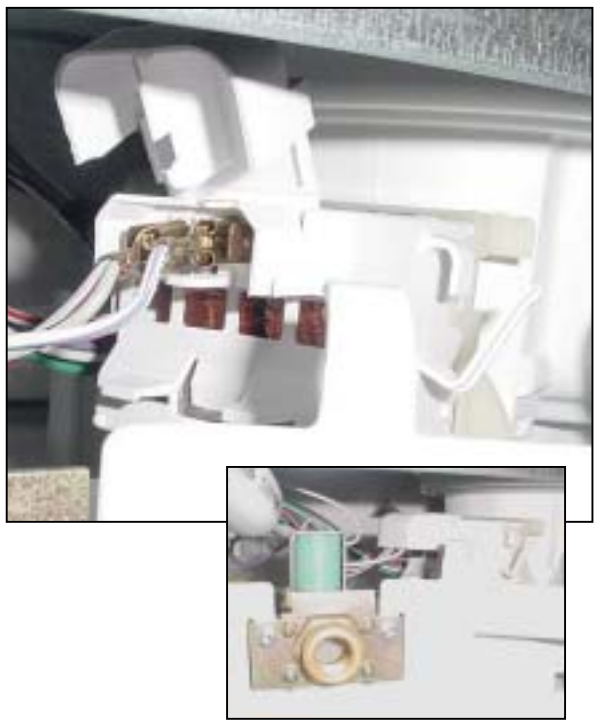
VI. Component Access/Replacement

Drain Pumps – Removal & Installation

Drain pumps are mounted to sumps in the front of dishwashers -- they're easily accessible from the front of dishwashers by removing toe kicks.

Removing & installing drain pump:

- Remove toe kick, then pull up terminal cover and disconnect wires. For easier access, remove base cover 1st.
- To remove pump, push latch (on circular collar) & rotate pump clockwise (cw). To install new pump, insert @ 2:00 position & rotate counterclockwise (ccw).
- Clean water & debris from base, then check float operation.
- Connect wires, then install base cover & toe kick.



HINT: Improper installation issues causing dishwashers to not drain properly -- its usually not a drain pump problem:

- Drain hoses without high loops or drains without air gaps
- Drain hoses > 10' long (i.e. > 4' extension)
- Drain hoses kinked when dishwashers installed under cabinets

DRAIN HOSE INSTALLATION TIPS:

- Must have drain hoses with high loops or drains with air gaps.
- Drain hoses can be up to 10' long – can add up to 4' to dishwasher hose.
- Secure drain hoses to rear of dishwashers with non-metal bands.

NOTE: Standard 6-vane drain pumps (# **167082**) are quieter and smoother than 4-vane pumps. Drain pumps used in installations (in Washington State) with Johnson Tees must use stronger 4-vane pumps (# **184178**). 4-vane pumps will be slightly noisier, which is normal.

VI. Component Access/Replacement

Dispensers – Removal & Installation (1)

To remove/install dispensers:

- Remove outer door, remove fascia panel & disconnect wire harness from fascia panel.
- Disconnect wire harness from above dispenser, then remove wires to wax motor & reed switch.
- Disconnect condensation tube (for older models with condensation tubes in doors).
- Bend retainer tabs, the push dispenser inward toward tank. Protect hand with towel as edges are sharp.
- Replace from inside of tank -- position O-ring seal and bend tabs to secure. When replacing dispensers, lubricate O-rings with rinse-aid & support inner doors to avoid damage if O-rings stick.

Disconnecting wire harness ***Bending retainer tabs***

CAUTION: Inner door edges are sharp! Cover door edges and remove dispenser carefully.

VI. Component Access/Replacement

Dispensers – Removal & Installation (2)

For UC/12 and later dishwashers, condensation tubes were moved (from dispensers) to the right side of tanks. This required a change from vented dispensers to unvented dispensers.

HINT: UC/12 model condensation tubes exit in the base behind the sump. There is no drain connection for these tubes.

HINT: Vented dispensers cannot be used to replace unvented dispensers. If they are, dishes won't dry properly and there can be water leaking inside dishwasher doors.

HINT: There are a limited number of UC/11 dishwashers with condensation tubes in tanks and with unvented dispensers. Treat them like UC/12 dishwashers.

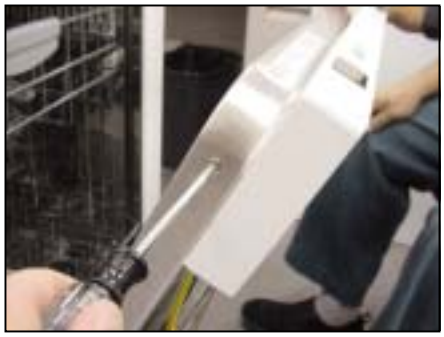
VI. Component Access/Replacement

Door Latches – Removal & Installation (1)

Usually the only door latch repairs will be replacing microswitches on fully integrated models (e.g. SHV, SHU 88/99).

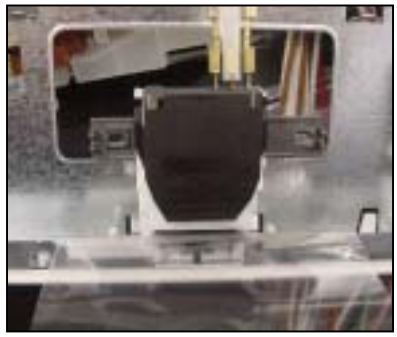
To disassemble door latches for integrated models:

- Remove T-20 Torx fascia panel screws from inner door.
- Lower fascia panel from door.
- Locate door latch in console.
- Bend out console metal tabs to allow latch removal.



Remove panel screws

Lower fascia panel



Door latch in console

Tabs (inner view)

Bend out metal tabs

NOTE: Door latches for UC/14 & up models are different than UC/06 - UC/12 models -- they cannot be interchanged. Must replace strike plate & door latch together.

VI. Component Access/Replacement

Door Latches – Removal & Installation (2)

To remove & install door latches for integrated models (continued):

- Remove door latch from console.
- Disconnect wire harness, then remove microswitch & cover.
- Disconnect wires, then remove microswitch from cover.
- Replace microswitch, then reassemble.

Remove door latch

Remove microswitch

Microswitch

Replace cover (in slots)

Insert latch into tabs

Bend tabs back

Replace fascia panel

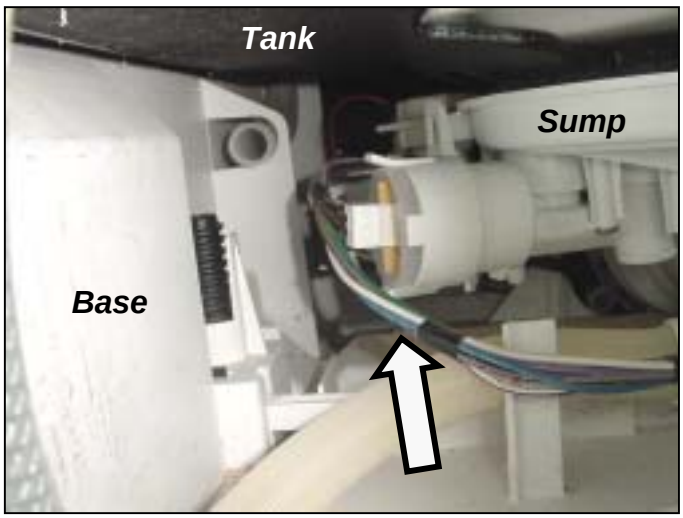
Replace screws

HINT: Make sure metal console tabs are bent back completely during reassembly.

VI. Component Access/Replacement

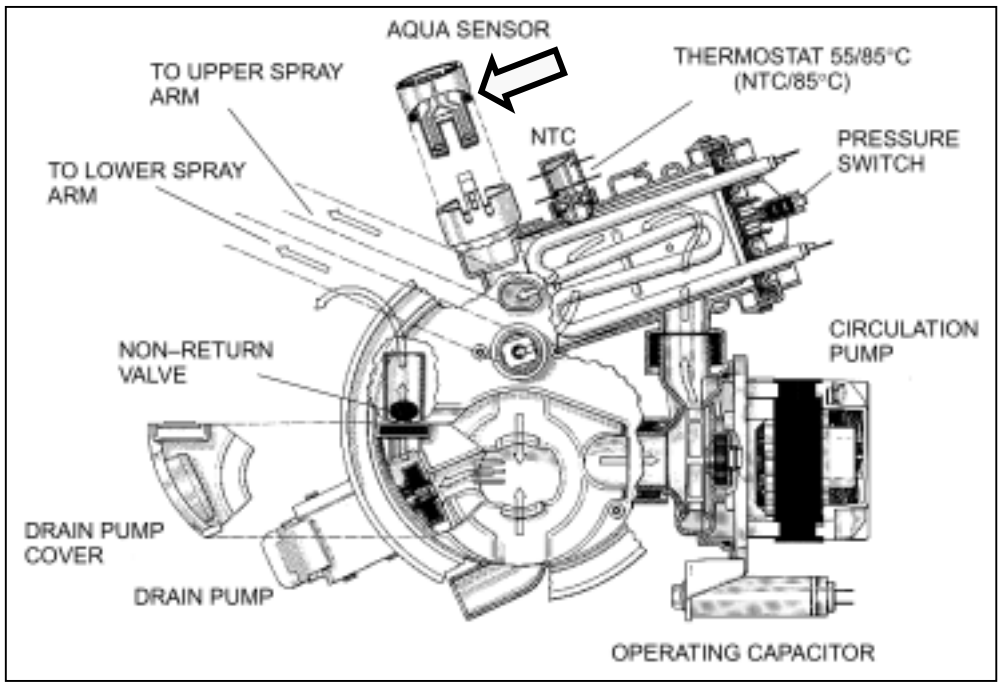
Aqua Sensors

The aqua sensor is located on the rear of the sump. It can be reached through the left side of the dishwasher (after the left side panel is removed). Its not necessary to block up the tank to reach the aqua sensor.



HINT: To change out the aqua sensor, pull off the connector and pull out the aqua sensor (toward the rear of the dishwasher).

HINT: The aqua sensor slides into slots in the sump. Make sure the aqua sensor is properly inserted into the slots.

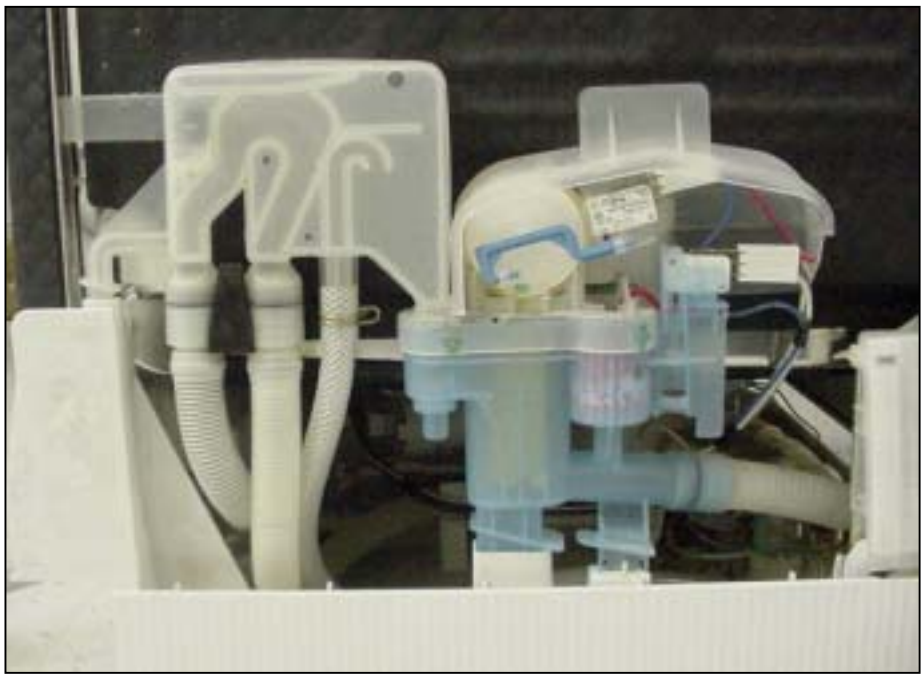


NOTE: The *Apexx Sensotronic 2* aqua sensor **# 175340** is similar to standard aqua sensor **# 165279**, except it has two (red & green) soil sensors. They mount the same way, but are **not** interchangeable.

VI. Component Access/Replacement

Water Fill Assemblies

The water fill assembly is easily accessed from the left side by just removing the left side panel.



HINT: Most water fill assembly repairs will involve replacing microswitches. Occasionally tank insulation or other debris can prevent the diaphragm switch lever from operating, allowing overfilling.

VII. Component Testing/Test Procedures

Using Test Programs

Using test programs for various models (UC/06 - UC/14)

Models	Buttons to Enter Test Program
SHU/SHI430x, SHU431x	*Power Scrub Plus + Regular Wash*
SHU33/DLX	*Power Scrub Plus + Rinse & Hold*
SHU43C, SL34A, SHU432x	*Regular Wash + Rinse & Hold*
SHU53/66C/68, SHI66A/68	*Scrub Wash + Delicate/Econo*
SHU53A, SHX/SHY56, SL95A	*Regular Wash + Quick Wash*
SHU88	*Power Scrub Plus + Quick Wash*
SHU990x, SHV43/48	*Power Scrub Plus + Regular Wash*
SHU991x (thru UC/11)	*Power Scrub Plus + Quick Wash*
SHU991x (UC/12), SHU992x	*Power Scrub Plus + Delicate/Econo*
SHU995x	*Regular Wash + Delicate Wash*
SHV46C, SL84A, SHX43E/ 46A-B	*Power Scrub + Delicate/Econo*
SHV66A, SHY66A	*Scrub Wash + Delicate/Econo*
SHV68	*Scrub Wash + Regular Wash*
SHV99, SHX99, SHY99	*(2) left buttons (see below)*
SHX33A	*Power Scrub + Rinse & Hold*
GI976/966, GM276	*Intensive + Delicate*
DW44	*Heavy Wash + Light Wash*

- **To enter test programs, hold down buttons above (2nd & 4th from left), then turn dishwasher on by pushing on/off button. Push buttons above a 2nd time to start test program. Allow program to finish to see fault codes. Turn dishwasher off to exit test program.**
- **To enter SHV/X/Y99 test program, open door, hold down 2 left buttons & turn dishwasher on by pushing on/off button. Press "+" button repeatedly until "S-3-" shows on display, then push start button to check faults on last 8 washes. Close door to begin test program. Allow program to finish to see fault codes. Push "-" button to skip test steps. Turn dishwasher off to exit test program. Choose "S-6-" to clear fault codes.**

HINT: Dishwasher test programs heat water to 150ºF, so test programs will generally run > 20 minutes for incoming water temperatures ~ 120ºF.

NOTE: Flow through heaters heat water ~ 2ºF / minute.

HINT: Open door to select test program for fully-integrated models, then close door to run program.

VII. Component Testing/Test Procedures (continued)

Fault Codes

DISHWASHER TEST PROGRAM ERROR CODES (on 2-digit digital displays):

00

- *0 – No faults*
- *1 – Aqua Sensor (Sensotronic) fault*
- *2 – Heating system fault (heater, Hi-Limit, flow switch, NTC, control module heater relay)*
- *4 – Water filling fault*
- *8 – NTC (temperature sensor) fault*
- *16 – Water switch fault*

TIP: Fault codes add up for multiple faults (e.g. heating + water filling fault = 2 + 4 = 6)

DISHWASHER CUSTOMER USE ERROR CODES (on 2-digit digital displays):

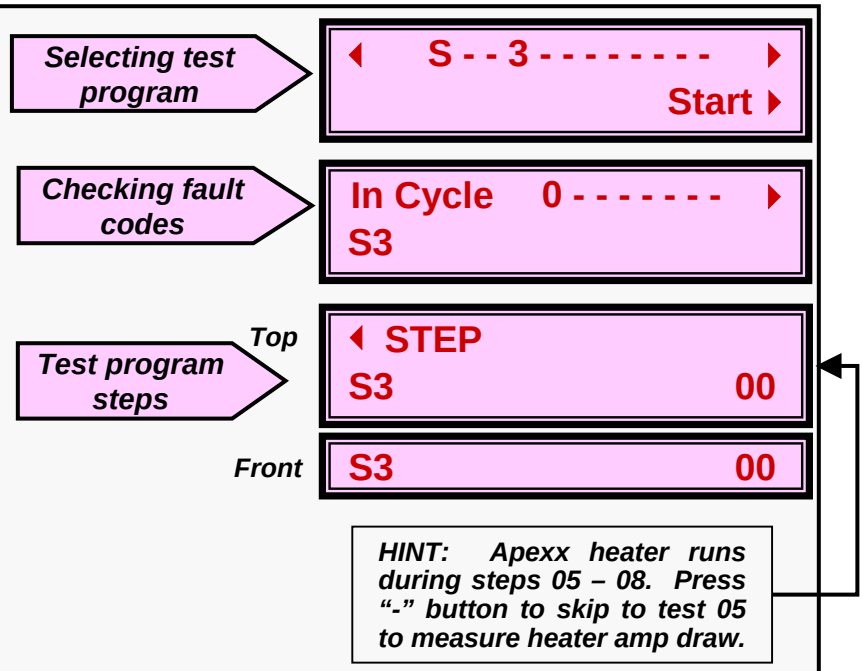
00

- *F – Water filling fault (underfill, overfill or water in the base)*
- *2H – Last wash cycle too long (> 99 minutes). Can be cold inlet water or heating system fault (heater, Hi-Limit, flow switch, NTC, control module heater relay).*
- *_h – Delay Start feature (not a fault code)*

DISHWASHER TEST PROGRAM ERROR CODES (on lower line of full text *Apexx* SH 99 displays):

- *S3 – No faults*
- *A – Aqua Sensor (red) fault*
- *B – Aqua Sensor (green) fault*
- *E – Water switch fault (no pulses detected)*
- *F – Water filling fault*
- *G – Water switch fault (won't stop running)*
- *H – Heating system fault (heater, Hi-Limit, flow switch, NTC, control module heater relay)*
- *K – NTC fault (short-circuited or open-circuited)*
- *xx – Test program step count (testing done when = 00)*

TIP: Top line shows wash cycle & bottom line shows fault code.



HINT: Dishwasher test programs heat water to 150ºF, so test programs will generally run > 20 minutes for incoming water temperatures ~ 120ºF.

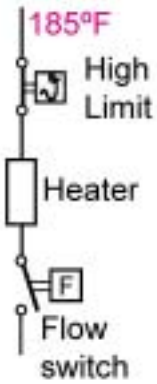
HINT: Open door to select test program for fully-integrated models, then close door to run program.

NOTE: Flow through heaters heat water ~ 2ºF / minute.

VII. Component Testing/Test Procedures (continued)

Using Test Programs to Measure Heater/NTC Resistances

TEST	TIME	NOTES
Entering test program	-----	Press ***On/Off*** button at the same time you press both the ***Power Scrub Plus*** & ***Regular Wash*** buttons (**SHUI 43** models) or the ***Scrub Wash*** & ***Delicate/Econo*** buttons (**SHUI 53** & **68** models). Indicating lights will flash.
Starting test program	-----	Press both the ***Power Scrub Plus*** & ***Regular Wash*** buttons (**SHUI 43** models) or the ***Scrub Wash*** & ***Delicate/Econo*** buttons (**SHUI 53** & **68** models) a 2nd time.
Skipping a test	-----	Press ***Scrub Wash*** button (**SHUI 43** models) or ***Regular Wash*** button (**SHUI 53** & **68** models).
Draining	30 seconds	Allow dishwasher to drain.
Aqua Sensor calibration	65 seconds	Not on SHUI 43 models. Skip this test.
Filling	Until water level switch closes	Can't skip this test.
Heating & Circulating	Until water reaches 150ºF (rises ~ 2ºF/minute)	Don't run entire test (to save time) -- when water starts circulating, measure current in main power line to dishwasher. Skip test once current has been measured. If current is ~ 11A, heater, flow switch and Hi-Limit are OK. If current ~ 1.5-2A, turn off dishwasher, remove or block up tank and measure resistance of heater, Hi-Limit & flow switch (see below).
Draining	60 seconds	Last test. To end test program, press ***On/Off*** button (all models).

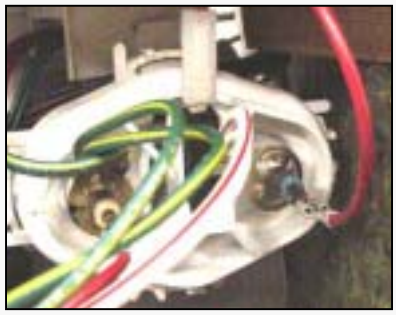


NOTE: Once its found one of these parts is faulty (from incoming current being 1.5 - 2A), check each part (once tank has been removed or blocked up) by measuring its resistance at its terminals:

- **Heater ~ 11 Ω**
- **Hi-Limit ~ .3 Ω**
- **Flow switch ~ .4 Ω** — must remove microswitch from heater housing & close its contacts to measure this. A spring loaded plunger closes microswitch when water is flowing.

Use dishwasher test program to fire up heater, then measure dishwasher incoming current. If ~ 1.5A, heater, Hi-Limit or flow switch has failed. Check voltage @ module (or timer) -- if 0V, module (or timer) has failed.

For electronic models, current can also be measured in **red** heater wire at control module (~ 9.5A). Since there can be more than one **red** wire, check wiring diagram to select heater wire.



HINT: Because the flow switch only closes when water is flowing, the heater resistance can only be measured at the heater terminals (not at the control module).

HINT: The NTC and High Limit are contained in the same part. When either fails, replace entire part **# 165281**.

NOTE: Open door to run test program for fully-integrated models.

NOTE: Flow through heaters heat water ~ 2ºF / minute.

VIII. Troubleshooting

Basic Dishwasher Troubleshooting

Problem	Possible Cause	Suggested Action
✓ **Washability problems (dishwasher won't clean properly)**	✓ Inappropriate dishwasher detergent used.	✓ Instruct customer to use a powdered dishwasher detergent (e.g. *Cascade* powder).
	✓ Blocked or clogged upper/ lower spray arms.	✓ Check spray arms – clean or replace as needed.
	✓ Water doesn't circulate properly due to debris in circulation motor impeller.	✓ Twist and remove filter, then remove debris from right side of sump where water enters circulation pump impeller. If debris has jammed impeller, turn off and pull out dishwasher, remove tank, remove circulation motor and unscrew and clean out imp *HINT: If impeller is damaged, replace entire impeller assembly or it won't seal adequately.*
	✓ Filter not locked down securely, allowing debris to enter sump. *CAUTION: Use caution when removing debris from sump to avoid being cut by sharp debris such as aluminum can tabs or broken glass.*	✓ Twist and remove filter, then remove debris from sump. Instruct customer to twist and lock filter (cylinder) securely into sump. *HINT: Due to high temperature rinse (161° breaking down food debris and triple filtering system trapping food debris, filters shouldn't normally clog up. Problem often caused by filter not being securely locked down. Instruct customer to twist and l*
HINT: Water level will not affect washability as water fill is measured by pressure, not time – water level cannot be adjusted.	✓ Drain hose behind dishwasher doesn't have an adequate loop.	✓ Loop drain hose behind the dishwasher (with the top of the loop) at least 20" above the floor.
	✓ Partially clogged air gap, allowing wastewater from prior washes to circulate in dishwasher.	✓ Unclog sink air gap. *NOTE: Cleaning sink air gaps is not covered under warranty.*
	✓ Water doesn't drain properly	✓ See ***Water doesn't drain properly*** on page xx.
	✓ Soap doesn't enter dishwasher due to dispenser actuator (*A2*) failure. *HINT: Must pull out dishwasher and remove left side panel to access float switch.*	✓ Turn off dishwasher and test actuator – replace if faulty. *HINT: One "wax" motor operates both the detergent and rinse aid dispensers through a mechanical linkage. The system always resets when door closes. Check linkage by moving it manually. Check "wax" motor by running a continuity check on its terminals.*
✓ **Suds or foam remains in dishwasher.**	✓ Too much detergent used. ✓ Improper detergent used (other than powdered dishwasher detergent).	✓ Instruct customer to use less. ✓ Instruct customer to use a powdered dishwasher detergent (e.g. *Cascade* powder).
	✓ Dishwasher doesn't drain properly.	✓ See ***Water doesn't drain properly*** on page xx.

VIII. Troubleshooting (continued)

Problem	Possible Cause	Suggested Action
✓ **Dishes won't dry properly.**	✓ Rinse aid not used.	✓ Instruct customer on using rinse aid – dishes won't dry without it.
✓ **Dishwasher has an odor.**	✓ Standing water in dishwasher sump. *HINT: Water level in sump should be at or below drain motor cover.* ✓ Standing water in dishwasher base. ✓ Minerals in customer water supply. ✓ Food debris in dishwasher filters.	✓ Unclog air gap. Make sure top of drain hose loop (behind dishwasher) is at least 20" above floor (add a loop in hose if there isn't one). ✓ Turn off dishwasher, drain water manually from dishwasher base and correct source of water leakage. ✓ Recommend customer to get water tested and use an appropriate water softener. ✓ Clean dishwasher filters.
✓ **Dishwasher won't run or indicator lights won't come on.**	✓ Dishwasher not turned on. ✓ No power to dishwasher. ✓ Door ajar or on/off switch failed. ✓ Door latch has broken. ✓ Indicator light failed.	✓ Turn on/off switch on. ✓ Check customer circuit breaker, fuse box or power connections. ✓ Turn off dishwasher and check door or on/off switch -- adjust or replace them. ✓ Turn off dishwasher and replace door latch – instruct customer to not pull on door without pulling latch. ✓ Run test program to see if light failed. If so, turn off dishwasher and replace indicator light.
✓ **Water doesn't drain properly.** *CAUTION: Use caution when removing debris from sump to avoid being cut by sharp debris such as aluminum can tabs or broken glass.*	✓ Kink in drain hose. ✓ Dishwasher filter(s) or sump clogged. ✓ Drain motor impeller clogged. ✓ Kitchen sink or sink air gap clogged. ✓ Drain motor (*m3*) failed. ✓ Timer (*SHU 30/40 models*) or module (*all other models*) failed. ✓ Improper drain connection height (< 20" or 508mm above floor).	✓ Straighten or replace drain hose. ✓ Clean dishwasher filters or sump. ✓ Turn off dishwasher, remove drain motor cover (in sump) and clean impeller. If necessary, remove drain motor to clean impeller. ✓ Unclog sink or sink air gap. *NOTE: Cleaning sink air gaps or sinks are not covered under warranty.* ✓ Turn off dishwasher and measure resistance at motor terminals (≈ 16.5 Ω Replace faulty motor. ✓ Check voltage at and wiring to timer or module. Turn off dishwasher and replace faulty timer or module (*for SHU/I 43/53 models, install existing module jumper onto new module*). ✓ Install drain height and sink air gap according to local codes.

NOTE: For minor problems from improper usage or lack of maintenance, please refer customer to the *Self-Help* chart in their *Use and Care Manual*.

VIII. Troubleshooting (continued)

Problem	Possible Cause	Suggested Action
✓ **Dishwasher won't stop filling or won't stop draining.**	✓ Water in dishwasher base from leaky or loose hose.	✓ Turn off dishwasher, drain water manually from dishwasher base and reinstall or replace hose.
	✓ Dishwasher isn't level, causing float switch (*e6*) to operate.	✓ Level dishwasher using front and rear leveling legs (see customer dishwasher installation instructions).
	✓ Float switch or diaphragm (*e6*) failed.	✓ Turn off dishwasher and replace float switch or diaphragm.
	✓ Debris in dishwasher base activated float switch (*e6*).	✓ Turn off dishwasher and remove debris from dishwasher base
✓ **Water fills too slowly.**	✓ Low customer water supply pressure.	✓ Adjust customer water supply pressure (to 5-20 psi or 0.3-8.27 bars).
	✓ Inadequate customer water supply piping.	✓ Install appropriate piping to dishwasher according to local codes.
	✓ Scale in customer supply piping or dishwasher piping/parts from hard water.	✓ Clean or replace clogged piping/parts and have customer get water tested and use appropriate water softener.
✓ **Water won't fill.** *NOTE: An "F" fault code in the display shows there's a filling problem (not filling, over-filling, underfilling or water in the base). The fault code can't be reset manually – it will reset itself 15 minutes after the dishwasher has been turned on (aft*	✓ Customer water supply turned off or disconnected.	✓ Reconnect and turn on customer water supply.
	✓ Water valve (*s2*) failed.	✓ Check resistance @ water valve terminals (≈ 1000 Ω). Turn off dishwasher and replace faulty valve.
	✓ Water level switch (*f1*) failed.	✓ Turn off dishwasher and replace faulty level switch.
	✓ Timer (*SHU 30/40 models*) or module (*all other models*) failed.	✓ Check voltage at and wiring to timer or module. Turn off dishwasher and replace faulty timer or module (*for SHU/I 43/53 models, install existing module jumper onto new module*).
	✓ Water in dishwasher base operated float switch (*e6*).	✓ Turn off dishwasher, drain water manually from dishwasher base, find source of leaking water and fix water leak.
✓ **Detergent or rinse aid won't dispense properly.**	✓ Dispenser actuator (*A2*) failed. ✓ Detergent dispenser door is jammed.	✓ Turn off dishwasher and replace actuator. ✓ Free jammed detergent dispenser door.
✓ **Refill rinse aid light won't come on**	✓ Rinse aid level switch failed (reed switch *e3* on standard dispensers or built-in actuator on top-load dispensers).	✓ Turn off dishwasher and replace reed switch (standard dispensers) or top-load dispenser.

NOTE: For minor problems from improper usage or lack of maintenance, please refer customer to the *Self-Help* chart in their *Use and Care Manual*.

VIII. Troubleshooting (continued)

Problem	Possible Cause	Suggested Action
✓ **Water doesn't circulate.**	✓ Circulation motor (*m2*) failed. ✓ Timer (*SHU 30/40 models*) or module (*all other models*) failed.	✓ Turn off dishwasher and replace motor. ✓ Check voltage at and wiring to timer or module. Turn off dishwasher and replace faulty timer or module (*for SHU/I 43/53 models, install existing module jumper onto new module*).
✓ **Water doesn't heat up properly.**	✓ Hi-Limit (*f5*) tripped and failed to reset.	✓ Run test program & measure current to dishwasher. If current ≈ 11A, Hi-Limit is OK. If not (and for all other models), turn off dishwasher and measure resistance @ Hi-Limit terminals (≈ .3 Ω). Replace faulty Hi-Limit.
	✓ NTC (temperature sensor) failed.	✓ Turn off dishwasher and check resistance of NTC (≈ 55 kΩ @ 72°F). Replace faulty NTC.
	✓ Heater (*r1*) failed.	✓ Run test program & measure current to dishwasher. If current ≈ 11A, heater is OK. If not (and for all other models), turn off dishwasher and measure heater resistance (≈ 11 Ω). Replace faulty heater.
	✓ Water flow switch (*e5*) failed.	✓ Run test program & measure current to dishwasher. If current ≈ 11A, flow switch is OK. If not, remove flow switch microswitch, close its contacts & measure its resistance (≈ .4 Ω). Replace faulty flow switch.
	✓ Timer (*SHU 30/40 models*) or module (*all other models*) failed.	✓ Check voltage at and wiring to timer or module. Turn off dishwasher and replace faulty timer or module (*for SHU/I 43/53 models, install existing module jumper onto new module*).
✓ **Dishwasher cycle runs too long, yet dishwasher washes, rinses and shuts off OK.**	✓ Customer hot water supply isn't hot enough (< 140°F/ 60 °C).	✓ Adjust hot water supply according to local codes.
✓ **Water leaks from front of dishwasher.**	✓ Blocked or clogged upper or lower spray arms. ✓ Excessive foaming.	✓ Check spray arms – clean or replace as needed. ✓ See ***Suds or foam remains in dishwasher*** on page xx.

NOTE: For minor problems from improper usage or lack of maintenance, please refer customer to the *Self-Help* chart in their *Use and Care Manual*.

NOTE: Use a multimeter with temperature, voltage/resistance and current (ampere) probes. Do all resistance checks with power turned **off**. Identify each wire color and location at the control module before looking at this chart.

NOTE: You will need a T20 Torx screwdriver and may need #1/ #2 flat blade screwdrivers and a pair of needlenose pliers. Many parts can be snapped out without using tools.

HINT: Symbols for parts (e.g. " f3" or "e6 ") refer to those on circuit/wiring diagrams.

VIII. Troubleshooting (continued)

NOTE: The following parts can't be serviced from the front of the dishwasher (the dishwasher must be pulled out and the tank removed or tilted/blocked up to replace them):

- *Heater*
- *Circulation motor*
- *Aqua sensor* – can be reached without blocking up tank
- NTC (temperature probe)/Hi-Limit (185ºF) thermostat

NOTE: On electronic models, run test program to identify dishwasher problems. The test can run 20 minutes or more (to get temperature up to 150ºF), but tests can be cancelled to shorten testing time. The test program allows draining, filling, circulating and heating to be checked more quickly than running a standard wash cycle.

To use test program for troubleshooting, measure voltages/currents as parts come on. For example, run heating test and measure current coming into dishwasher – if current ≈ 11A, Hi-Limit, heater and flow switch are OK. If not, check each part to see which one failed. This test saves time since you can't get to these parts without removing the tank and can't run resistance checks from front of dishwasher because flow switch stays open.

NOTE: Jumpers aren't included with SHU/I 43/53 replacement modules – take jumper off old module and put it on new module.

NOTE: An "F" fault code in the display shows there's a filling problem (not filling, overfilling, underfilling or water in the base). The fault code can't be reset manually – it will reset itself 15 minutes after the dishwasher has been turned on (after testing how it fills).

VIII. Troubleshooting

Dishwasher Parts Issues

- **Water valves**…. Most damaged valves occur from being cracked by fittings being overtightened -- some valves are damaged from hard water or debris from customer pipes clogging them so they can't close securely. A damaged valve can allow some water onto kitchen floors.
- **Impellers or circulation pumps**….They're improved and perform well, but expectations are high for dishwashers in rarely used summer homes.
- **Control modules**….From heater relay solder joints to broken buttons to "F" or "2H" fault codes, modules can fail occasionally. However, many good modules have been replaced due to unrelated problems.
- **Heaters & NTC's**….Either one can cause heating problems, but there can be other parts to check as well....
- **Drain pumps**….Check drain hose installation 1st to confirm if it's the pump or not. Many good pumps have been replaced because high loops were missing.
- **Dispensers**….Repairs often due to customer abuse.
- **Cosmetic damage**….Dinged doors and broken buttons, often during shipment.
- **Door latches**….Most problems are due to broken microswitches on integrated models. Understandable considering how dishwashers are treated.
- **Aqua sensors**….Not crucial to operation, but can affect energy & water usage.
- **Water fill assemblies**….Microswitches can fail. Can be affected when units have been flipped upside-down, allowing sump water to get into diaphragm.

Circulation Pump - Impeller

Symptom	*Problem*	*Solution*
Impeller won't turn.	Impeller is frozen.	Replace impeller with impeller kit # 167085. If not able to replace impeller, place 8mm nutdriver on 8mm stud on impeller and rotate clockwise twice until impeller is freed up (for temporary fix until impeller can be replaced).
Impeller won't turn.	Impeller cannot be broken loose.	Replace impeller with impeller kit # 167085. If pump is faulty, replace entire pump assembly.
Impeller won't turn.	Debris binding pump.	Open sump & remove sump pump cover, then carefully remove debris from impeller. Check for broken glass to avoid being cut.
Impeller won't turn.	Motor is faulty.	Check resistance at motor terminals or at control panel (~ 7Ω with water switch or 10Ω without). Replace motor if faulty.

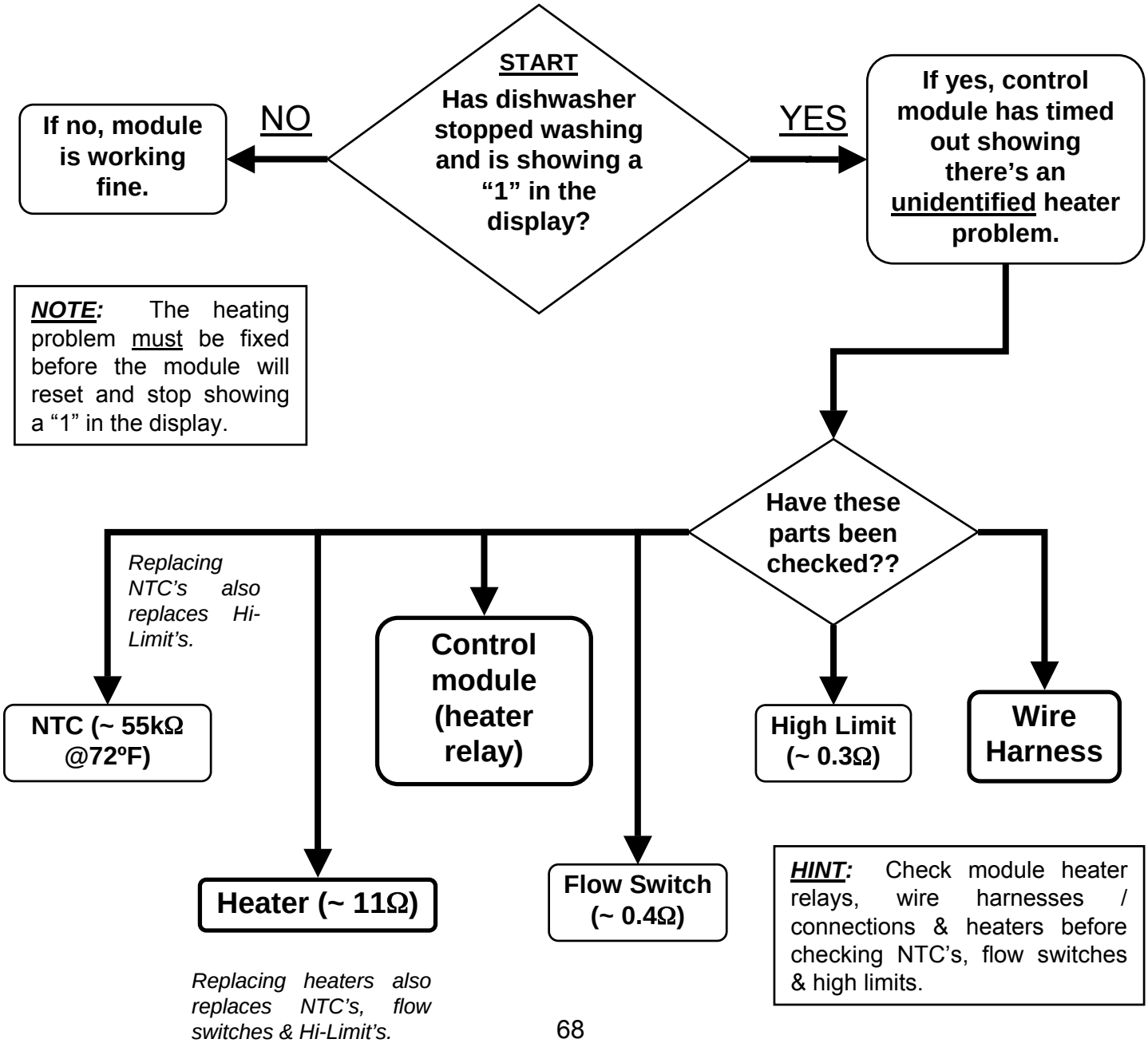
WARNING! Unplug dishwasher before starting any repairs.

VIII. Troubleshooting

Control Module - Modules Displaying "1"

Occasionally dishwashers will run for hours, not finish washing & show a "**1**" in the display. This means the module has timed out due to an unidentified heating problem -- *all* heating related parts must be checked until the problem is found.

IMPORTANT: Whenever a "1" shows in the module display, the module must be reset (after the heating problem has been fixed) by running the dishwasher. The module resets after the 1st run.



VIII. Troubleshooting

Heater - Troubleshooting Flowchart

NOTE: Flow through heaters heat water ~ 2ºF / minute.

Can also measure heater current @ module red heater wire (~ 9.5A).

START

With heater on (during test program), measure dishwasher incoming current (black wire).

If ~ 11A, heater is working fine.

If ~ 1.5A, heater circuit has failed.

Measure voltage @ control module.

If ~120 VAC, check heater circuit.

If ~ 0 VAC, control module (heater relay) has failed. Replace faulty module.

Measure resistance @ heater terminals.

If ~11 , check high limit & flow switch.

Measure high limit & flow switch resistance.

If , heater has failed (opened). Replace heater.

If ~ 0, heater has failed (shorted). Replace heater.

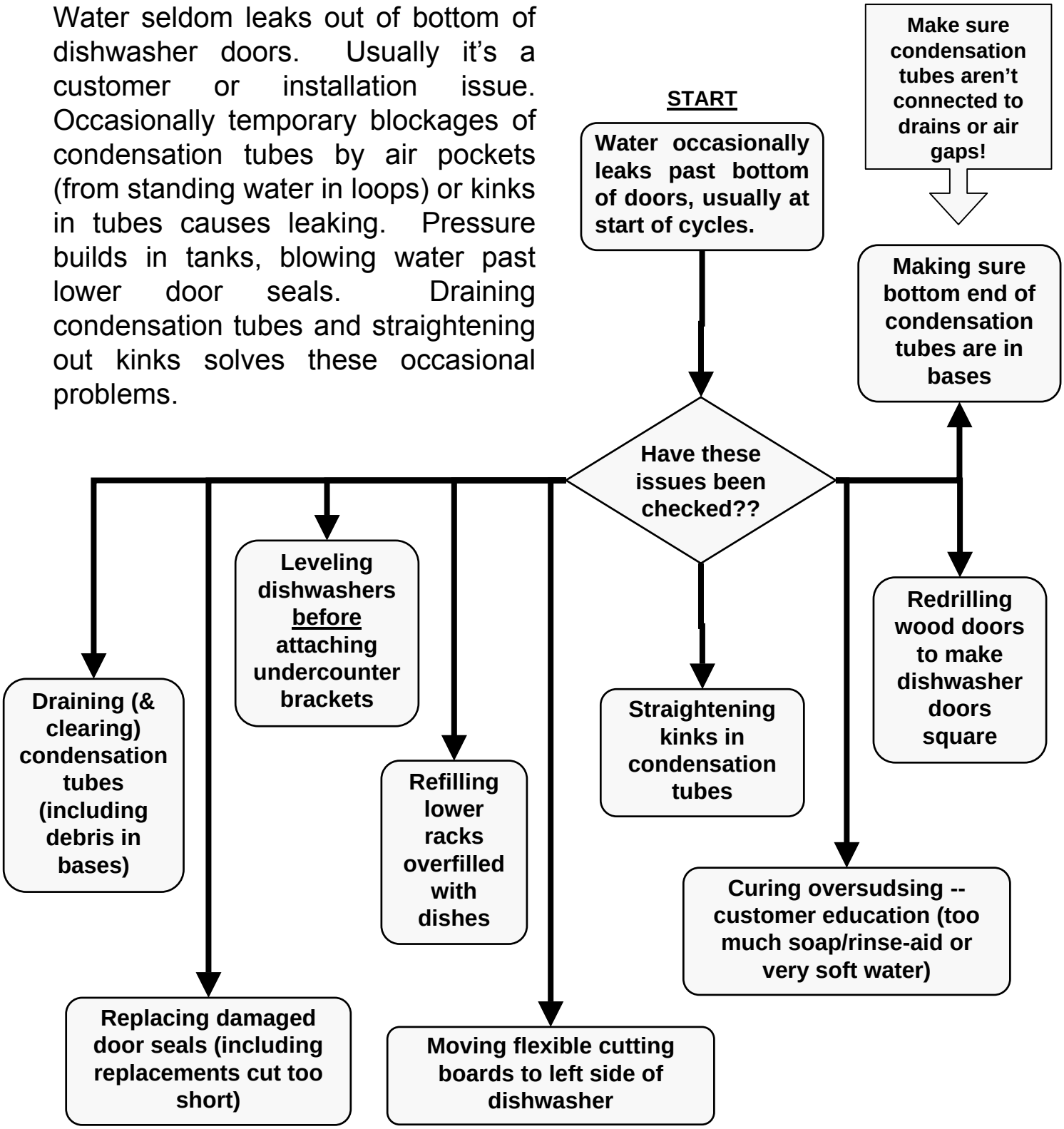
If high limit ~ 0.3 & flow switch ~ 0.4 , check wire harnesses. Replace faulty harness.

If high limit or flow switch = , replace faulty part.

VIII. Troubleshooting

Water Leaking Past Doors

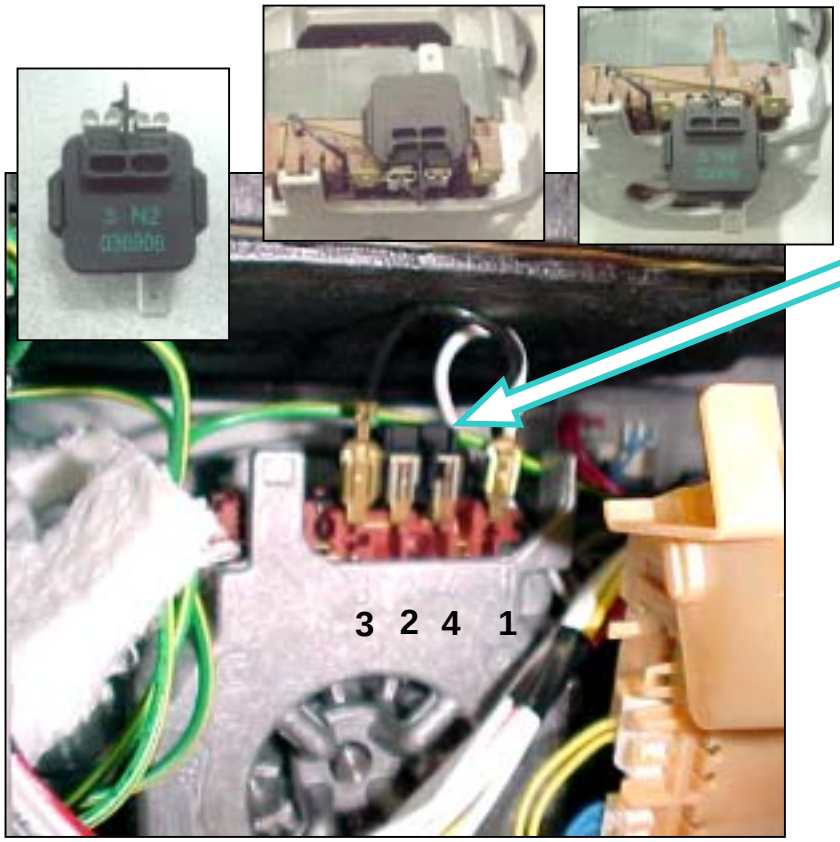
Water seldom leaks out of bottom of dishwasher doors. Usually it's a customer or installation issue. Occasionally temporary blockages of condensation tubes by air pockets (from standing water in loops) or kinks in tubes causes leaking. Pressure builds in tanks, blowing water past lower door seals. Draining condensation tubes and straightening out kinks solves these occasional problems.



VIII. Troubleshooting

Circulation Pump - Checking PTC Pump Motor Starter (1)

The (PTC) circulation pump motor starter (**# 182318**) is used on **SHX99B / SHV99A / SHY99A** *("Apexx")*, & **SHX56B / SHV66A / SHY56A-66C** *("ExactWash")* models with water switches. The matching circulation pump (**# 239129**) has three slightly smaller & more efficient windings compared to the traditional pump with two larger windings (**# 266511** motor / **# 239144** pump). The 3rd (start) winding is cut out when the motor gets running. This stronger pump is needed due to the increased water flow resistance from the water switch.



HINT: PTC (motor starter) is located on top of the pump motor and can face one of two directions -- facing out or facing over the motor.

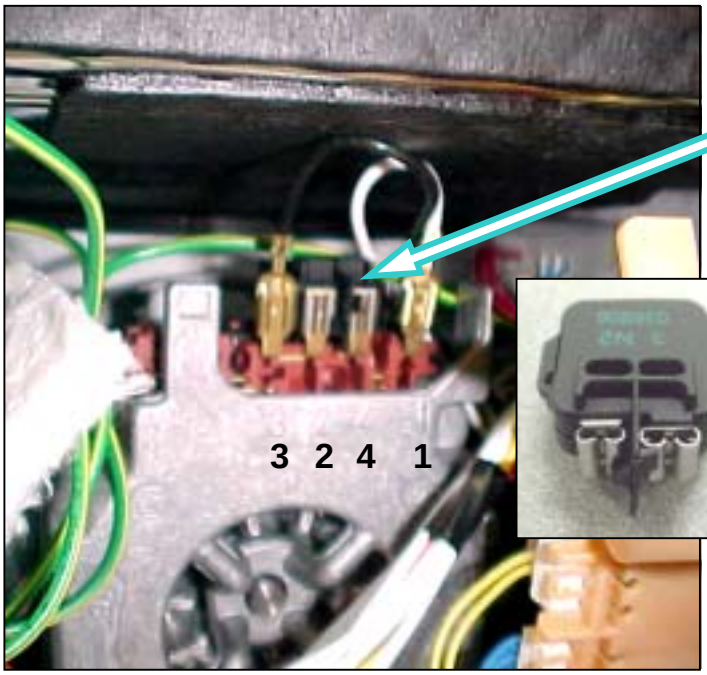
To install (PTC) motor starters, push female terminals over pump motor terminals 2 & 4. The terminals are different sizes to match the smaller motor terminal 4.

The (PTC) motor starter helps start the circulation pump. It's a ceramic thermal switch which conducts current & heats up, cutting out the 3rd (start) winding at a preset temperature. The two main windings (with the start/run capacitor) have power whenever the pump is running.

- Check the motor starter if the pump motor won't start (starter stuck open) or runs hot (starter stuck closed).

VIII. Troubleshooting

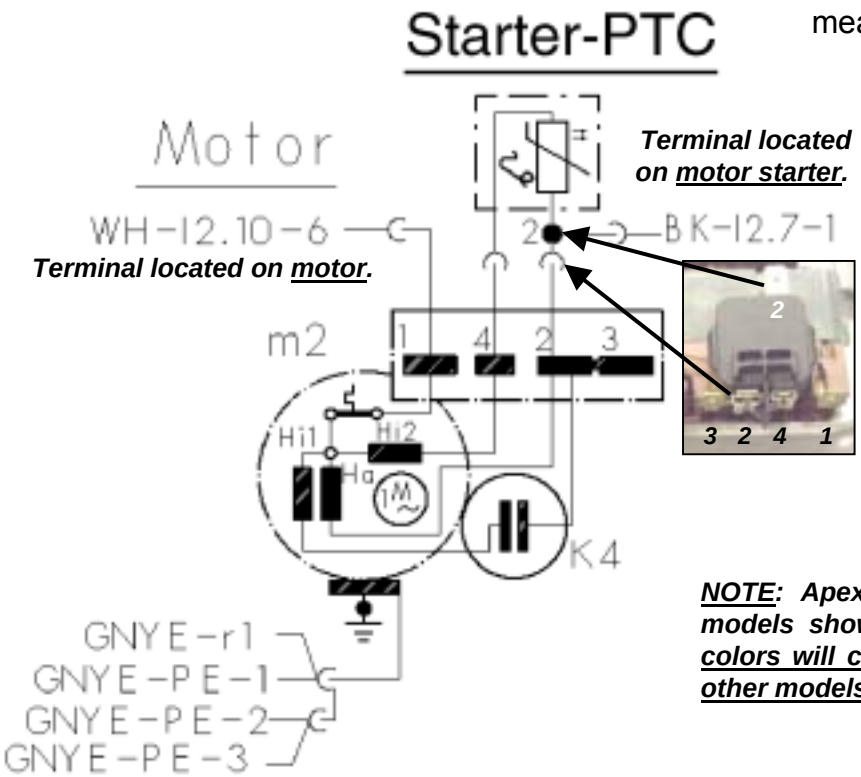
Circulation Pump - Checking PTC Pump Motor Starter (2)



Apexx model shown

TECH TIPS: Resistance measurements:

- Between terminals 1 - 2 is ~ 7 Ω (one of the main run windings).
- Won't help between terminals 2 - 4 (start winding, a run winding & the motor starter). The motor starter can't be measured since the windings are always connected. Must disconnect PTC 1st to measure its continuity.



NOTE: Apexx (SH_99) models shown. Wire colors will change for other models.

NOTE: Motor terminals 2 - 3 and one of the PTC terminals are tied together.

NOTE: Unlike standard two-winding pump motors, these three-winding pump motors have four terminals instead of three.

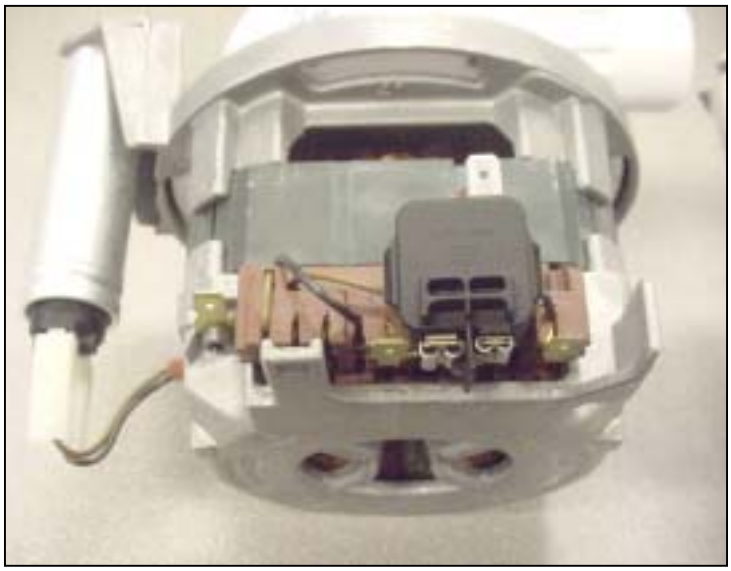
VIII. Troubleshooting

Circulation Pump - Water Switch Pump Nuisance Tripping (1)

There have been some nuisance tripping of thermal motor protectors on three-winding circulation pumps for use with water switches (**# 239129**). To prevent nuisance tripping, use pumps with upgraded thermal protectors (**# 437345**). If upgraded pumps (**# 437345**) aren't available, use original circulation pumps (**# 239129**) with new (PTC) motor starters designed to prevent nuisance tripping (**# 423023**).

IMPORTANT: Using new & original pumps & motor starters:

- Use "new" circulation pump # 437345 (with 135ºC OVLP) only with "original" motor starter # 182318 (4.7 – 4.8Ω).
- Use "original" circulation pump # 239129 (with 120ºC OVLP) only with "new" motor starter # 423023 (15Ω).



TECH NOTES: New motor starter # 423023 (15Ω) has a larger resistance to limit current draw through pump motor start windings. Winding temperatures are reduced, but starting torque is reduced as well. So, new motor starters (# 423023) should never be used with new circulation pumps (# 437345).

HINTS: Typical repairs will involve either replacing "original" circulation pump # 239129 with "new" circulation pump # 437345 (preferred) or replacing "original" motor starter # 182318 with "new" motor starter # 423023.

TECH TIPS: All circulation pump motors use auto-reset thermal protectors. Once motor windings cool below a preset temperature, protectors reset and pumps will work again. If thermal protectors fail to reset, replace pumps.

VIII. Troubleshooting

Circulation Pump - Water Switch Pump Nuisance Tripping (2)

HINTS: Identifying new & original pumps & motor starters:

- "New" circulation pump # 437345 – look for # "5600 060022" stamped on housing.
- "Original" circulation pump # 239129 – look for # "5600 050139" stamped on housing.
- "New" motor starter # 423023 – look for # "041692" stamped on housing.
- "Original" motor starter # 182318 – look for # "036906" stamped on housing.

"New" motor starter 423023

"Original" motor starter 182318

"New" pump 437345

"Original" pump 239129

TECH TIPS: Using new & original pumps & motor starters:

Use "new" circulation pump 437345 (with 135ºC OVLP) only with "original" motor starter 182318 (4.7 – 4.8Ω).

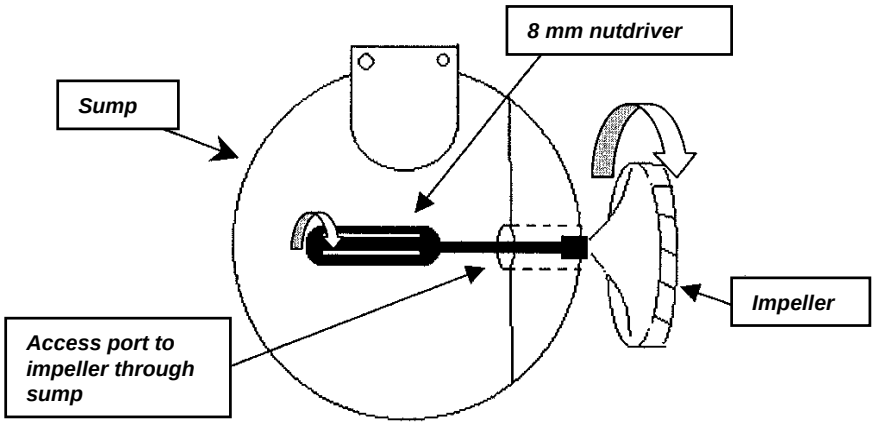
Use "original" circulation pump 239129 (with 120ºC OVLP) only with "new" motor starter 423023 (15Ω).

VIII. Troubleshooting

Circulation Pump – Replacing Impellers (1)

Occasionally, a circulation pump impeller can stick if a dishwasher hasn't been used for a long time. Impeller ceramic rings and carbon rings had been changed (during January, 2001) to reduce or eliminate impeller sticking (ceramic rings are located around shaft on rear of impeller).

For temporary repairs when impeller replacement isn't possible, impellers can be loosened by rotating them (through the sump) using an **8mm** nut driver (impellers should be replaced shortly thereafter when repairs are possible).



HINTS:

- ***Upgraded impellers (with upgraded ceramic rings) and carbon rings fit both old 263835 and new 266511 (softer bearing) circulation pump motors (and corresponding pump housings).***
- ***Check color of impeller ceramic rings as shown below to determine upgraded (January, 2001 & later) and old (December, 2000 & before) style rings.***
- ***Make sure black spacer is reinstalled -- failure to reinstall spacer can cause motor to bind.***

INSTRUCTIONS FOR LOOSENING IMPELLER:

To loosen stuck impeller, access sump by removing microfilter and sump screen. Insert an 8mm nutdriver through sump hole to impeller -- place nutdriver onto 8mm stud on impeller and carefully rotate impeller clockwise until it becomes free (at least two full revolutions).

NOTE: Upgraded spacers and ceramic rings (January, 2001 and later) provide lower friction and less contact area, preventing impeller sticking when dishwashers haven't been used for long periods of time.

NOTE: Impellers should be replaced (instead of loosened) whenever possible. Loosening impellers should be done only on a temporary basis.

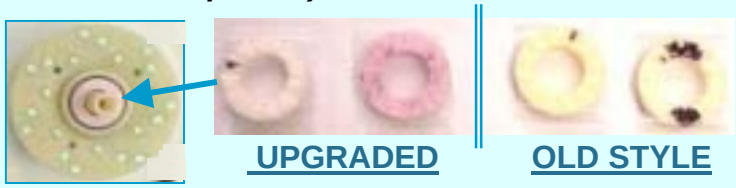
HINT: Impeller ceramic ring color code:

Bright white -- ***upgraded ring***

Pink -- ***upgraded ring***

Dull yellow/cream -- ***old ring (impeller should be replaced)***

Dull white (off white) -- ***old ring (impeller should be replaced)***

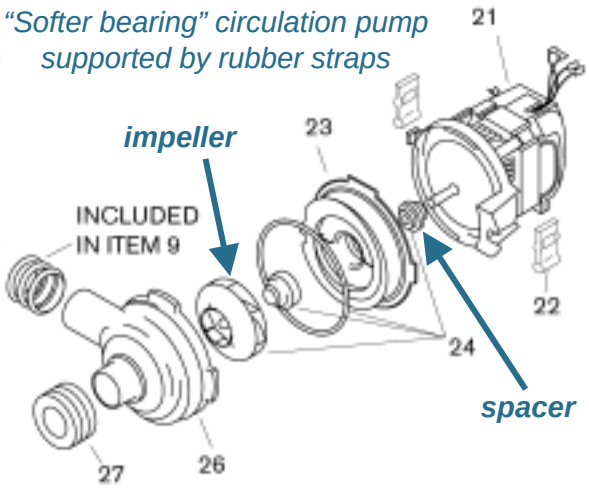


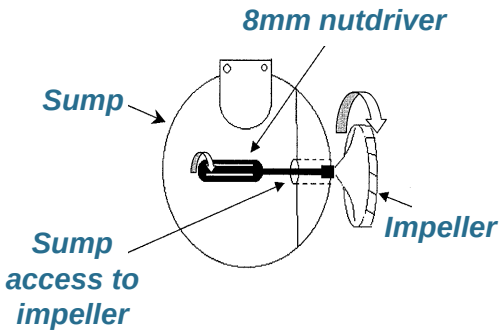
VIII. Troubleshooting

Circulation Pump – Replacing Impellers (2)

Occasionally, a circulation pump will jam when debris gets caught inside (when the sump filter wasn't tightened down) or when a dishwasher hasn't been used for months. Often circulation pumps are replaced when merely changing the ***impeller*** (kit **# 167085**, *item # 24*) will solve the problem.

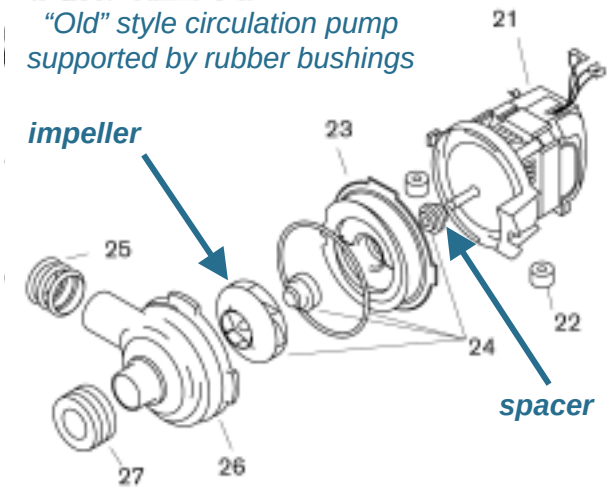
"Softer bearing" circulation pump supported by rubber straps



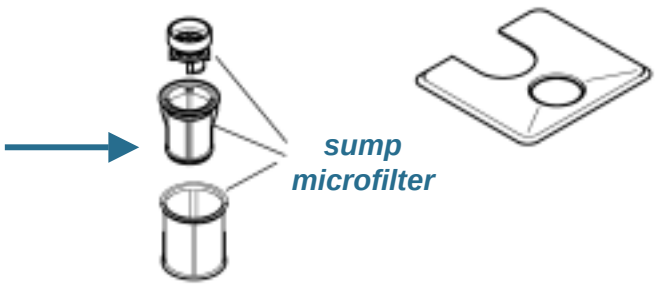


CAUTION: *When replacing an impeller, install the black spacer between the pump motor and the rear pump housing.* ***Failure to do so may lock up the pump and damage the rear pump housing!***

"Old" style circulation pump supported by rubber bushings



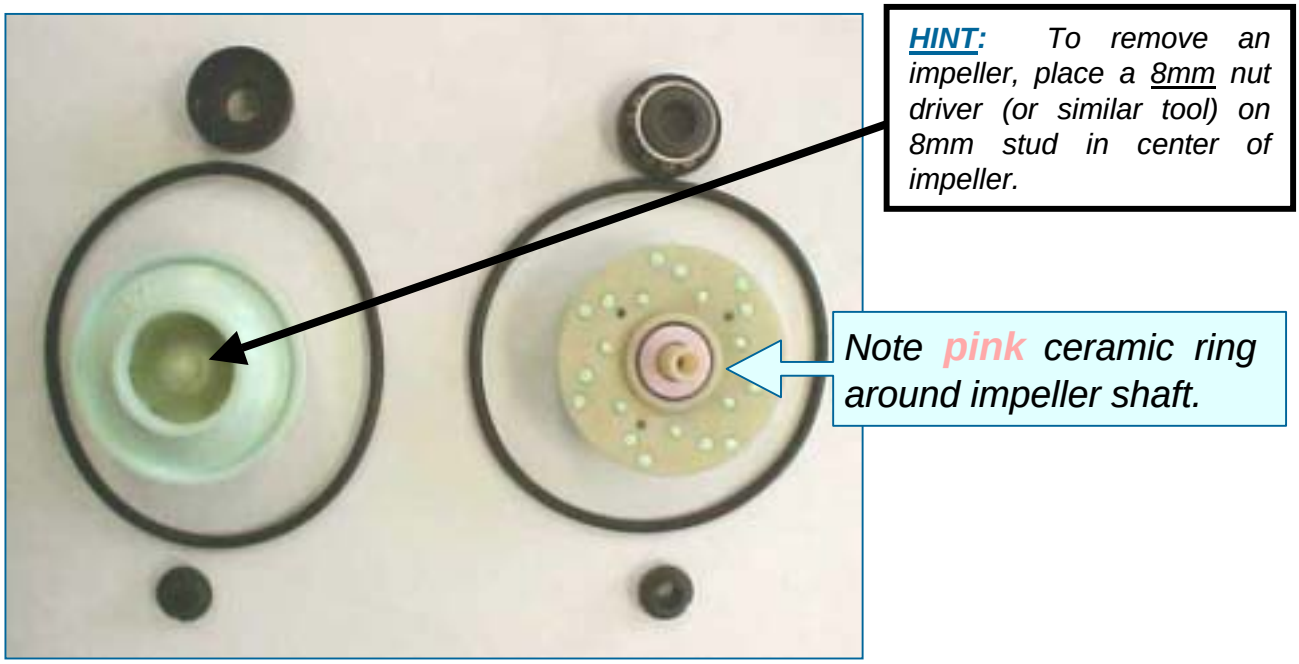
HINT: *When replacing an impeller, instruct the customer to tighten the sump filter properly to avoid future problems.*



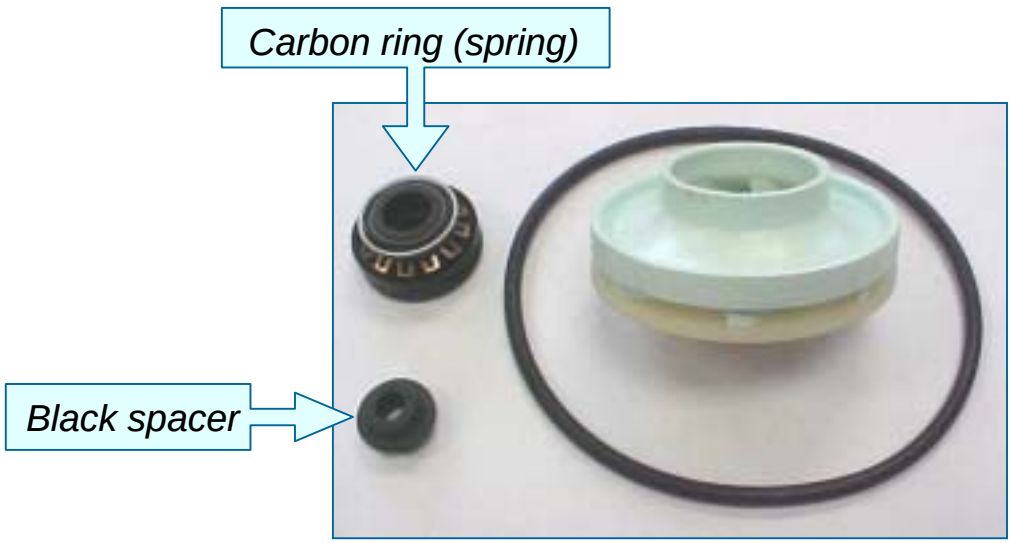
VIII. Troubleshooting

Circulation Pump – Replacing Impellers (3)

Replacement impellers will have a **green** tint compared to older impellers. The impeller ceramic ring should be **pink** or bright white.



Impeller kit # **167085**, showing front and rear sides of impeller and carbon ring (spring).



VIII. Troubleshooting

Circulation Pump – Service Index UC/06, UC/11 & UC/12 Parts Changes

Part description	*Old part #*	*Models used on*	*Softer bearing part #*	*Models used on*
Circulation pump	**263835 (motor only)**	All models (index #'s UC/06 & UC/09)	**491434 (pump) or 266511 (motor only)**	All models (index #'s UC/07, UC/11 & UC/12)
Pump support bushings	**167244**	All models (index #'s UC/06 & UC/09)	**--------**	--------
Pump support straps	**--------**	--------	**171596**	All models (index #'s UC/07, UC/11 & UC/12)
Gasket (pump to heater)	**165268**	All models (index #'s UC/06 & UC/09)	**--------**	--------
Pipe clamp (pump to heater)	**--------**	--------	**172272**	All models (index #'s UC/07, UC/11 & UC/12)
Pump rear housing	**263314**	All models (index #'s UC/06 & UC/09)	**267739**	All models (index #'s UC/07, UC/11 & UC/12)
Pump front housing	**263838**	All models (index #'s UC/06 & UC/09)	**266514**	All models (index #'s UC/07, UC/11 & UC/12)
Seal (pump to sump)	**165269**	All models (index #'s UC/06 & UC/09)	**171598**	All models (index #'s UC/07, UC/11 & UC/12)

NOTE: *Most circulation pump part #'s have changed due to the "**softer bearing**" upgrade -- the circulation pump has been suspended by flexible straps instead of being mounted onto the base (onto rubber bushings) to make the dishwashers quieter. The impeller kit hasn't changed – its still # **167085**.*

NOTE: *Parts can be changed without notice. Please refer to published CD parts lists for up to date part #'s.*

VIII. Troubleshooting

Circulation Pump – Service Index UC/14 Water Switch Parts Changes

Part description	*Old part #*	*Models used on*	*Water switch part #*	*Models used on*
Circulation pump	**491434 (pump) or 266511 (motor only)**	All models (index #'s UC/07, UC/11 & UC/12)	**239129 (pump)**	All *ExactWash* & *Apexx* models (index # UC/14)
Pump motor starter	**--------**	--------	**423023**	All *ExactWash* & *Apexx* models (index # UC/14)
Heater assembly	**Various**	Various	**219639 or 431412**	All *ExactWash* & *Apexx* models (index # UC/14)
Sump	**263103**	All models (index #'s UC/07, UC/11 & UC/12)	**482035**	All *ExactWash* & *Apexx* models (index # UC/14)
Pump support straps	**171596**	All models (index #'s UC/07, UC/11 & UC/12)	**171596**	All models (index #'s UC/07, UC/11, UC/12 & UC/14)
Pipe clamp (pump to heater)	**172272**	All models (index #'s UC/07, UC/11 & UC/12)	**172272**	All models (index #'s UC/07, UC/11, UC/12 & UC/14)
Pump rear housing	**267739**	All models (index #'s UC/07, UC/11 & UC/12)	**267739**	All models (index #'s UC/07, UC/11, UC/12 & UC/14)
Pump front housing	**266514**	All models (index #'s UC/07, UC/11 & UC/12)	**266514**	All models (index #'s UC/07, UC/11, UC/12 & UC/14)

NOTE: *This affects (ExactWash & Apexx) models with water switches -- **SH_56**, **SHV/Y66** & **SH_99**.*

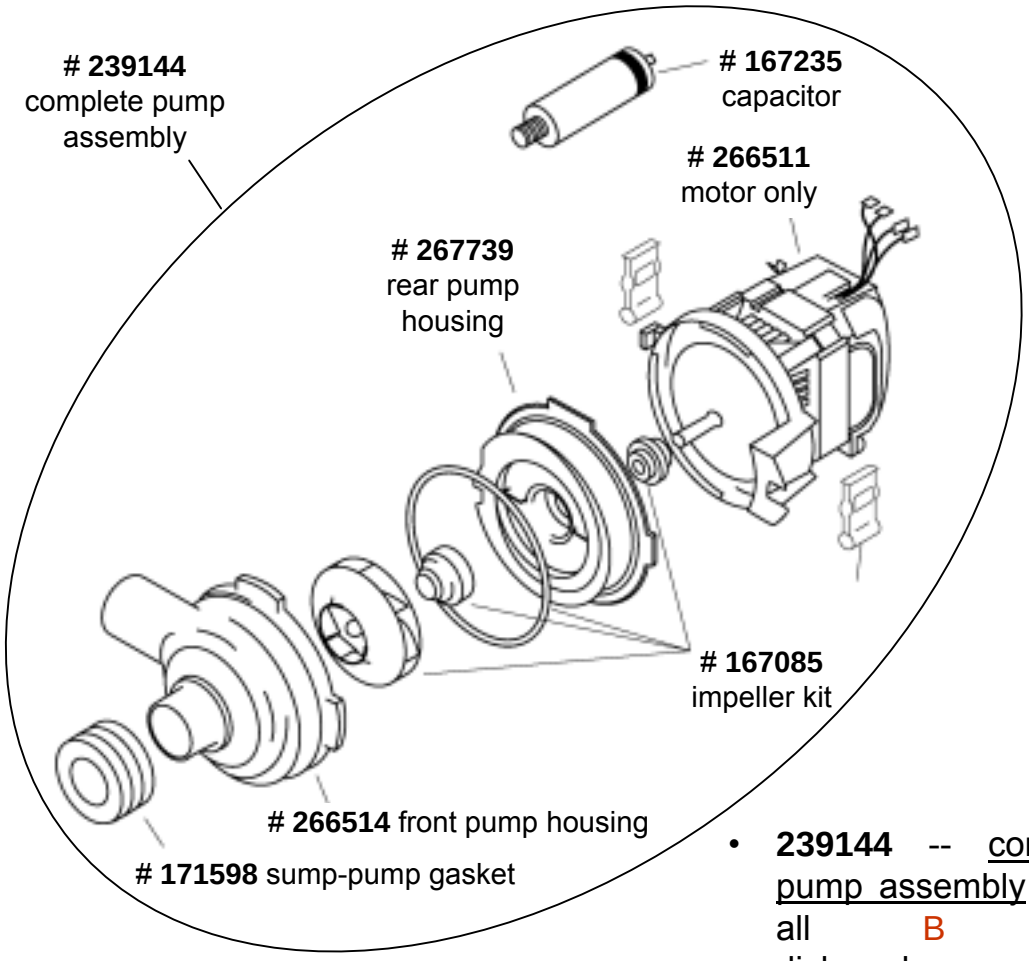
NOTE: *Parts can be changed without notice. Please refer to published CD parts lists for up to date part #'s.*

NOTE: *This does **not** affect (Sensotronic) UC/14 models without water switches. They use the same parts used on models from UC/06 through UC/12.*

VIII. Troubleshooting

Circulation Pump – Pump & Motor Part # Changes

The softer bearing (UC/07, UC/11 & UC/12 index) circulation pump and motor only part #'s for all B & G models have been changed to make parts ordering more consistent throughout the world. All B & G parts in stock have been changed to these new part #'s as follows:



NOTE: The circulation pump assembly part # has been changed from # **266511** to # **239144**. Please check all pumps ordered or already in stock to make sure they show part # **239144**.

HINT: The preferred repair for replacing pump impellers is the # **167085** impeller kit. The other solution is using complete pump assembly # **239144**. The # **266511** pump motor only should only be used if the motor fails (which rarely happens).

- **239144** -- complete circulation pump assembly (with impeller) for all B & G dishwasher models with softer bearing (all models with index #'s UC/07, UC/11 & UC/12)
- **266511** -- circulation pump motor only for all B & G dishwasher models with softer bearing (all models with index #'s UC/07, UC/11 & UC/12)

NOTE: The # **167085** impeller kit and # **263835** index UC/06 circulation pump motor only part #'s have not changed and still are used.

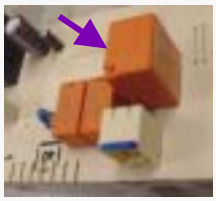
VIII. Troubleshooting

Control Module – Heater Relays

HINT: Occasionally, a heater relay terminal soldered to a **# 266746**, **263832** or **264461** control module pc board can burn or have insufficient solder. ***If so, do not resolder the relay, but replace the control module.***

*The heater relay is the **largest** of three relays in the center of the pc board & can be one of two colors:*

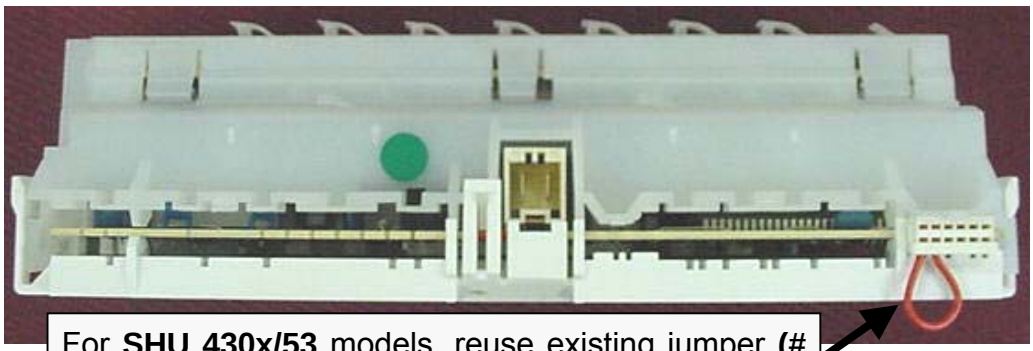
Black



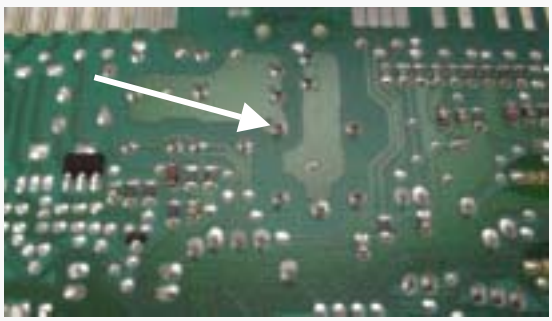
Orange

HINT: ***Faulty heater relays can cause modules to count down to "1" and stop.***

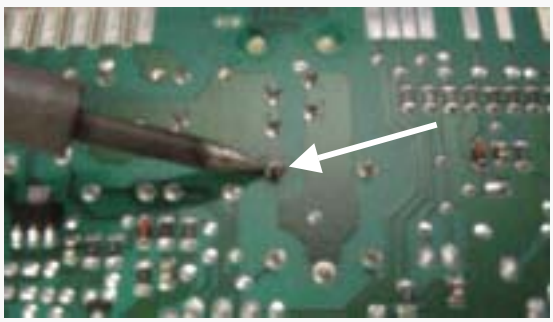
NOTE: ***Replace all faulty control modules and hold them for (60) days for possible return for analysis. Do not resolder control module pc boards.***



For **SHU 430x/53** models, reuse existing jumper **(# 167782**) for replacement module (SHU 53 shown).



Good board *-- showing proper soldering on back of pc board.*



Burned board *-- showing burned terminal on back of pc board.*

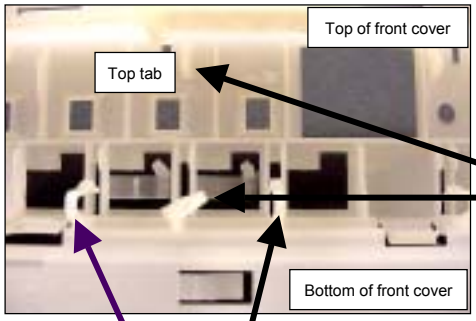
VIII. Troubleshooting

Control Module – Using # 264946 Front Cover to Replace Broken # 266746, # 263832 or # 264461 Control Module Buttons

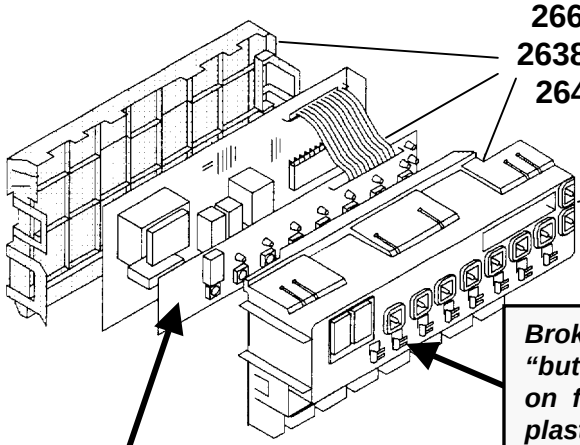
 # 266746, # 263832 or **# 264461** control modules are often replaced when buttons break, not for electronic failures. Replacing the **# 264946** front cover when buttons break instead of replacing the entire control module will save customers time and money.

NOTE: *# 264946 front cover fits on all three modules -- # 266746, # 263832 & # 264461.*

CAUTION: *Some pc board components are sensitive to static electricity and can be damaged when touched. Personnel handling pc boards should be grounded.*



Note cracks in plastic locking tabs.



Broken control module "buttons" occur when tabs on front cover break. Use plastic front cover when replacing "broken buttons".

CAUTION: ***Insert display module board carefully to prevent breaking spring locking tabs on front cover. When installing display module, carefully slide top of board into top of front cover, making sure board is fully seated into tabs. Then, carefully rotate bottom of board into position so spring locking tabs spring back and lock without cracking or breaking. DO NOT FORCE bottom or top of display board into position.***

INSTALLATION: *To install a front cover, insert the hinge tabs into the control module housing -- do NOT force the cover into the housing. To insert the hinge tabs, rotate the front cover (with the tabs contacting the housing hinge) until the cover hinge tabs slide easily into the hinge. When the hinge is in place, close the front cover until all three tabs lock the cover in place.*

HINT: *Use # **264946** front cover instead of replacing an older # **263832** module with a # **266746** module since modules cost more & have longer lead times than covers. Many # **263832** modules have been replaced merely for broken buttons.*

NOTE: To determine which control module you have, check the model #'s on the following list:

266746 -- SHU 5302/5304/5305/5306/5312/5314/5315/5316/6802/6805/6806 UC 11 - UC/12, SHU 5307/5317 UC/12 and SHI 6802/6805/6806 UC/11 - UC/12.

263832 -- SHU 5302/5304/5305/5306/5312/5314/5315/5316/6802/6805/6806 UC 06 and SHI 6802/6805/6806 UC/06.

264461 -- SHU 4302/4306/4312/4316 UC 06 - UC/11 - UC/12 and SHI 4302/4306 UC/06 - UC/11 - UC/12.

VIII. Troubleshooting

Control Module – Using # 481055 Control Modules in Older SHU 99 and SHV 43/48 Dishwashers (1)

Control module **# 265401** used on older **SHV 43/48** and **SHU 990x/991x UC/06, UC/07** & **UC/11** models has been replaced by control module **# 481055** used on all newer **SHU 99** & **SHV 43/48 UC/12** models. Since module **# 481055** has slightly different wash cycles and an end of cycle tone compared to the **# 265401** module, the pushbutton pad for the dishwasher must also be changed so the wash cycles will be shown correctly. Please follow these instructions to order the correct pushbutton pad and to turn off the end of cycle tone for older models.

NOTE: When replacing pushbutton pads for older **SHV 43/48** & **SHU 990x/991x** models when the **# 265401** control module won't be replaced (I.e. the **# 265401** control is functional and is still being used), use the following button pads:

- **# 170424** 4-button pad for **SHV 43** & **SHU 990x/991x** models (instead of **# 182605**)
- **# 170423** 5-button pad for **SHV 48** models (instead of **# 182600**)

NOTE: When replacing control module **# 481055** for newer **SHV 43/48** & **SHU 991x/992x** models, button pads don't need to be replaced. If the button pads are worn, order # 4-button pad **# 182605** (for **SHV 43** & **SHU 991x** models) or 5-button pad **# 182600** (for **SHV 48 & SHU 992x** models).

NOTE: When replacing control module **# 265401** for older **SHV 43/48** & **SHU 990x/991x** models, use module **# 481055** along with 4-button pad **# 182605** (for **SHV 43** & **SHU 990x/991x** models) or 5-button pad **# 182600** (for **SHV 48** models).

VIII. Troubleshooting

Control Module – Using # 481055 Control Modules in Older SHU 99 and SHV 43/48 Dishwashers (2)

5-button pushbutton pad # 182600 used on SHV 48 UC/06, UC/07, UC/11 & UC/12 and SHU 992x UC/12

4-button pushbutton pad # 182605 used on SHV 43, SHU 991x UC/06, UC/11 & UC/12 and SHU 990x UC/06

New pushbutton pads:

INSTRUCTIONS FOR TURNING OFF END OF CYCLE TONE:

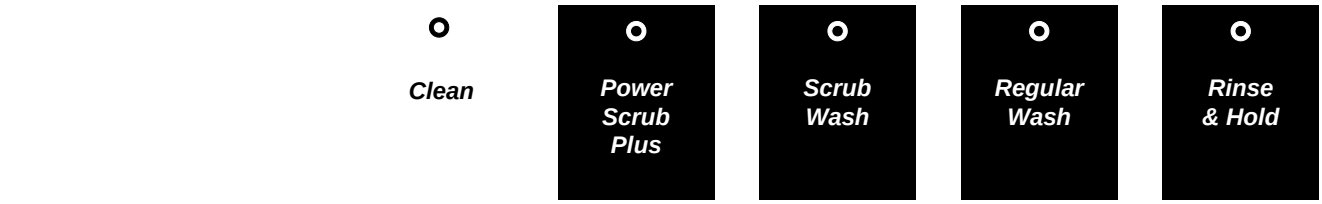
- Open door, push and hold *Delicate/Econo* button, then turn dishwasher on while holding *Delicate/Econo* button.
- Release *Delicate/Econo* button. If module beeps, then end of cycle tone is on. Press *Delicate/Econo* button to disable tone. If module doesn't beep after button is pressed, then tone is disabled.
- Turn off dishwasher to save selection.

VIII. Troubleshooting

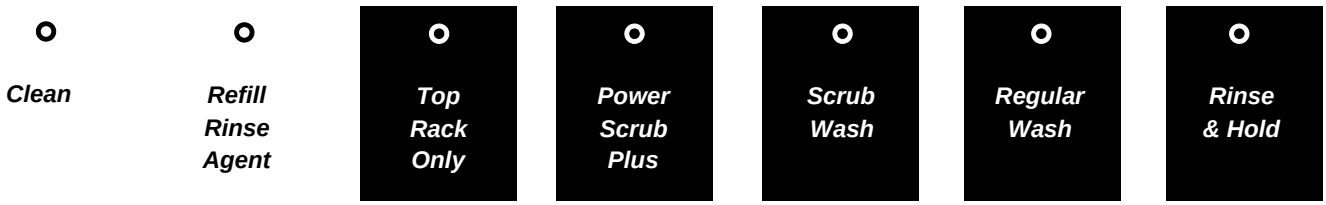
Control Module – Using # 481055 Control Modules in Older SHU 99 and SHV 43/48 Dishwashers (3)

Comparison of old and new pushbutton pads:

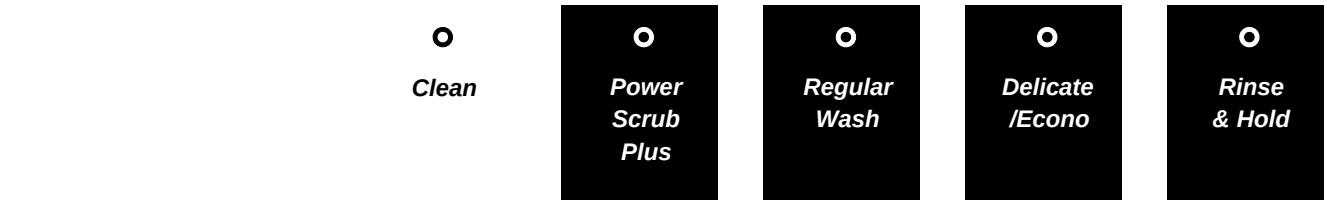
SHV 4303 UC/06 & UC/11 models program buttons & indicator lights:



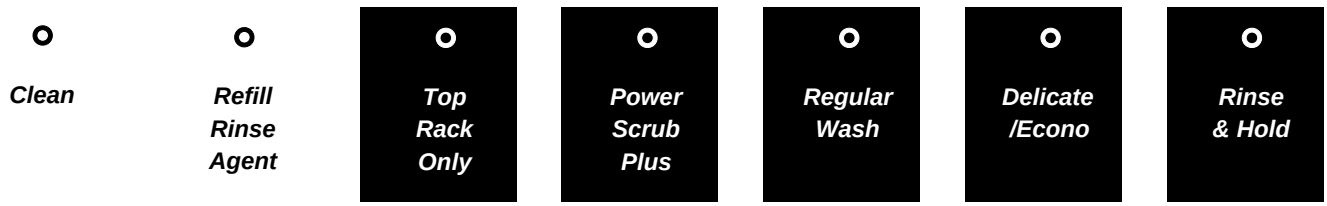
SHV 4803 UC/06 & UC/07 models program buttons & indicator lights:



SHV 4303 UC/12 models program buttons & indicator lights:



SHV 4803 UC/12 models program buttons & indicator lights:

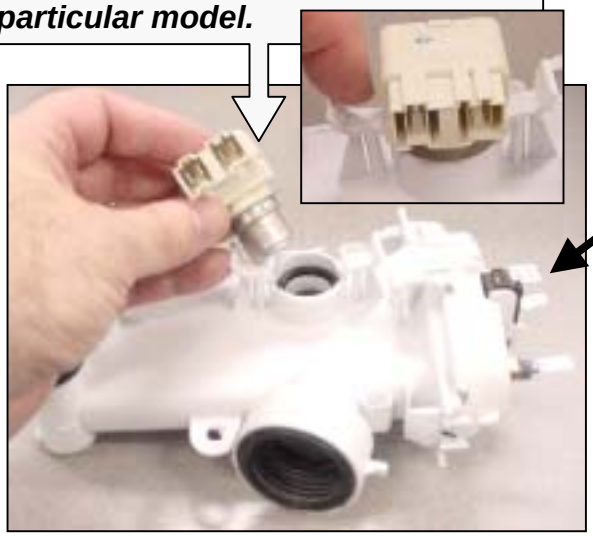


VIII. Troubleshooting

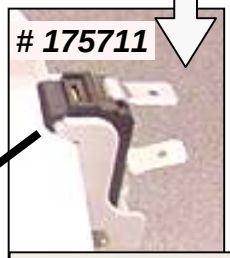
Heater – Replacing Older UC/06 NLA Heaters

Some heater assemblies for old index UC/06 models aren't available -- **# 264463** (for **SHU 3000/4000** models) & **# 269255** (for **SHU 3030/3130** models). Similar heater assemblies for other index UC/06 models can be used when thermostats are installed, flow switches are replaced and aqua sensors are removed – use **# 263869** (used on **SHU 53/68** models) or **# 264462** (used on **SHU 33/43/99** models).

Push latches to remove NTC, then replace with appropriate thermostat (& o-ring) for the particular model.



Must replace 2-terminal flow switch # 175711 with 3-terminal # 069796.



Remove aqua sensor

HINT: Do not use softer bearing heater assemblies (UC/11 & later) such as # 480317 on older UC/06 models since the sump, circulation pump, base and heater clamps/gaskets have to be replaced as well for the heaters to fit.

HINT: Remove aqua sensors from heater assemblies before installation as aqua sensors aren't used and have no wires to be connected to.

NOTE: Individual heating elements aren't available. Use 263869 or 264462 heater assemblies only.

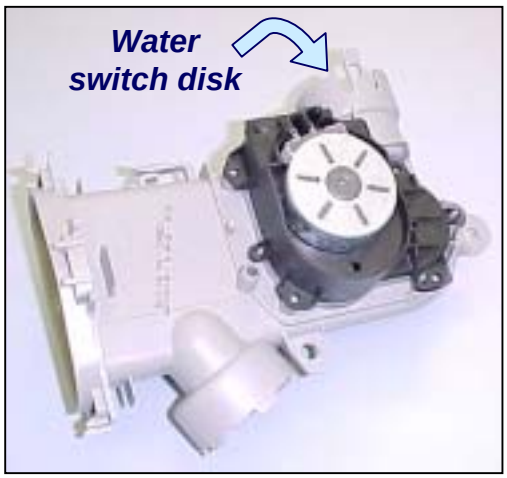
168575 thermostat for SHU 3000/4000 models

165384 thermostat for SHU 3030/3130 models

VIII. Troubleshooting

Heater – Water Switch ("Flow Control") (1)

All *Apexx* (**SH_99**) and *ExactWash* (**SHX/Y56 & SHV/Y66**) model heater assemblies have motor operated water switches inside them, with motors attached where *Top Rack Only* housings have been traditionally mounted (underneath heater assemblies). They consist of a motor-controlled disk (with 3 holes) which rotates to provide precise water flow control -- using both spray arms, upper spray arm only or lower spray arm only.



HINT: Models with water switches require stronger circulation pumps (**# 239129**) with separate motor starters (**# 182318**). Circulation pumps, heaters & sumps for water switch and non-water switch models **cannot** be interchanged.

HINT: Models with water switches and *Top Rack Only* have the *Top Rack Only* parts integrated with the water switches. No separate actuators are needed.

VIII. Troubleshooting

Heater – Water Switch ("Flow Control") (2)

Part description	*Old part #*	*Models used on*	*Water switch part #*	*Models used on*
Circulation pump	**491434 (pump) or 266511 (motor only)**	All models (index #'s UC/07, UC/11 & UC/12)	**239129 (pump)**	All *ExactWash* & *Apexx* models (index # UC/14)
Pump motor starter	**--------**	--------	**182318**	All *ExactWash* & *Apexx* models (index # UC/14)
Heater assembly	**Various**	Various	**219639 or 431412**	All *ExactWash* & *Apexx* models (index # UC/14)
Sump	**263103**	All models (index #'s UC/07, UC/11 & UC/12)	**482035**	All *ExactWash* & *Apexx* models (index # UC/14)
Pump support straps	**171596**	All models (index #'s UC/07, UC/11 & UC/12)	**171596**	All models (index #'s UC/07, UC/11, UC/12 & UC/14)
Pipe clamp (pump to heater)	**172272**	All models (index #'s UC/07, UC/11 & UC/12)	**172272**	All models (index #'s UC/07, UC/11, UC/12 & UC/14)
Pump rear housing	**267739**	All models (index #'s UC/07, UC/11 & UC/12)	**267739**	All models (index #'s UC/07, UC/11, UC/12 & UC/14)
Pump front housing	**266514**	All models (index #'s UC/07, UC/11 & UC/12)	**266514**	All models (index #'s UC/07, UC/11, UC/12 & UC/14)

NOTE: *This affects (ExactWash & Apexx) models with water switches -- **SH_56**, **SHV/Y66** & **SH_99**.*

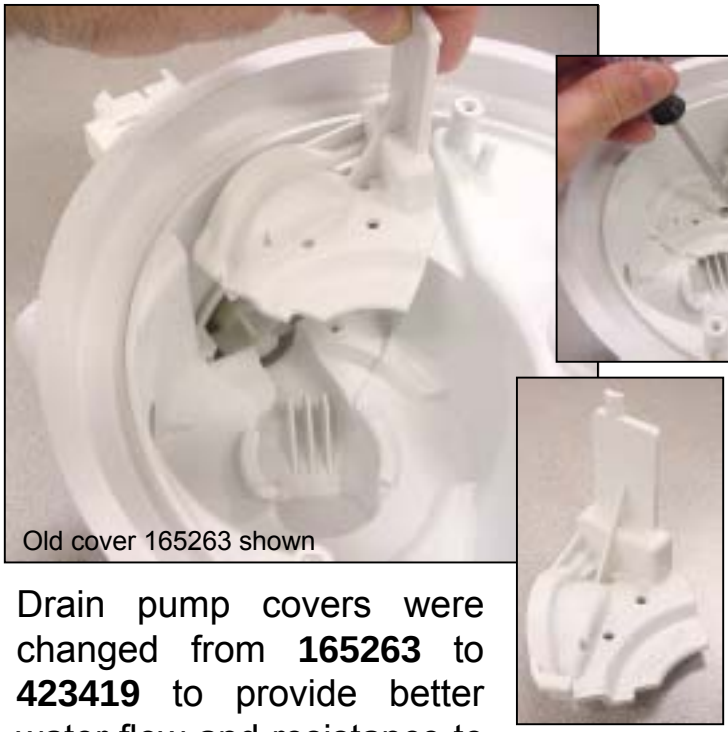
NOTE: *This does **not** affect (Sensotronic) models without water switches. They use the same parts used on models from UC/06 through UC/12.*

NOTE: *Parts can be changed without notice. Please refer to published CD parts lists for up to date part #'s.*

VIII. Troubleshooting

Drain Pump – Sump Improvements to aid Draining

Two improvements have been made in sump parts during mid 2003 to improve draining. Drain pump performance can be optimized if these parts are replaced when drain pumps are replaced.



Old cover 165263 shown

Drain pump covers were changed from **165263** to **423419** to provide better water flow and resistance to jamming.

Old valve 165262 shown

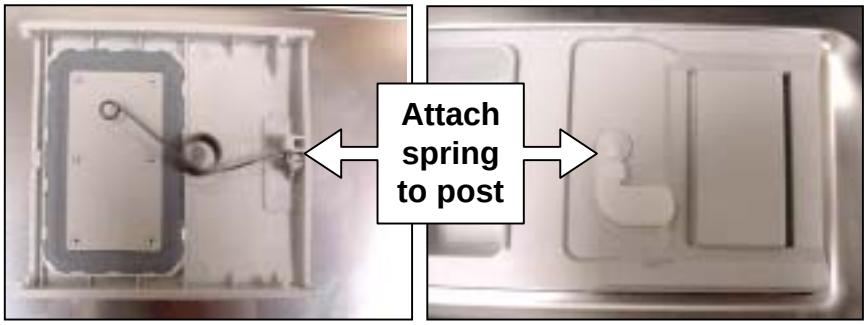
Check (backflow) valves were changed to provide superior leak resistance. The new material is leak proof. Part # is still **165262.**

VIII. Troubleshooting

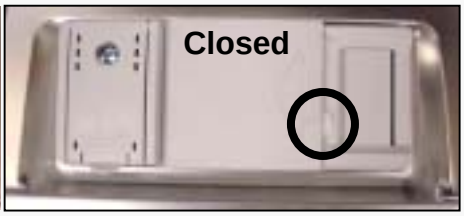
Dispenser – Replacing Dispenser Doors

Most dispenser problems occur from dispenser doors being damaged or pulled off (due to misuse). Please follow the instructions below when replacing doors.

- Connect spring to door & dispenser housing posts.
- While keeping spring attached to posts, carefully slide door onto housing -- <u>making sure door tabs engage dispenser door rails</u>.
- Door levers don't need to be preset during installation.



<u>HINT</u>: Make sure door tabs engage dispenser door rails.



<u>HINT</u>: To close dispenser doors, slide doors closed, then push white lever until lever locks (showing doors are closed). Levers don't need to be preset during installation.

VIII. Troubleshooting

Dispenser – Top Load Dispenser (1)

Many high-end models (with digital displays) have top-load dispensers, enabling detergent and rinse-aid to be added while doors are partially open (preferably @ 45º).

Rinse-aid dosage is shown on the digital display and is changed through the dishwasher controls, not through a dispenser dial.

Standard dispenser

Top-load dispenser

NOTE: Top-load and standard dispensers are **NOT** interchangeable.

HINT: Top-load dispensers are mounted similarly to standard dispensers.

HINT: Check the Use & Care Manual on changing top-load dispenser rinse-aid dosage using dishwasher controls.

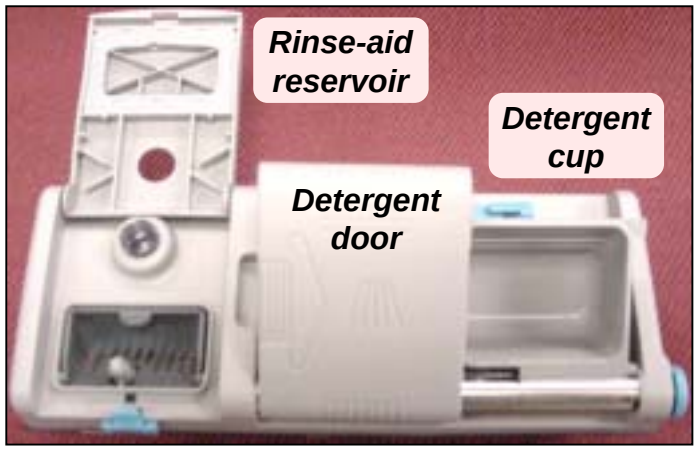
Push onto the **blue** button to release the detergent cup (once the door has been opened).

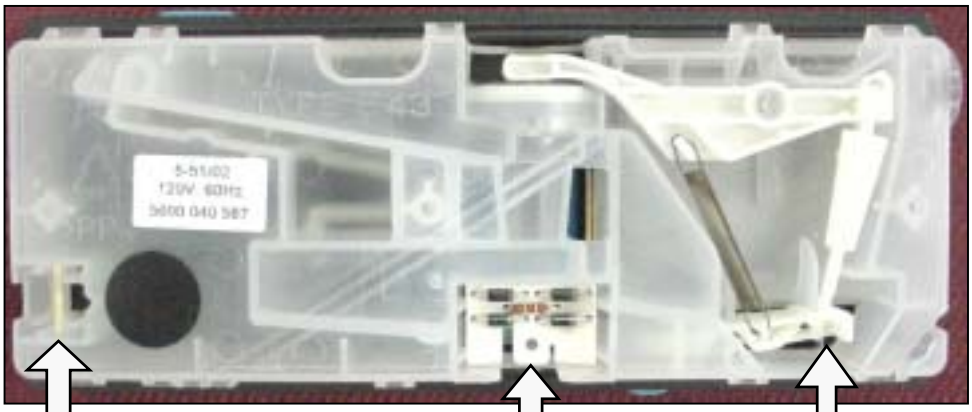
VIII. Troubleshooting

Dispenser – Top Load Dispenser (2)

Top-load dispensers measure rinse-aid levels, but not with removable reed switches as with traditional dispensers. The dispensing mechanism also operates differently from traditional dispensers. All top-load dispensers are unvented.

HINT: *Resistances of actuator and rinse-aid sensor cannot be measured.*

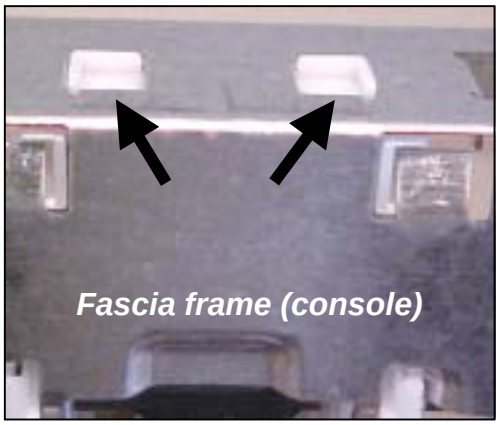


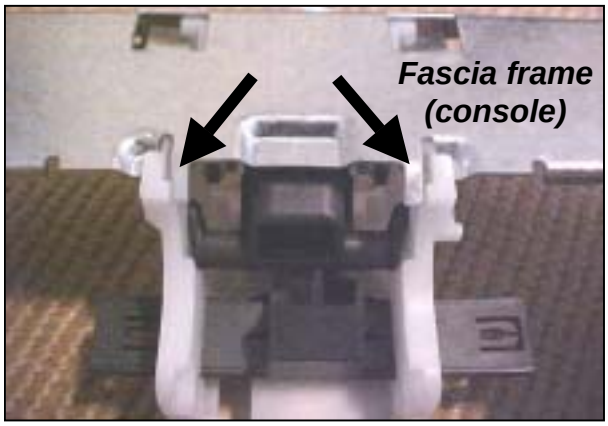


VIII. Troubleshooting

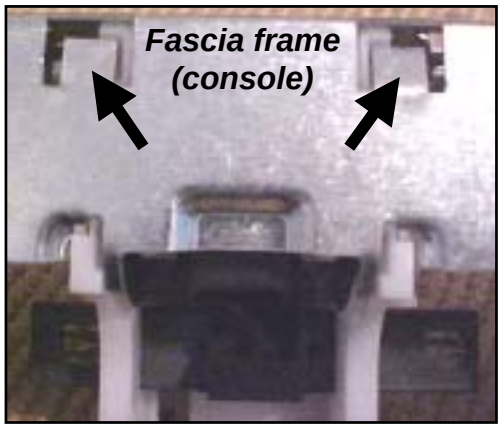
Door Latch – Misaligned Latches

Occasionally integrated dishwasher door latches can be misaligned, causing doors to not close properly or dishwashers to run with doors open (when latches don't reset). Follow these steps to realign door latches.

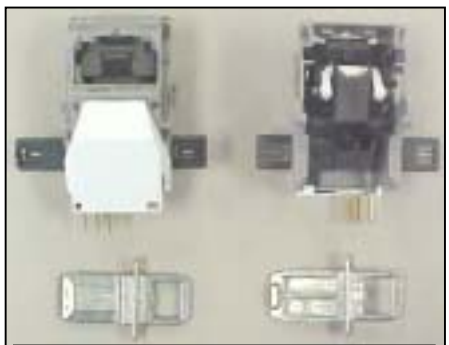




Insert latch tabs into frame ***Bend tabs down next to latch***



Bend tabs down into latch



419828 door latch with microswitch

187184 ball bearing door latch with microswitch

NOTE: Integrated dishwashers include the following models: SHV, SHX, SHY & SHU88/99/995x.

HINT: Make sure latch tabs are seated, all fascia frame (console) tabs are bent completely, door strikes are aligned with latches and door latches get reset.

VIII. Troubleshooting

Door Latch – Miswired Latches

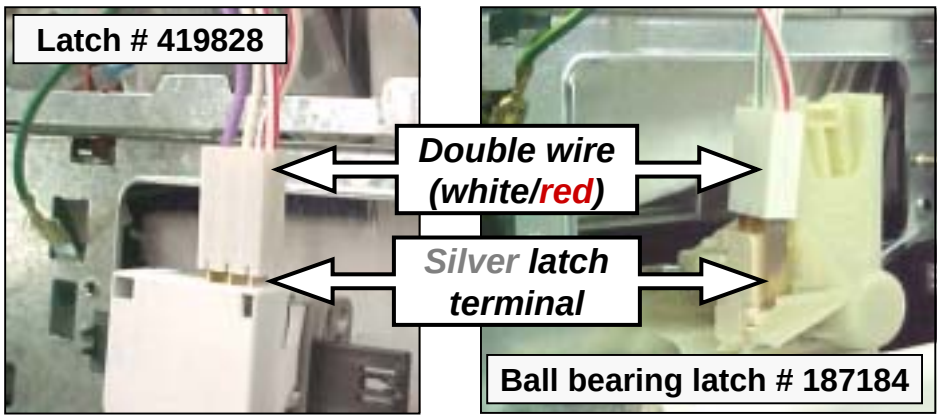
If replacement **SHV46/66**, **SHX33/43/46** or **SHY56/66** door latches/wire harnesses are miswired (with door latch terminals backwards), dishwashers run with doors open and lights won't turn on when doors are open. Control modules can be irreversibly damaged.

No display – door latch wired incorrectly

Proper display – door latch wired correctly

Rewiring door latches:

- Check wiring to photos below – the double wire must be connected to the silver door latch terminal.
- With door open, turn on dishwasher – keep door open. If display doesn't turn on, turn off dishwasher and reverse door latch terminal.



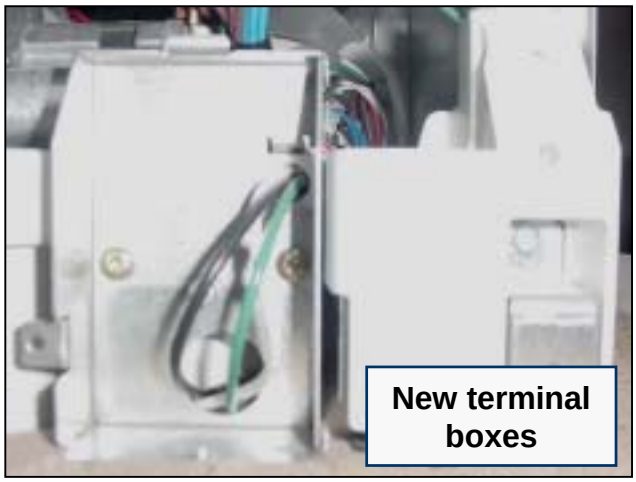
CAUTION: Operating dishwashers with miswired door latches will cause **irreversible** damage to control modules if doors have been closed and circulation pumps have started – modules must be replaced. Check door latch wiring whenever door latch terminals are changed or disconnected or when displays don't light up when dishwashers are turned on.

IMPORTANT: If dishwashers with miswired door latches are corrected before doors are closed and circulation pumps started, modules can still be used. If displays don't light up, turn off dishwashers and reverse door latch terminals before modules are damaged.

VIII. Troubleshooting

All Dishwashers – Terminal Box Covers

Since September, 2003, all dishwashers have included larger terminal boxes (junction boxes/J-boxes) with covers.

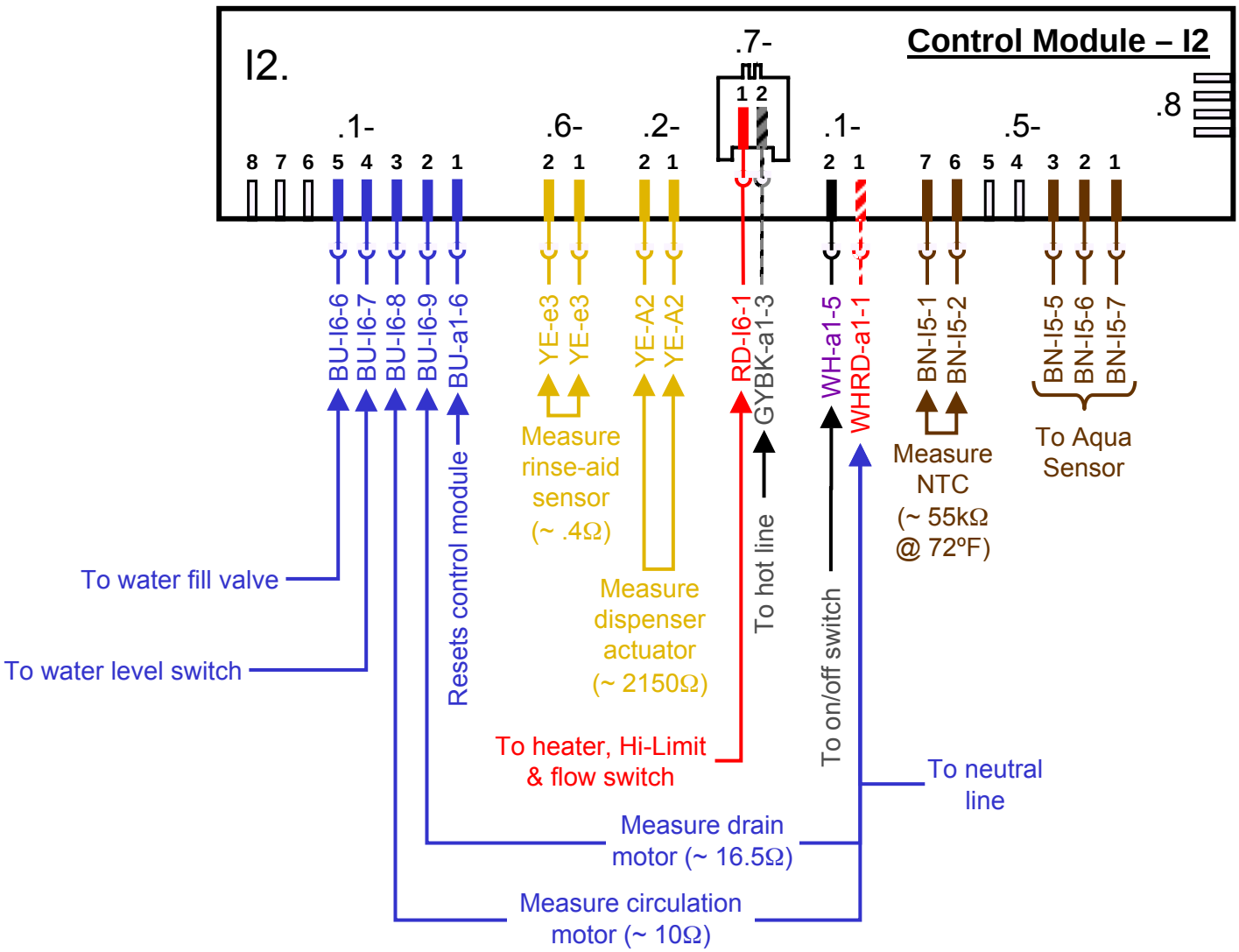


NOTE: Unlike old boxes (where conduits exited bottom of boxes), new terminal boxes have rear conduit exits.

NOTE: Old terminal boxes met UL standards – toe kicks were approved as terminal box covers. There's no need to change out old terminal boxes.

IX. Wiring Diagrams/Tech Sheet

Measuring SHU43C/53A Resistances @ Modules



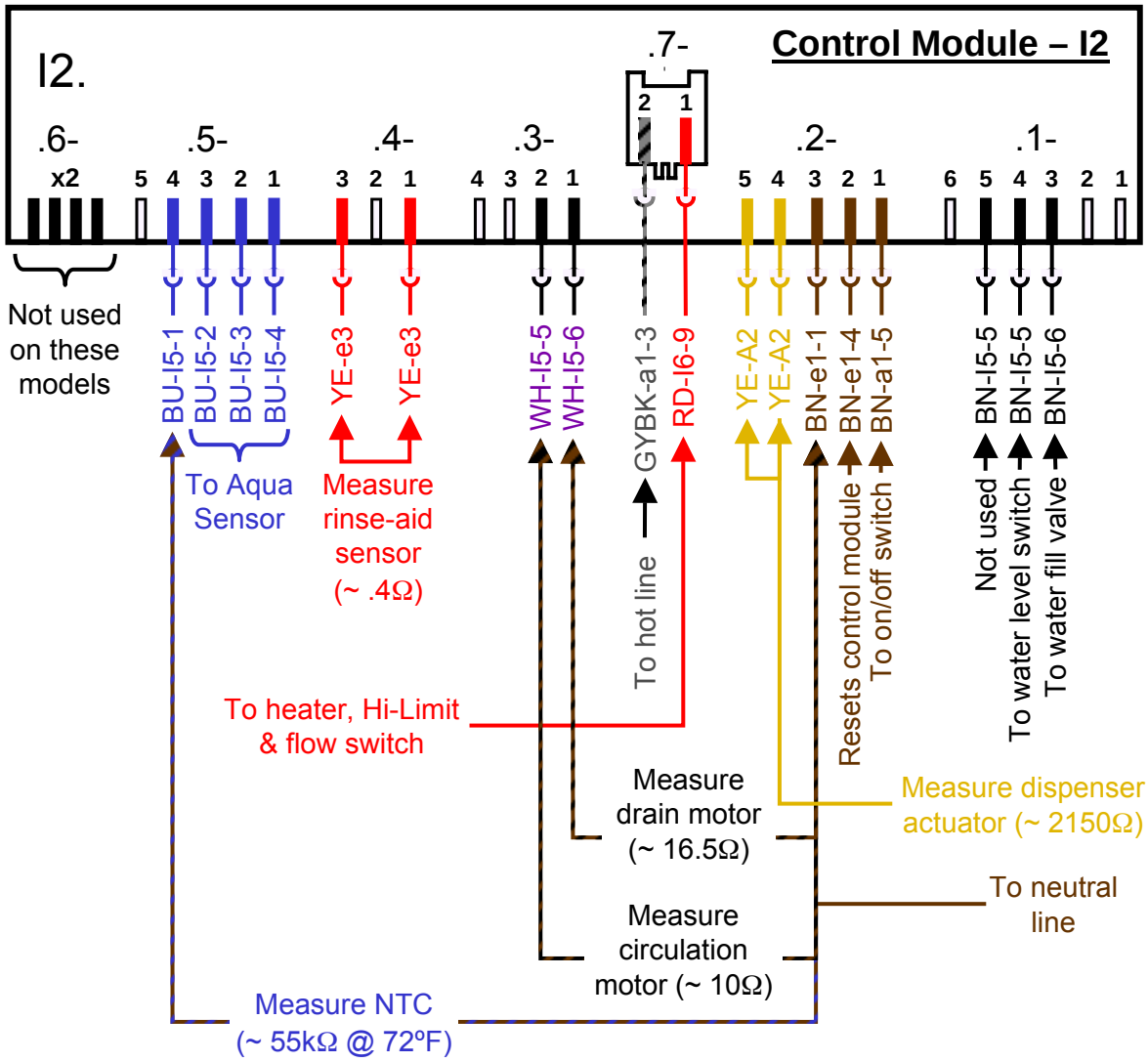
Wire color codes:
BK = Black
BN = Brown
BU = Blue
GY = Gray
RD = Red
WH = White
YE = Yellow

HINT: *Water valve and drain motor can be measured from front of dishwasher without accessing control module wire harnesses. Resistances are:*

- **Water valve ~ 1 k**
- **Drain motor ~ 16.5**

IX. Wiring Diagrams/Tech Sheet

Measuring SHX33A/43E/46A/B, SHV46C Resistances @ Modules



Wire color codes:
BK = Black
BN = Brown
BU = Blue
GY = Gray
RD = Red
WH = White
YE = Yellow

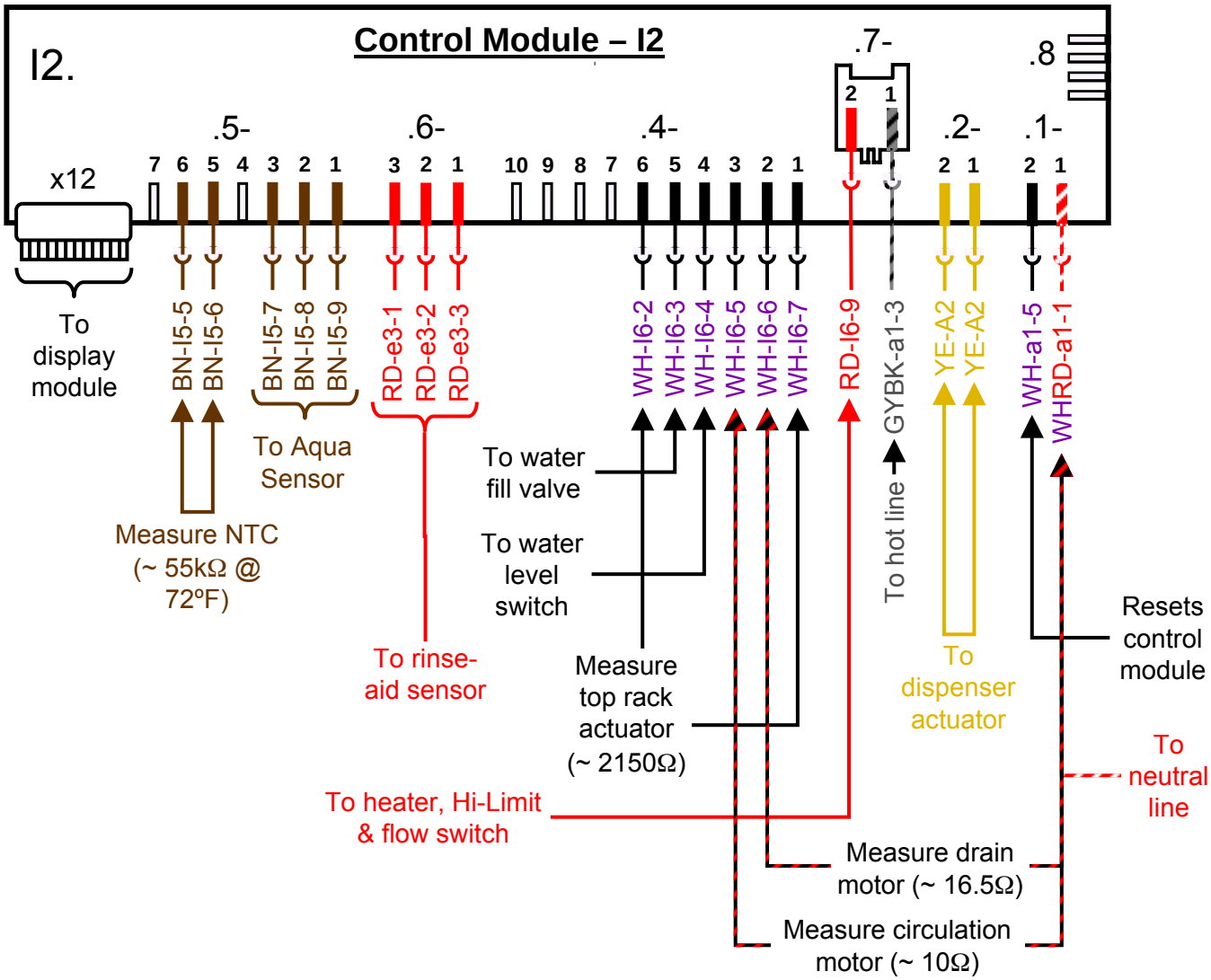
NOTE: *This control module measures the NTC differently – measuring voltage (NTC - neutral) instead of current.*

HINT: *Water valve and drain motor can be measured from front of dishwasher without accessing control module wire harnesses. Resistances are:*

- **Water valve ~ 1 k**
- **Drain motor ~ 16.5**

IX. Wiring Diagrams/Tech Sheet

Measuring SHU66C, SHI66A Resistances @ Modules



Wire color codes:
BK = Black
BN = Brown
BU = Blue
GY = Gray
RD = Red
WH = White
YE = Yellow

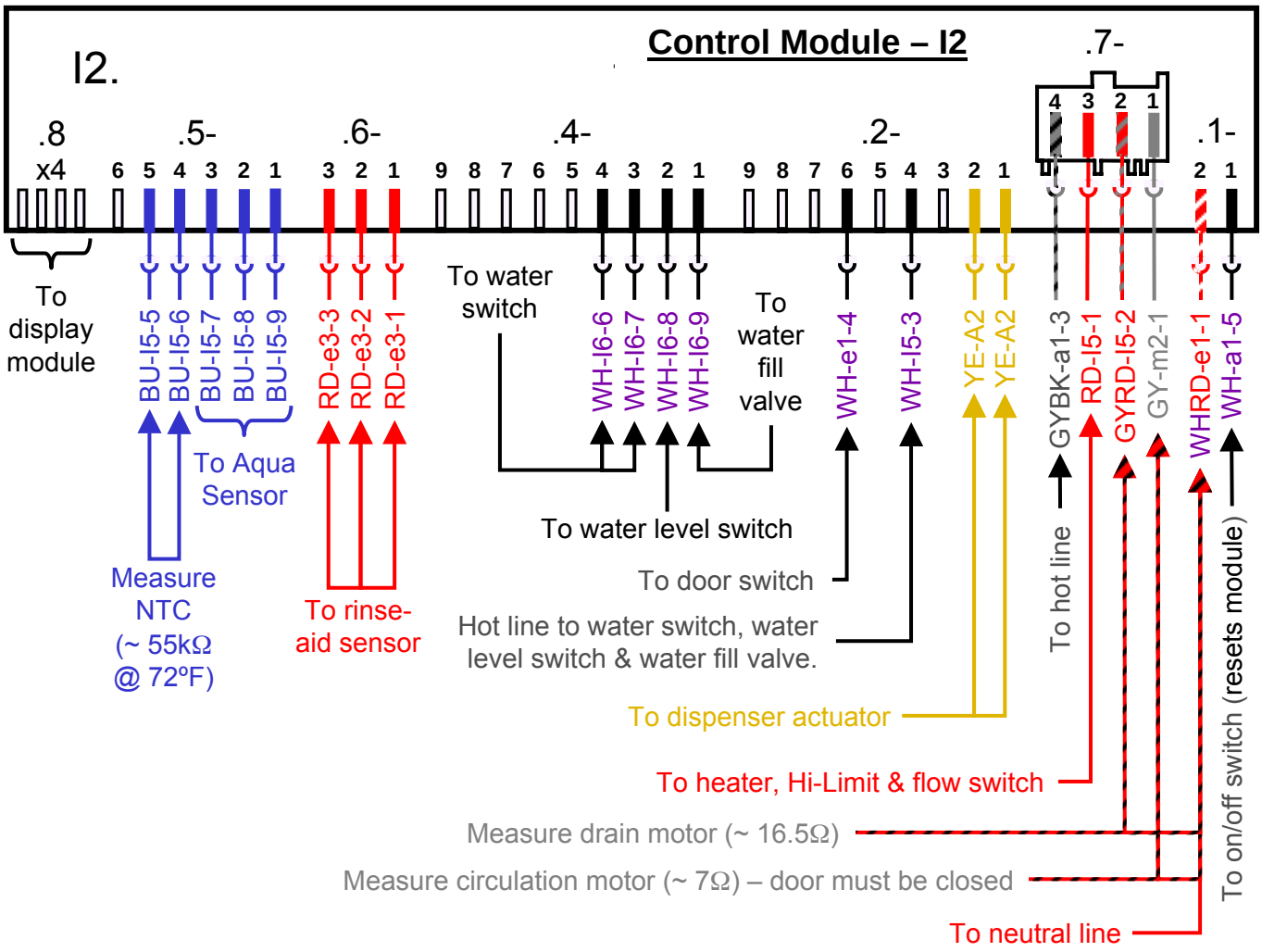
NOTE: *These models use the top-load dispenser, which has different actuator & rinse-aid sensor resistances.*

HINT: *Water valve and drain motor can be measured from front of dishwasher without accessing control module wire harnesses. Resistances are:*

- **Water valve ~ 1 k**
- **Drain motor ~ 16.5**

IX. Wiring Diagrams/Tech Sheet

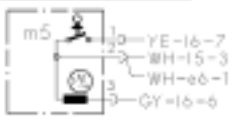
Measuring SHX56B, SHV66A, SHY56/66 Resistances @ Modules



Wire color codes:
BK = Black
BN = Brown
BU = Blue
GY = Gray
RD = Red
WH = White
YE = Yellow

NOTE: *The wiring diagram calls the "water switch" a "flow control motor".*

Flow Control Motor



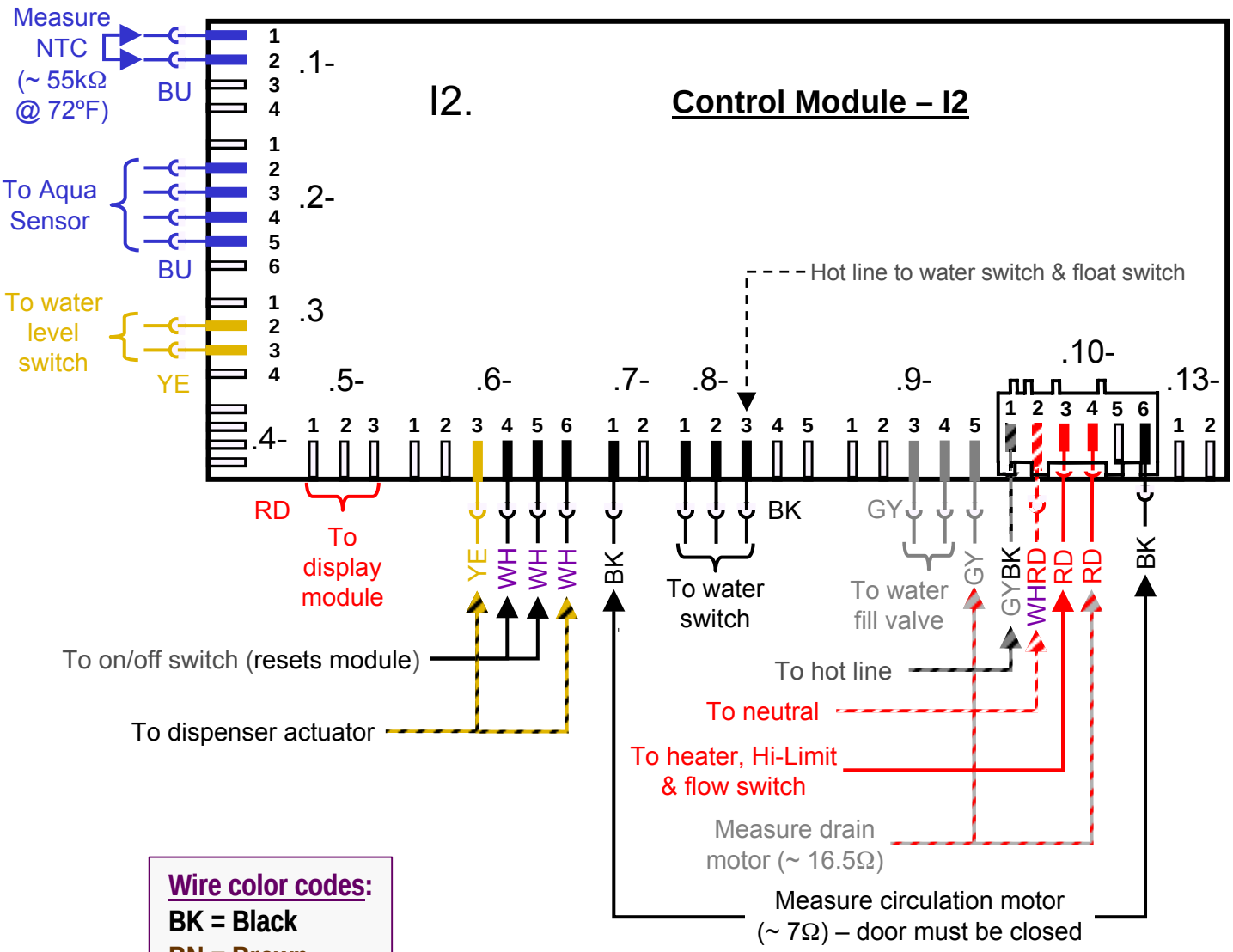
NOTE: *These use the top-load dispenser with different actuator & rinse-aid sensor.*

HINT: *Water valve and drain motor can be measured from front of dishwasher without accessing control module wire harnesses. Resistances are:*

- **Water valve ~ 1 k**
- **Drain motor ~ 16.5**

IX. Wiring Diagrams/Tech Sheet

Measuring SHV99, SHX99, SHY99 Resistances @ Modules



Wire color codes:

- **BK = Black**
- **BN = Brown**
- **BU = Blue**
- **GY = Gray**
- **RD = Red**
- **WH = White**
- **YE = Yellow**

NOTE: *These use the top-load dispenser with different actuator & rinse-aid sensor.*

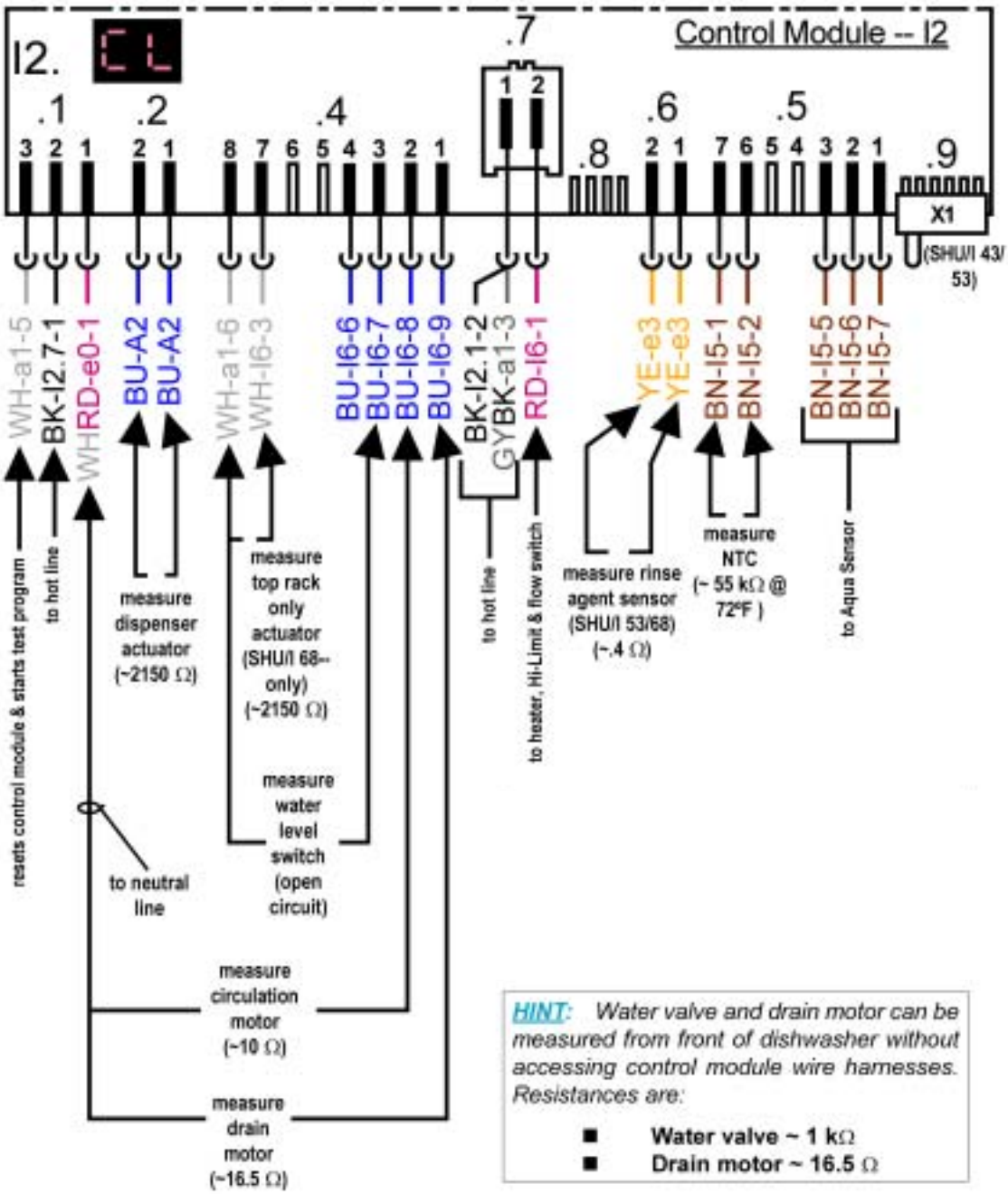
HINT: *Water valve and drain motor can be measured from front of dishwasher. Resistances are:*

- **Water valve ~ 1 k**
- **Drain motor ~ 16.5**

NOTE: Control modules for SHV/SHX/SHY99 models are mounted on bases where base wiring harnesses are mounted for other models. Control modules are accessed through the right side after pulling dishwashers out, so resistances cannot be measured from the front.

IX. Wiring Diagrams/Tech Sheet

Measuring SHU/SHI43/53/68 Resistances @ Modules



HINT: Water valve and drain motor can be measured from front of dishwasher without accessing control module wire harnesses. Resistances are:

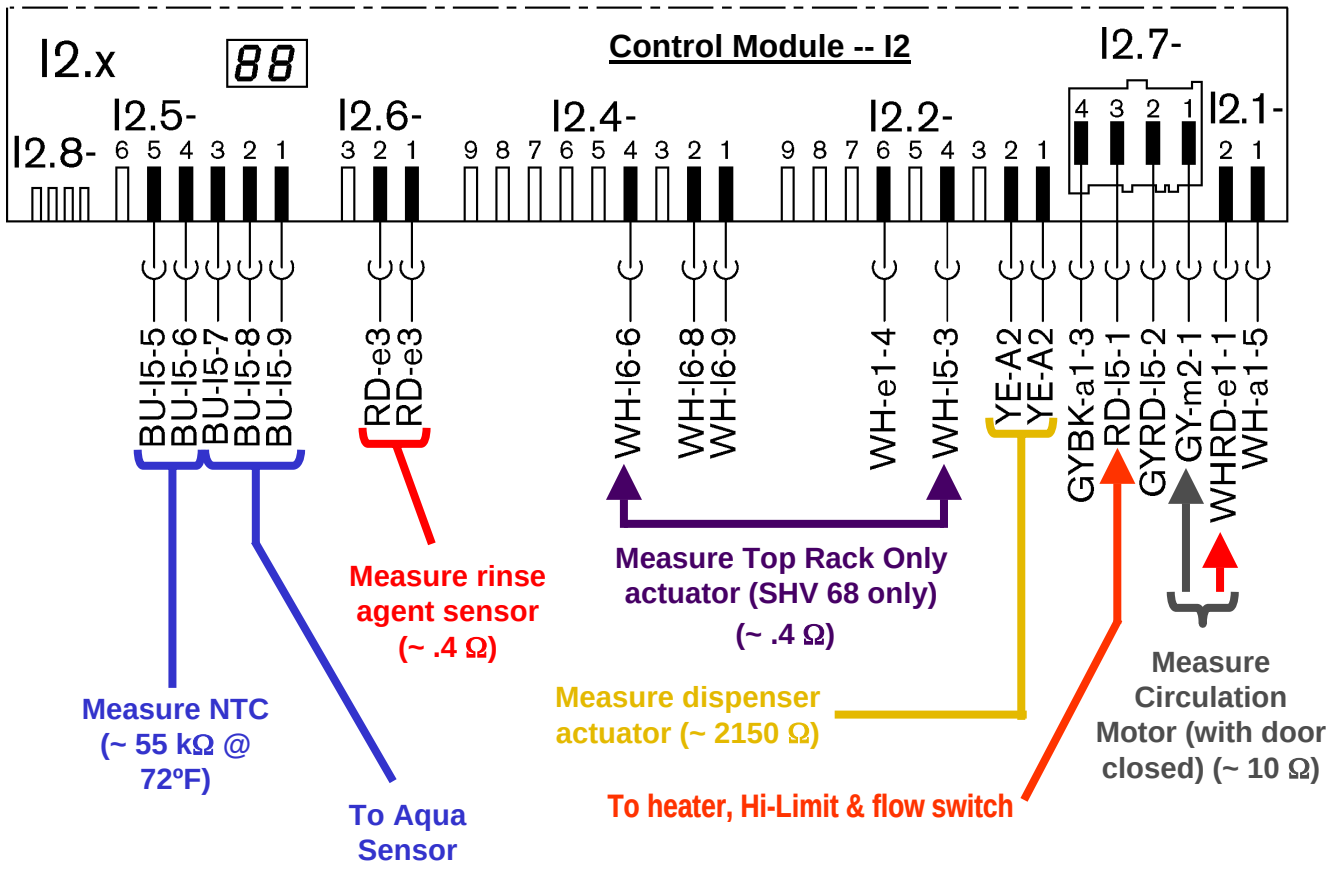
- **Water valve ~ 1 kΩ**
- **Drain motor ~ 16.5 Ω**

Wire color codes:

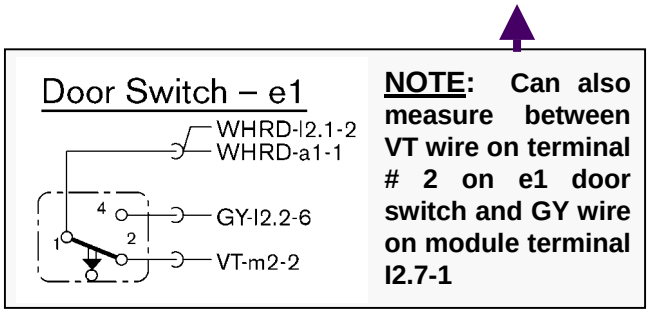
BK = Black
BN = Brown
BU = Blue
GY = Gray
RD = Red
WH = White
YE = Yellow

IX. Wiring Diagrams/Tech Sheet

Measuring SHU995X, SHV68 Resistances @ Modules



Wire color codes:
- BK = Black
- BN = Brown
- BU = Blue
- GY = Gray
- RD = Red
- WH = White
- YE = Yellow



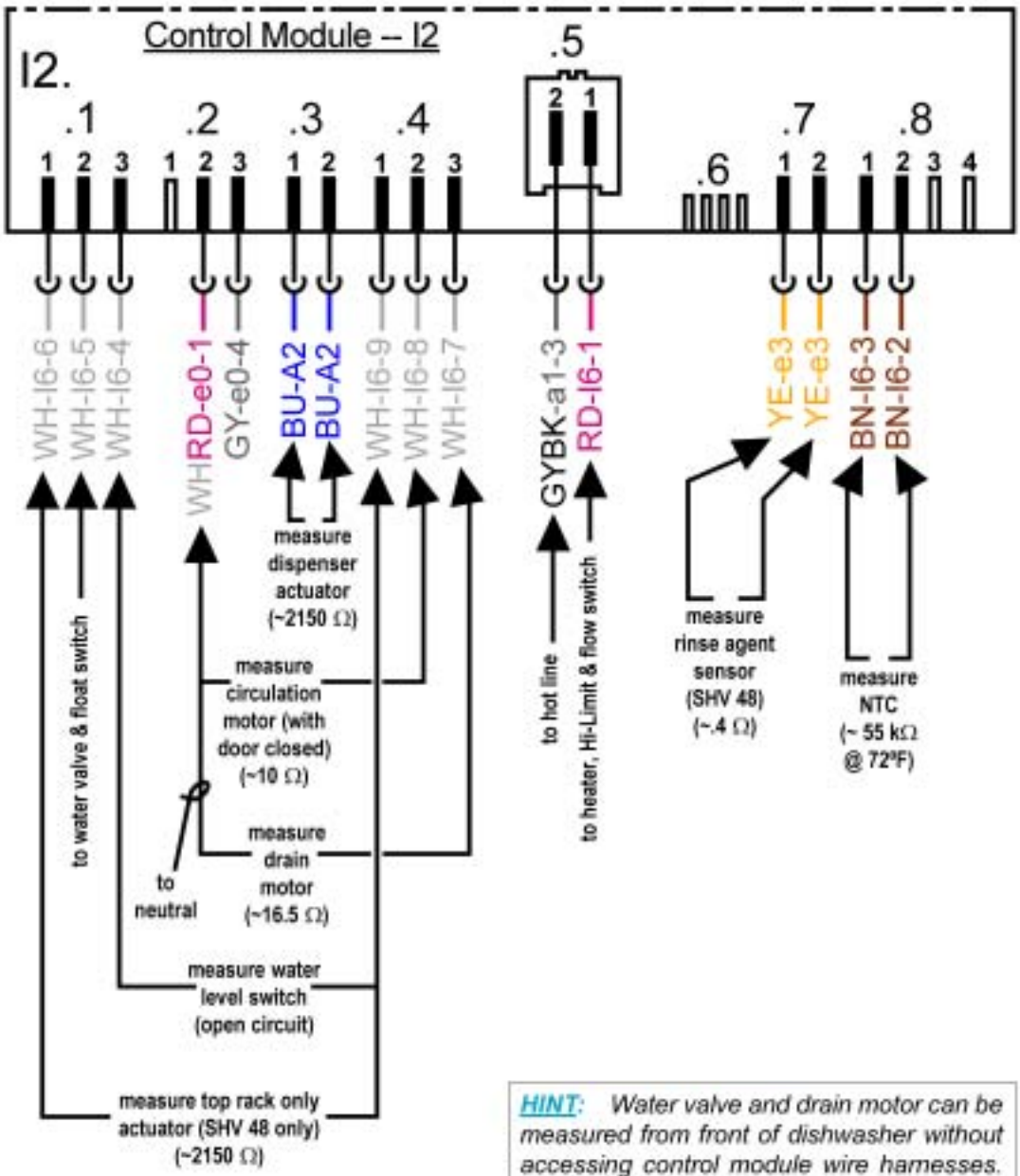
NOTE: Can also measure between VT wire on terminal # 2 on e1 door switch and GY wire on module terminal I2.7-1

HINT: To measure integrated model resistances while door is open, use a screwdriver to trip door latch closed.

HINT: Water valve and drain motor can be measured from front of dishwasher without accessing control module wire harnesses. Resistances are:
- **Water valve ~ 1 k**
- **Drain motor ~ 16.5**

IX. Wiring Diagrams/Tech Sheet

Measuring SHU88/99 (not 995x) , SHV43/48 Resistances @ Modules



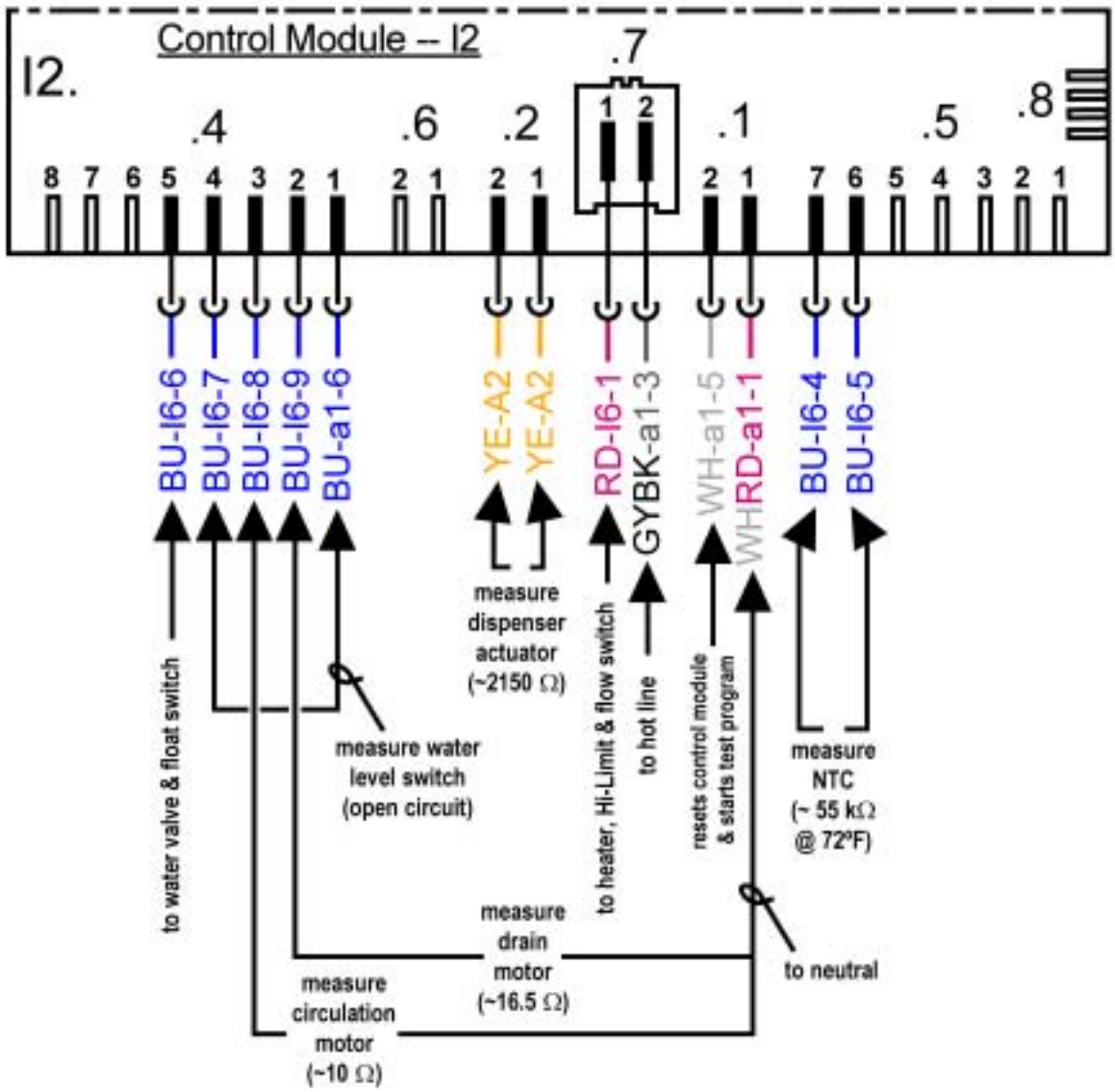
HINT: *Water valve and drain motor can be measured from front of dishwasher without accessing control module wire harnesses. Resistances are:*

- **Water valve ~ 1 kΩ**
- **Drain motor ~ 16.5 Ω**

Wire color codes:
BK = Black
BN = Brown
BU = Blue
GY = Gray
RD = Red
WH = White
YE = Yellow

IX. Wiring Diagrams/Tech Sheet

Measuring SHU33/432x Resistances @ Modules



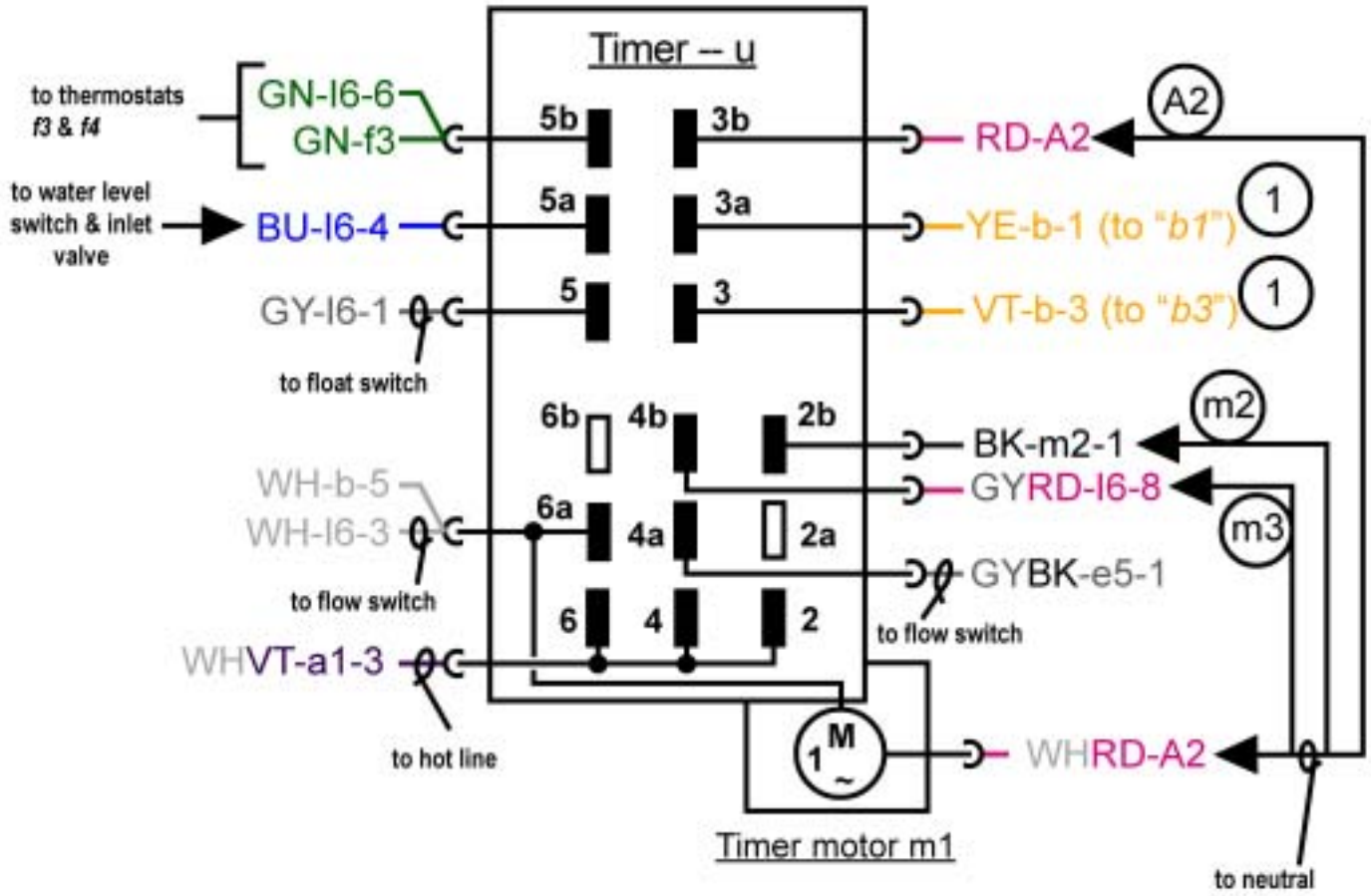
Wire color codes:
BK = Black
BN = Brown
BU = Blue
GY = Gray
RD = Red
WH = White
YE = Yellow

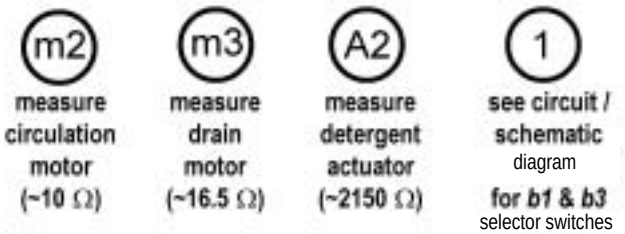
HINT: Water valve and drain motor can be measured from front of dishwasher without accessing control module wire harnesses. Resistances are:

- **Water valve ~ 1 kΩ**
- **Drain motor ~ 16.5 Ω**

IX. Wiring Diagrams/Tech Sheet

Measuring SHU303x/313x Resistances @ Modules





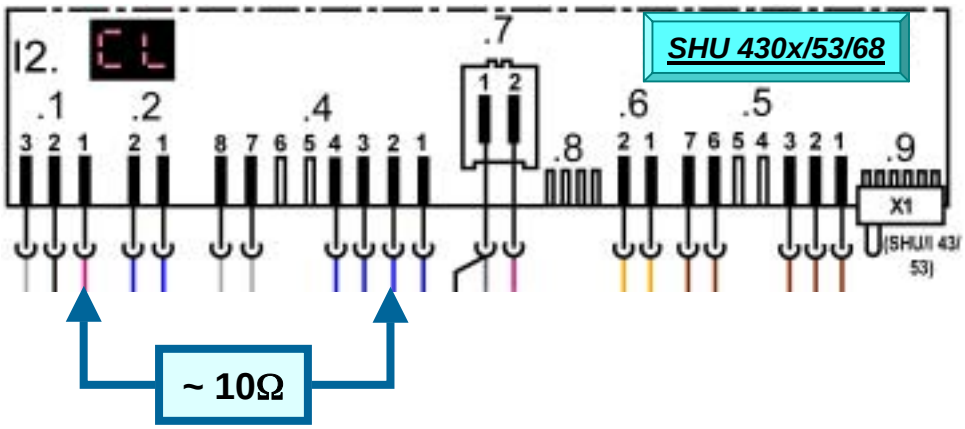
Wire color codes:
BK = Black
BN = Brown
BU = Blue
GN = Green
GY = Gray
RD = Red
WH = White
YE = Yellow

HINT: Water valve and drain motor can be measured from front of dishwasher without accessing timer wire harnesses. Resistances are:

- **Water valve ~ 1 kΩ**
- **Drain motor ~ 16.5 Ω**

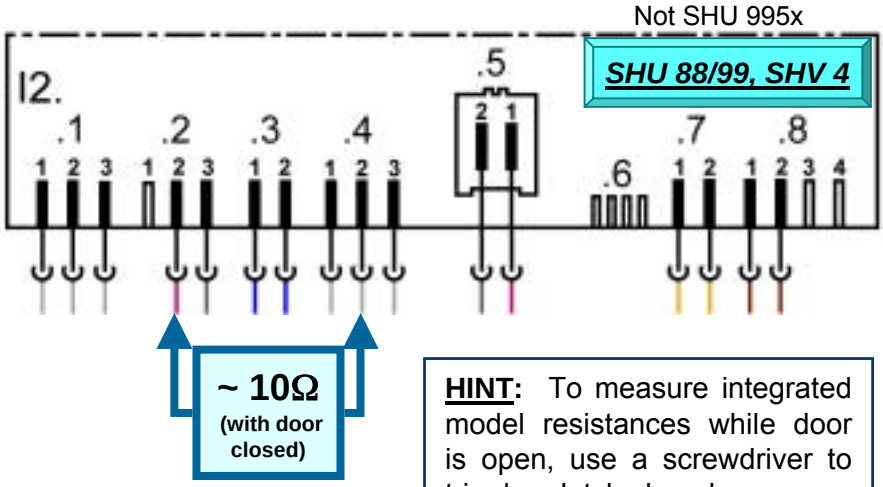
IX. Wiring Diagrams/Tech Sheet

Measuring SHU303x/313x/33/430x/432x/53/68/88/99, SHV43/48 Circulation Pump Resistances @ Modules

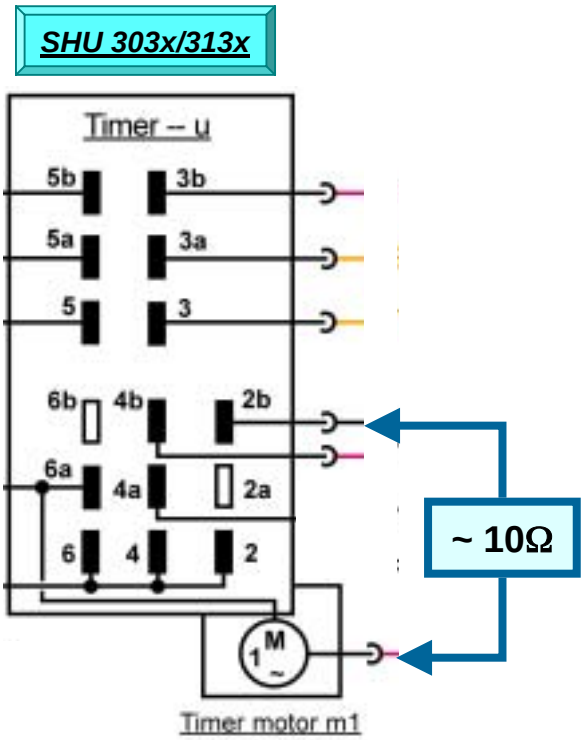


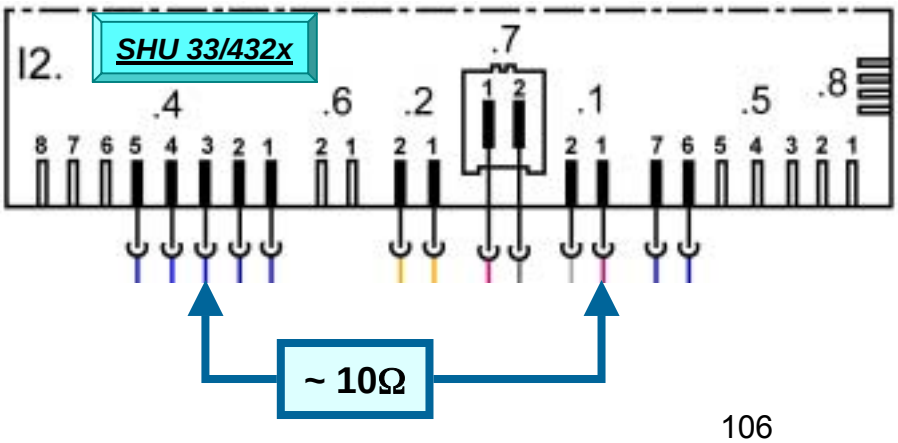
CAUTION: Disconnect dishwasher power before measuring circulation pump motor resistance.

Not SHU 995x



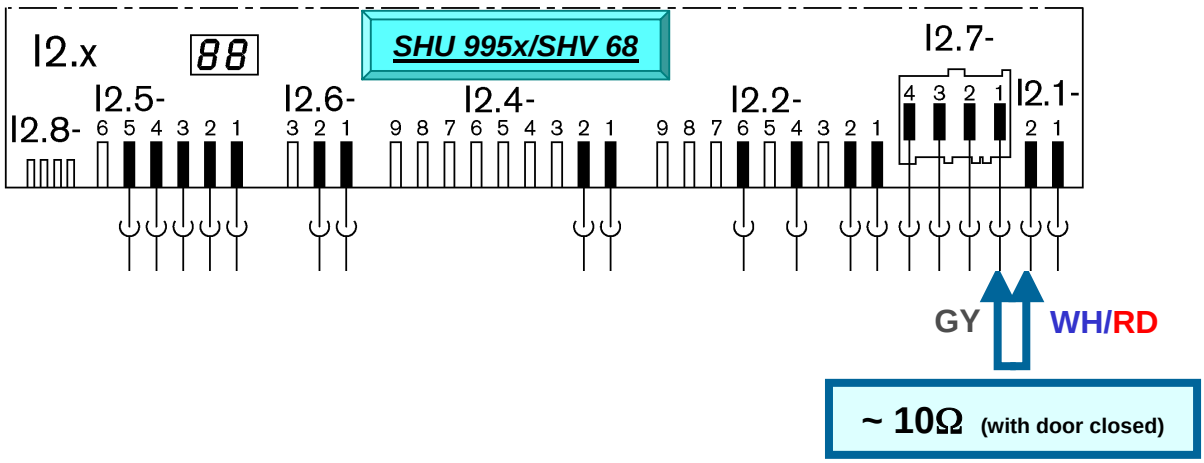
HINT: To measure integrated model resistances while door is open, use a screwdriver to trip door latch closed.





IX. Wiring Diagrams/Tech Sheet

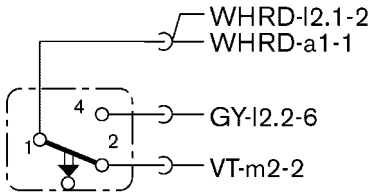
Measuring SHU995x, SHV68 Circulation Pump Resistances @ Modules



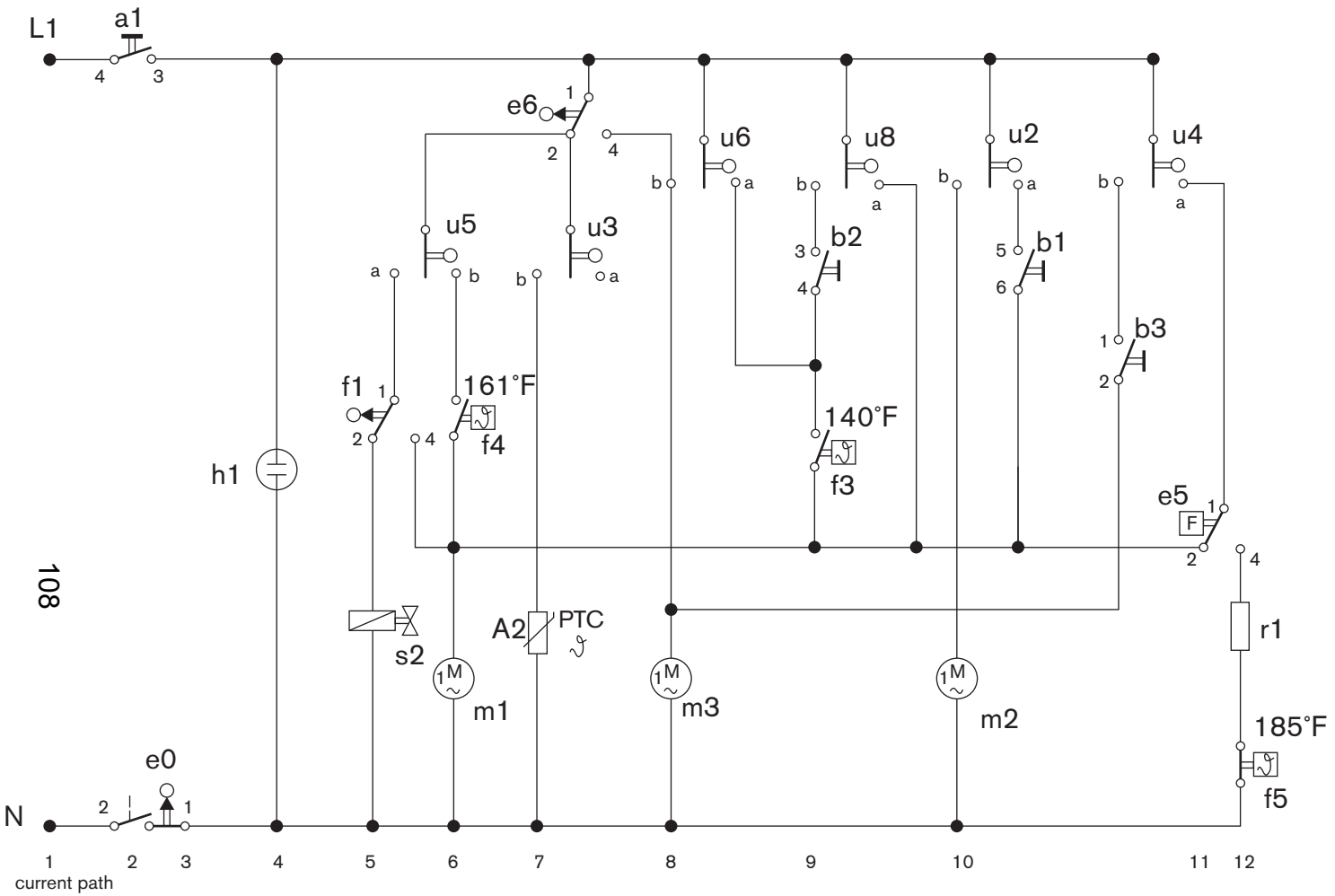
HINT: To measure integrated model resistances while door is open, use a screwdriver to trip door latch closed.

CAUTION: Disconnect dishwasher power before measuring circulation pump motor resistance.

Door Switch – e1



HINT: Can also measure between **VT** wire on terminal # **2** on **e1** door switch and **GY** wire on module terminal **I2.7-1**.



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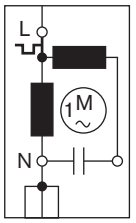
permanent split capacitor motor (m2)

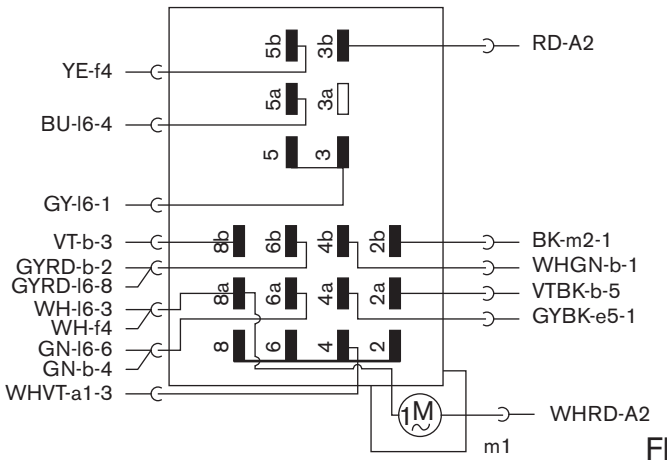


Symbol Key			Symbol Key			Selector Switch Contacts	
a1	MAIN SWITCH	2	f5	HIGH LIMIT 185°F	12	POWER SCRUB	b1 & b3
A2	ACTUATOR (Dispenser)	7	h1	ON/OFF LAMP	4		
e0	DOOR SWITCH	3	m1	TIMER MOTOR	6	REGULAR	b1 & b2
e5	FLOW SWITCH	11	m2	CIRCULATION MOTOR	10	RINSE & HOLD	b3
e6	FLOAT SWITCH	7	m3	DRAIN MOTOR	8		
f1	WATER LEVEL SWITCH	5	r1	HEATING ELEMENT	12		
f3	THERMOSTAT 140°F	9	s2	WATER SOLENOID	5		
f4	THERMOSTAT 161°F	6	u–	TIMER CONTACTS	–		
		current path			current path		

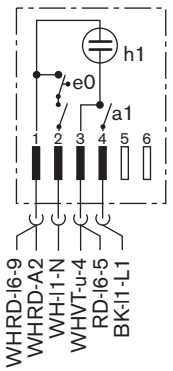
SHU 30

SHU 30

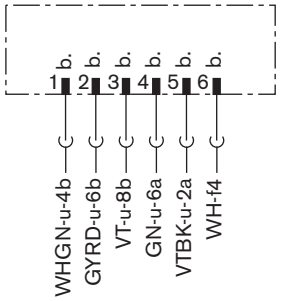
Timer – u



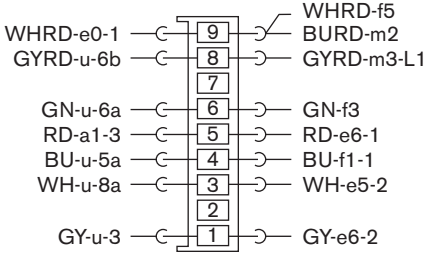
On / Off Switch – a1
Door Switch – e0



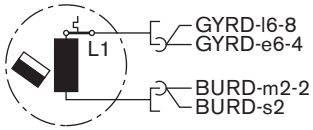
Selector Switch – b



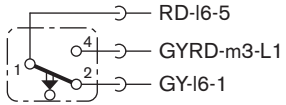
Wiring Connector – l6



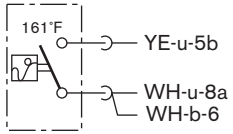
Drain Motor – m3



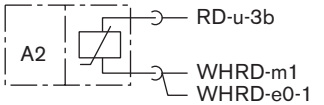
Float Switch – e6



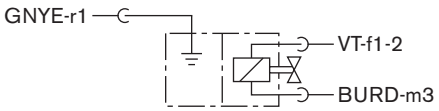
Thermostat – f4



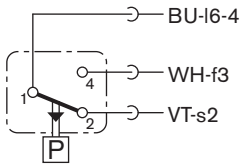
Actuator (Dispenser) – A2



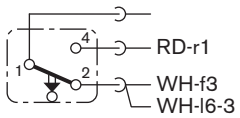
Water Solenoid – s2



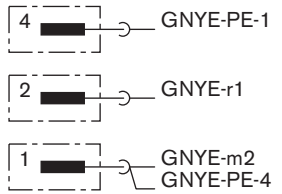
Water Level Switch – f1



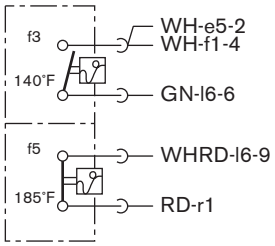
Flow Switch – e5



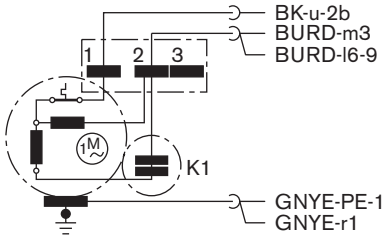
Ground – PE



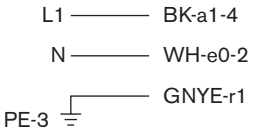
Thermostats – f3 & f5



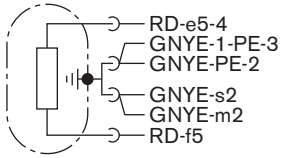
Circulation Motor – m2



Electrical Supply – l1

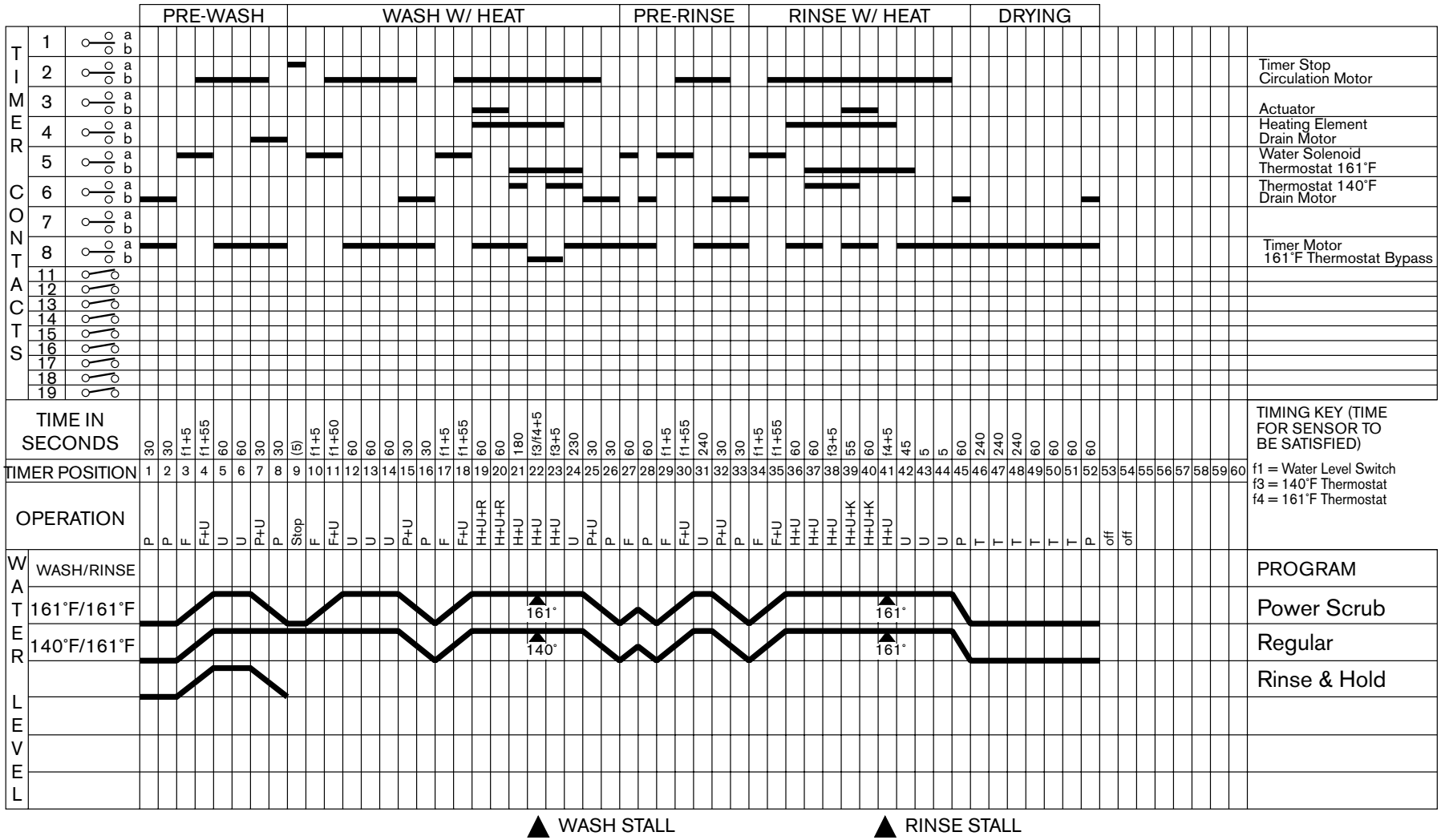


Heating Element – r1



High Limit

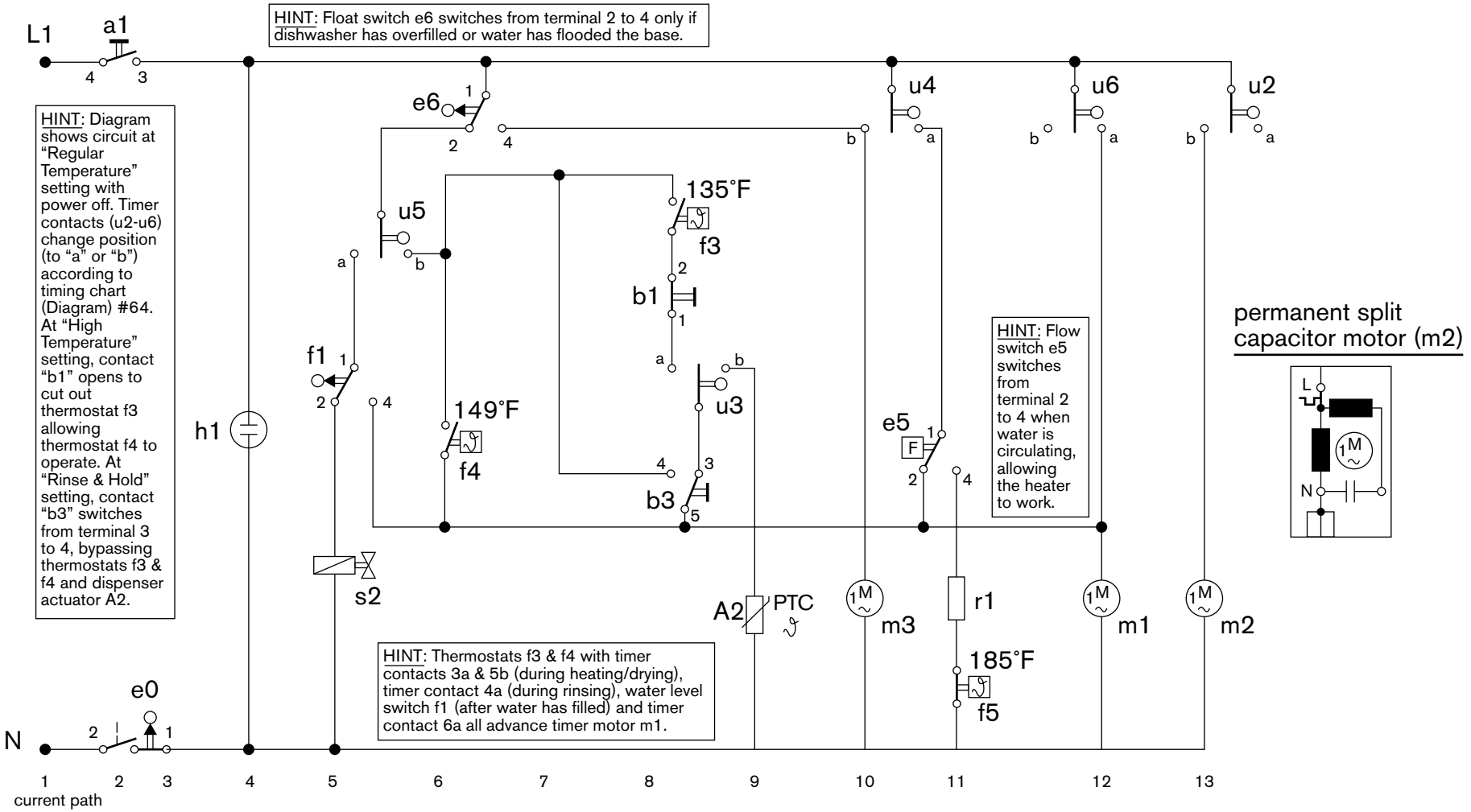
BK	=	black
BN	=	brown
RD	=	red
YE	=	yellow
GN	=	green
BU	=	blue
VT	=	violet
GY	=	gray
WH	=	white
PK	=	pink



OPERATION KEY

P = DRAINING
F = FILLING
U = CIRCULATION
H = HEATING
R = DETERGENT DISPENSING
K = RINSE–AID DISPENSING
T = DRYING

SHU 30



permanent split capacitor motor (m2)

Symbol Key		current path
a1	ON/OFF SWITCH	2
A2	ACTUATOR (Dispenser)	9
e0	DOOR SWITCH	3
e5	FLOW SWITCH	11
e6	FLOAT SWITCH	7
f1	WATER LEVEL SWITCH	5
f3	THERMOSTAT 135°F	8
f4	THERMOSTAT 149°F	6

Symbol Key		current path
f5	HIGH LIMIT 185°F	11
h1	ON/OFF LAMP	4
m1	TIMER MOTOR	12
m2	CIRCULATION MOTOR	13
m3	DRAIN MOTOR	10
r1	HEATING ELEMENT	11
s2	WATER SOLENOID	5
u–	TIMER CONTACTS	–

Selector Switch Contacts	
HIGH TEMPERATURE	b1
REGULAR TEMPERATURE	none
RINSE & HOLD	b3

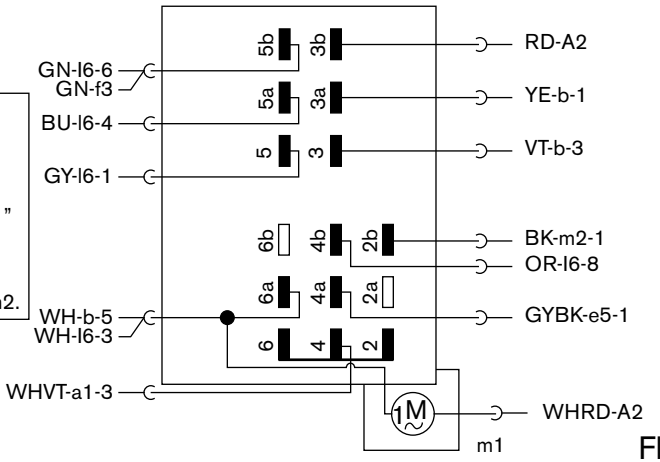
To locate each part, match current path from this table with current path along bottom of circuit diagram above.

NOTE: Use timer to select wash program and selector switch to select water temperature.

SHU 303X/313X

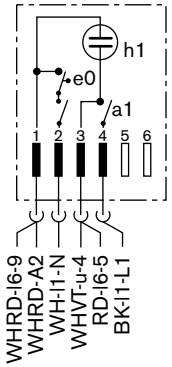
SHU 303X/313X

Timer – u

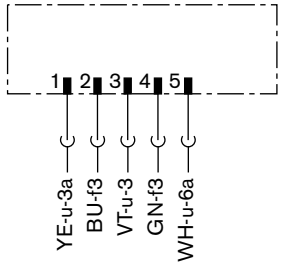


HINT: Format for wire connections includes wire color and part/terminal connected to. For example, "BK-m2-1" = BK (black wire) connected to terminal 1 of circulation motor m2.

On / Off Switch – a1
Door Switch – e0

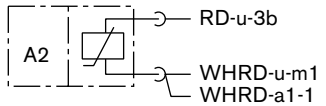


Temperature Selector Switch – b

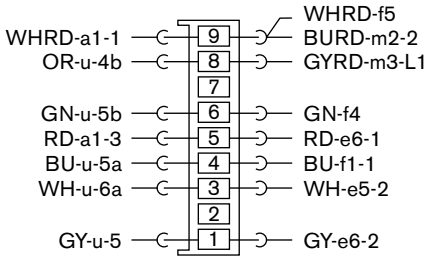


HINT: When a wire color consists of four letters, the 3rd and 4th letters show the stripe. For example, "GYBK" wire is a gray wire with a black stripe.

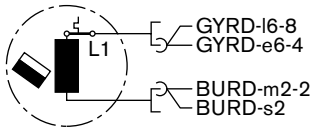
Actuator (Dispenser) – A2



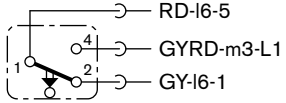
Base Wiring Connector – l6



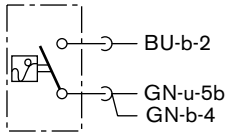
Drain Motor – m3



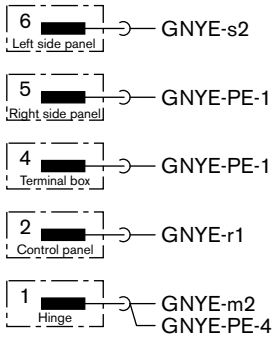
Float Switch – e6



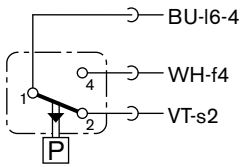
Thermostat – f3
135°F



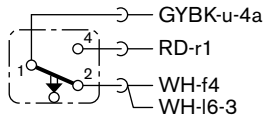
Ground – PE



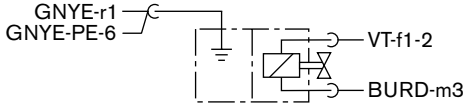
Water Level Switch – f1



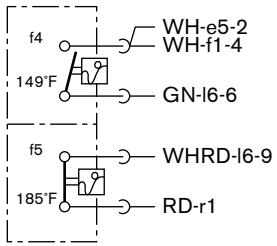
Flow Switch – e5



Water Solenoid – s2

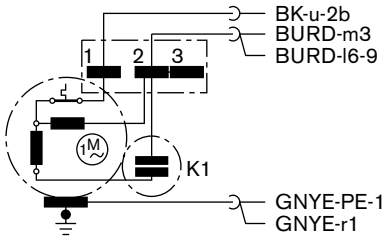


Thermostats – f4 & f5

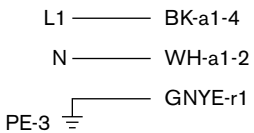


High Limit

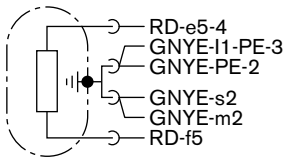
Circulation Motor – m2



Electrical Supply – l1

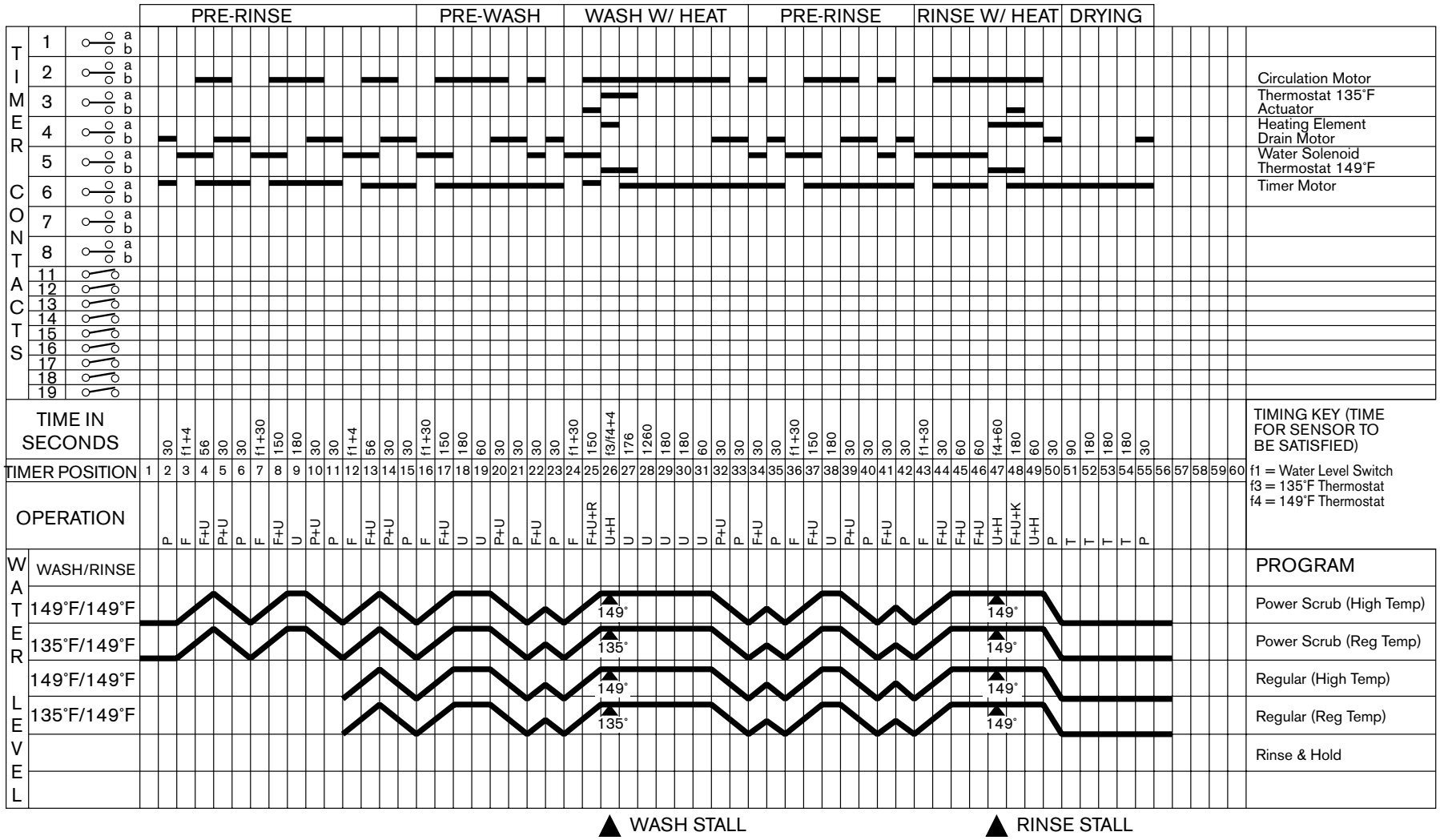


Heating Element – r1



Wire Color Code

BK	=	black
BN	=	brown
RD	=	red
YE	=	yellow
GN	=	green
BU	=	blue
VT	=	violet
GY	=	gray
WH	=	white
PK	=	pink
OR	=	orange



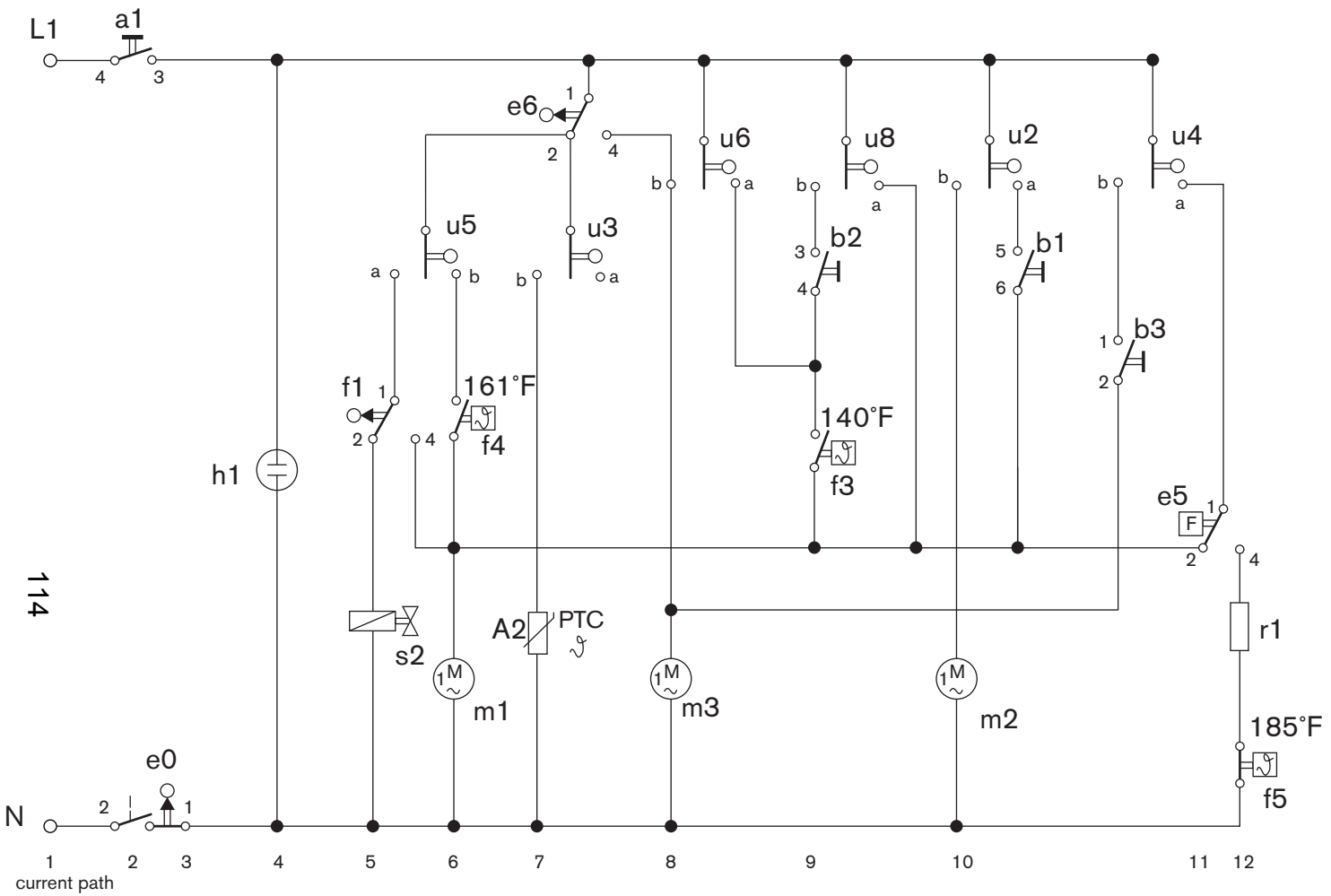
OPERATION KEY

P = DRAINING
F = FILLING
U = CIRCULATION
H = HEATING
R = DETERGENT DISPENSING
K = RINSE–AID DISPENSING
T = DRYING

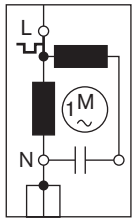
SHU 303X/313X

NOTE: Before wash cycle starts, dishwasher will drain:
5 times – Power Scrub (High or Reg Temp)
3 times – Regular (High or Reg Temp)

NOTE: When timer is set to "Rinse & Hold" cycle, if selector switch is not also set to "Rinse & Hold" setting, dishwasher will enter a "heat delay" where it will run longer than usual.



permanent split capacitor motor (m2)



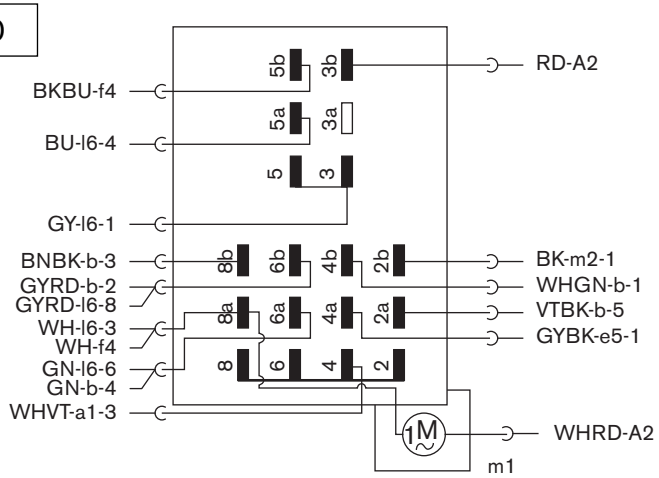
Symbol Key			Symbol Key		
a1	MAIN SWITCH	2	f5	HIGH LIMIT 185°F	12
A2	ACTUATOR (Dispenser)	7	h1	ON/OFF LAMP	4
e0	DOOR SWITCH	3	m1	TIMER MOTOR	6
e5	FLOW SWITCH	11	m2	CIRCULATION MOTOR	10
e6	FLOAT SWITCH	7	m3	DRAIN MOTOR	8
f1	WATER LEVEL SWITCH	5	r1	HEATING ELEMENT	12
f3	THERMOSTAT 140°F	9	s2	WATER SOLENOID	5
f4	THERMOSTAT 161°F	6	u–	TIMER CONTACTS	–
		current path			current path

Selector Switch Contacts	
POWER SCRUB	b1 & b3
REGULAR	b1 & b2 & b3
ECONOMY	b1 & b2
RINSE & HOLD	b3

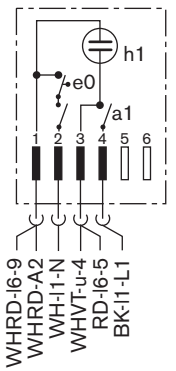
SHU 40

SHU 40

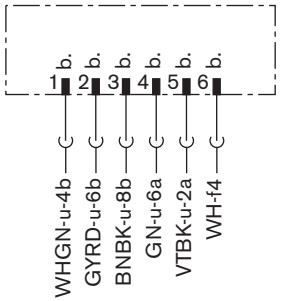
Timer – u



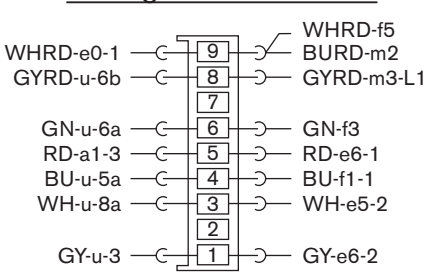
On / Off Switch – a1
Door Switch – e0



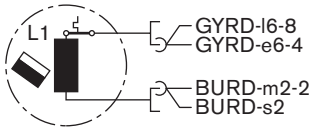
Selector Switch – b



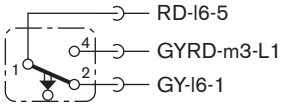
Wiring Connector – l6



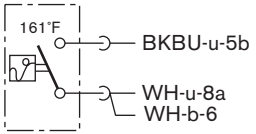
Drain Motor – m3



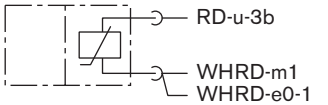
Float Switch – e6



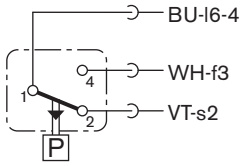
Thermostat – f4



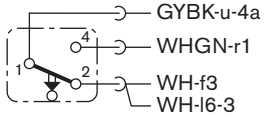
Actuator – A2



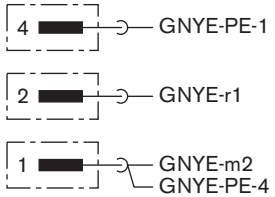
Water Level Switch – f1



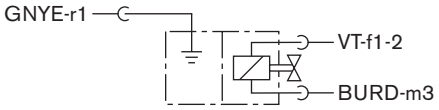
Flow Switch – e5



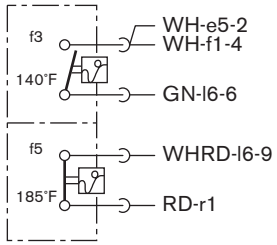
Ground – PE



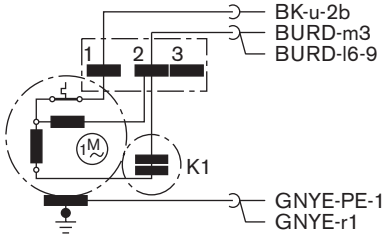
Water Solenoid – s2



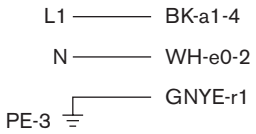
Thermostats – f3 & f5



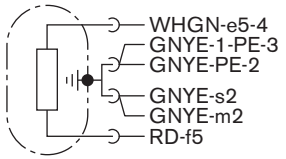
Circulation Motor – m2



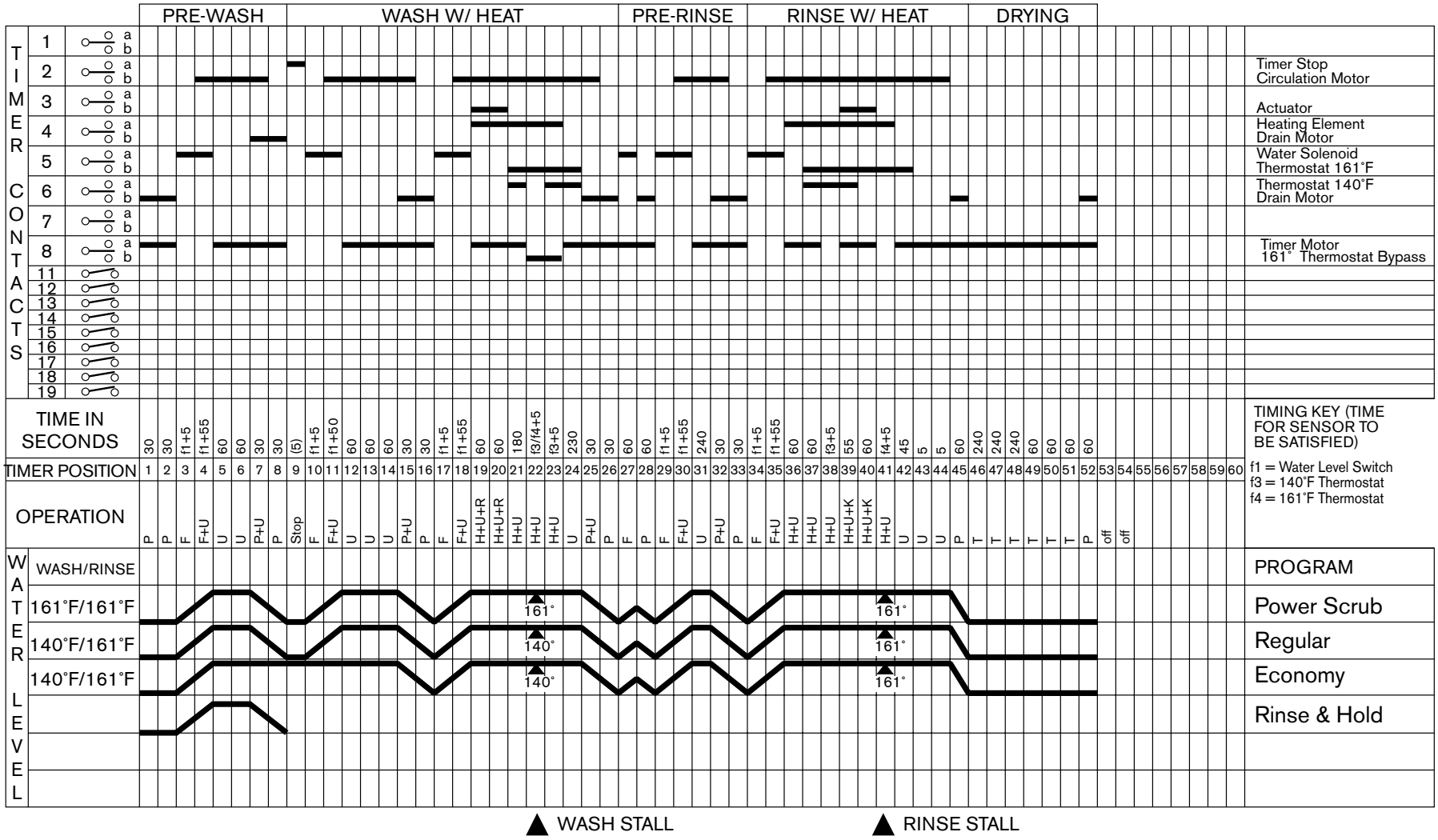
Electrical Supply – l1



Heating Element – r1



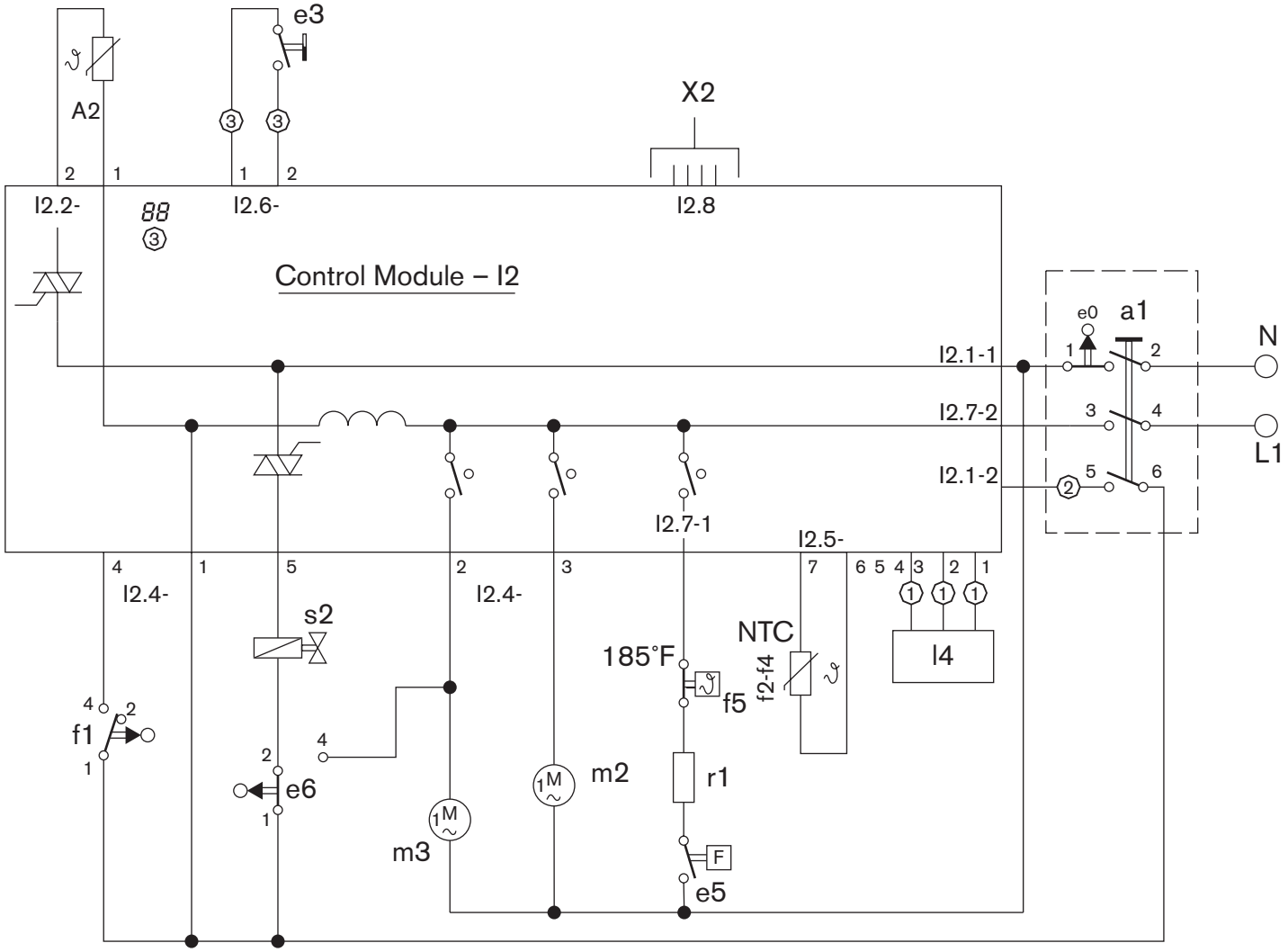
BK	=	black
BN	=	brown
RD	=	red
YE	=	yellow
GN	=	green
BU	=	blue
VT	=	violet
GY	=	gray
WH	=	white
PK	=	pink



OPERATION KEY

P = DRAINING
F = FILLING
U = CIRCULATION
H = HEATING
R = DETERGENT DISPENSING
K = RINSE–AID DISPENSING
T = DRYING

SHU 40

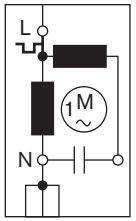


SHU 33 &
SHU 4322/4326

Symbol Key

a1	ON/OFF SWITCH
A2	ACTUATOR (Dispenser)
e0	DOOR SWITCH
e3	REED SWITCH
e5	FLOW SWITCH
e6	FLOAT SWITCH
f1	WATER LEVEL SWITCH
f5	HIGH LIMIT 185˚F
I4	AQUA SENSOR
m2	CIRCULATION MOTOR
m3	DRAIN MOTOR
NTC	TEMPERATURE SENSOR
r1	HEATING ELEMENT
s2	WATER SOLENOID
X2	SERVICE CONNECTOR

permanent split
capacitor motor (m2)



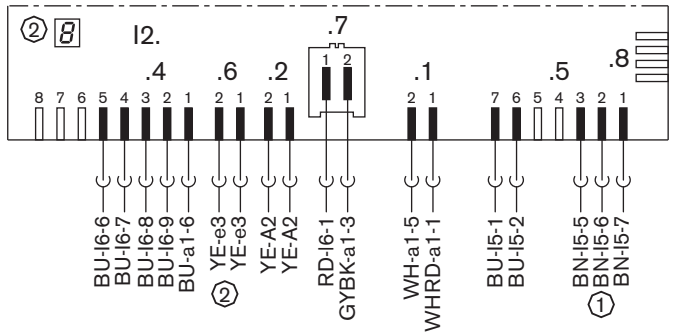
① used on SHU 3322/3326/3336/4322/4326

② contacts 5-6 are momentary – they reset the control module & actuate the test program

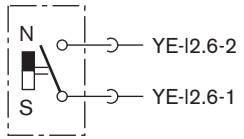
③ used on SHU 4322/4326

SHU 33 &
SHU 4322/4326

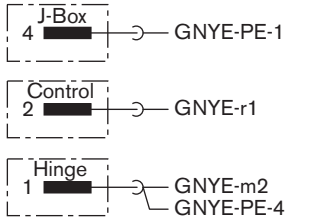
Control Module– I2



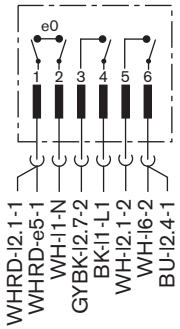
Reed Switch – e3 ②



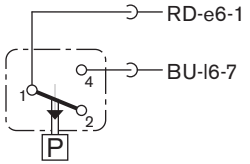
Ground – PE



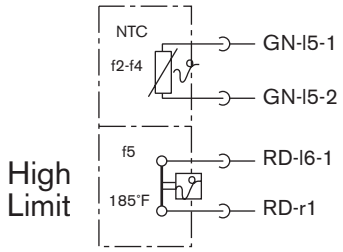
On/Off Switch – a1
Door Switch – e0



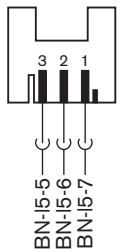
Water Level Switch – f1



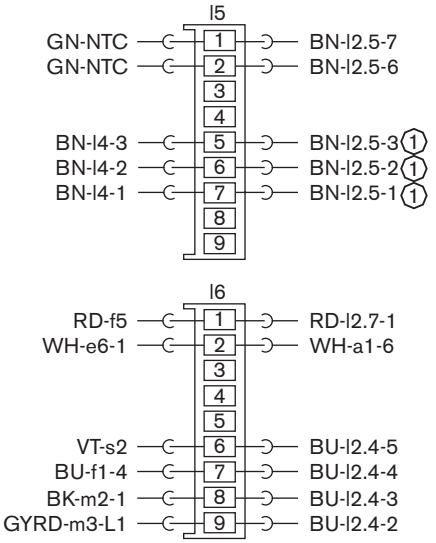
NTC – f2 & f4 / Thermostat – f5



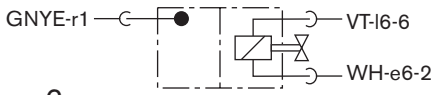
Aqua Sensor – I4 ①



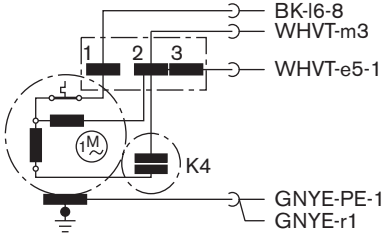
Wiring Connectors – I5 & I6



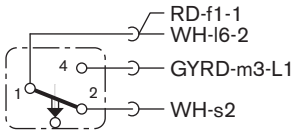
Water Solenoid – s2



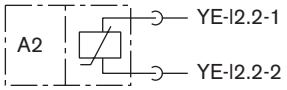
Circulation Motor– m2



Float Switch – e6

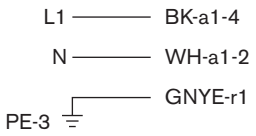


Actuator (Dispenser) – A2

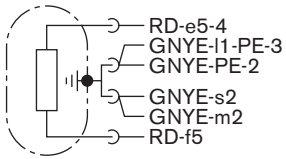


BK	=	black
BN	=	brown
RD	=	red
YE	=	yellow
GN	=	green
BU	=	blue
VT	=	violet
GY	=	gray
WH	=	white
PK	=	pink

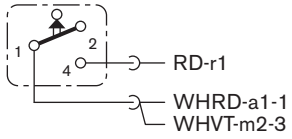
Electrical Supply – I1



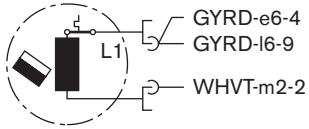
Heating Element – r1



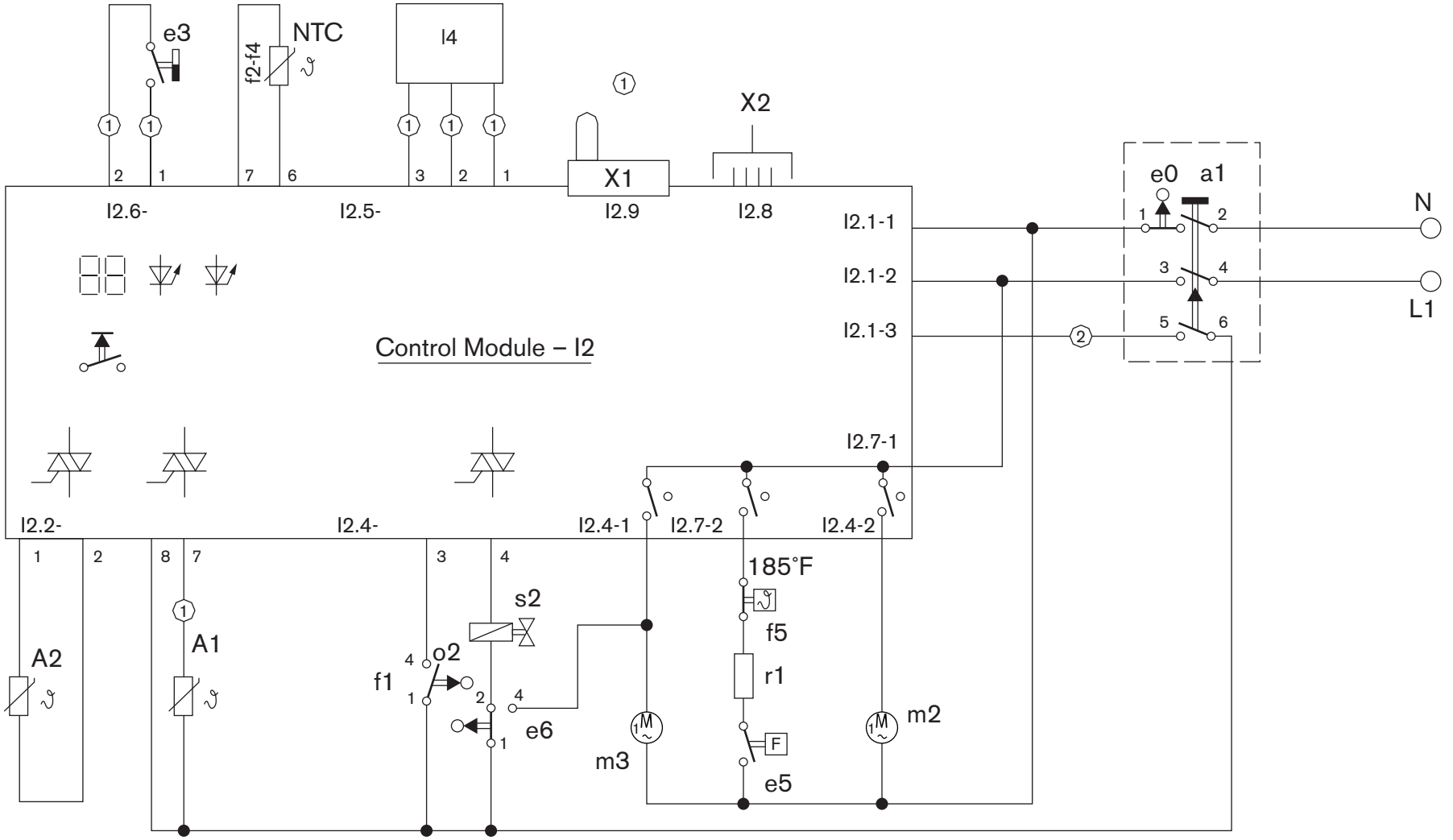
Flow Switch – e5



Drain Motor – m3



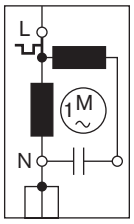
① used on SHU 3322/3326/ 3336/4322/4326
② used on SHU 4322/4326



Symbol Key		Symbol Key	
a1	ON/OFF SWITCH	I4	AQUA SENSOR
A1	ACTUATOR (Upper Basket)	m2	CIRCULATION MOTOR
A2	ACTUATOR (Dispenser)	m3	DRAIN MOTOR
e0	DOOR SWITCH	NTC	TEMPERATURE SENSOR
e3	REED SWITCH	r1	HEATING ELEMENT
e5	FLOW SWITCH	s2	WATER SOLENOID
e6	FLOAT SWITCH	X1	JUMPER
f1	WATER LEVEL SWITCH	X2	SERVICE CONNECTOR
f5	HIGH LIMIT 185°F		

SHI 43/68
and SHU 43/53/68

permanent split
capacitor motor (m2)

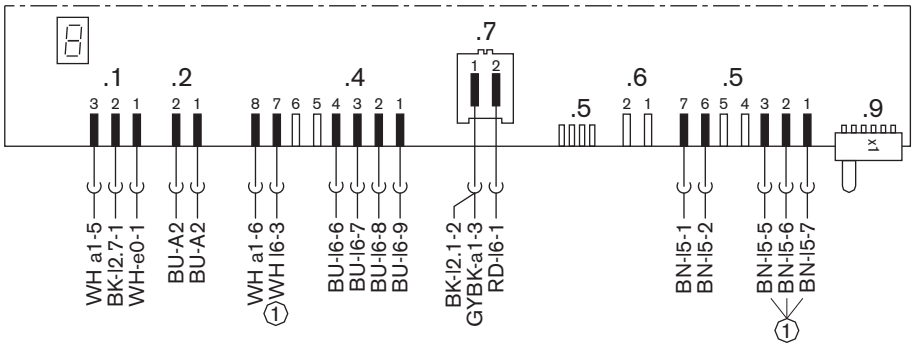


① dependent on equipment

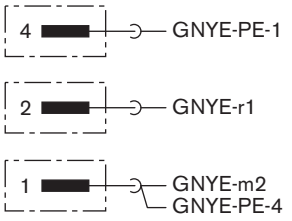
② contacts 5–6 are momentary – they reset the control module & actuate the test program

SHI/SHU 43

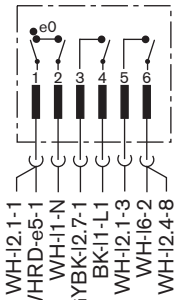
Control Module– I2



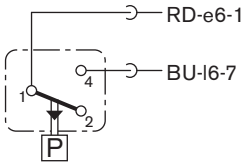
Ground – PE



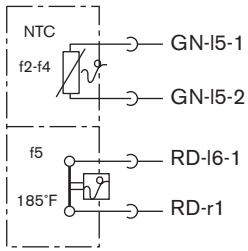
On/Off Switch – a1
Door Switch – e0



Water Level Switch – f1

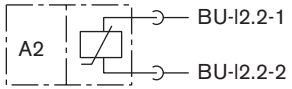


NTC – f2 & f4 / Thermostat – f5

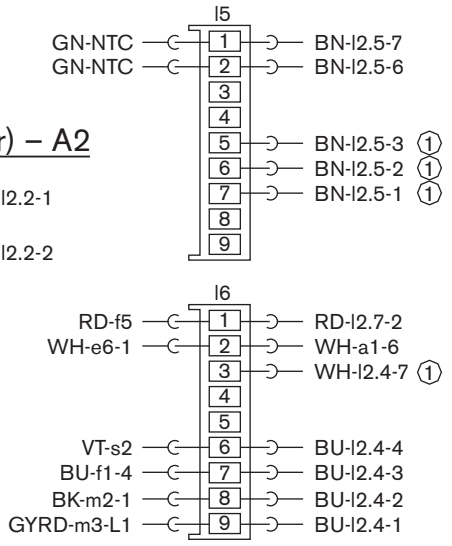


High Limit

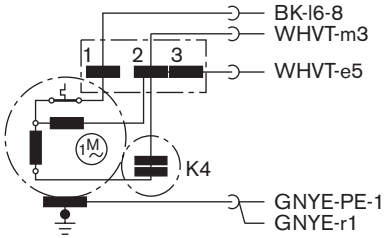
Actuator (Dispenser) – A2



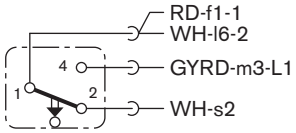
Wiring Connectors – I5 & I6



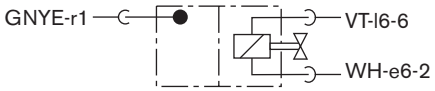
Circulation Motor – m2



Float switch – e6



Water Solenoid – s2



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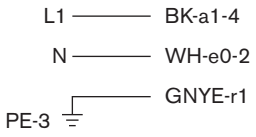
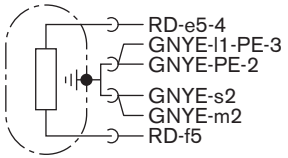
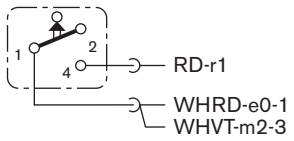
Electrical Supply – I1



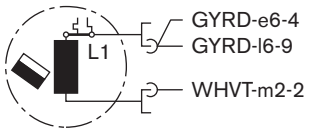
Heating Element – r1



Flow Switch – e5



Drain Motor – m3



(1) may exist without function

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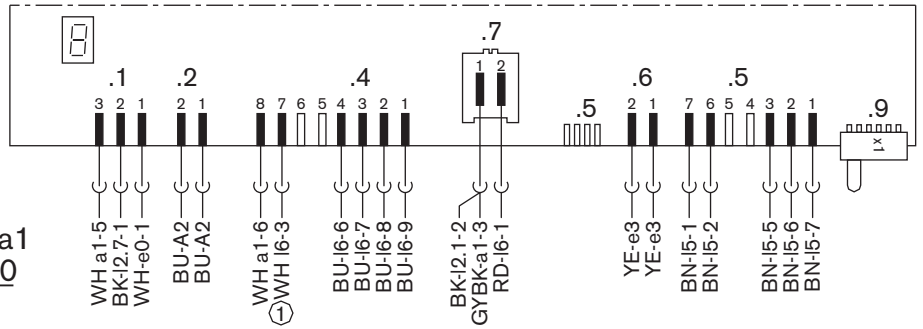
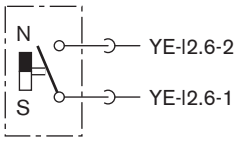
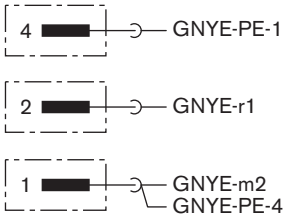
Control Module – I2



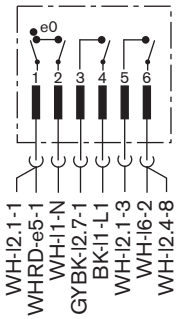
Reed Switch – e3



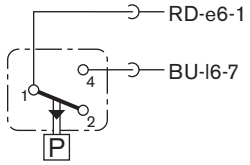
Ground – PE



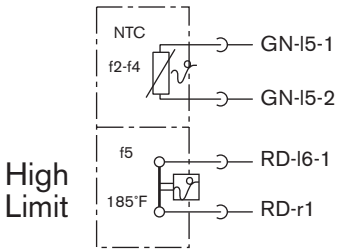
On/Off Switch – a1
Door Switch – e0



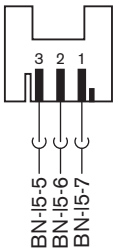
Water Level Switch – f1



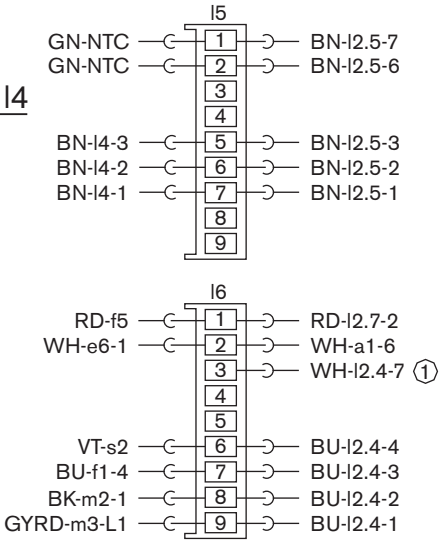
NTC – f2 & f4 / Thermostat – f5



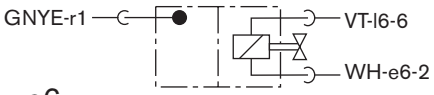
Aqua Sensor – I4



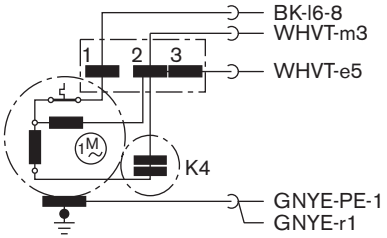
Wiring Connectors – I5 & I6



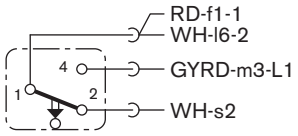
Water Solenoid – s2



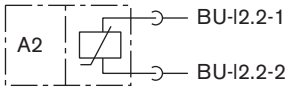
Circulation Motor– m2



Float Switch – e6



Actuator (Dispenser) – A2



BK	=	black
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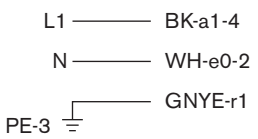
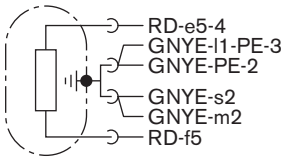
RD	=	red
YE	=	yellow
GN	=	green
BU	=	blue
VT	=	violet
GY	=	gray
WH	=	white
PK	=	pink

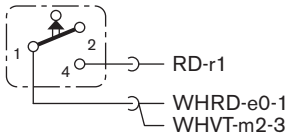
Electrical Supply – I1



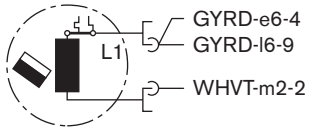
Heating Element – r1



Flow Switch – e5



Drain Motor – m3



(1) may exist without function

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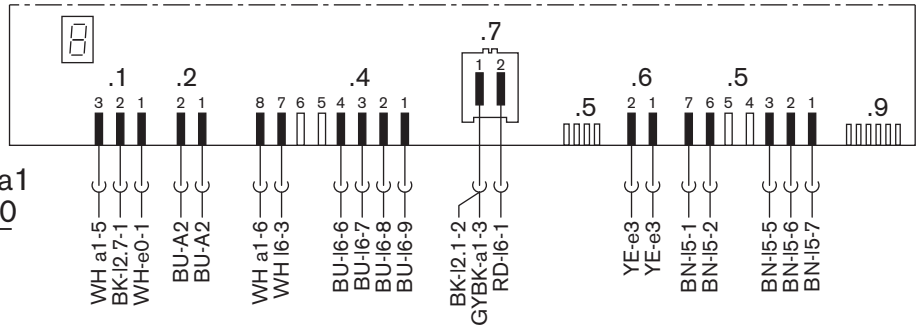
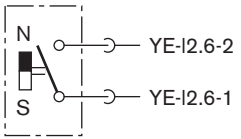
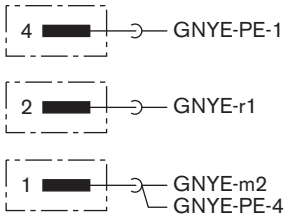
Control Module – I2



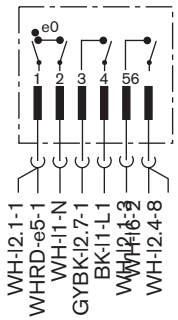
Reed Switch – e3



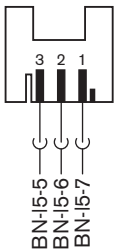
Ground – PE



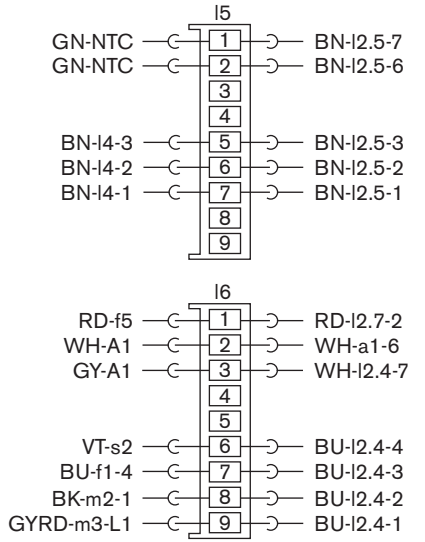
On/Off Switch – a1
Door Switch – e0



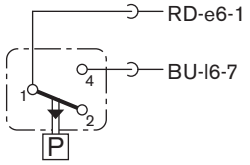
Aqua Sensor – I4



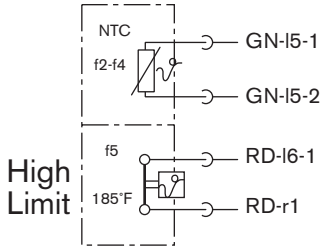
Wiring Connectors – I5 & I6



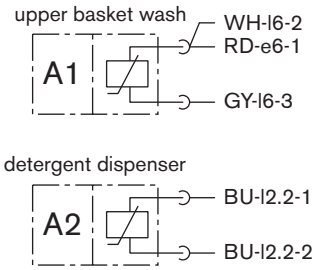
Water Level Switch – f1



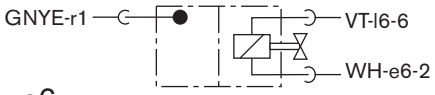
NTC – f2 & f4 / Thermostat – f5



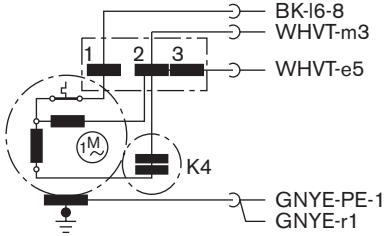
Actuators – A1 & A2



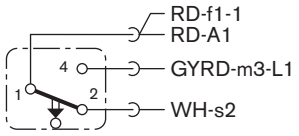
Water Solenoid – s2



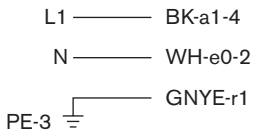
Circulation Motor – m2



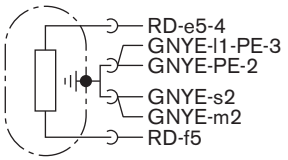
Float Switch – e6



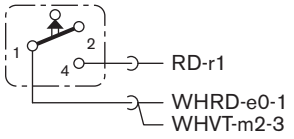
Electrical Supply – I1



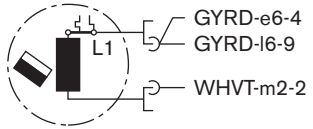
Heating Element – r1



Flow Switch – e5



Drain Motor – m3



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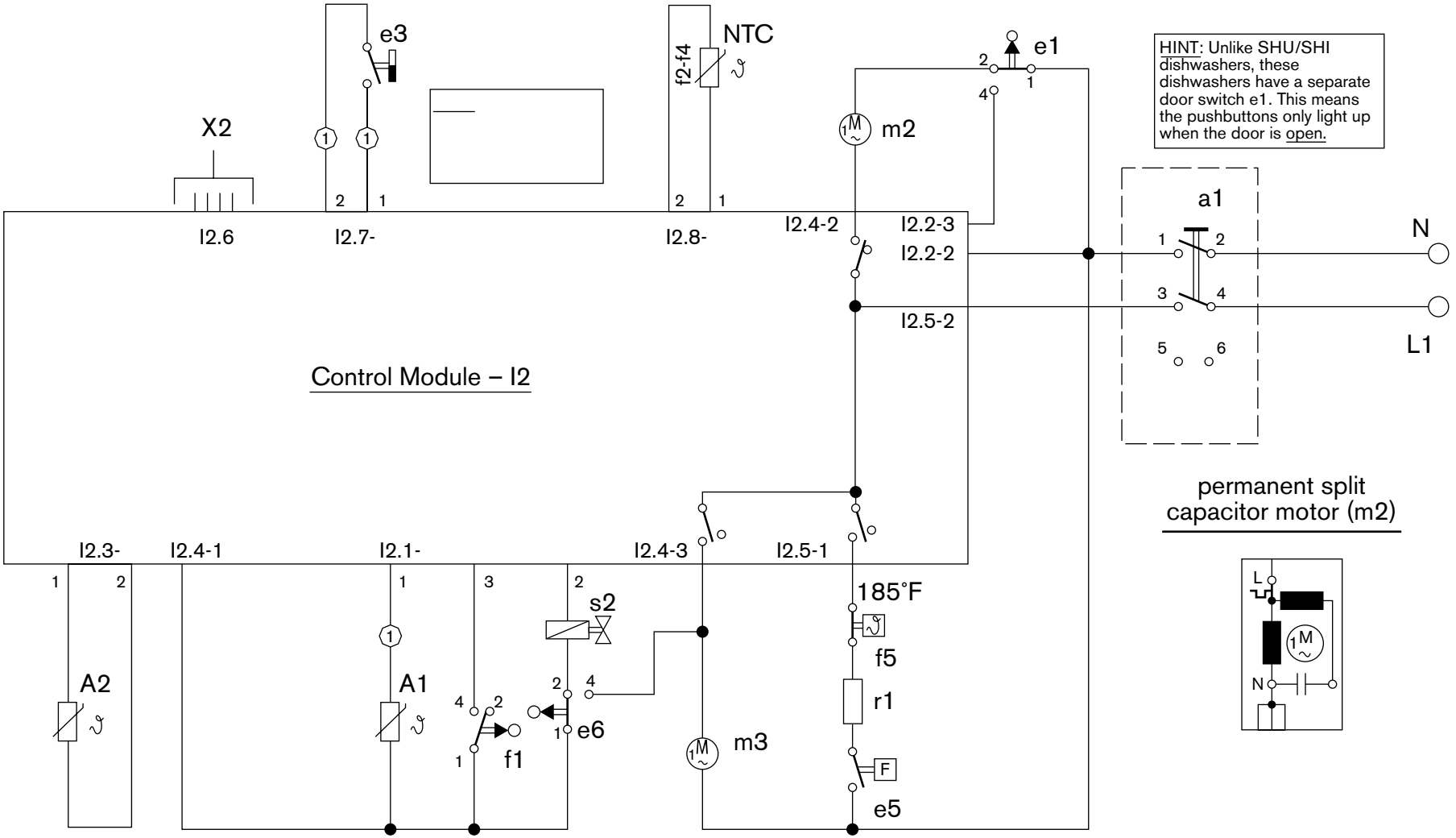
PK	=	pink



HINT: Unlike SHU/SHI dishwashers, these dishwashers have a separate door switch e1. This means the pushbuttons only light up when the door is open.

Symbol Key		Symbol Key	
a1	ON/OFF SWITCH	L1	LINE VOLTAGE (120 VAC)
A1	ACTUATOR (Top Rack Only) (1)	m2	CIRCULATION MOTOR
A2	ACTUATOR (Dispenser)	m3	DRAIN MOTOR
e1	DOOR SWITCH	N	NEUTRAL
e3	REED SWITCH (1)	NTC	TEMPERATURE SENSOR
e5	FLOW SWITCH	r1	HEATING ELEMENT
e6	FLOAT SWITCH	s2	WATER SOLENOID
f1	WATER LEVEL SWITCH	X2	SERVICE CONNECTOR
f5	HIGH LIMIT 185°F		

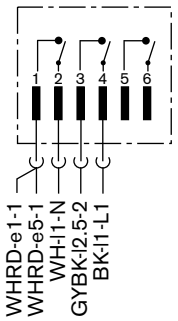
(1) used on SHV 4803, SHU 9922/9925/9926

SHU 88/99 (except 995x), SHV 43/48

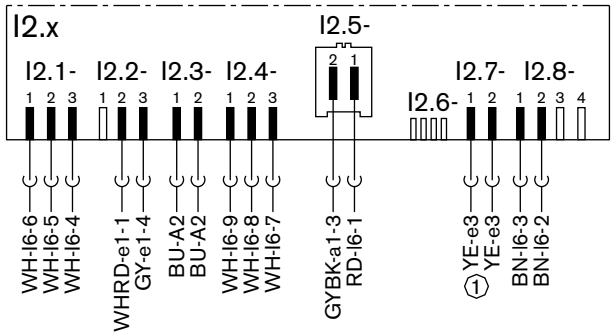
HINT: Flow switch e5 closes when water flows, allowing the heater to work. It will be open when dishwasher is off.

HINT: Float switch e6 switches from terminal 2 to 4 only if dishwasher has overfilled or water has flooded the base.

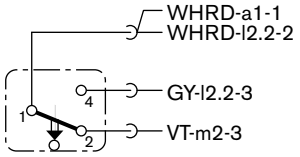
On/Off Switch – a1



Control Module – I2

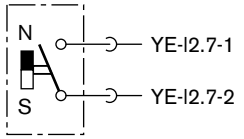


Door Switch – e1

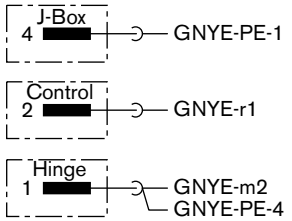


HINT: Format for wire connections includes wire color and part/terminal connected to. For example, "VT-m2-3" = VT (violet wire) connected to terminal 3 of circulation motor m2.

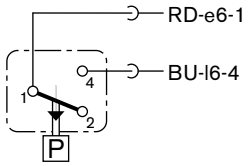
Reed Switch – e3 ①



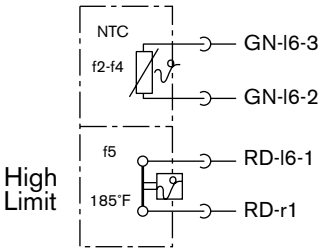
Ground – PE



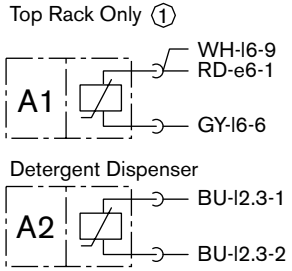
Water Level Switch – f1



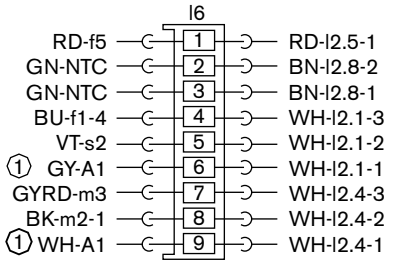
NTC – f2 & f4 / Thermostat – f5



Actuators – A1 & A2

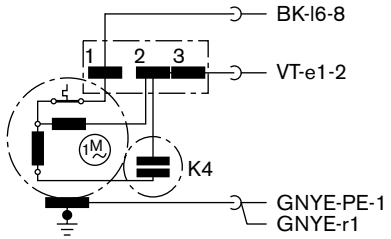


Base Wiring Connector – I6



SHU 88/99 (except 995x), SHV 43/48

Circulation Motor– m2



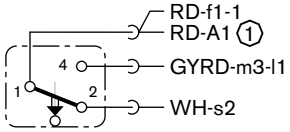
Wire Color Code

BK	=	black
BN	=	brown
RD	=	red
YE	=	yellow
GN	=	green
BU	=	blue
VT	=	violet
GY	=	gray
WH	=	white
PK	=	pink

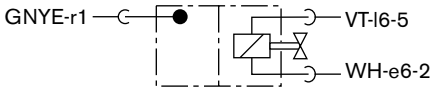
HINT: A wire color with four letters shows the wire color and the stripe (e.g. "GYRD" = gray wire with red stripe).

① used on SHV 4803, SHU 9922/9925/9926

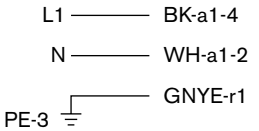
Float Switch – e6



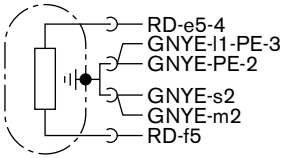
Water Solenoid – s2



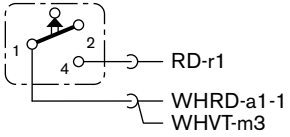
Electrical Supply – I1



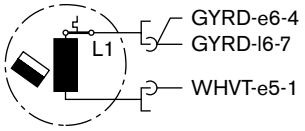
Heating Element – r1

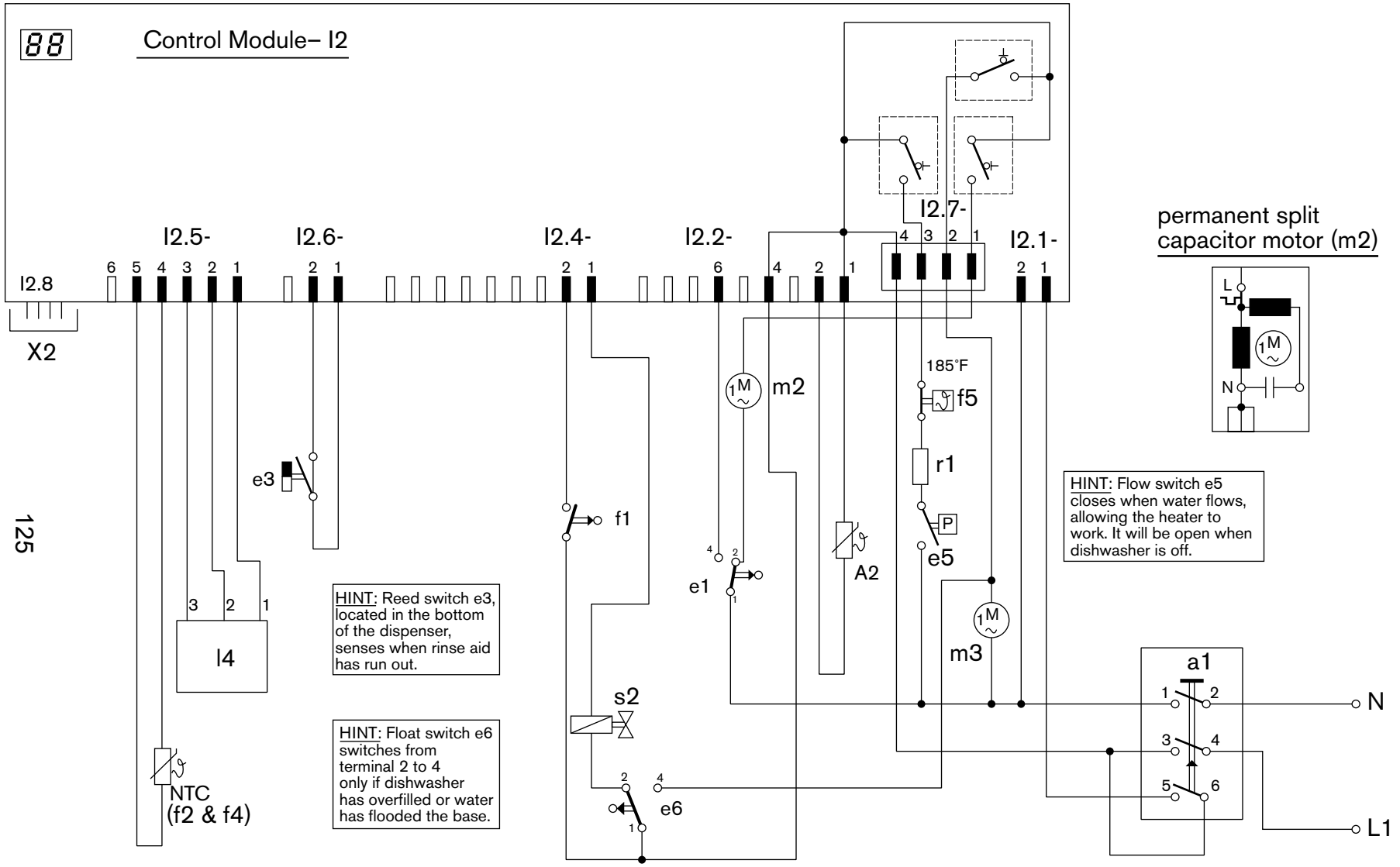


Flow Switch – e5



Drain Motor – m3





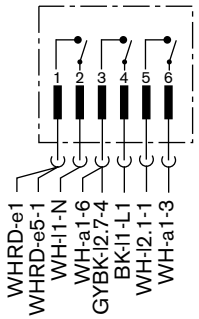
Symbol Key		Symbol Key	
a1	ON/OFF SWITCH	L1	LINE VOLTAGE (120 VAC)
A2	ACTUATOR (Dispenser)	m2	CIRCULATION MOTOR
e1	DOOR SWITCH	m3	DRAIN MOTOR
e3	REED SWITCH	N	NEUTRAL
e5	FLOW SWITCH	NTC	TEMPERATURE SENSOR
e6	FLOAT SWITCH	r1	HEATING ELEMENT
f1	WATER LEVEL SWITCH	s2	WATER SOLENOID
f5	HIGH LIMIT 185°F	X2	SERVICE CONNECTOR
I4	AQUA SENSOR		

HINT: Unlike SHU/SHI dishwashers, these dishwashers have a separate door switch (e1). This means the pushbuttons light up and the digital display is on only when the door is open.

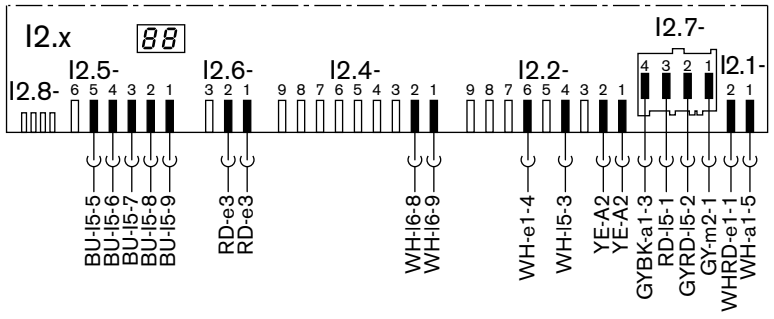
HINT: This is similar to Diagram #72 for SHV 68 dishwashers, except Diagram #72 (SHV 68) has a top rack only actuator (A1).

SHU 995X

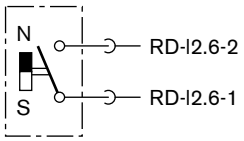
On/Off Switch – a1



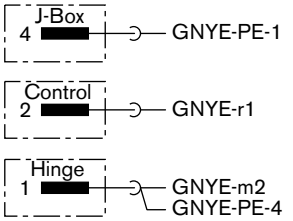
Control Module– I2



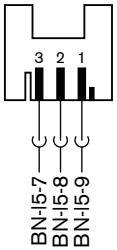
Reed Switch – e3



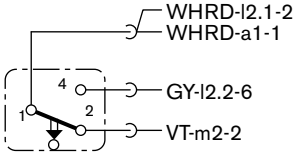
Ground – PE



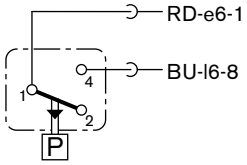
Aqua Sensor – I4



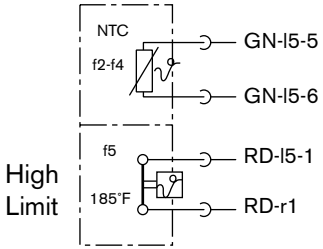
Door Switch – e1



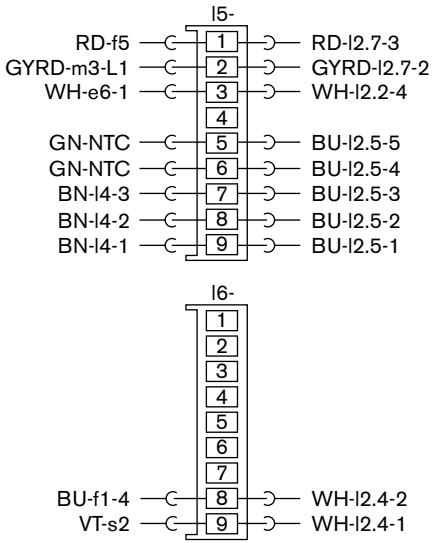
Water Level Switch – f1



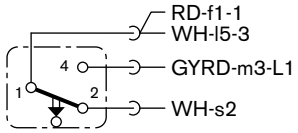
NTC – f2 & f4 / Thermostat – f5



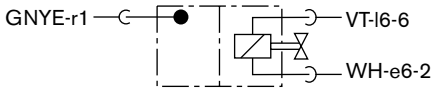
Base Wiring Connectors – I5 & I6



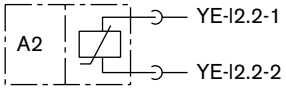
Float Switch – e6



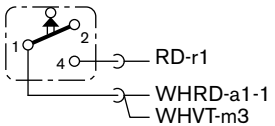
Water Solenoid – s2



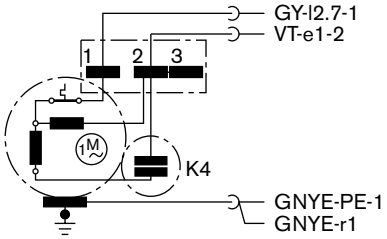
Actuator (Dispenser) – A2



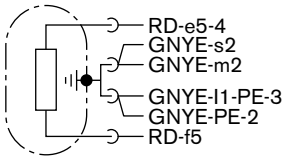
Flow Switch – e5



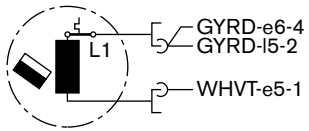
Circulation Motor– m2



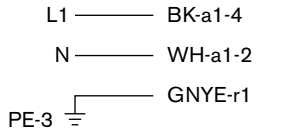
Heating Element – r1



Drain Motor – m3



Electrical Supply – I1



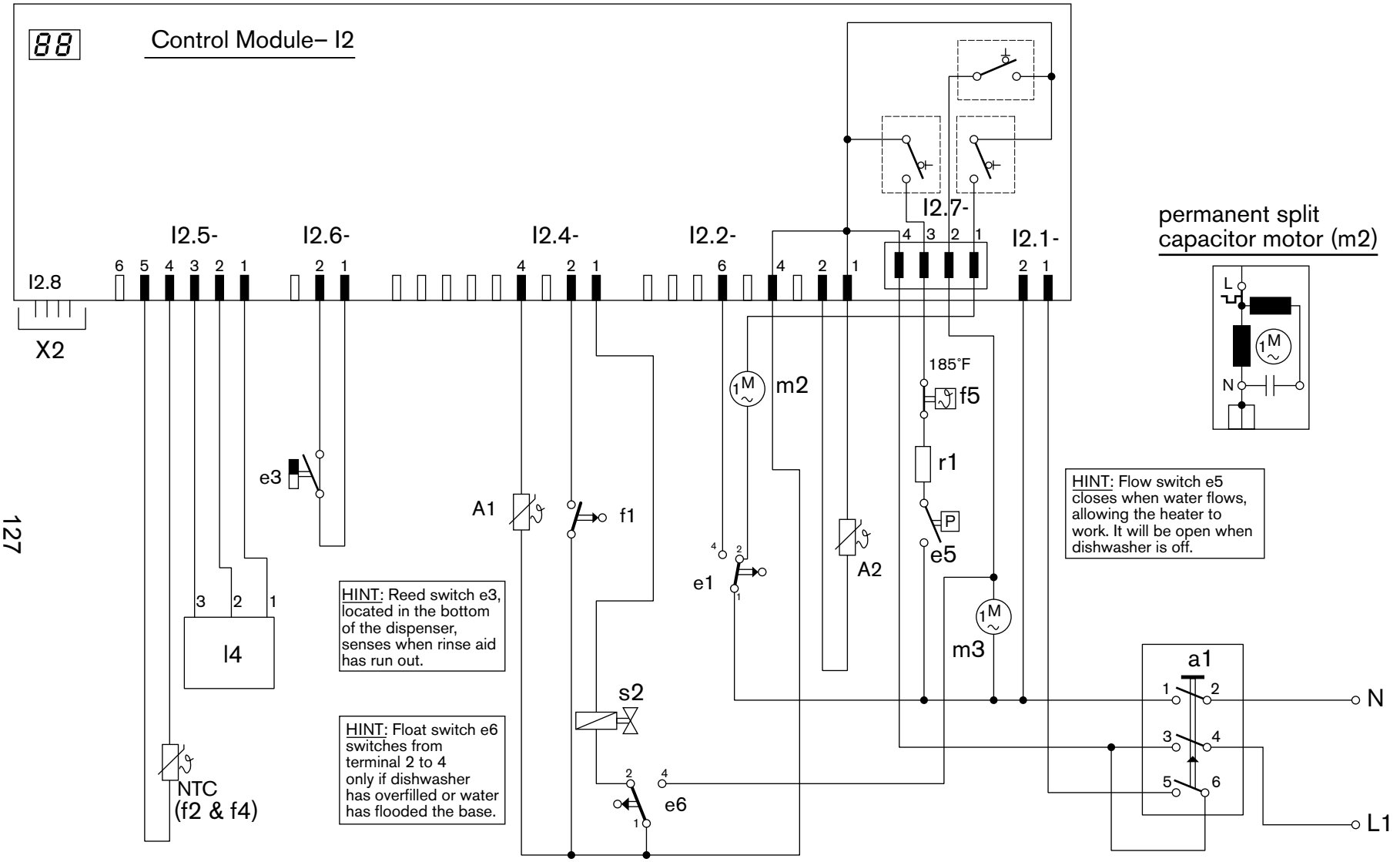
HINT: When a wire color consists of four letters, the 3rd & 4th letters show the stripe. For example, a “GYBK” wire is a gray wire with a black stripe.

Wire Color Code

BK	=	black
BN	=	brown
RD	=	red
YE	=	yellow
GN	=	green
BU	=	blue
VT	=	violet
GY	=	gray
WH	=	white
PK	=	pink

HINT: Format for wire connections includes wire color and part/terminal connected to. For example, “BU-I6-8” = BU (blue wire) connected to part I6 (rear base wiring connector) @ terminal 8.

SHU 995x



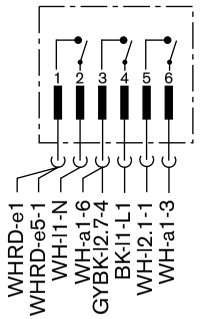
Symbol Key		Symbol Key	
a1	ON/OFF SWITCH	I4	AQUA SENSOR
A1	ACTUATOR (Top Rack Only)	L1	LINE VOLTAGE (120 VAC)
A2	ACTUATOR (Dispenser)	m2	CIRCULATION MOTOR
e1	DOOR SWITCH	m3	DRAIN MOTOR
e3	REED SWITCH	N	NEUTRAL
e5	FLOW SWITCH	NTC	TEMPERATURE SENSOR
e6	FLOAT SWITCH	r1	HEATING ELEMENT
f1	WATER LEVEL SWITCH	s2	WATER SOLENOID
f5	HIGH LIMIT 185°F	X2	SERVICE CONNECTOR

HINT: Unlike SHU/SHI dishwashers, these dishwashers have a separate door switch (e1). This means the pushbuttons light up and the digital display is on only when the door is open.

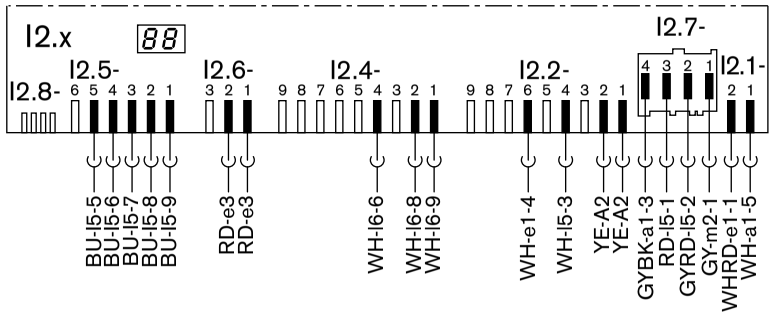
HINT: This is similar to Diagram #68 for SHU 995X dishwashers, except Diagram #68 (SHU 995X) does not have a top rack only actuator (A1).

SHV 68

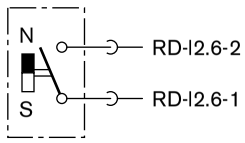
On/Off Switch – a1



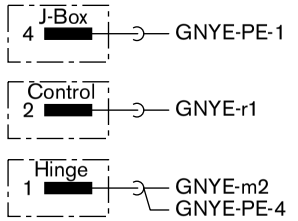
Control Module– I2



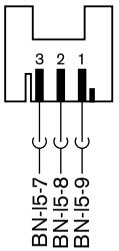
Reed Switch – e3



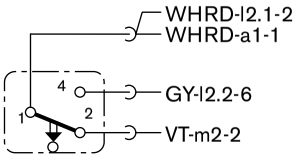
Ground – PE



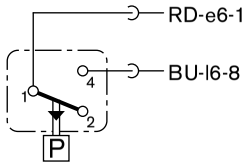
Aqua Sensor – I4



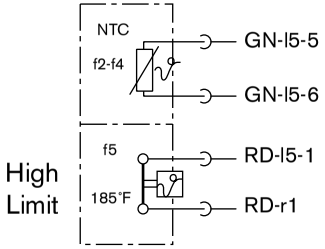
Door Switch – e1



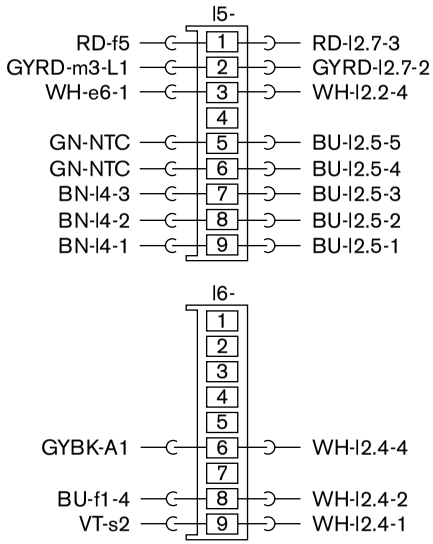
Water Level Switch – f1



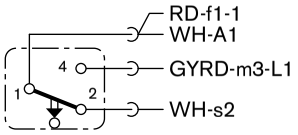
NTC – f2 & f4 / Thermostat – f5



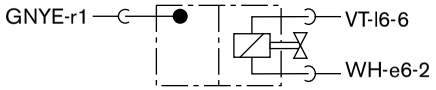
Base Wiring Connectors – I5 & I6



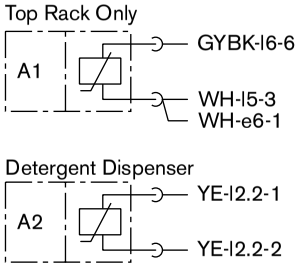
Float Switch – e6



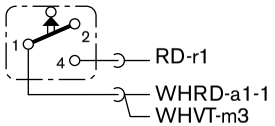
Water Solenoid – s2



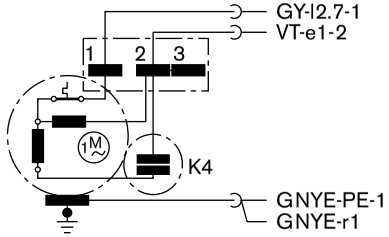
Actuators – A1 & A2



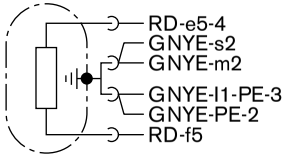
Flow Switch – e5



Circulation Motor– m2



Heating Element – r1

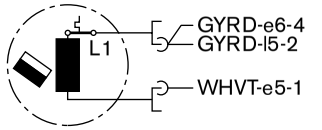


Electrical Supply – I1

Wire Color Code

BK	=	black
BN	=	brown
RD	=	red
YE	=	yellow
GN	=	green
BU	=	blue
VT	=	violet
GY	=	gray
WH	=	white
PK	=	pink

Drain Motor – m3



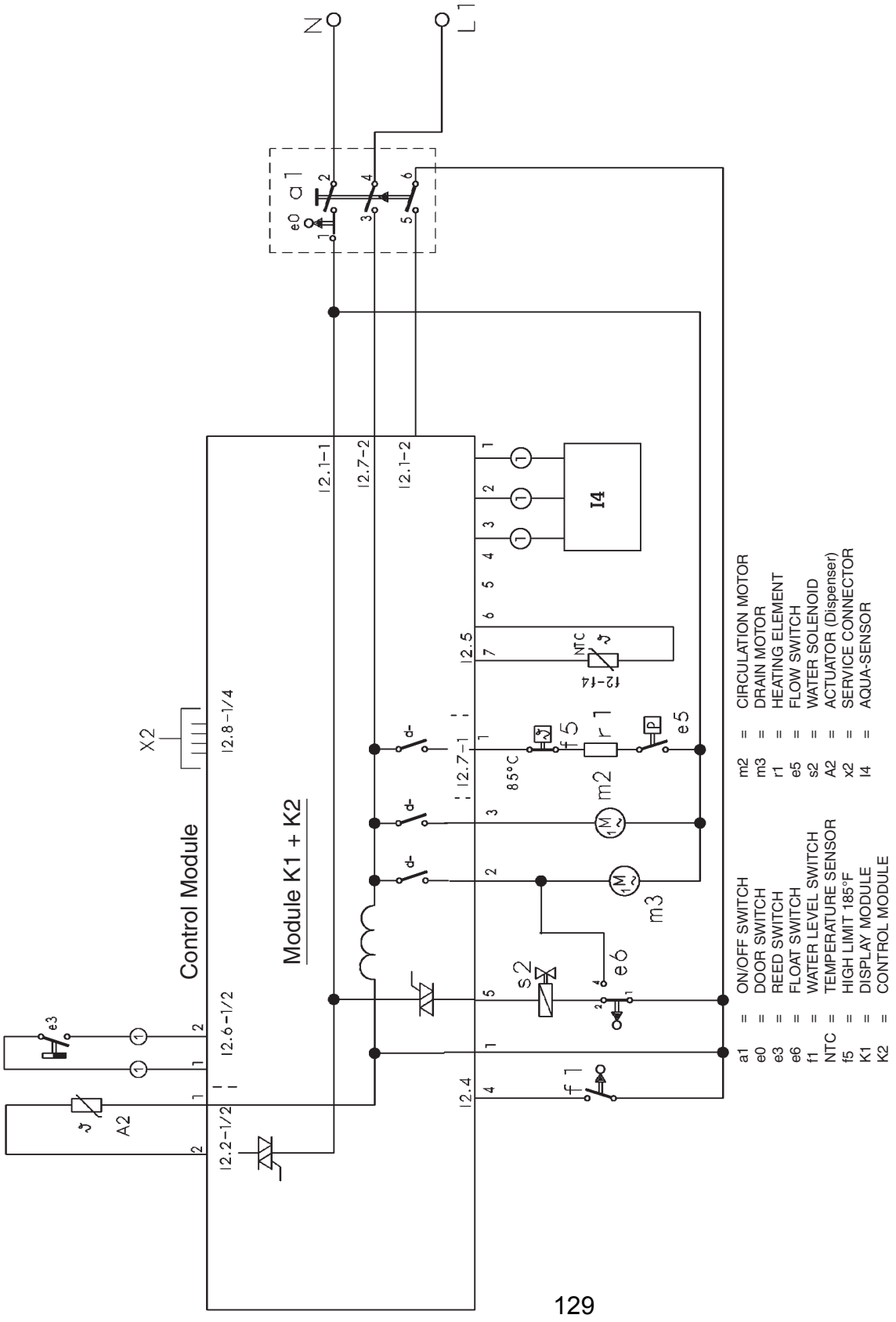
HINT: When a wire color consists of four letters, the 3rd & 4th letters show the stripe. For example, a "GYBK" wire is a gray wire with a black stripe.

HINT: Format for wire connections includes wire color and part/terminal connected to. For example, "BU-I6-8" = BU (blue wire) connected to part I6 (rear base wiring connector) @ terminal 8.

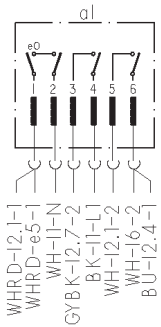
SHV 68

IX. Wiring Diagrams/Tech Sheet

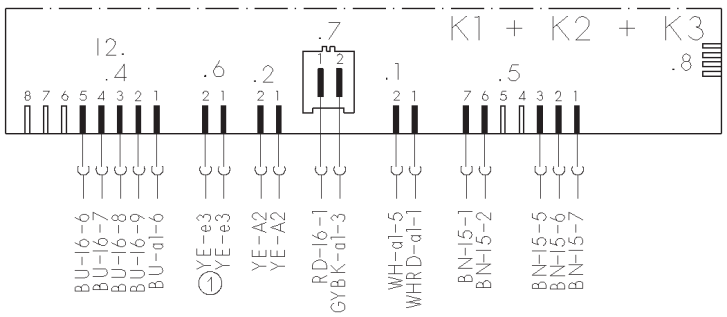
Wiring Diagram
SHU 43C **SHU 53A**



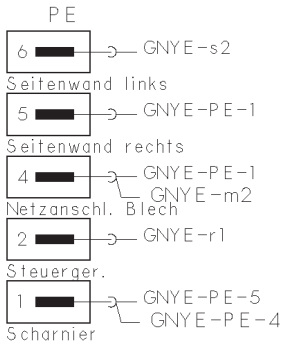
On/Off Switch



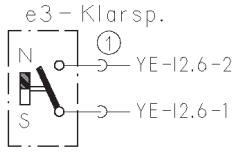
Control Module



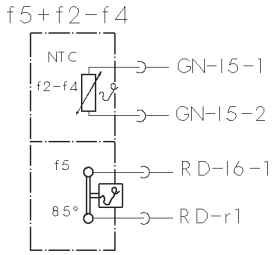
Ground Connections



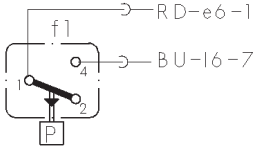
Reed Switch



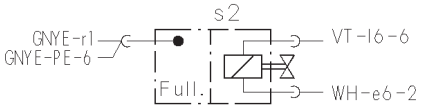
Thermostat + NTC



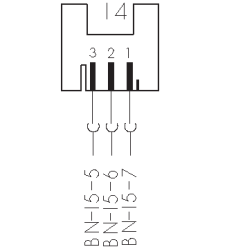
Water Level Switch



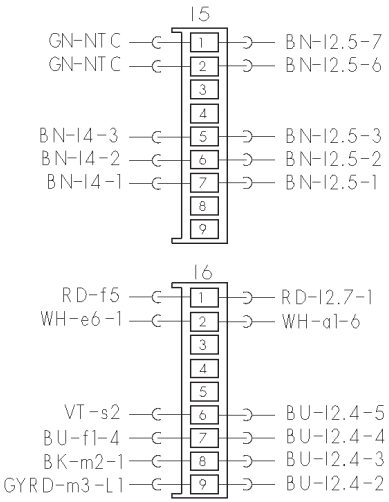
Water Solenoid



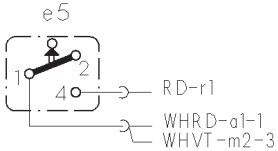
Aqua-Sensor



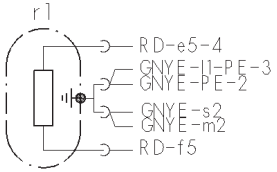
Wiring Connections



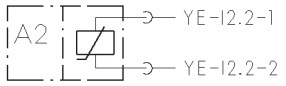
Flow Switch



Heating Element

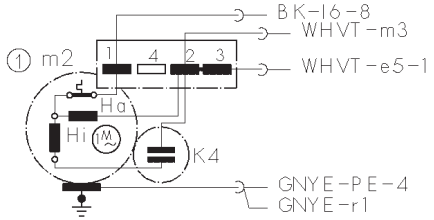


Dispenser

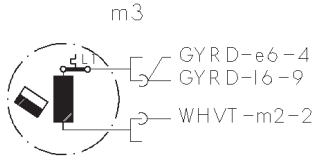


Float Switch

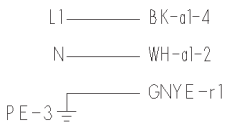
Circulation Motor



Drain Motor



Electric Supply



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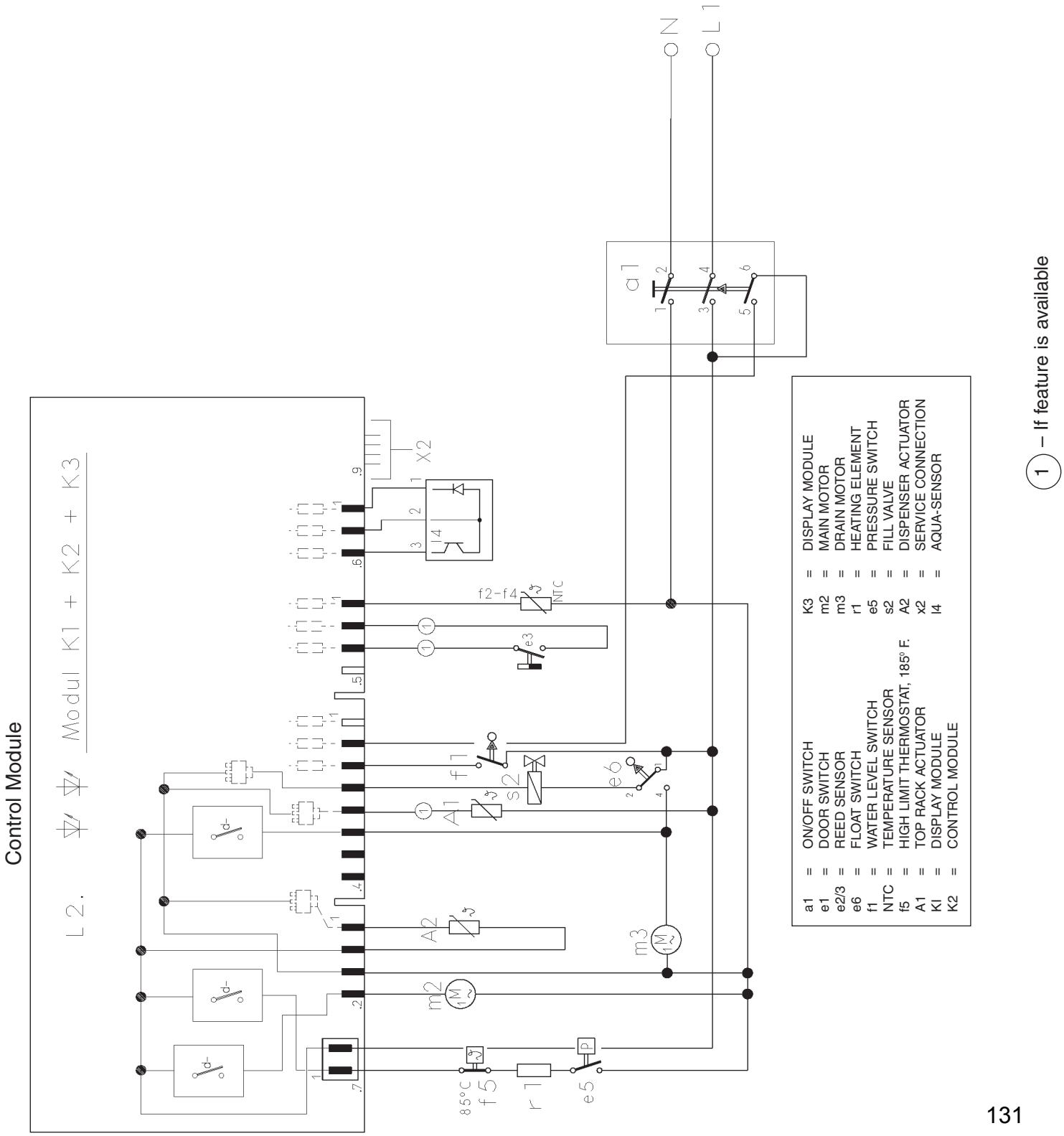
GN	=	green
BU	=	blue
VT	=	violet
GY	=	grey
WH	=	white
PK	=	pink

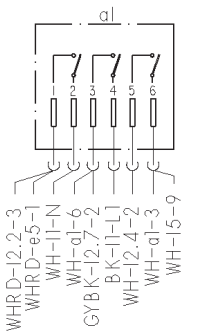
(1) – If feature is available

IX. Wiring Diagrams/Tech Sheet

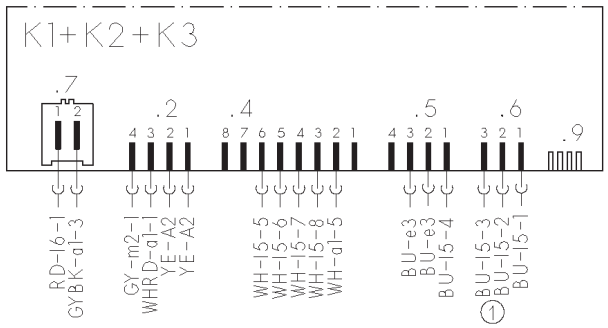
Wiring Diagram
SHU 43E **SHU 53E** **SHU 66E**



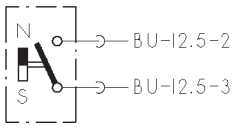
On/Off Switch



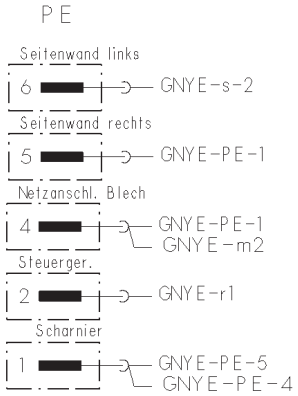
Control Module



Reed Switch ①



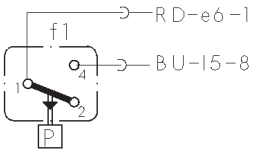
Ground Connections



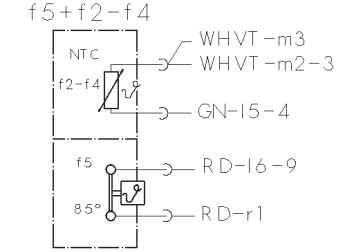
Aqua-Sensor

Float Switch

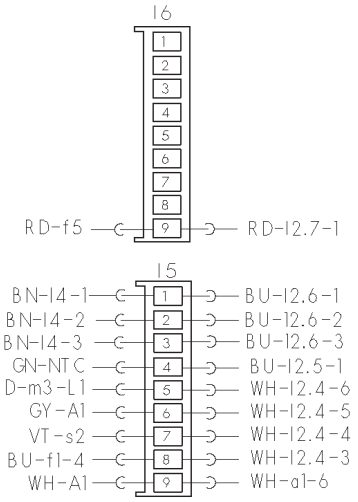
Water Level Switch



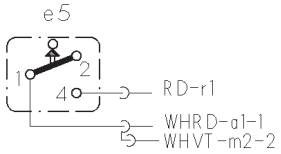
Thermostat + NTC



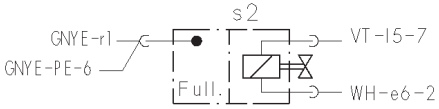
Wiring Connections



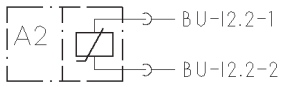
Flow Switch



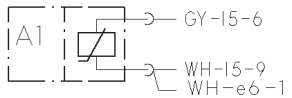
Water Solenoid



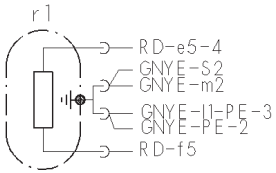
Dispenser



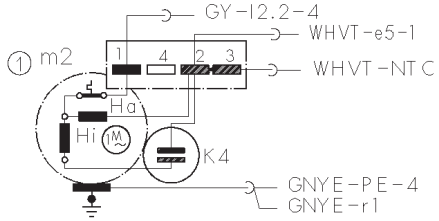
Top Rack ①



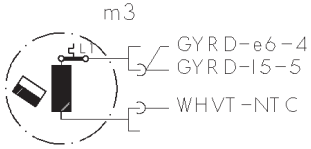
Heating Element



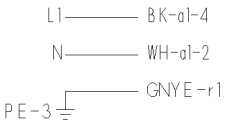
Circulation Motor



Drain Motor



Electric Supply



BK	=	black
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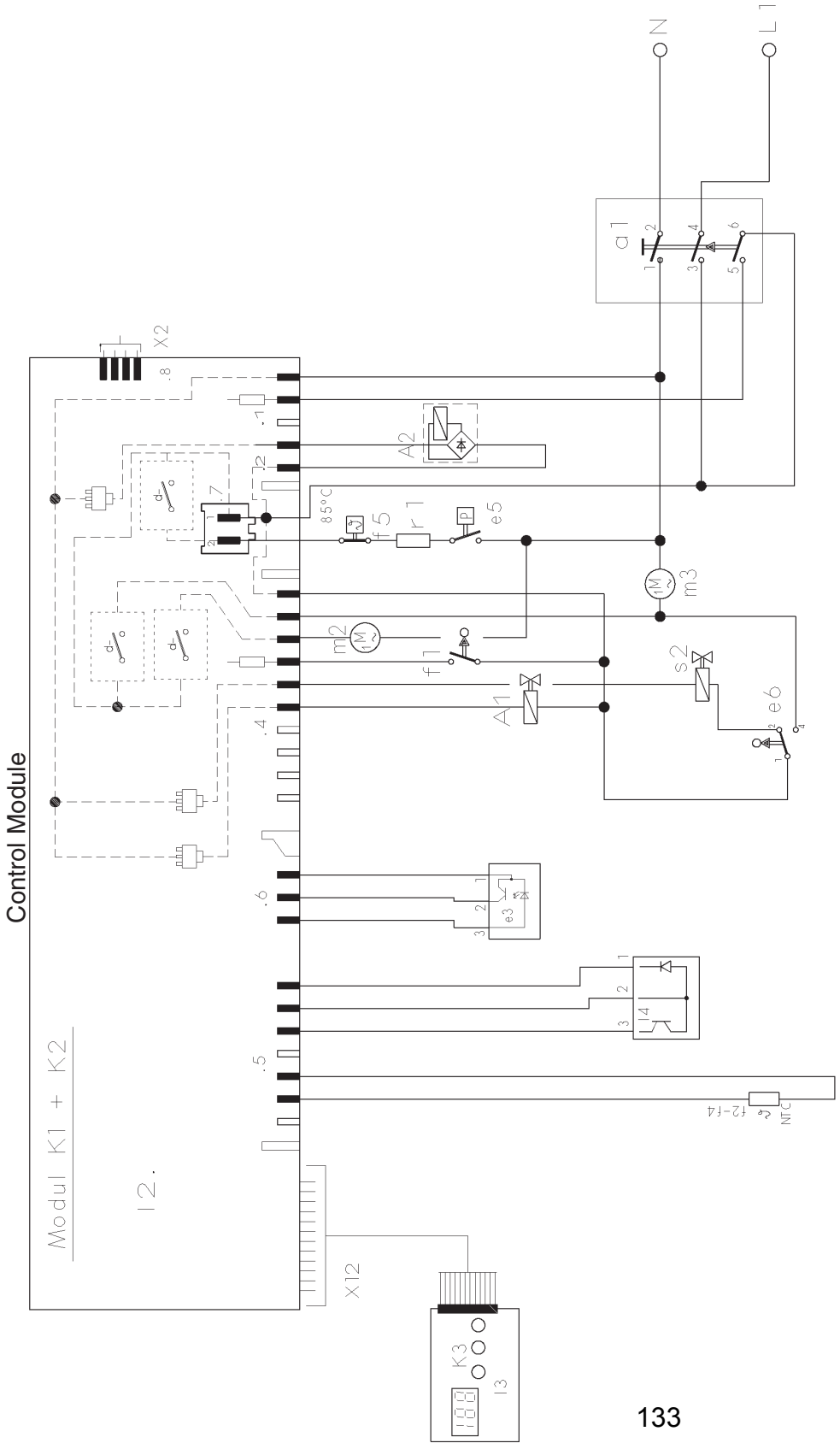
GN	=	green
BU	=	blue
VT	=	violet
GY	=	grey
WH	=	white
PK	=	pink

① – If feature is available

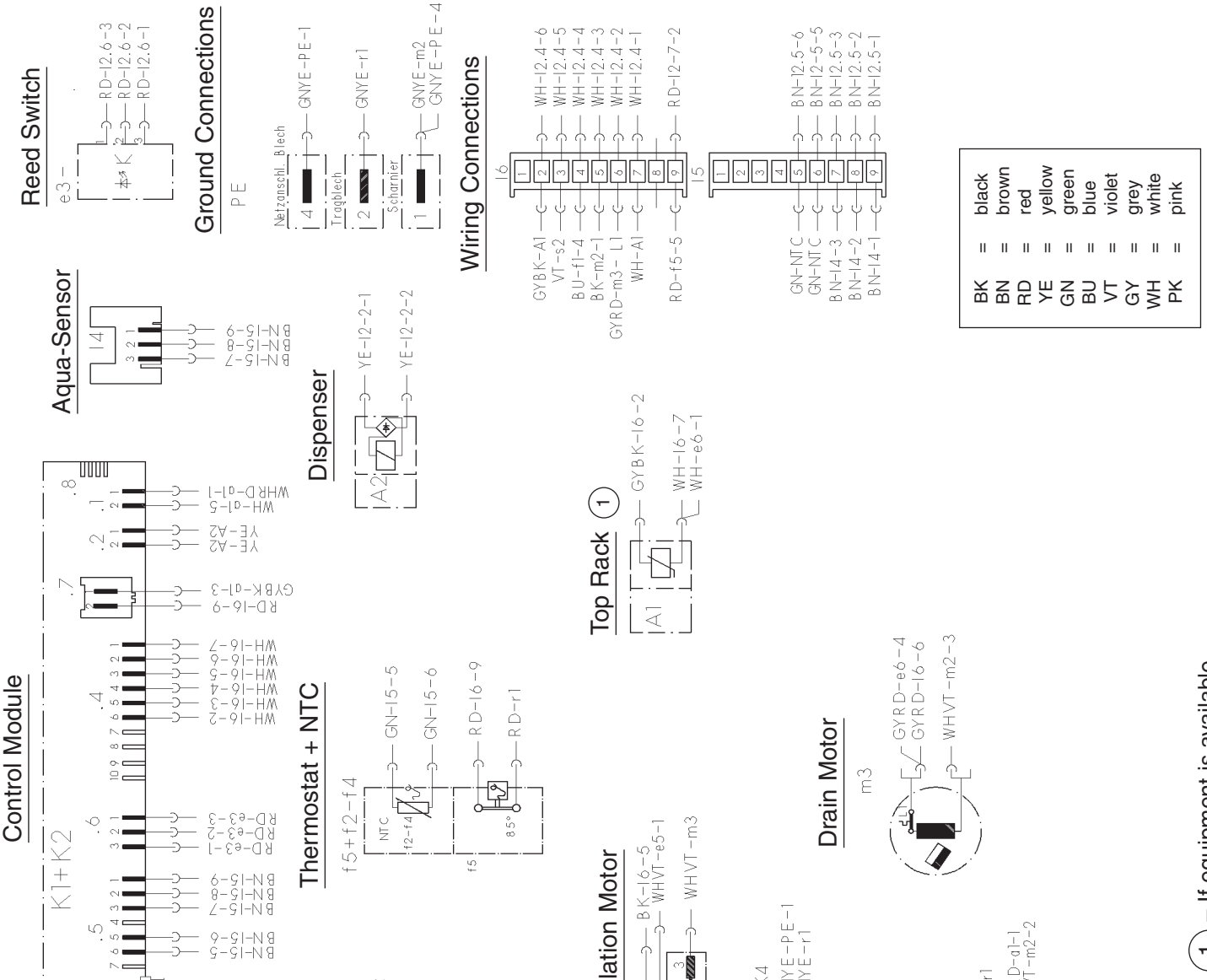
IX. Wiring Diagrams/Tech Sheet

Wiring Diagram
SHU 66C **SHI 66A**



(1) – If equipment is available

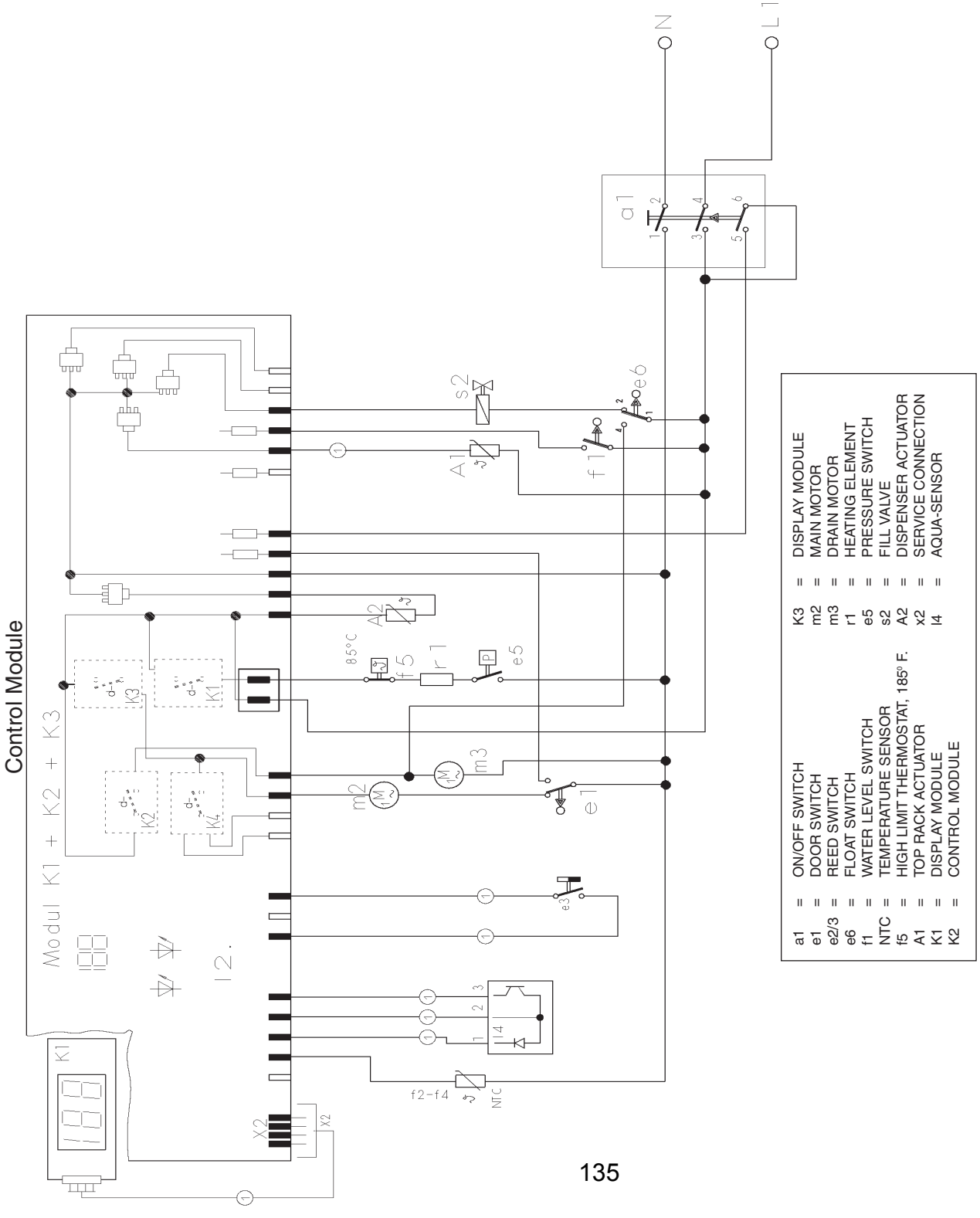
IX. Wiring Diagrams/Tech Sheet



(1) – If equipment is available

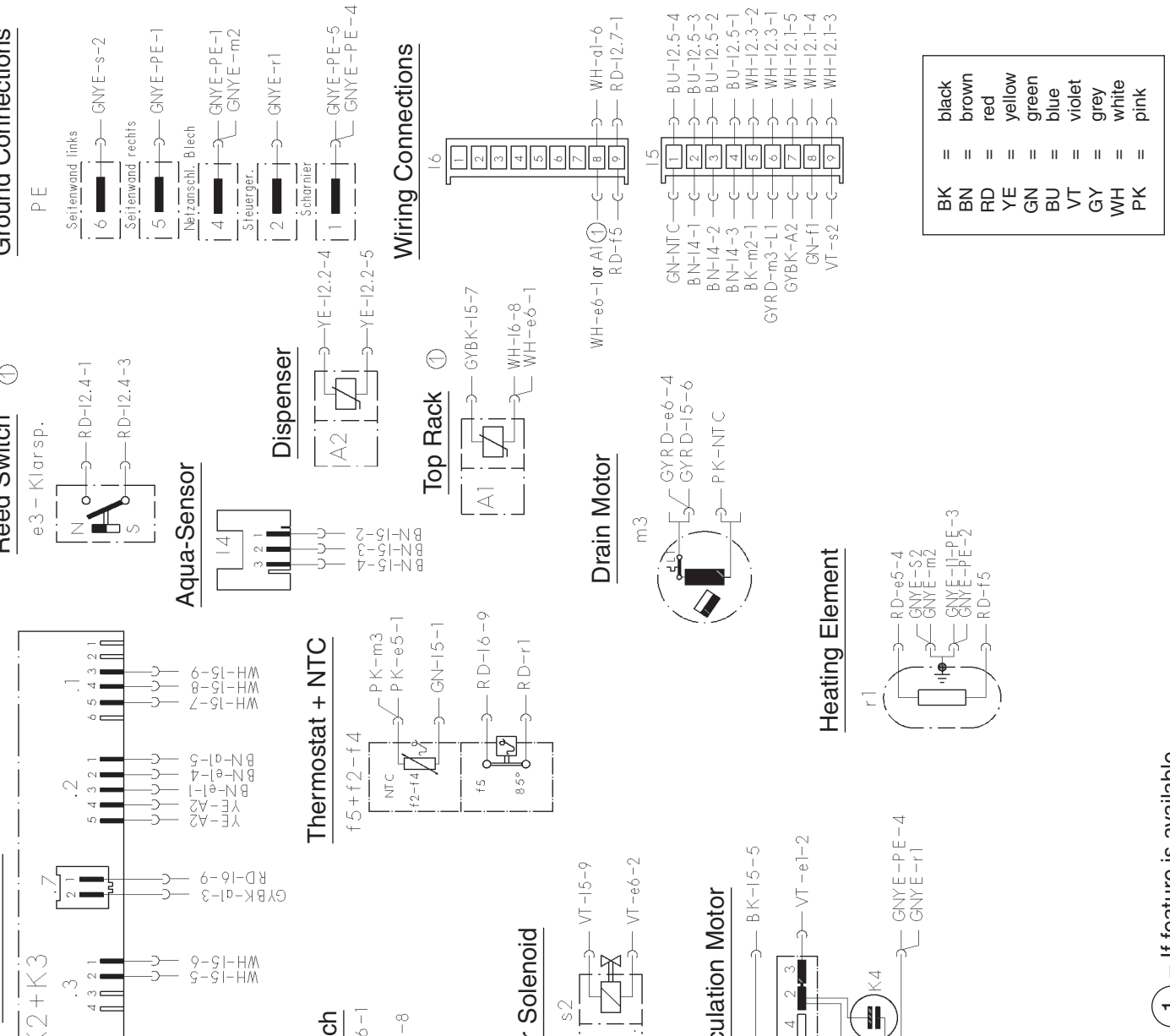
IX. Wiring Diagrams/Tech Sheet

Wiring Diagram
SHX 33A **SHX 46A** **SHX 46B** **SHV 46C** **SHX 43E**



(1) – If feature is available

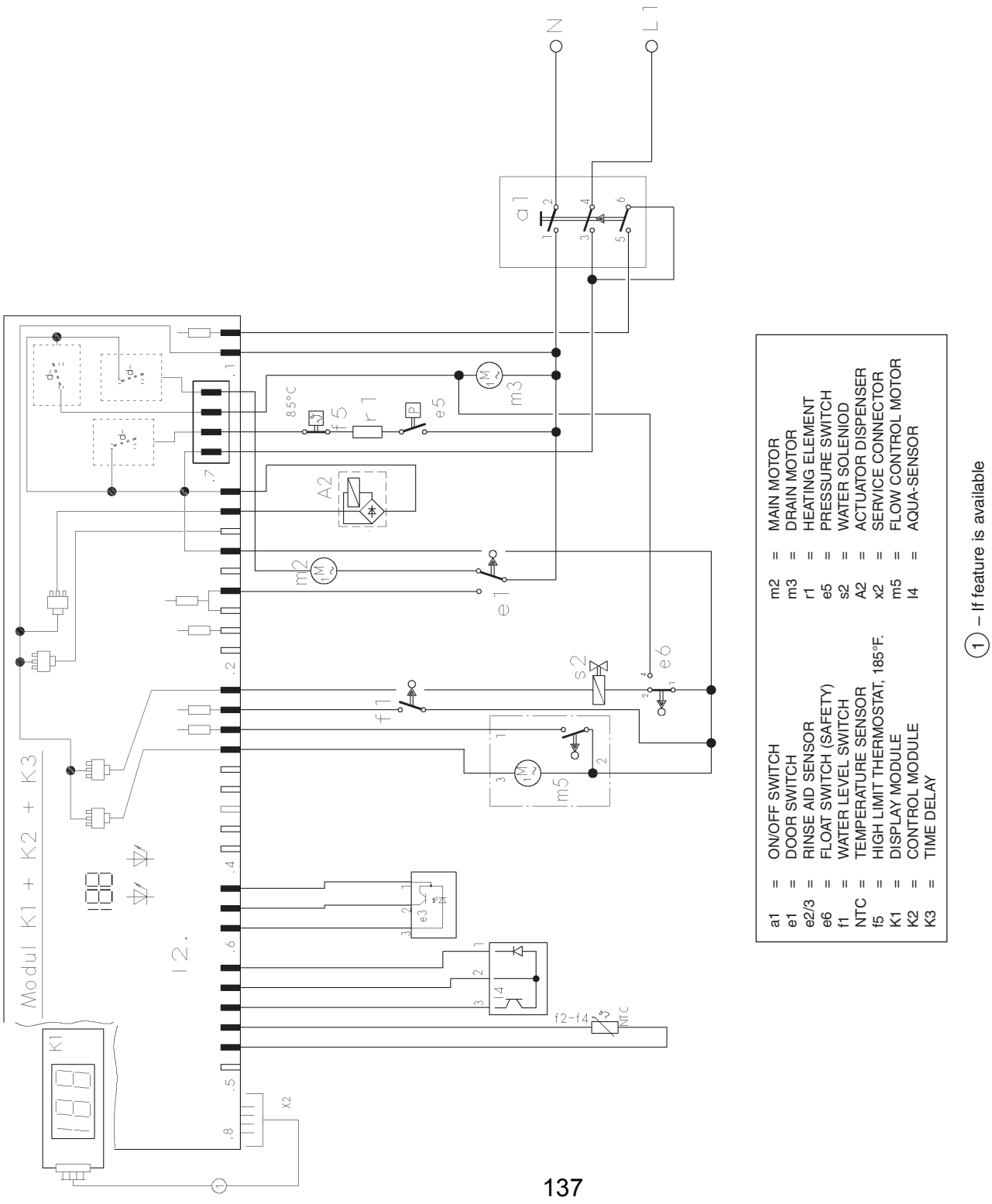
IX. Wiring Diagrams/Tech Sheet



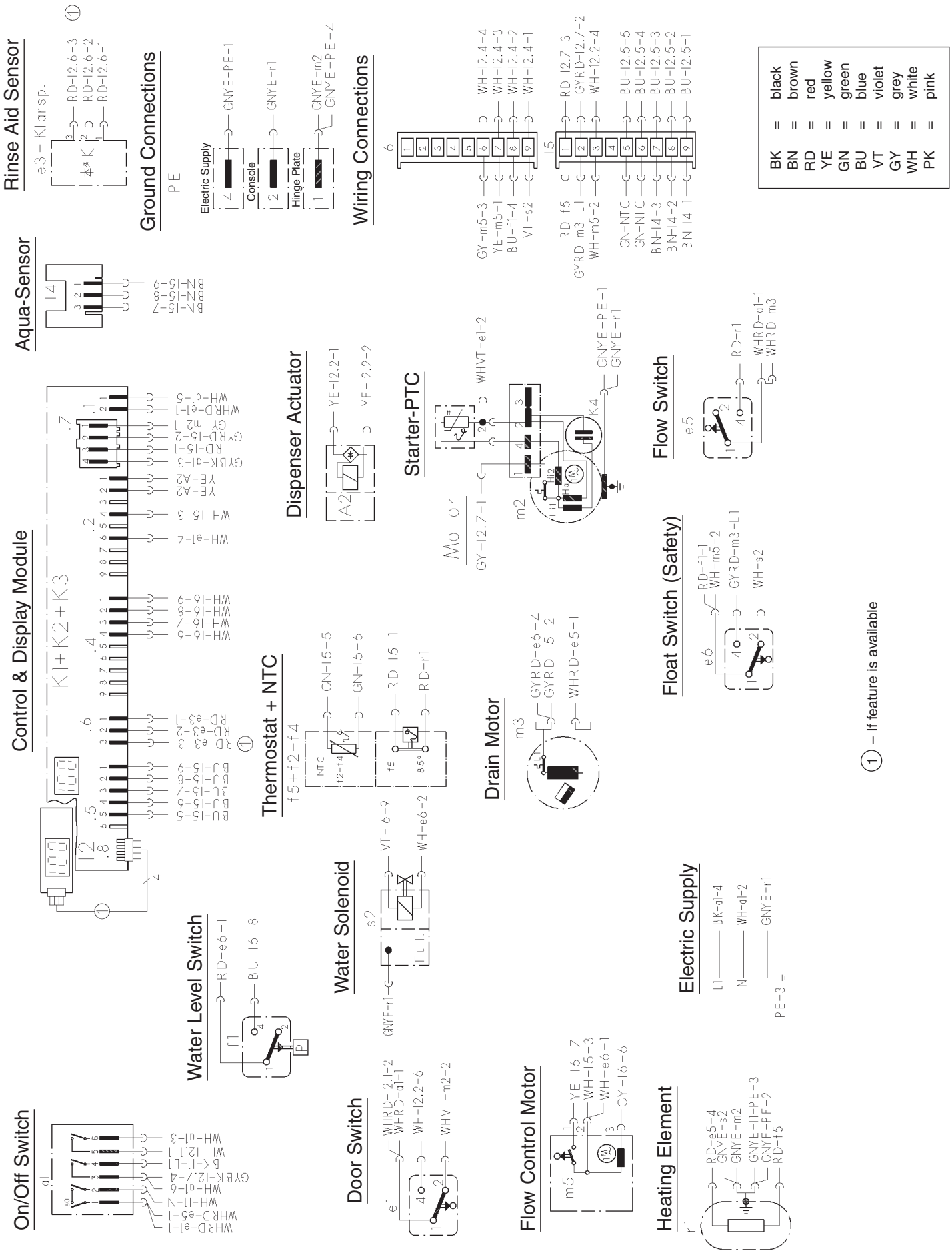
① – If feature is available

IX. Wiring Diagrams/Tech Sheet

Wiring Diagram
SHY 56 **SHY 66** **SHX 56** **SHV 66**



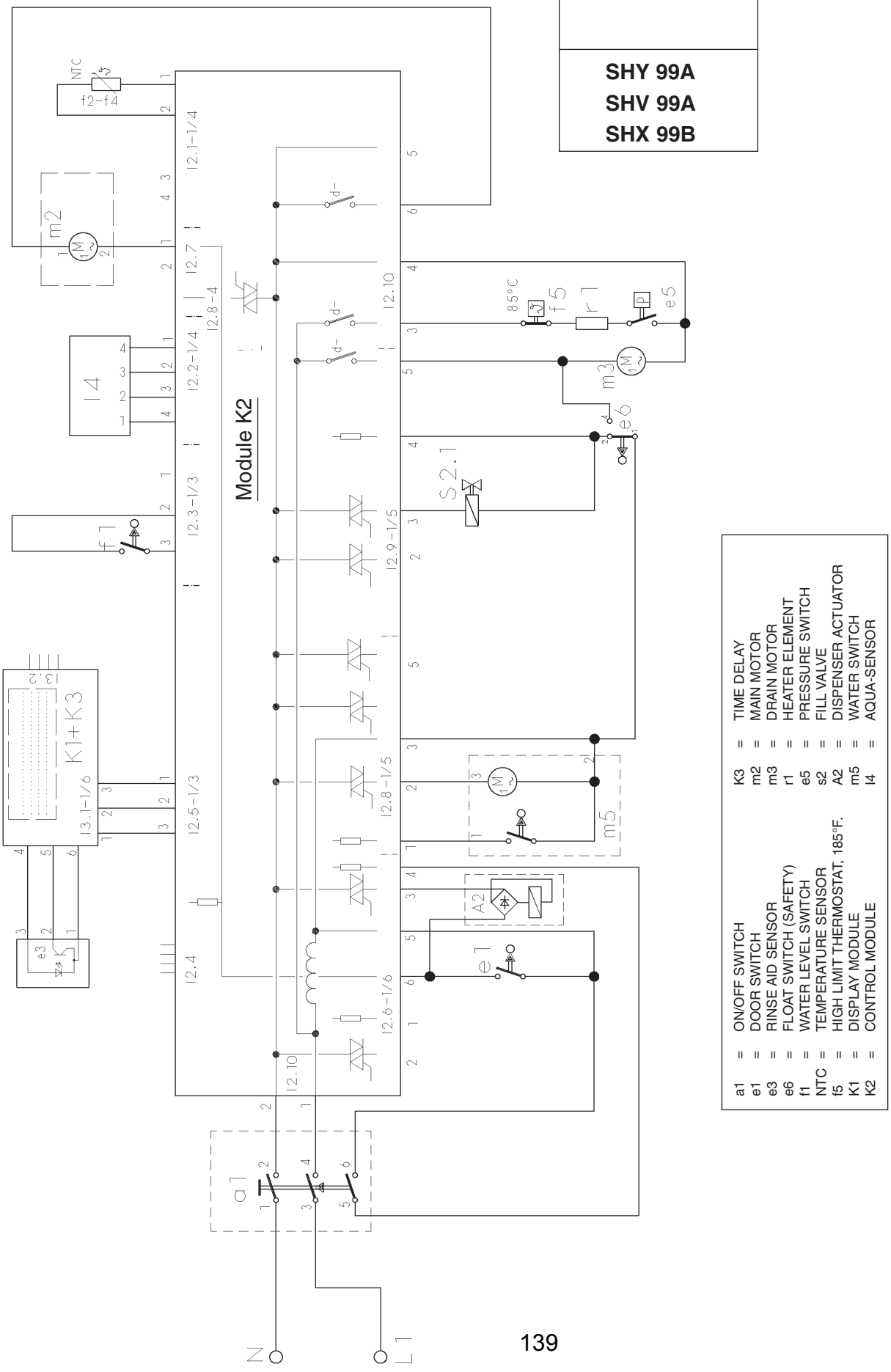
IX. Wiring Diagrams/Tech Sheet



IX. Wiring Diagrams/Tech Sheet

Wiring Diagram

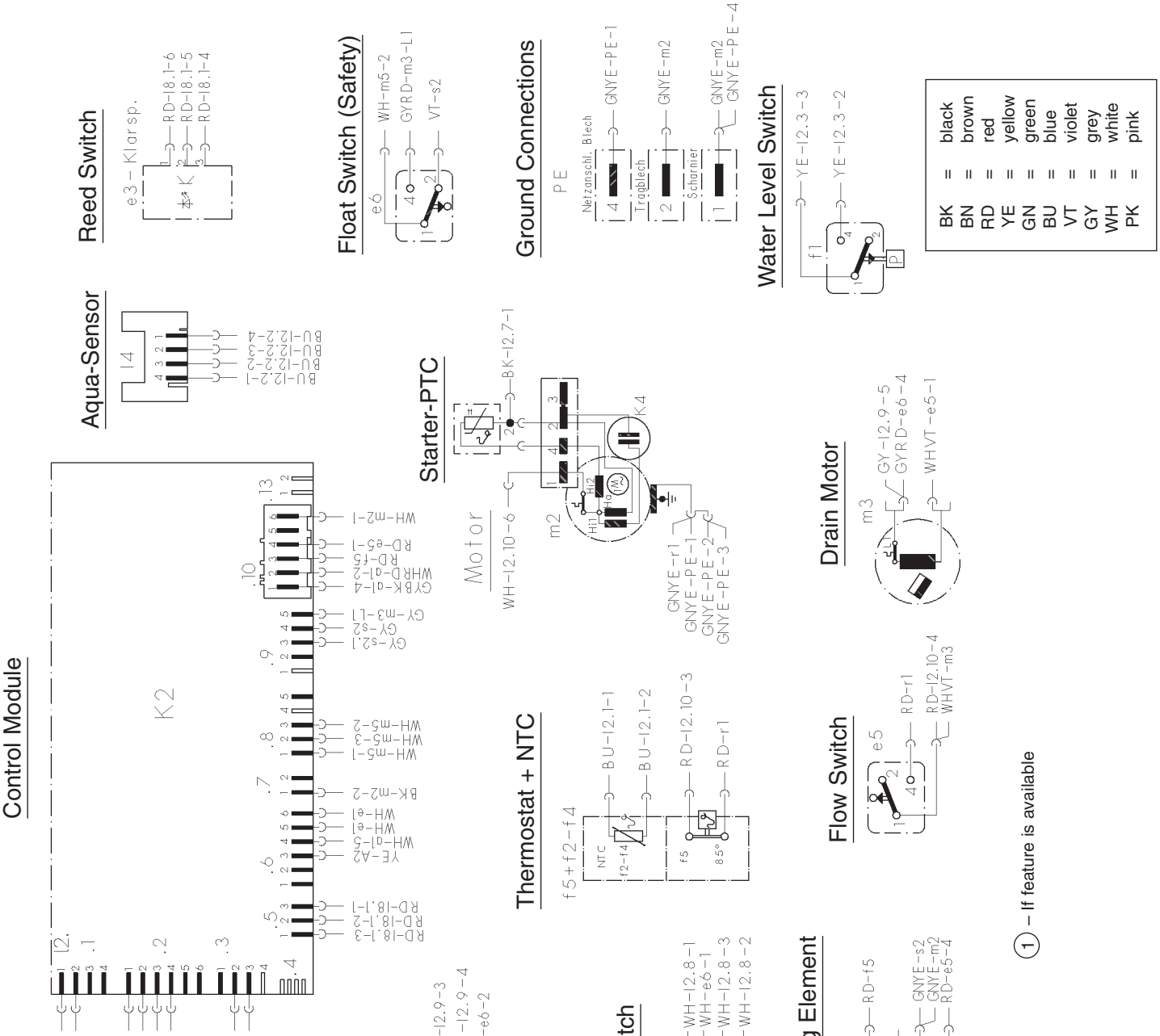
SHY 99A
SHV 99A
SHX 99B



a1	=	ON/OFF SWITCH	K3	=	TIME DELAY
e1	=	DOOR SWITCH	m2	=	MAIN MOTOR
e3	=	RINSE AID SENSOR	m3	=	DRAIN MOTOR
e6	=	FLOAT SWITCH (SAFETY)	r1	=	HEATER ELEMENT
f1	=	WATER LEVEL SWITCH	e5	=	PRESSURE SWITCH
NTC	=	TEMPERATURE SENSOR	s2	=	FILL VALVE
f5	=	HIGH LIMIT THERMOSTAT, 185°F.	A2	=	DISPENSER ACTUATOR
K1	=	DISPLAY MODULE	m5	=	WATER SWITCH
K2	=	CONTROL MODULE	l4	=	AQUA-SENSOR

(1) – If feature is available

IX. Wiring Diagrams/Tech Sheet



'You Can Count on me . . .
to Work Safely.'