DYNEX
TECHNOLOGIES

Opsys MW™ Microplate Washer

User's Guide

IMPORTANT
Please read carefully before using the Opsys MW

Part No. 91000051, Revision B

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Table of Contents

About this Manual

This manual has been written for laboratory technicians and provides detailed instructions for using the *Opsys* MW™ system.

This manual gives you the information needed to:

- Review safety precautions.
- Install the *Opsys* MW™ system.
- Understand the *Opsys* MW™ menus.
- Set the *Opsys* MW™ system up to suit your exact needs.
- Create or modify wash protocols.
- Run wash protocols using the *Opsys* MW™ system.
- Perform required preventive maintenance.
- Troubleshoot the system.

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Chapter 1 Introduction

The *Opsys* MW™ is a microprocessor-controlled microplate washing system that performs wash protocols that are defined by the user. It is designed to wash all of the wells in one column or one row of a 96-well plate at once. The washing protocol can be programmed so that all of the columns (or rows) are washed in the same manner, or different wash cycles can be applied to specified columns (or rows) on the plate.

Description

The *Opsys* MW Microplate Washer is shown in Figure 1.

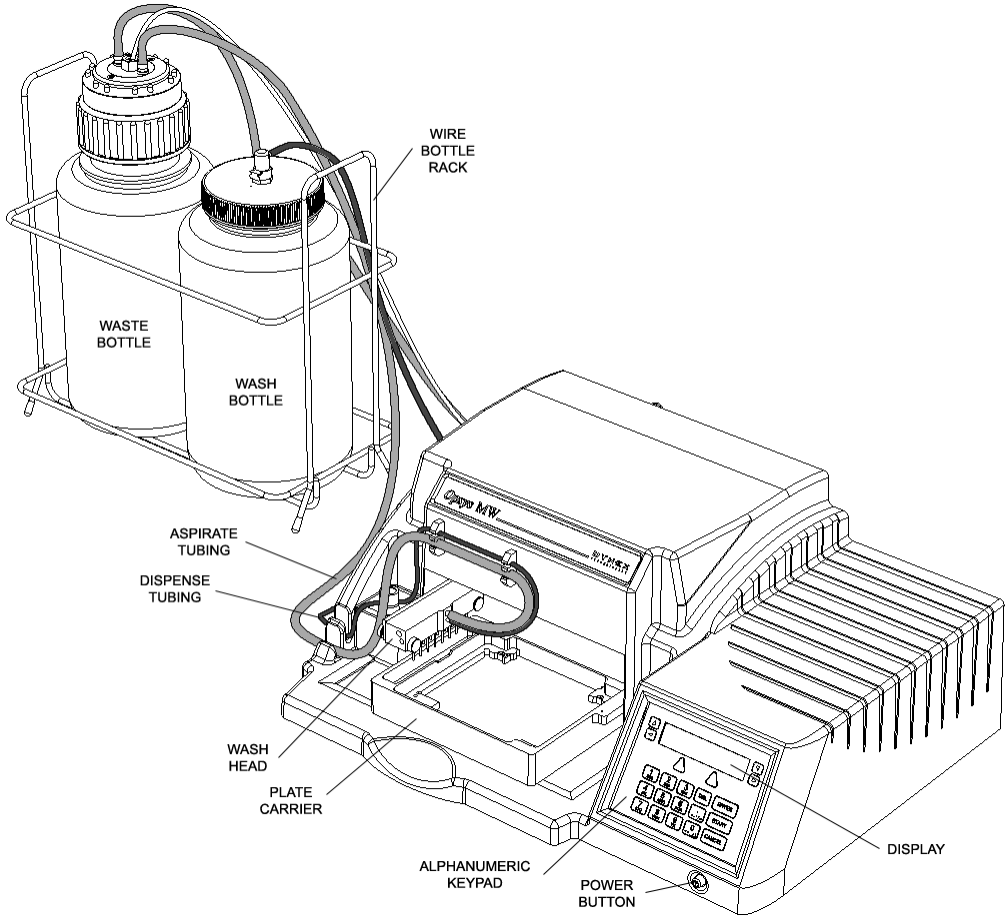

Figure 1. The Opsys MW™ Microplate Washing System

Programming

All wash protocols on the *Opsys* MW™ Microplate Washer are user-defined. Up to 40 wash protocols can be contained on the system.

Note: Memory limitations may restrict the size and complexity of an individual wash protocol.

In addition, the system can be configured with up to ten different plate types so that the wash head positions for each plate type can be specified.

Programming of a new wash protocol (or modifying an existing one) and configuration of the system are carried out using the keypad and display.

Wash Head

The wash head on the *Opsys* MW™ Microplate Washer contains multiple sets of dual **wash pins**. Each set of dual wash pins consists of a **dispense pin** and an **aspirate pin** that are closely spaced so that fluid can be aspirated from and dispensed into a well simultaneously.

The following wash heads can be fitted on the *Opsys* MW™:

Wash Head	Description
1 x 8	Eight sets of dual wash pins for washing a 96-well microplate one column (8 wells) at a time.
1 x 12	Twelve sets of dual wash pins for washing a 96-well microplate one row (12 wells) at a time.

If a wash head is installed to wash plates by columns, the plates are placed on the instrument so that the columns of the plate are aligned with the wash head. If a wash head is installed to wash plates by row, the plate is rotated 90 degrees and placed on the instrument so that the rows of the plate are aligned with the wash head.

The wash pins are fixed to the wash head. During operation, the wash head assembly is lowered to insert the wash pins into the wells or raised to remove the wash pins from the wells. Lowering the wash head assembly allows the well contents to be aspirated or a bottom wash to be performed. Raising the wash head assembly allows the plate to be moved so another column (or row) can be washed or so the wells can be filled.

Wash Head Positions

The vertical positions that the wash head can assume are described below. Each wash head position can be specified by the user to within 0.1 mm.

***Note**: Procedures for specifying wash head positions for various plate types are described on page 30.*

Wash Head Position	Description
Dispense Height	Positions the aspiration pins slightly below the top of the well so that fluid can be dispensed into the well up to a certain level before it is aspirated.
Well Top	Positions the aspiration pins so they are aligned with the top of the well.
Aspiration Height	Positions the aspiration pins at the bottom of the well so that the contents of the well can be completely aspirated.
Sweep Height	Raises the aspiration pins slightly above the Aspiration Height (see above) so that the aspiration pins can be moved back and forth in the well while the fluid is being aspirated.
Bottom Wash Height	In protocols with a bottom wash, lowers the wash head during **dispense** so that the force of the dispensed fluid can wash the bottom of the wells.

Wash Fluid

A single wash fluid is used on the *Opsys* MW™ Microplate Washer. The wash fluid is contained in the Wash Container and is dispensed into the wells whenever a Dispense or Fill operation is specified in the wash protocol. In addition, wash fluid is dispensed into the purge tray during a Purge operation.

Dispensing of the fluid from the Wash Container is controlled by a pump attached to the back of the *Opsys* MW™ Microplate Washer and a dispense valve located near the wash head (Figure 1).

Waste

Fluid is removed from the wells during an Aspirate or Dispense operation and collected in the Waste Container. The Waste Container contains a level sensor to alert the operator when the container is full.

Removal of the fluid from wells is controlled by lowering the wash head so that the aspiration pins are immersed into the well fluid (the **aspiration height**). A vacuum is applied to the aspiration pins at all times during operation so that the contents of a well are aspirated whenever the wash head is lowered to the aspiration height.

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Features

The *Opsys* MW™ system has a number of performance and convenience features. These are summarised below:

- Small footprint
- Up to 40 wash protocols can be programmed
- Up to ten plate types can be programmed
- Two wash head configurations (1 x 8 and 1 x 12)
- On-board self diagnostics
- SHOW function allows visual verification of wash head height settings
- High-level alarm on Waste Container

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Specifications

Dimensions and Weight

Length	49 cm (19.3 in)
Width	38 cm (15.0 in)
Height	19 cm (7.5 in)
Weight	9.1 kg (20 lbs)

Operation

Dispense Range	50 – 999 μL
Dispense Precision	5% CV (with 300 μL distilled water)
Residual Aspirate Volumes	< 1 μL for U and V bottom plates < 5 μL for flat bottom plates
Washing Time	Typical 5 cycle wash: 5 min 30 sec
Power	< 100 W
Display	2 by 20 character back lit LCD
Keypad	21 key tactile membrane
Output	Display, Printer, RS232

Environmental

Operating Range	15° C to 30° C 15% to 85% relative humidity (non-condensing) 2000m altitude

Computer Interface

Port	Serial RS-232 port (Service Access)
Baud Rate	19200. Character format
Character Format	7 data bits, 1 stop bit, no parity

Power Requirements

	Voltage	Power	Frequency
Main Unit	100 - 240 V	200 VA	50/60 Hz
Line Voltage Variation	± 10%		
Line Frequency Variation	± 3 Hz		

Input Ranges

Assay Programming

Assay Name	Up to 10 characters
Password	Up to 8 characters
Move: Start Strip	1 - 8 for 1 x 8 heads and 1 - 12 for 1 x 12 heads (Increment: 1)
Move: End Strip	1 - 8 for 1 x 8 heads and 1 - 12 for 1 x 12 heads (Increment: 1)
Move: #Cycles	1 - 9 (Increment: 1)
Aspirate: Cycles	1 - 9 (Increment: 1)
Dispense	50 - 999 (Increment: 1 μL)
Purge	50 - 9999 (Increment: 1 μL)
Fill	50 - 300 (Increment: 1 μL)
Soak	1 - 999 (Increment: 1 second)

Plate Setup

Plate Name	Up to 10 characters
Dispense Height	001 - 999 (Increment: 1)
Top of Well Height	001 - 999 (Increment: 1)
Aspirate Height	001 - 999 (Increment: 1)
Sweep Height	001 - 999 (Increment: 1)
Sweep Stroke	001 - 999 (Increment: 1)
Bottom Wash: Dispense Height	001 - 999 (Increment: 1)

Standards

The instrument is designed in accordance with CSA 1010.1-92, UL 3101-1, EN61010-1 and EN61326.

Warning Labels

The *Opsys* MW™ or its components may contain certain labels that that either warn the user of a hazard or note an electrical connection. The labels that may be used on the *Opsys* MW™ system are described below.

Label	Description
	Alternating current is present.
	(*English*) Caution symbol. Refer to the *Routine Maintenance* chapter. (*French*) Attention (voir documents d'accompagnement).
	(*English*) Caution, hot surface. (*French*) Attention, surface chaude.
	Protective conductor terminal.
	Earth (ground) terminal.
	(*English*) Caution, risk of electric shock. (*French*) Attention, risque de choc électrique.

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Chapter 2 Installation

Unpacking

Materials Provided

The main carton contains the instrument. The contents of this carton are listed below:

Article	Quantity
Opsys MW™ *System*	1
Instrument Power Cable	1
Cleaning Wire, Aspirate	1
Cleaning Wire, Dispense	1
Instrument Configuration Report	1
User's Guide	1
Declaration of Conformity	1
Wash Head, 1 x 8 or 1 x12	1
Plate Holder	1

A sub-carton contains the wash container and waste container assemblies. The contents of this carton are listed below:

Article	Quantity
Wash Container Assembly	1
Waste Container Assembly	1

To unpack the components:

1. Place the *Opsys* MW™ instrument in the position where it will be located for use.

2. Place the Wash Container, Waste Container and Foam/Aerosol Trap at the rear of the instrument.

3. Examine the packaging to be sure that the power cord and other materials have been removed. Please save packaging material for future use.

4. Verify that all of the materials listed above have been unpacked.

5. Inspect the components for damage. If damage is observed, contact your shipper or service representative immediately.

Hardware Components

Hardware components of the *Opsys* MW™ instrument are shown in Figure 2 and described below.

Note: The Wash Container, Waste Container and Foam/Aerosol Trap are external to the instrument and are not shown in Figure 2.

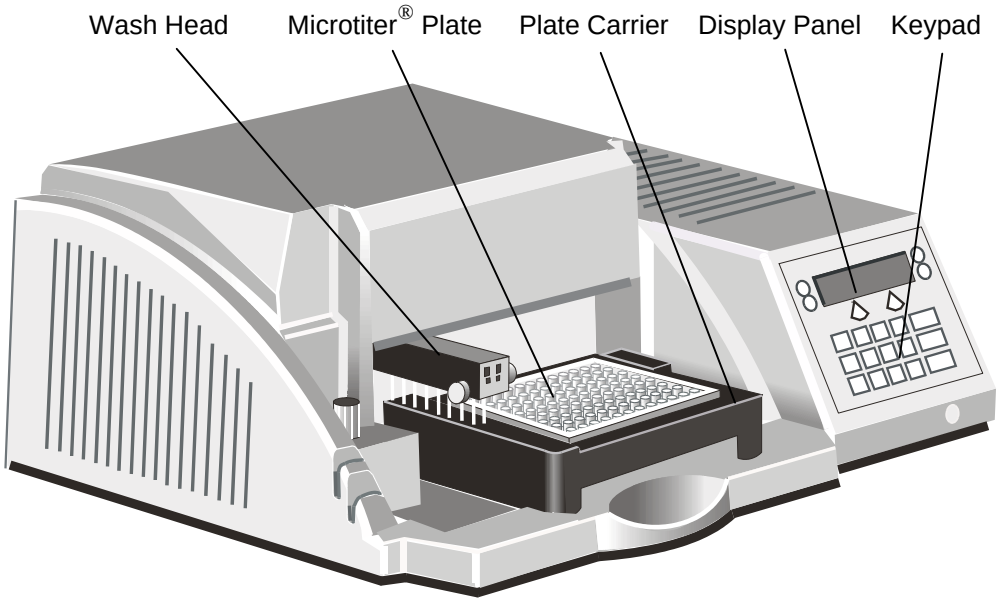


Figure 2. The *Opsys* MW™ System

- **Wash Head**. The wash head contains sets (1 x 8 or 1 x 12) of dual **wash pins**. Each set of wash pins consists of a **dispense pin** and an **aspirate pin**, closely spaced so that fluid can be aspirated from a well while fluid is being dispensed into the same well. The wash head moves back and forth to wash each row (or column, depending on the wash head that is used) of the plate by lowering the wash pins into the corresponding wells.

- **Plate Carrier**. The plate carrier holds the plate in a fixed position so that the wash pins can be precisely lowered to the correct height and position in the wells during the washing procedure.

- **Display Panel**. The display panel is the means by which the system communicates to the user. All messages, commands, and wash parameters entered by the user are displayed.

- **Keypad**. The keypad is used by the operator to select commands and enter wash parameters.
- **RS232 Interface**. The system includes an RS232 interface so that an external computer can be connected for technical service purposes.
- **Wash Container**. (Shown in Figure 1). The wash container contains the wash fluid that is used for Dispense, Fill and Purge operations.
- **Waste Container**. (Shown in Figure 1). The waste container contains the fluid that is aspirated from the wells. A level sensor is contained inside of the waste container.

Connectors at the rear of the *Opsys* MW™ system are shown in Figure 3.

Connections for the power cord, dispense pump power, waste bottle level sensor, waste bottle vacuum line and an external computer are made at the rear of the system.

☞ ***Important****: Be sure that the vacuum exhaust is not obstructed.*

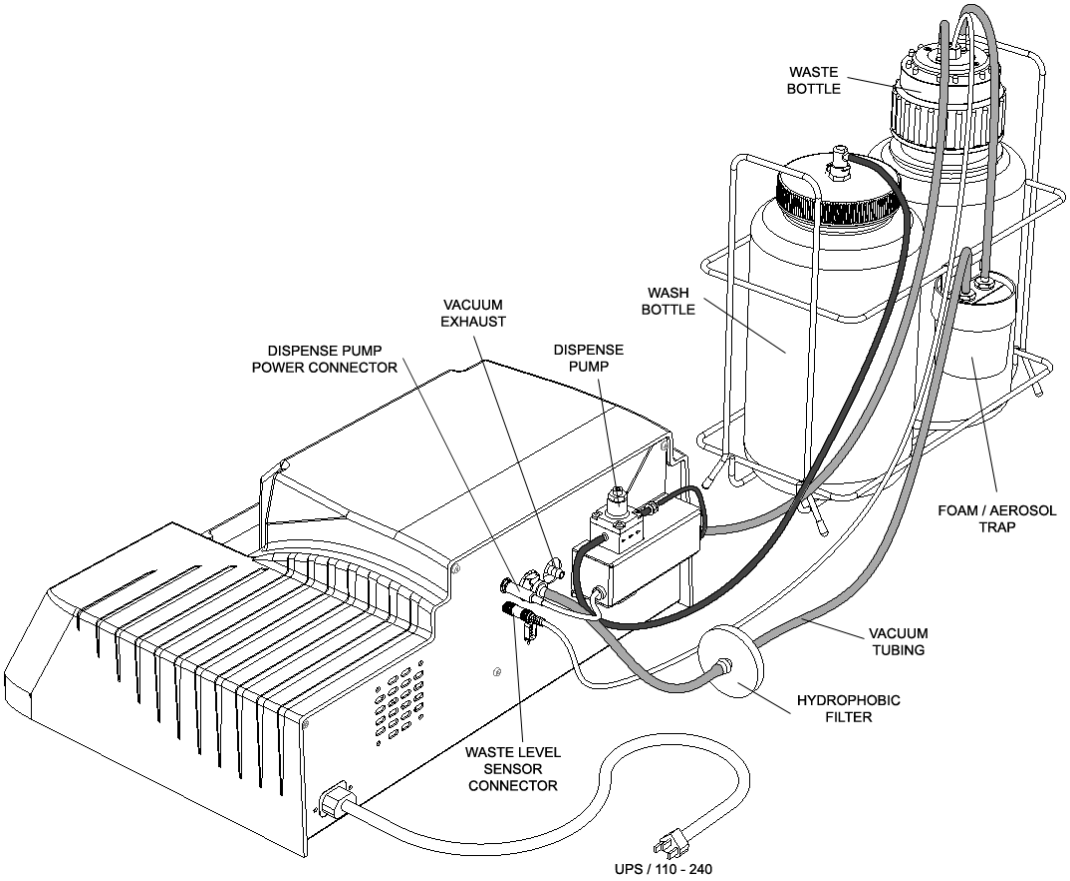


Figure 3. Rear View of the *Opsys* MW™ System

Positioning the Instrument

Determine the area where the system will be located. You will need a firm and level area that is approximately 51 cm (20 inches) wide, 62 cm (24 inches) deep, and 40 cm (16 inches) high for the *Opsys* MW™.

Installing the Wash Head

The Wash Head must be located on the Wash Head Arm.

To install the Wash Head:

1. Position the Arm over the Purge Reservoir portion of the Plate Holder.
2. Place the Wash Head on the two Arm Pins, being careful to properly seat the Wash Head on the support pins.
3. Level the Wash Head in relation to the Plate Holder and tighten the two thumbscrews at the front of the Wash Head / Arm Assembly.

Installing the Wash Container

The dispense tubing and dispense pump power cable must be connected.

To install the Wash Container:

1. Fill the Wash Container with the wash solution that is to be used.

   ☞ ***Note**: The Wash Container contains up to 4 liters.*

2. Insert the Pick-Up Filter into the Wash Container and secure the cap. Attach the Quick-Connector at the end of the pump tubing, to the mating connector in the cap.

3. Route the dispense tubing through the upper slot at the front corner of the instrument and through the routing clips at the front of the instrument.

4. Connect the end of the dispense tubing to the wash tubing connector on the wash head.

5. Thread the dispense tubing through the dispense valve. (Figure 1).

   ☞ ***Note**: The tubing must be inserted fully into the dispense valve opening to ensure proper operation.*

6. Connect the dispense pump power cable to the dispense pump power connector at the rear of the instrument (Figure 3).

Installing the Waste Container

To install the Waste Container and Foam/Aerosol Trap:

1. Insert the Quick-Connect end of the vacuum tubing on the Foam/Aerosol Trap to the Quick-Connect vacuum connector at the rear of the instrument Figure 3).

2. Screw on the Waste Container cap.

3. Route the waste tubing through the lower slot at the front corner of the instrument and through the routing clips at the front of the instrument.

4. Connect the end of the waste tubing to the waste tubing connector on the wash head.

5. Connect the waste level sensor cable to the waste level sensor connector at the rear of the instrument (Figure 3).

Turning on the System

***Note**: Depending upon local electrical codes, an uninterruptible power system (UPS) may be required in your laboratory. A UPS is not provided with the* Opsys *MW™ system.*

1. Connect the *Opsys* MW™ to the laboratory electrical supply outlet.

***CAUTION:** The* Opsys *MW™ instrument must be connected to properly grounded electrical outlets. Obtain assistance from a qualified electrician to verify that your electrical outlets are properly grounded.*

Before connecting the power cable, be sure that the components have been connected to each other as outlined in the previous section.

2. Push the instrument power switch once. After a series of self-tests, the software version is displayed momentarily

```
Opsys MW. v1.0
```

before the main menu is displayed:

```
1: - - - - - - - -
   SETUP    PROGRAM
```

***Note:** The self-test results indicate whether the system is operating properly. If a self-test failure is reported, it is recommended that you call Technical Service.*

*Dashes are initially displayed after the wash protocol number (i.e., **1: - - - - - - - -** in the above example) if a wash protocol has not yet been named.*

Chapter 3 Configuration

The Keypad

The keypad is used to access the menus and commands for setting up the *Opsys* MW™ entering new wash protocols and running the wash protocols. The keypad contains **scroll keys**, **function keys**, and **alphanumeric keys**.

The keys on the keypad are shown in Figure 4.

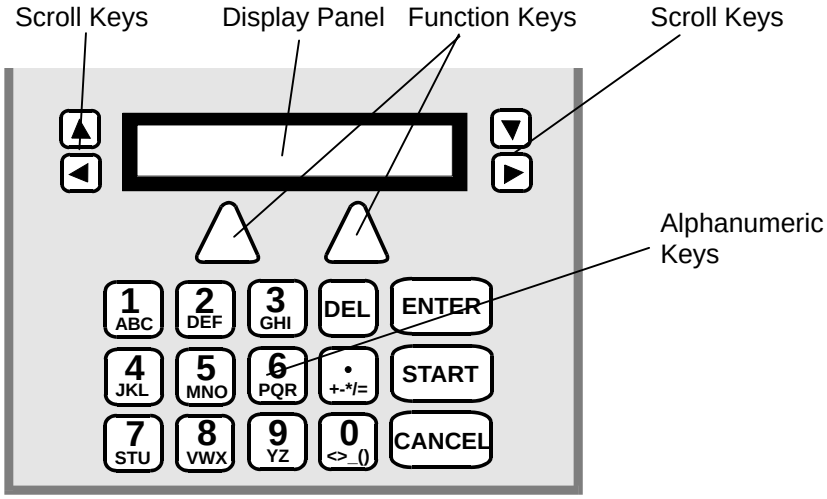


Figure 4. Keys on the Keypad

The use of each of the keys is summarized below:

Key	Purpose
Scroll keys	The functionality of the scroll keys depends upon what is being displayed. During display of the main menu (page 26), pressing the up or down scroll keys will display successive wash protocol numbers and names (or dashes, if a protocol is not yet named). Horizontal scrolls will scroll through selections for the selected menu. Repeatedly pressing the horizontal scroll button will show the next two items in a list. A list with one item will have a blank entry. If you are **entering or editing information**, a scroll will move the cursor through edit fields. When editing an existing plate or protocol name, you may either type over the existing name, or press the **DEL** key to delete the characters from the existing name. (NOTE:To delete the entire name, either type over it or press the right arrow key and **DEL** to delete all characters to the right of the cursor. The *first* character of an existing name cannot be deleted, but it can be overwritten.)
Function keys	Two function keys select the item or execute the command shown directly above each key on the second line of the display.
"Del" key	When a modifiable entry is displayed, selecting Delete will allow the entry to be modified. While editing a field, selecting Delete removes the character at the cursor location and all characters to the right of the cursor.
"Enter" key	Completes an entry of characters, accepts default prompt data, and displays the next prompt in a series of commands
"Start" key	Starts a wash protocol. This can only be done while the main menu is being displayed.
"Cancel" key	Returns to the previous menu within the function

Key	Purpose
Alphanumeric Keys	The numeral shown on the key is displayed by pressing the key once. If the key is pressed two to seven times rapidly, one of the letters on the key will be displayed. The letter that is displayed depends upon the number of times the key is pressed.

Menus

The *Opsys* MW™ menus are hierarchical and are organised by function. There are two main menus: Setup and Program.

Menu	Purpose
SETUP	Configure the Instrument
PROGRAM	Create or edit plate washing protocols *****

***** A protocol includes general information (e.g. the type of microplate to be washed) as well as a listing of the various steps to be used in the washing process.

Once the instrument is switched on and the self-test is successfully completed, the main menu is displayed. It contains SETUP and PROGRAM menu headers:

***Note**: Dashes are initially displayed after the wash protocol number (i.e., **1: - - - - - - - - -** in the above example) if a wash protocol has not yet been named. Once a wash protocol is named, the name is displayed after the protocol number. Refer to page 41 for the procedure to create and name a wash protocol.*

Display a different wash protocol number and name (there can be up to 40) by pressing the up or down scroll keys or by entering the protocol number using the keypad.

Access a menu by pressing the function key beneath the menu header. Cancel a menu selection and display the previous (higher level) menu by pressing the CANCEL key.

The SETUP Menu

Press the function key under SETUP to display the SETUP menu (Figure 5). The SETUP menu contains commands to configure the instrument.

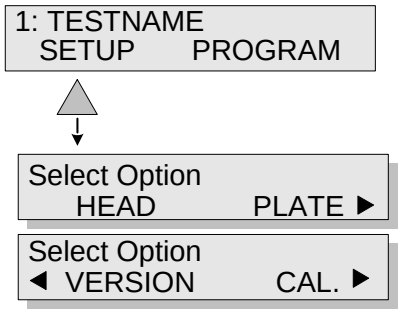


Figure 5. SETUP Menu

The PROGRAM Menu

Press the function key under PROGRAM to display the PROGRAM menu (Figure 6). The PROGRAM menu contains commands to name and create a new wash protocol or to edit an existing wash protocol.

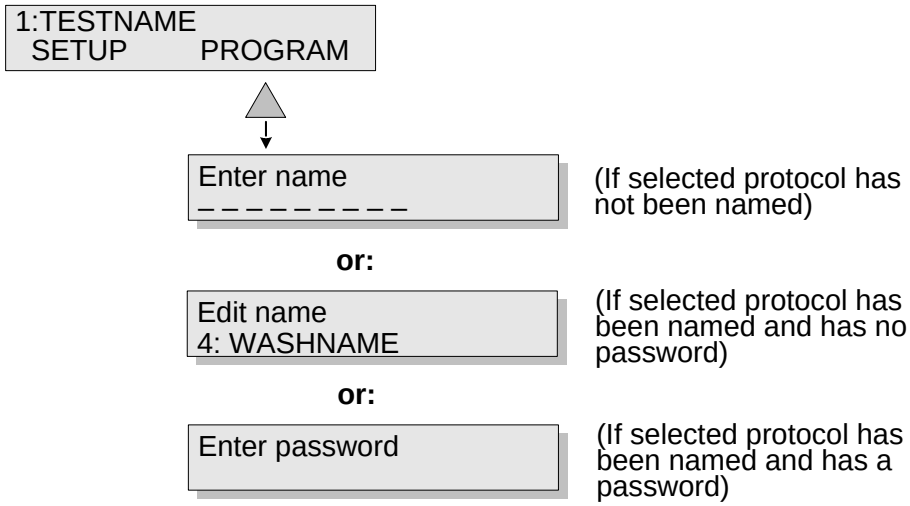


Figure 6. PROGRAM Menu

Configuring the System

The *Opsys* MW™ must be configured before it is operated for the first time. The commands for doing this are contained in the SETUP menu (Figure 7). Use ARROW keys to scroll through the menus.

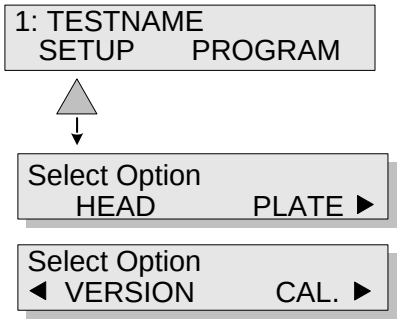


Figure 7. SETUP Menu

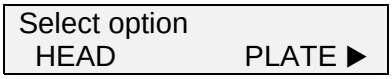
The purpose of each command on the SETUP menu is summarised below:

Command	Purpose
HEAD	Specify the type of head that is fitted
PLATE	Displays the PLATE menu. The commands on this menu allow parameters (such as well top height, dispense height and wash height) for various plate types to be specified.
VERSION	Displays the version number of the software
CAL.	Displays the CAL. menu. The commands on this menu allow the pump parameters to be specified.
CLEAN	The CLEAN command enables the washer to be cleaned automatically at a specified interval. This feature assists in assuring that tubing and dispense pins are free from potential salt build up.

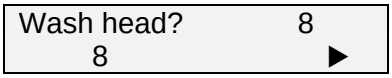
Specifying the Wash Head

The HEAD command allows the installed wash head to be specified:

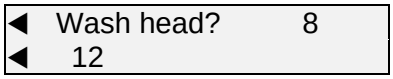
1. Select SETUP. The display will read:



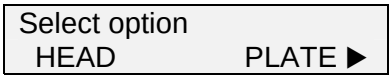
2. Select HEAD. The current wash head selection is displayed in the upper line:



   If needed, scroll right to view the remaining selection:



3. Select the desired option using the function key. After the selection is made, the display will again read:



Specifying Plate Parameters

The PLATE command allows plate parameters to be specified for up to 10 plate types.

When setting plate parameters, a default value is displayed for each of the wash head positions. The default values are factory-set and represent approximate starting values for each wash head position.

***Note**: The wash head positions are described on page 4.*

Increasing the value of a wash head position by one unit lowers the head 0.1 mm and decreasing the numerical value of a wash head position by one unit raises the head 0.1 mm. (e.g. an increment of 20 steps equals one millimeter of vertical pin travel (+20 = 1mm *up*, -20 = 1mm *down*)).

The SHOW command is available when setting each wash head position. Select SHOW to move the wash head to the indicated position so that the height can be observed.

For example, when setting dispense height, the default value is **180**:

```
DISP. HEIGHT?    180
    SHOW
```

If, after selecting SHOW, the dispense pins are found to be too low by approximately 1.0 mm, the dispense height position can be raised by 1.0 mm by entering **170** for the dispense height.

When using the **SHOW** function when defining the aspirate height, if the aspirate pins touch the well bottom, increase the aspirate height. If you cannot move the plate slightly side-to-side and up-down without immediate interference from the aspirate pins, increase the aspirate height.

To specify parameters for a plate type:

1. Obtain an empty plate of the plate type being specified and place it in the plate holder.

2. Select SETUP (if needed). The display will read:

```
Select option
 HEAD            PLATE ▶
```

3. Select PLATE. The name of the first plate is displayed in the lower line:

```
Select plate
 1: - - - - - - - - - -
```

***Note**: Dashes will be displayed if the plate has not yet been named.*

4. If needed, display a different plate number using the up or down scroll keys (or use the keypad to enter the desired plate number).

   When the desired plate number is displayed, press ENTER. The display will read:

```
Enter name
 - - - - - - - - - -
```

5. Use the keypad to enter the plate name (up to 10 characters).

***Note**: Refer to page 23 for instructions on entering alphabetic characters.*

6. Press ENTER. The display will read:

```
DISP. HEIGHT?    180
    SHOW
```

***Note**: The default value is displayed. Select SHOW to move the wash head to the default dispense position so that the height can be checked. Then, determine the correct value as outlined on page 30. Repeat the procedure as needed.*

7. Enter the dispense height using the keypad and press ENTER. The display will read:

Well top? 160
SHOW

***Note**: The default value is displayed. Select SHOW to move the wash head to the default well top position so that the height can be checked. Then, determine the correct value as outlined on page 30. Repeat the procedure as needed.*

8. Enter the desired value using the keypad and press ENTER. The display will read:

ASP. HEIGHT? 380
SHOW

***Note**: The default value is displayed. Select SHOW to move the wash head to the default aspiration position so that the height can be checked. Then, determine the correct value as outlined on page 30. Repeat the procedure as needed.*

9. Enter the desired value using the keypad and press ENTER. The display will read:

Sweep? NO	
YES	NO

10. Select YES to specify a sweep. The display will read:

All cycles? NO	
YES	NO

***Note**: If a sweep is specified, the wash pins are moved up and down and across the bottom of the well during aspiration to better remove all droplets of liquid. If NO is selected, the **Wash height?** prompt (Step **14**) will be displayed.*

***Note**: Use the sweep function with Flat or "C" bottom plates only. Sweeping aspirates fluid more completely from the wells than a regular aspiration. Sweep all cycles to get the most thorough well aspiration when using multiple aspiration cycles, but remember that each sweep adds seconds to the protocol.*

Remember if your protocol requires sweeping, that must first be specified in the plate definition used in the protocol.

11. Select YES to specify a sweep on all aspiration cycles. The display will read:

Sweep height? 370
SHOW

***Note**: The default value is displayed. Select SHOW to move the wash head to the default sweep position so that the height can be checked. Then, determine the correct value as outlined on page 30. Repeat the procedure as needed.*

12. Enter the desired value using the keypad and press ENTER. The display will read:

Sweep stroke? 100

***Note**: There isn't a **SHOW** function for the sweep stroke. Determine optimum sweep stroke setting by starting with a small number and increase it if the residual aspirate volume is not acceptable. If you run a protocol and the wash pins strike the sides or bottom of the well, reduce the sweep stroke and review your plate setup parameters.*

13. Enter the desired value using the keypad and press ENTER. The display will read:

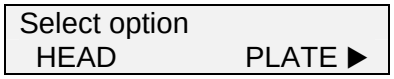
Bottom wash? NO
YES NO

14. Select YES if a bottom wash is to be included. The display will read:

Wash height? 368
SHOW

***Note**: The default value for bottom wash height is displayed. Select SHOW to move the wash head to the default bottom wash position so that the height can be checked. Then, determine the correct value as outlined on page 30. Repeat the procedure as needed.*

15. Enter the desired value using the keypad and press ENTER. The display will read:

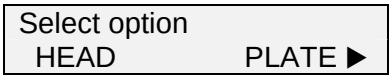


***Note**: If NO is selected for **Bottom wash?** (Step 13), the display will read as shown above.*

Displaying the Software Version

The VERSION command displays the software version that is currently installed on the *Opsys* MW™ instrument:

1. Select SETUP (if needed). The display will read:



2. Scroll right to display the next selection:

3. Select VERSION. The display will momentarily read:

***Note**: The software version that is displayed will depend on the version installed in the instrument.*

Specifying the Pump Parameters

The CAL. command allows the calibration values for each pump to be specified:

1. Select SETUP (if needed). The display will read:

Select option
HEAD PLATE ▶

2. Scroll right to display the next selection:

Select option
◀ VERSION CAL. ▶

3. Select the pump pressure (high or low). The display will read:

Pump speed? 190

4. Enter the desired value using the keypad and press ENTER. The display will read:

Slope? 2.1

***Note**: The Slope and Intercept values should only be changed by DYNEX Technologies Service Personnel.*

5. Press ENTER to keep the existing value. The display will read:

Intercept? 24

6. Press ENTER to keep the existing value. The display will again read:

Select option
◀ VERSION CAL. ▶

***Note**: Refer to page 74 for additional pump calibration instructions.*

Selecting Clean

The CLEAN command enables the washer to be cleaned automatically at a specified interval.

1. Scroll right to display the next section:

Select option
◀ CLEAN

2. Select CLEAN. The display will read:

Auto Clean?	
YES	NO

3. Select YES if you want periodic automatic cleaning. The display will read:

Interval (Hrs)	1

4. Enter the desired interval using the up/down scroll keys and press ENTER.

***Note**: The minimum interval is 1 hour, and the maximum interval is 9 hours.*

The display will read:

Fluid Volume?	2500

5. Enter the desired volume of fluid to be dispensed.

***Note**: A cleaning volume ranging from 50 to 9,999 microliters can be entered. Follow the instructions on page **Error! Bookmark not defined.** for refilling the wash container.*

6. Press ENTER. The display will read:

Select option
◀ CLEAN

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Chapter 4 Wash Protocols

Wash Protocol Operations

A wash protocol consists of a series of **Purge**, **Move**, **Soak**, **Aspirate**, **Dispense** and **Fill** operations.

Purge, **Move** and **Soak** can be carried out in any sequence. **Aspirate**, **Dispense** and **Fill** can only be carried out within a **Move** operation, and there cannot be a **Move** within a **Move**.

Each of these operations is described below:

Operation	Description
Purge	Dispenses fluid from the dispense wash pins while the wash head is positioned over the purge tray ☞ ***Note**: **Purge** is usually carried out at the beginning of a wash protocol to rinse the dispense wash pins and remove air bubbles.*
Move	Performs **Aspirate**, **Dispense**, **Fill** and/or **Soak** operations on specified strips of the Microplate
Aspirate	Removes the contents of a well by positioning the wash pins at the aspiration height in the well and aspirating the liquid from the wells A sweep may also be performed during **Aspirate**. ☞ ***Note**: The aspirate height and sweep parameters for a particular plate type are specified during system configuration (30). If a sweep is specified during configuration, the wash pins are moved back and forth during the aspiration cycle.*

Operation	Description
Dispense	Dispenses a specified amount of fluid into the wells after aspirating the contents of the wells (i.e. wherever a DISPENSE step is added to a protocol, the OPSYS MW will automatically aspirate the wells before dispensing more fluid in order to prevent a well overflow). If a bottom wash is specified, the wash head is then lowered to the bottom wash position so that fluid will be aspirated from the bottom of the wells while fluid is being dispensed. ☞ ***Note**: The dispense height for a particular plate type is specified during system configuration (page 30).*
Soak	The contents of the wells are allowed to equilibrate for the specified number of seconds.
Fill	The wells are filled with a specified amount of fluid.

Creating a New Wash Protocol

Specifying the Header

☞ ***NOTE:*** *Pressing CANCEL while creating or editing a protocol will bring you back to the main menu without saving your changes.*

▲ or ▼ (or use keypad)	Select one of the 40 protocol numbers.
↓	
PROGRAM	Select PROGRAM from the main menu.
↓	
(keypad)	Enter a protocol name (up to 9 characters).
↓	
(keypad)	Enter an optional password. **NOTE**: If the password for a protocol is lost, the ability to access the method and the method position are also lost.
↓	
▲ or ▼ (or use keypad)	Select the plate type.
↓	
Variable strips?	Specify whether the operator will be prompted at run time to enter the number of strips to be washed (avoids reprogramming the number of strips).
↓	
Constant timing?	(If **Variable strips?** is **YES**). Specify whether the time for washing any number of strips on a plate is constant.

Figure 8. Specifying the Wash Protocol Header

After the wash protocol header information is defined, the specific steps in the wash protocol are specified.

The procedures for defining the wash protocol header are described in the following pages. The procedures for specifying the steps in a wash protocol are described beginning on page 45.

To create a new wash protocol header:

1. Display the main menu.

1: - - - - - - - - - -
SETUP PROGRAM

2. Use the up or down scroll keys to display the protocol number (or use the keypad to enter the protocol number) that is to be created:

6: - - - - - - - - - -
SETUP PROGRAM

***Note**: Dashes will be displayed if a protocol has not yet been named.*

3. Select PROGRAM. The name of the wash protocol is displayed in the lower line:

Enter name
- - - - - - - - - -

4. Use the keypad to enter the protocol name (up to 9 characters) and press ENTER. The display will read:

Password?
YES NO

***Note**: Refer to page 24 for instructions on entering alphanumeric characters.*

5. Select YES if the protocol is to be password protected. The display will read:

Enter password
****

***Note**: If **NO** is selected, the **Select plate** prompt (Step **7**) will be displayed.*

6. Enter the password, (up to eight numeric characters) and press ENTER. The display will read:

Confirm password
****

7. Re-enter the password and press ENTER. The display will read:

Select plate
2: DYNEX_1

***Note**: The plate name that is shown is an example. The actual name will be the plate name that is entered for that plate type during system configuration (see page 30).*

8. Use the up and down scroll keys to select the plate type (or enter the number using the keypad) to be used and press ENTER. The display will read:

Variable strips?	
YES	NO

***Note**: "Variable Strips" is used to run an established protocol on fewer strips than originally specified in the "MOVE" cycle(s) of an established protocol.*

*If **YES** is selected, the operator will be prompted at run time to specify the number of strips that are to be washed. Processing will begin on the first strip selected in the "MOVE" cycle and will end on the total number of strips entered at run time (e.g. the protocol states: "Move 3-12 1 cycle(s)" and at run time, 2 strips are entered, only strips 3 and 4 will be processed).*

9. If YES is selected, the display will read:

Constant timing?	
YES	NO

***Note**: If **NO** is selected for **Variable strips?**, the **Select option** prompt will be displayed (see below).*

***Note**: The Constant Timing prompt only appears if you are using Variable Strips.*

10. Select YES if the total elapsed time for washing any number of strips within a plate is to be constant. The display will read:

Select option
MOVE PURGE ▶

The sequential steps in the wash protocol can now be specified, as outlined on page 45.

Specifying Wash Cycle Operations

The final step in creating a wash protocol is to specify individual operations within the wash protocol.

An example of a wash protocol is shown in 45. In this example, the dispense wash pins are purged, and then a **Dispense** and **Aspirate** are carried out twice on each of the 12 strips (columns) of a 96-well Microtiter® plate. Finally, after all 12 strips have been washed twice, the contents of the Microtiter plate are allowed to soak (equilibrate) for another 600 seconds.

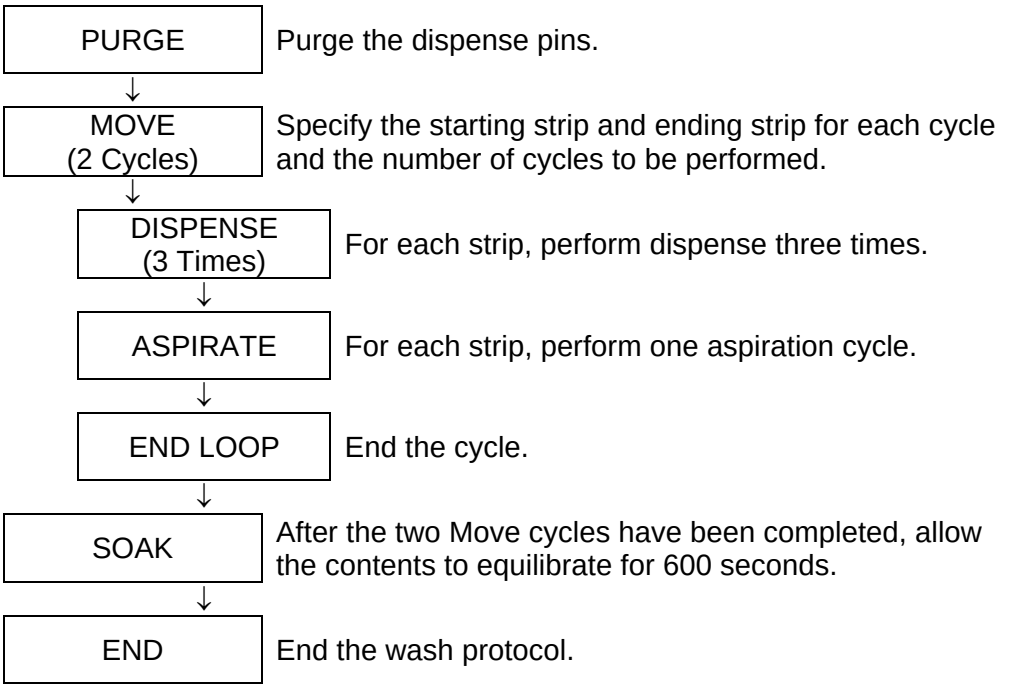


Figure 9. Example of a Wash Protocol

The procedures for specifying the steps in this and other wash protocols are described on the following pages.

To specify a Purge:

***Note**: A purge must be performed outside of a **Move** cycle.*

1. Display the header information for the selected wash protocol, as outlined on page 41. The display will read:

Select option
MOVE PURGE ▶

2. Select PURGE. The display will read:

Fluid volume? 350

3. Use the keypad to enter the volume of fluid to be dispensed.

***Note**: A purge volume ranging from 50 to 9,999 microliters can be entered.*

4. Press ENTER. The display will read:

Select option
MOVE PURGE ▶

To specify a Move cycle:

1. Display the header information for the selected wash protocol, as outlined on page 41. The display will read:

Select option
MOVE PURGE ▶

2. Select MOVE. The display will read:

Start strip? 1

3. Using the keypad, enter the strip number where the move cycle should start.

4. Press ENTER. The display will read:

End strip? 12

5. Using the keypad, enter the strip number where the move cycle should end.

6. Press ENTER. The display will read:

Cycles? 1

7. Using the keypad, enter the number of the specified move cycles that are to be sequentially performed.

***Note**: Between **1** and **9** Move cycles can be specified.*

8. Press ENTER. The display will read:

Select option
ASPIRATE DISPENSE ▶

9. Specify **Aspirate**, **Dispense**, **Soak** and **Fill** operations in the sequence as they are to be carried out, as described in the following sections.

10. When all of the operations for the **Move** cycle have been sequentially specified, specify **End Loop** to designate the end of the **Move** cycle.

To specify an Aspiration (within a Move):

***Note**: An **Aspirate** or **Dispense** must be performed within a **Move** cycle.*

1. Select ASPIRATE. The display will read:

Cycles? 1

2. Using the keypad, enter the number of aspiration cycles that are to be to be performed within the MOVE cycle.

3. Press ENTER. The display will read:

Select option ASPIRATE DISPENSE ▶

To specify a Dispense (within a Move):

***Note**: A **Dispense** or **Aspirate** must be performed within a **Move** cycle.*

1. Select DISPENSE. The display will read:

Fluid volume? 350

2. Use the keypad to enter the volume of fluid to be dispensed.

***Note**: A volume ranging from 50 to 999 microliters can be entered.*

3. Press ENTER. If a bottom wash is specified for the plate being used, the display will read:

Bottom Wash? NO YES NO

***Note**: If the protocol requires bottom washing, that must first be specified in the plate definition used in the protocol.*

If a bottom wash is not specified for the plate being used or if **NO** is selected for the **Bottom Wash?** prompt, the display will read:

Select option ASPIRATE DISPENSE ▶

4. Select **YES** if a bottom wash is to be included. The display will read:

Fluid volume? 350

5. Use the keypad to enter the volume of fluid to be dispensed during the bottom wash.

***Note**: A volume ranging from 50 to 999 microliters can be entered.*

6. Press ENTER. The display will read:

Cycles? 1

7. Use the keypad to enter the number of bottom wash cycles to be performed and press ENTER. The display will read:

Select option ASPIRATE DISPENSE ▶

To specify a Soak (within a Move):

***Note**: A **Soak** can be performed either within or outside of a **Move** cycle. The procedure below describes the procedure for specifying a soak within a **Move** cycle.*

*The procedure for specifying a **Soak** outside of a **Move** cycle is described on page 50.*

1. Scroll right to display the next selection. The display will read:

Select option
◀ SOAK FILL ▶

2. Select SOAK. The display will read:

Duration? 5

3. Enter the desired soak duration using the keypad.

***Note**: A soak duration ranging from 1 to 999 seconds can be entered.*

4. Press ENTER The display will read:

Select option
◀ SOAK FILL ▶

To specify a Fill (within a Move):

***Note**: A **Fill** must be performed within a **Move** cycle.*

1. Scroll right to display the next selection. The display will read:

Select option
◀ SOAK FILL ▶

2. Select FILL. The display will read:

Fluid volume? 50

3. Use the keypad to enter the volume of fluid to be dispensed during well filling.

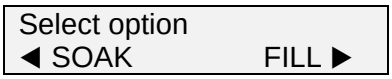
***Note**: A volume ranging from 50 to 300 microliters can be entered.*

4. Press ENTER. The display will read:

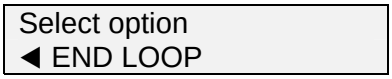
Select option
◀SOAK FILL ▶

Ending a MOVE Cycle

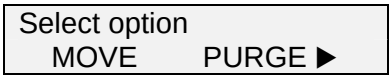
1. Scroll right to display the next selection. The display will read:



2. Scroll right to display the next selection. The display will read:



3. Select END LOOP. The display will read:



To specify a Soak (outside of a Move):

***Note**: A **Soak** can be performed either within or outside of a **Move** cycle. The procedure below describes the procedure for specifying a soak outside of a **Move** cycle.*

*The procedure for specifying a **Soak** within a **Move** cycle is described on page 47.*

1. Scroll right to display the next selection. The display will read:

Select option
◀ SOAK END

2. Select SOAK. The display will read:

Duration? 5

3. Enter the desired soak duration (1 to 999 seconds) using the keypad.

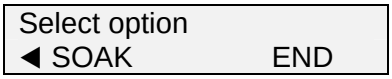
***Note**: A soak duration ranging from 1 to 999 seconds can be entered.*

4. Press ENTER The display will read:

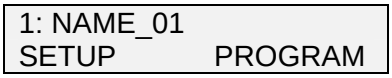
Select option
◀ SOAK END

To specify the End of the wash protocol:

1. Scroll right to display the next selection. The display will read:



2. Select END. The display will read:



Modifying a Wash Protocol

An existing wash protocol can be modified by using many of the same commands that are used to create a wash protocol.

To modify a wash protocol:

1. Display the main menu:

1: NAME_01
SETUP PROGRAM

2. Use the up and down scroll keys to select the wash protocol to be modified (or enter the number using the keypad). The display will read:

4: NAME_04
SETUP PROGRAM

3. Select PROGRAM. If the wash protocol is password protected, the display will read:

Enter password

***Note**: If a Password is not specified for the selected wash protocol, the display will read as shown in Step **5**.*

4. Enter the Password using the keypad and press ENTER.

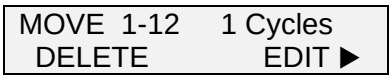
***Note**: If the Password is entered incorrectly an error message is displayed. The operator is allowed three attempts to enter the password. After the third attempt, the main menu (Step **1**) will again be displayed.*

***Note**: If the password for a protocol is lost, the ability to access the method and the method position are also lost.*

5. After a password is successfully entered (or if a password was not specified for the selected protocol), the display will read:

Edit name
4: NAME_04 COPY

6. The cursor is positioned under the first character of the name. If the name is to be changed, enter the name using the keypad and press ENTER. The first step of the wash protocol will be displayed:



***Note**: The example above shows the MOVE operation as the first step in the protocol. The actual operation that is shown will depend upon the protocol that is being modified.*

***Note**: For each step that is displayed, the operation being carried out and the value for that operation are displayed. In the MOVE example above, the **Start Strip** is **1**, the **End Strip** is **12**, and the number of cycles is **1**.*

To modify a wash operation:

1. Select EDIT while the operation is displayed. The first step in the operation is displayed:

Start strip? 1 Cycles

***Note**: The actual step that is displayed depends upon the operation being modified.*

2. Modify the operation, using the same procedures as when creating a new wash protocol.

MOVE 1-10 1 Cycles DELETE EDIT ▶

***Note**: In the example above, the End Strip was changed from **12** to **10**. The actual values that are displayed will depend upon the operation being modified and the new value(s) entered.*

***Note**: Once the move loop is modified, the display will no longer read as shown above. Instead, it will display the first command in the move loop or End of Move.*

3. Press ENTER to display the next step on the wash protocol.

To delete a wash operation:

1. Select DELETE while the operation is displayed. The operation is removed from the wash protocol.

***Note**: If a MOVE operation is deleted, all operations within the MOVE (i.e., **Aspirate**, **Dispense**, **Soak** and **Fill**) are also removed.*

To insert a wash operation:

1. Scroll right while the operation that the new operation is to precede is displayed:

MOVE 1-10 1 Cycles
◀ INSERT

   ☞ ***Note**: The inserted operation will take place immediately before the operation that is displayed.*

2. Select INSERT. The display will read:

Select option
MOVE PURGE ▶

3. Select the option that is to be inserted, using the same procedure as when creating a new wash protocol.

Copying a Wash Protocol

An existing wash protocol can be copied to another program number. If a wash protocol is already in that location, it will be overwritten.

To copy a wash protocol:

1. Display the main menu:

1: NAME_01
SETUP PROGRAM

2. Use the up and down scroll keys to select the wash protocol to be modified (or enter the protocol number using the keypad). The display will read:

4: NAME_04
SETUP PROGRAM

3. Select PROGRAM. If the wash protocol is password protected, the display will read:

Enter password

4. Enter the Password using the keypad and press ENTER.

☞ ***Note**: If the Password is entered incorrectly an error message is displayed. The operator is allowed three attempts to enter the password. After the third attempt, the main menu will be displayed.*

5. After a password is successfully entered, the display will read:

Edit name
4: NAME_04 COPY

6. Select COPY. The display will read:

Copy to? 7

☞ ***Note**: The protocol number that is displayed represents the first free protocol number, if any are available.*

7. Using the keypad, enter the number of the wash protocol that the commands are to be copied to. If a wash protocol already exists at that location the display will read:

Overwrite test? NO
YES NO

8. Select YES. The display will read:

7: NAME_04
SETUP PROGRAM

Chapter 5 Washing a Plate

Once the parameters for at least one plate type and one wash protocol have been set, the system can be used to wash a plate.

Preparation

The only preparation that is required is to check the fluid levels in the Wash Container and the Waste Container. Service the containers if necessary.

To empty the waste container:

1. Unscrew the cap of the Waste Container. Lay the cap and level sensor assembly on a paper towel.

2. Discard the waste in accordance with local regulations.

3. Rinse the waste container with deionized water. Discard the rinse water.

   ☞ ***Note**: If desired, the waste container can be disinfected with a 10% (v/v) solution of household bleach in water.*

4. Place the level sensor and tube back into the Waste Container and screw the cap on.

To refill the wash container:

1. Separate the dispense line quick-connector in the cap of the Wash Container.

2. Unscrew the cap of the Wash Container and lay it and the Pick-Up Filter on a clean paper towel.

3. Fill the Wash Container with the wash fluid that is being used.

***Note**: If the wash solution is being changed, discard the contents of the Wash Container and thoroughly clean it before filling it with the new wash solution.*

4. Place the Pick-Up Filter into the Wash Container and screw the cap on. Re-connect the dispense line quick-connector.

Washing a Plate

A plate is washed by positioning it on the carrier block, selecting the wash protocol to be run, and pressing the START key.

To wash a plate:

1. (If needed) Turn on the instrument. The display will read:

1: TESTNAME
SETUP PROGRAM

2. Place the microplate on the plate carrier.

***Note**: Be sure that the plate position on the carrier plate corresponds to the wash head configuration that is being used. For example, if a 1 x 8 head is used, be sure that the plate is positioned with the columns aligned with the wash head rather than perpendicular to the wash head.*

3. Select the desired wash program using the up or down scroll keys or by entering the wash protocol number using the keypad.

***Note**: Before starting the wash protocol, verify that the correct wash protocol name is displayed.*

4. Press the START key. The wash program will be automatically carried out.

***Note**: If **variable strips** was specified for the wash protocol, you will be prompted to enter the strips that are to be washed before the wash will commence.*

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Chapter 6 Routine Maintenance

Routine Maintenance Procedures

The *Opsys* MW™ Microplate Washer is constructed from materials that resist chemical attack. If a spill occurs, it should be cleaned up as soon as possible using a cloth moistened with a mild laboratory detergent (If needed, dilute the laboratory detergent according to the manufacturer's directions).

The following periodic maintenance procedures are required for the *Opsys* MW:

Daily maintenance:

- Verify that the self-test passes, by observing Arm movement and the absence of error messages.
- Clean the plate carrier, using a moist towel.
- Clean the external surfaces, using a moist towel.

Weekly maintenance:

- **Empty the Wash Container and clean it.**
  The wash solution should be replaced at least once a week. The Wash Bottle should be cleaned whenever fresh wash solution is required.

  ☞ ***Note**: If particulate matter is observed in the Wash Bottle, the wash solution should be discarded at once.*

  To replace the wash solution:

  1. Discard any wash solution that is left in the Wash Bottle.
  2. Rinse the Wash Bottle with fresh solution.
  3. Fill the Wash Bottle with wash solution.
  4. Purge the system to ensure that all of the old solution is removed from the tubing.
- **Empty the Waste Container and clean it.**
- **Inspect the tubing between the Wash Bottle and the Wash Head.**
- **Inspect the tubing between the Wash Head and the Waste Bottle.**
- **The tubing should be replaced if it has cracks, is cloudy, remains pinched, or is otherwise defective.**

Six month maintenance:

- Replace the dispense (Wash) tubing.
- Replace the aspirate (Waste) tubing.

***Note**: The dispense tubing and aspiration tubing may need to be replaced more frequently than every six months, depending upon the frequency of use and the severity of operating conditions.*

Contact DYNEX Technologies for information on replacement tubing.

- Replace the in-line hydrophobic filter.

  If the system will not be used for a period of time, the system should be flushed with de-ionized water so that buffers and/or reagents used to wash the plates are not deposited on the Wash Head or other components of the system.

As required maintenance:

- *Pump Calibration (page 74)*

Cleaning and Decontamination

The *Opsys* MW™ is constructed from materials that resist chemical attack.

Spills should be cleaned as soon as possible. If you need to decontaminate the *Opsys* MW™ instrument (for example, before servicing the instrument), clean the system and then decontaminate it as described below.

***CAUTION**: Always disconnect the power cable before cleaning the instrument.*

To clean the system:

1. Clean external surfaces with a cloth moistened with mild laboratory detergent.

***Note**: If needed, dilute the laboratory detergent according to the manufacturer's instructions before using.*

To decontaminate the system:

1. Wipe the surfaces with a cloth moistened with 10% bleach or 70% alcohol.

Cleaning the Containers

Procedures for emptying, cleaning and refilling the Wash Container and the Waste Container are described below.

To empty and clean the waste container:

1. Unscrew the cap of the Waste Container. Lay the cap and level sensor assembly on a paper towel.

2. Discard the waste in accordance with local regulations.

3. Rinse the waste container with deionized water. Discard the rinse water.

***Note**: If desired, the waste container can be disinfected with a 10% (v/v) solution of household bleach in water.*

4. Place the level sensor and tube back into the Waste Container and screw the cap on.

To refill the wash container:

1. Separate the dispense line quick-connector in the cap of the Wash Container. Unscrew the cap and lay it and the Pick-Up Filter on a clean paper towel.

2. Fill the Wash Container with the wash fluid that is being used.

***Note**: If the wash solution is being changed, discard the contents of the Wash Container and thoroughly clean it before filling it with the new wash solution.*

3. Place the Pick-Up Filter into the Wash Container and screw the cap on. Reconnect the dispense line quick-connector.

Replacing the Tubing

To replace the dispense tubing:

1. Separate the dispense line quick-connector in the cap of the Wash Container. Unscrew the cap, lay it and the Pick-Up Filter on a clean paper towel.

2. Discard the contents of the Wash Container. Thoroughly rinse the container with deionized water and let it dry.

3. Disconnect and discard the Wash Container Internal Tube and pick-up filter that is attached to the barb on the Quick Connect Fitting in the Cap.

4. Replace the Wash Container Internal Tube and pick-up filter.

5. Remove the Quick Connect Fitting from the Pump Tube that is attached to the Pump Inlet. Disconnect the tube from the pump and discard.

6. Reattach the Quick Connect Fitting to a new length of Pump Tube and attach the free end of the tube to the Pump Inlet.

7. Disconnect both ends of the Dispense Tube that is attached to the Pump Outlet and the Wash Head, remove the tubing from the dispense valve and discard.

8. Attach the short length of larger diameter tube to the Pump Outlet and to the other end fit the larger barb of the Reducer Fitting. To the small end of the Reducer fit the long length of small diameter dispense tube and attach the free end to the Wash Head

9. Route the dispense tubing through the upper slot in the front corner of the instrument and through the routing clips at the front of the instrument. Fit the dispense tubing in the dispense valve.

10. Fill the Wash Container with fresh wash fluid. Place the Wash Container Internal Tube and pick-up filter back into the Wash Container and screw the Cap on. Reconnect the dispense line quick-connector.

To replace the vacuum tubing:

***Note**: This procedure describes replacement of the vacuum tubing connecting the Waste Container to the Foam/Aerosol Trap. The vacuum tubing connecting the Foam/Aerosol Trap to the rear of the instrument should not require changing.*

1. Unscrew the Cap of the Waste Container, lay it and the level sensor assembly on a clean paper towel.

2. Discard the contents of the Waste Container in accordance with local regulations. Thoroughly rinse the container with deionized water and let it dry.

3. Disconnect the vacuum tubing from the connector in the Cap and from the connector in the Foam/Aerosol Trap. Discard the old tube.

4. Obtain a new length of vacuum tubing.

5. Connect one end of the vacuum tubing to the connector in the Waste Container Cap and the other end to the connector in the Foam/Aerosol Trap.

6. Place the level sensor assembly back into the Waste Container and screw the Cap on.

To replace the waste tubing:

1. Unscrew the Cap of the Waste Container and lay it with the level sensor assembly on a clean paper towel.

2. Discard the contents of the Waste Container in accordance with local regulations. Thoroughly rinse the container with deionized water and let it dry.

3. Disconnect the waste tubing from the connector on the Waste Container cap and from the waste tubing connector on the wash head.

4. Remove the waste tubing from the instrument.

5. Obtain a new length of waste tubing.

6. Route the waste tubing through the lower slot at the front corner of the instrument and through the routing clips at the front of the instrument.

7. Connect one end of the waste tubing to the waste tubing connector on the wash head and connect the other end to the connector in the Waste Container cap.

8. Place the level sensor assembly back into the Waste Container and screw the Cap on.

Pump Calibration

Each *Opsys* MW™ washer manifold, or head, (e.g., 1 x 8, 1 x 12) has three calibration values stored in memory. These values are calculated and stored during manufacture at DYNEX Technologies. When the *Opsys* MW configuration is changed from one manifold to another, the corresponding calibration settings will be recalled by correctly setting the head size using the SETUP/HEAD feature (refer to page 28 for Specifying the Wash Head).

This calibration protocol may be used at any time to verify the performance of the *Opsys* MW washer.

IMPORTANT! It is recommended that this protocol be completed if any fluid-carrying component of the *Opsys* MW is replaced. This protocol may also be used to recalibrate the *Opsys* MW if a new wash buffer with different viscosity is used. Customize the protocol to emulate your assay, using the appropriate dispense volume, pump speed and fluid density.

Calibration Protocol:

1. Define a flat bottom plate profile using the SETUP/PLATE function (refer to page 30 for Specifying Plate Parameters).

2. Program an assay to dispense 200µl/well into columns 1-12 (refer to page 41 for Creating a New Wash Protocol).

3. Obtain a clean, dry flat bottom 96-well styrene plate.

4. Weigh the plate and record the empty plate weight in grams.

5. Run the assay programmed in Step 2. (This assay will dispense 200µl to all 96 wells in the plate.)

6. Weigh the plate and record the filled plate weight in grams.

7. Calculate the actual dispensed volume and % error using the following formulas:

   A. Actual Volume = [(Full weight – Empty weight) x 1000mg/g] / (96 wells x fluid density)

   B. %Error = 100 x (Actual Volume – Target Volume)/Target Volume

   Example:

   Empty plate weight: 48.38g
   Full plate weight: 67.42g
   Density of water at 20°C = 0.998mg/µl
   Actual Volume = [(67.42 – 48.38) x 1000]/(96 x 0.998) = 198.7µl/well
   %Error = 100 x (198.7 – 200)/200 = -0.6%

8. If the dispensed volume is too high, decrease the pump speed using the SETUP/CAL function (refer to page 36).

   - A pump speed change of -10 units *roughly* corresponds to a well volume change of -10µl.

9. If the dispensed volume is too low, increase the pump speed using the SETUP/CAL function (refer to page 36).

   - A pump speed change of +10 units *roughly* corresponds to a well volume change of +10µl.

10. Repeat Steps 3-9 until fluid is dispensed with the accuracy required. (e.g., Error less than or equal to ±5%)

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Chapter 7 Troubleshooting

Operational Problems

Problems that may occur during normal operation of the *Opsys* MW™ are described below. For each problem, the symptom, probable cause and the means for resolving the problem are shown.

Symptom	Probable Cause	Resolution
The instrument fails to power up.	The cord is not connected.	Check that the cord is plugged into the instrument and into the electrical outlet.
		Verify that the electrical outlet is not controlled by a switch or timer.
		Verify that there is power at the electrical outlet by plugging in and checking another device.
	The powerstrip is faulty.	Replace the powerstrip.
	The fuse is blown.	Service is required.
	The breaker is tripped.	Service is required.
	The power supply is defective.	Reset the breaker.
Liquid is not dispensed from the dispense pins.	The dispense pins are clogged.	Remove the wash head assembly and clean it using the manifold head cleaning wire. Then run a purge. Service is required if problem persists.
	The Wash Container is empty.	Refill the Wash Container.

Symptom	Probable Cause	Resolution
Liquid is not dispensed from the dispense pins (continued).	The wash protocol is incorrectly defined.	Check the system configuration and wash protocol for the number fluids and fluid volume.
	The dispense tubing or the dispense pump power supply is not connected.	Verify that the dispense tubing and the dispense power supply are connected (see page 20).
	The dispense tubing is sealed shut at the dispense valve.	Remove the tubing from the dispense valve and massage the tubing to release it. Replace the tubing into the dispense valve at a different location.
		Purge the tubing more frequently.
		Replace the tubing.
	The dispense valve does not open.	Service is required.
	The wash head manifold tubing is blocked.	Remove the wash head assembly and clean it using the manifold head cleaning wire. Then run a purge. Service is required if problem persists.
	There is a pressure leak.	Check the seals and tubing for leaks.
		Check for air leaks.
		Reseat the tubing in the dispense valve.
	The dispense pump is faulty.	Service is required.
Liquid is dispensed continuously from the dispense pins	The dispense tubing is not inserted in the dispense valve.	Insert the dispense tubing into the dispense valve (see page 20).

Symptom	Probable Cause	Resolution
Dispense volumes are incorrect.	The dispense pins are leaking.	Check the pins, seals and tubing for leaks.
	The dispense pressure is low.	Check the seals and tubing for leaks.
		Check for air leaks.
		Reseat the tubing in the dispense valve.
	The dispense pins are clogged.	Remove the wash head assembly and clean it using the manifold head cleaning wire. Then run a purge. Service is required if problem persists.
	Incorrect Calibration	Recalibrate Pump
Aspiration is not complete.	The aspiration pins are clogged.	Remove the wash head assembly and clean it using the manifold head cleaning wire. Service is required if problem persists.
	The aspiration pin height is set too high.	Repeat the plate setup procedure (page 30).
	The seal on the waste container is leaking.	Check the seal and waste tubing for leaks.
	The wash protocol is not optimized.	If the bottoms of the plate wells are flat, use a sweep.
		Add additional aspiration cycles to the wash protocol.
	Aspiration tubing may be blocked or kinked.	Check the aspiration tubing and remove any blockages or kinks.
	The vacuum exhaust may be blocked.	Remove any obstructions at the vacuum exhaust (see page 17).
	The vacuum pump may be contaminated by overflow.	Service is required.

Symptom	Probable Cause	Resolution
Aspiration is not complete. (continued)	Hydrophobic filter may be obstructed.	Replace filter.
High Waste Level is displayed.	The Waste Container is full.	Empty the Waste Container (see page 70).
	The waste level sensor cable is not plugged in.	Connect the waste level sensor cable (see page 17).
	The waste level sensor connector is defective.	Service is required.
	The waste level sensor detector is reversed.	Service is required.
The waste container is deformed.	The waste tubing is blocked.	Remove the waste tubing from the rear of the instrument (see page 17). Check the waste tubing (and aspiration tubing) and remove any blockages or kinks.
	The waste container is damaged or defective.	Replace the waste container.
X Motor Home Error is displayed.	Motion of the wash head is being blocked.	Check the wash head vicinity and remove any obstacles.
	The motor is defective.	Service is required.
Z Motor Home Error is displayed.	Motion of the wash head is being blocked.	Check the wash head vicinity and remove any obstacles.
	The motor is defective.	Service is required.
Test Too Large is displayed.	The wash protocol exceeds the memory limit.	Reduce the number of steps in the wash protocol and try again.

Chapter 8 Service

Service Procedures

The only user service procedures that can be carried out for the *Opsys* MW™ are listed below:

- Removal and replacement of the wash head assembly
- Cleaning of the wash head assembly

To remove the wash head assembly:

1. Loosen the two thumbscrews at the front of the Arm/Head assembly.

2. Grasp the wash head assembly and lift it up from the retaining pins on the Arm.

3. Lift the wash head and tubing clear of the instrument. If necessary, remove the wash tubing and waste tubing from the retainer clips at the front of the instrument.

To clean the wash head assembly:

1. Pass the Cleaning Wire through the inside of each wash pin and waste pin on the wash head.

2. Run a PURGE to rinse any material from the wash pins.

To replace the wash head assembly:

1. Position the wash head assembly back on the Arm pins.

2. If necessary, replace the wash tubing and waste tubing into the retainer clips at the front of the instrument.

Spare Parts

Accessories

13001580	Plate Holder Assembly
13001610	8-Way Head Assembly
13001630	12-Way Head Assembly
352104000	Cleaning Wire, 0.040”
352101800	Cleaning Wire, 0.018”
91000051	User Manual
91000070	OPSYS MW Quick Set Up Instructions
23501800	Bottle Wide Mouth (2120-0010, Nalgene, Wide Mouth Bottle w/Cap)
029006501	Jar, Aerosol Trap
029027400	Bottle, Waste, 4L w/ Modified Top
200074300	Rack, Bottle
394000400	Sponge, Round, 60mm Diameter
32000170	Stainless Steel Washer
43000200	Fitting, Reducer, 3/16" X 3/32"
43000390	Hydrophobic Filter
43000491	Quick Connect Fitting (Dispense)
43000540	Pick Up Filter
816400500	Silicon, 5/64” ID x 1/8” OD (Dispense)
816400600	Tubing, Silicon, 4 x 7.2 MM (Aspirate)
816400700	Tubing, Silicon, 3 x 5 MM (Dispense)
62503160065	Quick Connect Fitting (Aspirate)
43000540	Pick Up Filter

Major Assemblies

13001541	Bottle Assembly
13001555	Chassis Assembly
13001572	X/Z Drive Assembly
43000320	Dispense Pump
582050204	PCB, Washer Main Board
582051001	PCB, Washer Daughter Board
14000410	Micro, Programmed, OPSYS MW Main PCB
14000420	PLD, Programmed, OPSYS MW Main PCB
14000430	PLD, Programmed, OPSYS MW Daughter PCB

Hardware

43000530	Pump, Vacuum, 12 VDC
528300700	Stepper Motor
50500140	LPS113 Power Supply, 12V/6.7A
564300100	Float Switch, 0.5 AMP

Returning a Washer for Service

If the instrument must be returned for service, it must be cleaned and decontaminated if it has been in contact with potentially infectious body fluids (including human blood), pathological samples, or toxic or radioactive materials.

☞ ***Note**: Refer to page 69 for cleaning and decontamination instructions.*

To return a Washer for service:

1. Contact the nearest DYNEX Technologies technical service facility for return authorization.
2. Clean and decontaminate the Washer.
3. Fill out an Equipment in Transit form (Figure 10)
4. Pack the Washer and the Equipment in Transit form for shipment.
5. After you receive a return authorization, ship the Washer to the nearest DYNEX Technologies facility (see page 85).

DYNEX
TECHNOLOGIES

EQUIPMENT IN TRANSIT

IMPORTANT: Please include a copy of this form with each instrument. If your instrument contains a hard drive, please retain back-up copies of any stored files. Failure to do so may result in the loss of those files.

Return Authorization Number: _____
Contact Technical Service, DYNEX Technologies
phone: (800) 288-2354 or (703)631-7800 ext. 1440
fax: (703) 631-7816
Equipment: _____
Serial Number: _____

EQUIPMENT DECLARATION

Clearly indicate fault condition or reason for return.

CERTIFICATE OF DECONTAMINATION

I certify that the equipment described above has been disinfected/decontaminated* and is clean, dry and fit for transport.
Signed: _____
Title: _____
Date: _____
(DYNEX Technologies reserves the right to refuse improperly cleaned equipment)

Shipping Address: DYNEX Technologies, Inc.
Attn.: (Above return number)
14340 Sullyfield Circle
Chantilly, VA 20151-1683

***Suggested decontamination methods:**

Readers- Wash all surfaces with a 10% Hypochlorite solution, Follow that with a mild detergent solution.

Washers- Please follow the "Decontamination Procedure" found in the back of the manual.

Figure 10. Equipment in Transit Form

Contact DYNEX Technologies

DYNEX Technologies
14340 Sullyfield Circle
Chantilly, VA 20151
USA
Tel: 703-631-7800
Toll Free: 800-288-2354
Fax: 703-803-1441

www.dynextechnologies.com

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