

Operator's Manual

DRS-601 Automatic Slide Stainer



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INSTALLATION

Installation Recommendations

1. Install the instrument in a location away from the direct rays of the sun and away from air conditioning ducts.
2. Select a location where the surface is level; the leveling feet provided on the bottom of the instrument should be used to level the instrument.
3. Install the instrument in a well ventilated area.
4. Install the instrument in a proximity to a water supply.

Note: The instrument must be located on the same level as the sink. Drain must be lower than the instrument to facilitate drainage of the rinse water.

5. Install the instrument in an electrically noise free environment.

Connection of Water and Drain Hoses

The water supply hose connection is located on the right rear corner of the instrument.

Note: The water adjustment valve has a RED knob; turn this knob fully clockwise to turn the water OFF or counterclockwise to turn the water ON.

A water connection kit is provided to allow connection of the water supply from a dedicated shut off valve. The DRS-601 Automatic Slide Stainer is capable of sustaining a continuous working pressure up to 120 psi (8.5kg/cm²).

*Note: It is recommended that the water supply to the instrument be turned OFF when the laboratory is left unattended, *i.e., overnight or weekends.*

Connection Kit Components

The connection kit contains the following components:

Description	Quantity
Washer 3/4"	1 ea
Hose Assembly 3/4" to 3/4"	1 ea
This manufactured hose assembly consists of 6 feet of flexible hose, terminated at both ends with female 3/4" hose fittings.	
Combination Washer/Strainer (3/4")	1 ea

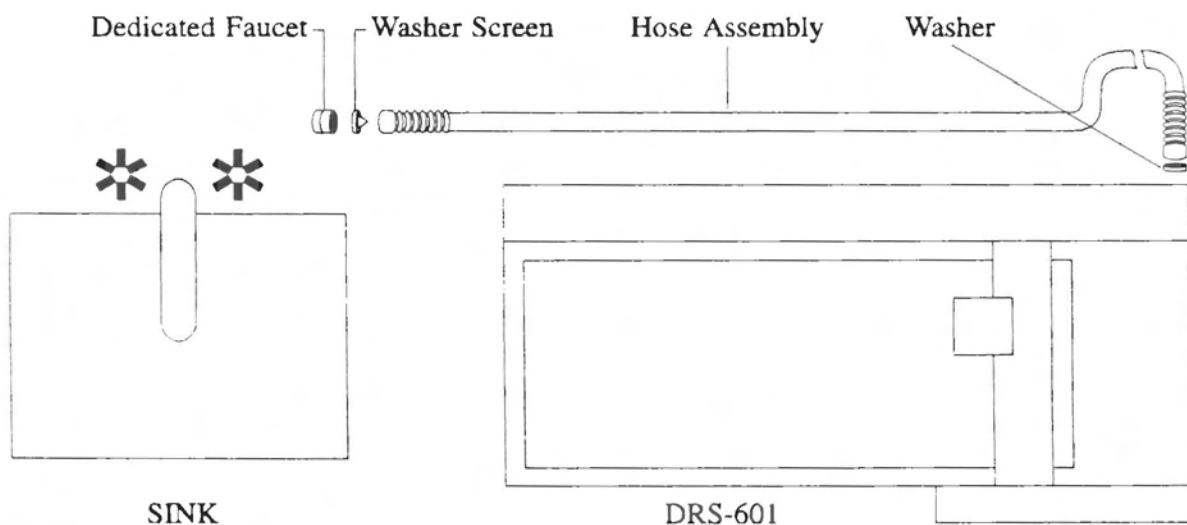
This combination washer/strainer should be used at the input side of the hose assembly to provide a water tight seal and to prevent particulate matter from entering the DRS-601 Slide Stainer.

Installation of Water Connection Kit.

The water supply to the DRS-601 Automatic Slide Stainer should be regulated to a nominal water pressure of 80 psi (customer responsibility).

The water supply should be provided with a shut-off valve terminated with a 3/4" hose coupling at the outlet side. (customer responsibility).

Diagram of the preferred method of Water Connection is shown below.



All connections should be firmly tightened to prevent water leaks;- however, do not over tighten as damage to connectors may result.

After installation of the Drain Hose, the water supply faucet should be turned ON and all connections should be checked for leaks.

Connection of Drain Hose

Drain hose can be connected to the Drain port located on the center, rear of the unit.

Connect-drain hose to the drain port. Secure with the hose clamp.

Insert the other end of the hose into the sink or drain hole on the floor.

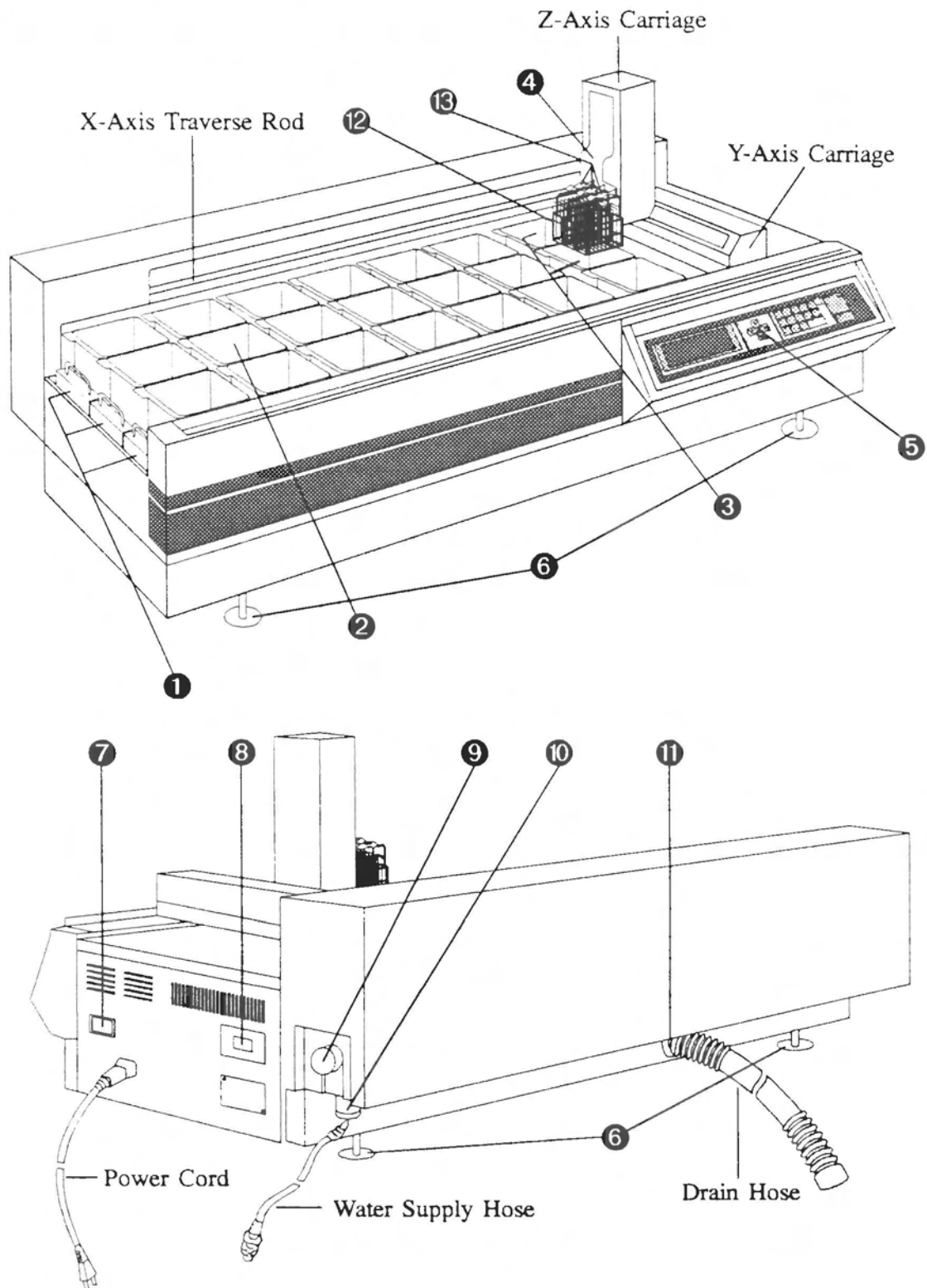
Note: Inspect the drain hole located in the center of the instrument located under the middle rack of the staining reservoirs. Remove any tape or debris. Install the drain screen at the top of the drain hole.

Connection to Electrical Source

Plug the instrument power cord into an exclusively grounded electrical power source.

Make sure the power switch is OFF before plugging the power cord into the power source.

MAJOR COMPONENTS

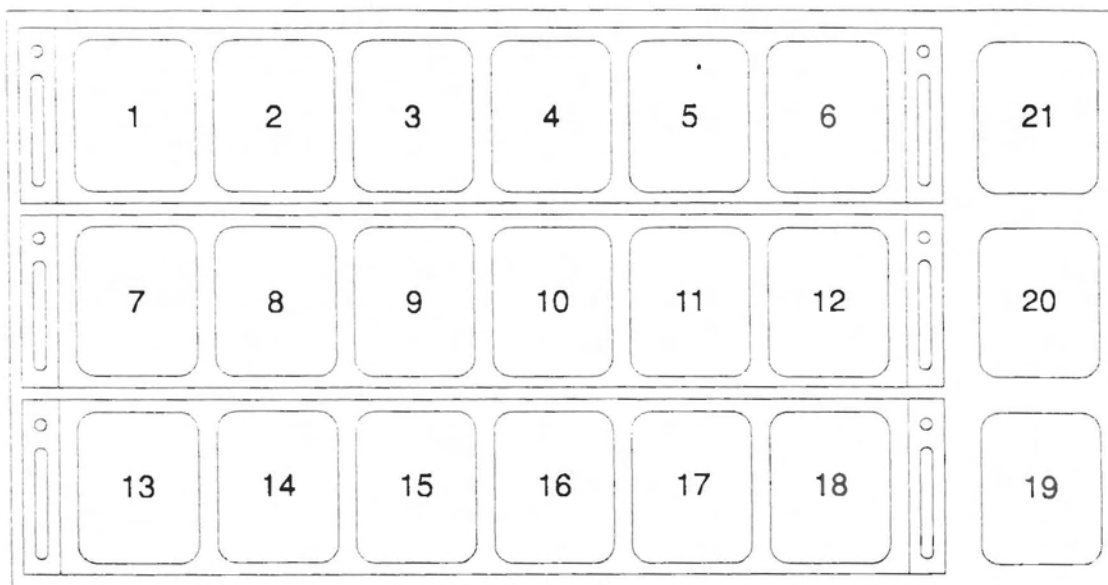


DESCRIPTION

Component Name and Function

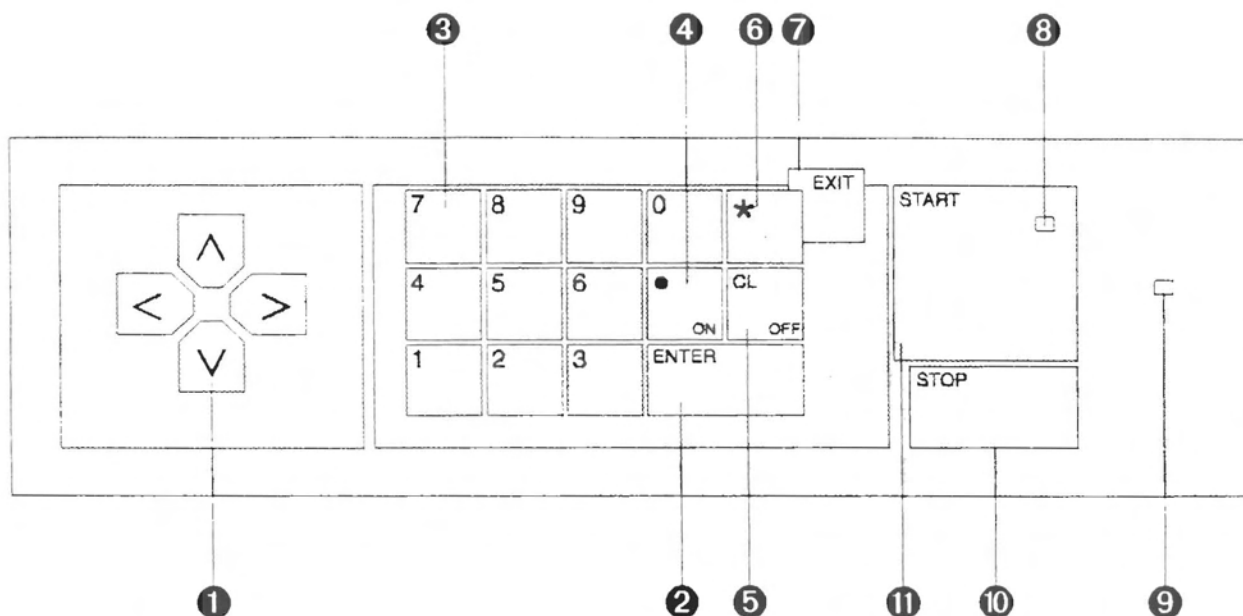
- ① **Tray**
Metal tray holds six (6) reagent reservoirs.
- ② **Reagent Reservoirs**
A total of nineteen (19) reagent reservoirs are provided. Reagent reservoir capacity: 1100 ml.
- ③ **Rinse Reservoirs**
A total of two (2) rinse reservoirs are provided. Each rinse reservoir is removable. Each is equipped with a movable water-level adjusting plate. Water level may be controlled by moving the plate up or down.
- ④ **Robotic Arm**
Transports up to three (3) slide carriers through all phases of staining and rinsing.
- ⑤ **Control Panel**
See control panel section below.
- ⑥ **Adjustable Feet**
Allows operator to level the instrument.
- ⑦ **Power Supply Switch**
Provides electrical power to the instrument.
- ⑧ **Receptacle for Fume Hood**
Provides electrical power to the Fume Hood (Optional Accessory)
- ⑨ **Water Adjustment Valve**
Adjusts the water flow rate to the rinse reservoir.
- ⑩ **Water Supply Port**
Connection for the Water Supply hose.
- ⑪ **Drainage Port**
Connection for the Drain hose.
- ⑫ **Slide Carrier**
Up to three slide carriers may be hung from the robotic arm at one time. Each slide carrier holds 20 slides. Total throughput is 60 slides per stain cycle.
- ⑬ **Slide Carrier Hook**
Permits a slide carrier to be hung on the robotic arm.

REAGENT RESERVOIR ARRANGEMENT



Note: Reagent reservoir position number is also the station number to be used when programming the instrument.

CONTROL PANEL



Control Panel Description

- 1 Arrow Keys**
 Moves cursor to the desired position by pressing  keys, or selects menu position.
- 2 Enter Key**
 Inputs data into memory in the programming mode. Press ENTER key to input data.
- 3 Numeric Keys**
 Used to input numeric values 0 to 9 or for the selection of various menus.
- 4 Decimal/ON Key**
 Multi-function key. Also, establishes placement of decimal for solution concentrations less than 10%. Sets HOLD during programming, turns rinsing ON during manual operation and turns certain maintenance tests ON for servicing.
- 5 Clear/OFF Key**
 Dual function key. Deactivates various functions; deletes or clears the screen of specific input.

- ⑥ **Asterisk (*) Key**
When pressed in combination with other keys, allows activation of HELP menu and associated programming functions.
- ⑦ **Exit Key**
Allows the operator to exit or escape current mode. Can be used to return to the previous menu or to escape when operation is complete.
- ⑧ **Start Indicator**
Illuminated during staining process.
- ⑨ **Power Indicator**
Illuminated when electrical power is supplied to the instrument.
- ⑩ **Stop Key**
Used to halt automatic operation. Also used to interrupt a program, delete the remaining steps and to turn beeper off.
- ⑪ **Start Key**
When pressed, automatic staining process begins.

GLOSSARY OF TERMS

Listed below are various terms which may be used when describing programming or operation of the DRS-601 Automatic Slide Stainer.

Main Menu Display

Microprocessor controller allows the operator to perform a number of various functions. The selection of these functions will be displayed on the LCD panel.

Cursor

Visual blinking indicator appearing under an alpha-numeric character indicating the position of the next entry. The message column is linked to the cursor.

Station or Sta

Reagent reservoir or Rinse Reservoir. Each reagent reservoir or rinsing reservoir is assigned a position number. This number must be used during programming.

Step

Indicates the process order number of the program. A maximum of 50 steps can be input into each program.

Program Number

Each program is assigned a number. A maximum of 16 programs may be input.

Reagent

Any solution, solvent or stain used in the staining cycle.

Wash (20)

Wash (21)

Indicates the water wash/rinse stations. The instrument has two (2) wash stations. Each is assigned a station number. This number must be used to program the use of a particular wash station.

Up

Means to move the slide carrier upward

Down

Means to move the slide carrier downward.

Home

Means to move the robotic arm to the "home" position over station #20.

Con (Concentration)

Indicates the strength or percentage of a reagent.

REAGENT PREPARATION

Placement of Stains/Reagents

Arrangements and placement of reagents and stains is totally dependent on the type of staining being performed and user preference as to reagent placement. The arrangement of stains/reagents shown in Table 1 are to be used as an example.

1 Xylene	2 Xylene	3 100% Alcohol	4 100% Alcohol	5 95% Alcohol	6 80% Alcohol	21 Wash
7 95% Alcohol	8 Eosin	9 80% Alcohol	10 Ammonia Water	11 Hema- toxylin	12 Acid Alcohol	20 Wash
13 95% Alcohol	14 100% Alcohol	15 100% Alcohol	16 100% Alcohol	17 Xylene	18 Xylene	19 Xylene

TABLE 1

Place reagent reservoirs in the three (3) stainless steel trays. Place stainless steel trays into the instrument.

Program Documentation

It is recommended that a programming chart be prepared showing reagent placement, station number, processing time, reagent identification and concentration. This will greatly simplify the programming procedure.

Once the placement and arrangement of the reagents has been determined, reagents and stains may be placed in the reagent reservoirs.

Reagent Reservoir Placement

Pour reagents/stains into their respective containers. Total reservoir capacity is 1100 ml. Place approximately 700 ml of fluid into each reservoir.

Note: Sufficient fluid should be placed into the reservoirs to completely cover the slides during automatic operation.

REAGENT/STAIN LIST

The following reagent list with code numbers is stored in memory. The code numbers are used to prepare the individual solution lists for each processing program.

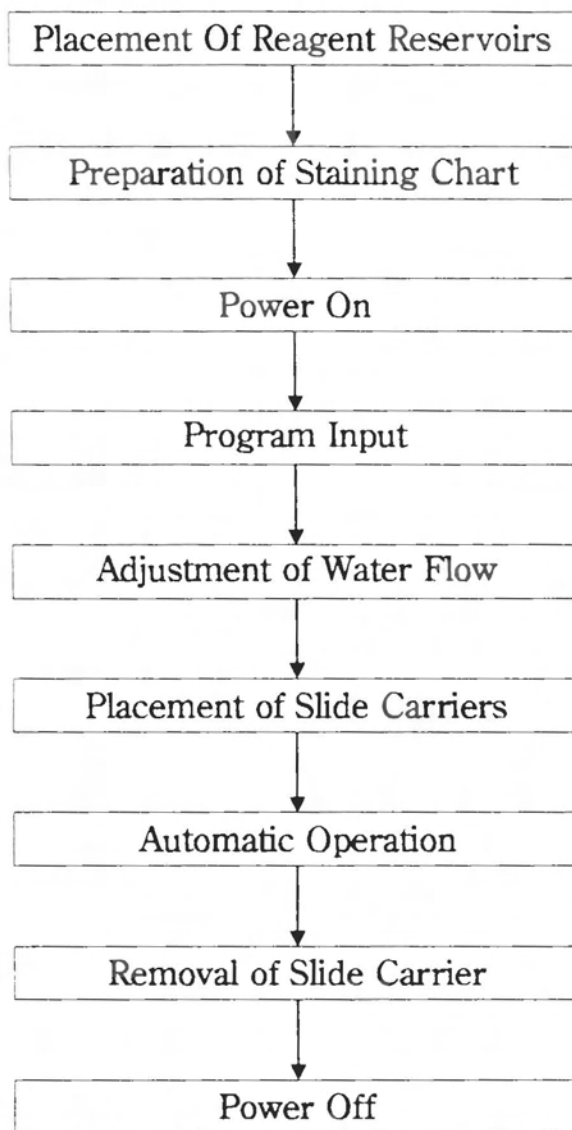
<u>Code</u>	<u>Reagent/Stain</u>	<u>Abbreviation</u>
1	Hematoxylin	Hematoxylin
2	Eosin	Eosin
3	OG-6	OG-6
4	EA-36	EA-36
5	EA-50	EA-50
6	Ammonia	Ammonia
7	Ammonia + Ethyl Alcohol	Ammonia/ETOH
8	HCL	HCL
9	HCL + Ethyl Alcohol	HCL/ETOH
10	Isopropyl Alcohol	Isopropanol
11	Acid + Ethyl Alcohol	ETOH/Ether
12	Ethyl Alcohol + Xylene	ETOH/Xylene
13	Absolute Ethyl Alcohol	ABS ETOH
14	Dehydrated Ethyl Alcohol	Anhydr. ETOH
15	Ethyl Alcohol	ETOH
16	Absolute Methyl Alcohol	ABS Methanol
17	Xylene	Xylene
18	Tap Water	Tap Water
19	Distilled Water	Distilled Wat
20	Deionized Water	Ion Ech Water
21	Periodic Acid Solution	Per Acid Soln
22	Schiffs Reagent	Schiffs Reag
23	Sulfurous Acid Solution	H ₂ SO ₃

CAUTION: USE EXTREME CARE WHEN HANDLING FLAMMABLE FLUIDS SUCH AS XYLENE AND ALCOHOL. KEEP AWAY FROM OPEN FLAME AND OTHER IGNITION SOURCES. DISPOSAL OF THESE FLUIDS SHOULD BE DONE IN ACCORDANCE WITH ACCEPTED PROCEDURES.

This section describes the fundamental operation of the DRS-601 Automatic Slide Stainer. It is important that the Operator read and understand this information prior to operating the instrument. A general outline follows:

OPERATIONAL OUTLINE

Outline



Preparation of Slide Staining Chart

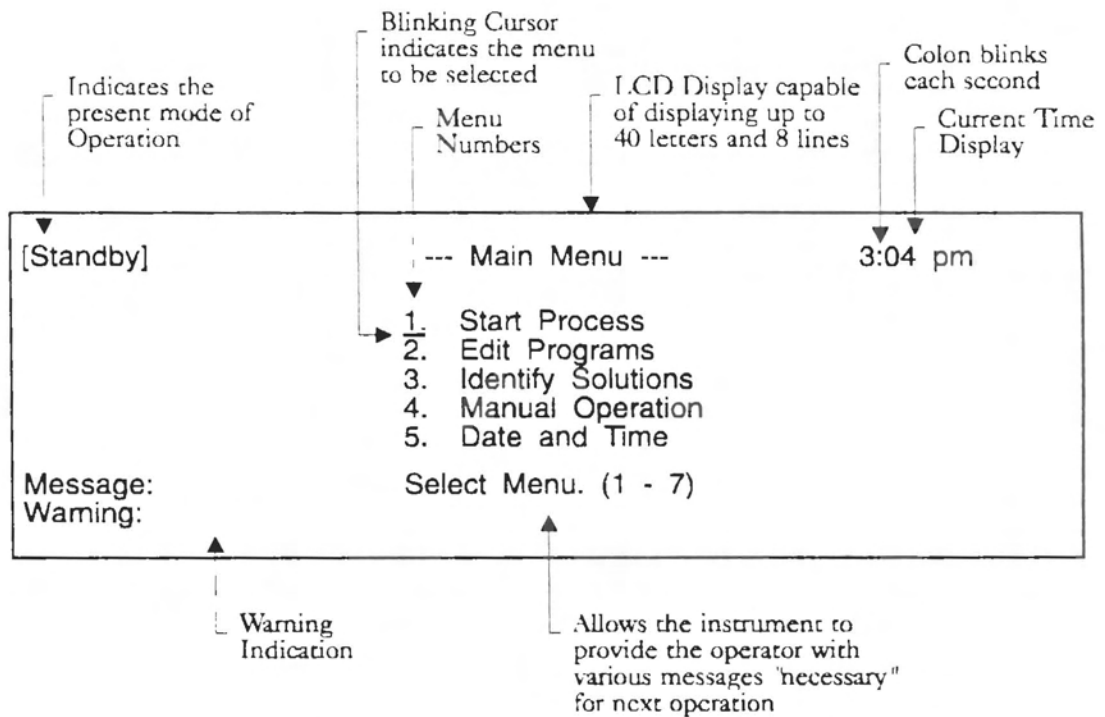
Before attempting to program the DRS-601 Automatic Slide Stainer it is helpful to complete a slide staining chart which provides the following record:

Step Number
 Station Number
 Reagent Identification (See Solution Code List)
 Concentration
 Staining Time
 Hold ON or OFF

STAINING RECORD						
PATHOLOGIST:					PROGRAM NO.	
TYPE OF STAIN:						
TECHNOLOGIST:					DATE	
* SOLUTION PLACEMENT						
STA 1	STA 2	STA 3	STA 4	STA 5	STA 6	WASH-1
STA 7	STA 8	STA 9	STA 10	STA 11	STA 12	WASH-2
STA 13	STA 14	STA 15	STA 16	STA 17	STA 18	STA 19
* STAINING PROCEDURE						
STEP	STA	TIME	SOLUTION	NOTE		
1		M S				
2		M S				
3		M S				
4		M S				
5		M S				
6		M S				
7		M S				
8		M S				
9		M S				
10		M S				
11		M S				
12		M S				
13		M S				
14		M S				
15		M S				
16		M S				
17		M S				
18		M S				
19		M S				
20		M S				
21		M S				
22		M S				
23		M S				
24		M S				
25		M S				

Power "ON"

Turn the Power Switch ON. After a very brief period, the following display will appear on the panel.



Note: When the Switch is turned ON, the water to the wash station will be turned ON for a period of 30 seconds to either fill or exchange the wash water.

Upon applying electrical power to the instrument, the first display to be shown on the control panel is displayed below:

During this time period, the robotic arm will search for the "HOME" position located over station #20 Rinse Station. Also at this time, water will be supplied to the two rinse stations. After a brief period of time, the flow of water will turn off.

JULY 10, 1992 3:04 pm	
SAKURA Automatic Stainer	
DRS-601	
Message:	Welcome to this system

Initial Display

After a brief time period, the display will change as shown below:

[Standby]	--- Main Menu ---	3:04 pm
	1. Start Process	
	2. Edit Programs	
	3. Identify Solutions	
	4. Manual Operation	
	5. Date and Time	
Message:	Select Menu. (1 - 7)	
Warning:	Supplying Water	

Main Menu Display

Note: By using the  arrow key, additional menu selections #6 and #7 may be chosen:

- 6. Diagnostics
- 7. Miscellaneous

Setting Date and Time

Note: If the date and time have already been entered, check to confirm both are correct. Move on to the next step.

[Date and Time]

--- Correct Date ---
Year 1990
Date 10/10
Time 2:00 pm
Message: Enter Year

Setting Date and Time

To set the Date and Time:

1. Move the cursor using the arrow keys to [Menu #5 DATE and TIME]. Press the numeric key (5) and press ENTER key. The above display will appear on the control panel.
2. The cursor will appear to the far right position of the year (example: 1990)

To input the year 1991, the numeric keys must be used. Press the numeric key "1" followed by numeric key "9" followed by numeric key "9" followed by numeric key "1". Press the ENTER key to enter the year 1991 into memory.

3. The cursor will automatically go to the far right position of the [Date: Month/Day]

To enter the date of January 9th, the operator would use the numeric key pads. The numeric value for January (01) would be entered by pressing the numeric key "0" followed by the numeric key "1". This enters the numeric value for January.

To enter the date, press the numeric key "0" followed by the numeric key "9". The entire date, month and day, have been input. Press ENTER to place month and day in memory.

4. The cursor will automatically move to the far right position for time. (Example: Time: XX/XX)

To input the time of 12:52 p.m. press the numeric key "1", followed by the numeric key "2", followed by the numeric key "5", followed by the numeric key "2". Press the ENTER key to place time into memory.

The cursor will move to the far right position of [a.m.] or [p.m.]. The message column will provide instructions for selecting a.m. or p.m. To select "P.M." press the (CL/OFF) key and press Enter. To input "A.M." press the (./ON) key and then press ENTER.

If all of the programming for Date/Time has been done correctly, the instrument display will return to the "MAIN MENU"

If a mistake is made during the input phase, the instrument will sound an "alarm". The operator must then press the (CL/OFF) key and input the correct values. The instrument will not move to the next step until the requested information is properly entered.

Adjusting the Flow Rate of the Rinsing Stations

From the "MAIN MENU" select [4, Manual Operation]. Press the numeric key "4" and press ENTER.

[Manual Operation]	3:50 pm
•1. Wash (20)	
• <u>2</u> . Wash(21)	
3. Up	
4. Down	
5. Go home position	
Message: Select Menu. (1 - 5)	

To supply rinse water to station "No. 20", press the numeric key "1" and press ENTER. Water will begin flowing to this station only; an asterisk (*) will appear to the left of the menu number showing that the water is turned ON.

To supply rinse water to station "No. 2", press the numeric key "2" and press ENTER or ON. Water will begin flowing to this station only; an asterisk (*) will appear to the left of 2.

To increase or decrease the flow rate, locate the red adjusting knob located on the right side of the instrument. The flow rate can be increased or decreased by turning this adjustment valve CCW or CW respectively. This knob controls the flow rate for both rinse stations.

The flow at either WASH station can be turned OFF by positioning the cursor at the selected station and pressing the (OFF) key; the asterisk (*) will disappear.

When the adjustment is complete, press the EXIT key. The display returns to the "MAIN MENU" and water supply is automatically turned OFF.

SOLUTION IDENTIFICATION

The "MAIN MENU" listing must be displayed. If it is not, press the EXIT key repeatedly until "MAIN MENU" appears on the display screen.

Select [3, Identify Solutions] from the Main Menu. Press the numeric key "3" and press ENTER key. The following display will appear.

[Solution]		--- SOLN-LIST	1 ---			
Sta	Solution	Code	Con	Set	Used	
1			%	--	0	
2			%	--	0	
3			%	--	0	
4			%	--	0	
5			%	--	0	
Message: Enter SOLN-LIST No. (0-16)						

Selection of the Solution List Number

Solution List Numbers (0-16) can be assigned. The Solution List Numbers (1-16) correspond to the Program Numbers. Example: Solution List Number "1" corresponds to Program #1. Solution List Number "10" corresponds to Program #10.

Solution List Number "0" is a Solution List which is common to all Programs 1-16. Example: If stations No. 1, 2, 15, 16, 17, 18, 19 utilize the same reagents for all programs, then the information for each station can be entered into Solution List Number "0". This information for each station will automatically appear in each program. This eliminates the need for the Operator to separately enter this "Common" information into each program.

In each solution list, the common solution stations must be assigned. This is performed by pressing "*", "0" and ENTER when the cursor is in the [CODE] Column. A "C" will then appear to the left of the station number and the solution information (entered in SOLN LIST "0") will appear.

Note: The solution code and concentration for common solution stations is only entered in Solution List "0".

Make sure that when entering information into the Solution List the Solution List Number corresponds to the Program Number.

To select the proper Solution List Number, use the numeric keys (0-9). Example: to program Solution List Number "1" press the numeric key "1" and then press ENTER.

If Solution List Number "1" has been used before, the contents of the list will be displayed. If it has not used before, no solutions will appear on the display.

Programming the Solution List

Before programming the solutions to be used in Program #1*, examine both the Staining Record previously prepared and the Solution Code List (See Page 14).

After selecting the Solution List Number, the cursor will appear in the CODE COLUMN for Station #1. Looking at the Solution Code List, (See page 14) enter the code number which corresponds to the correct solution to be input. Example: if Station #1 is Xylene, look down the Solution Code List until Xylene is located. The Solution Code for Xylene is "17".

Using the numeric keys, press numeric key "1" followed by numeric key "7"; Xylene will appear on the screen under the Solution column.
Press the ENTER key.

The cursor will move to a position under [Con]. Since Xylene has no concentration value to be assigned to it, press the [CL/OFF] key and press the ENTER key. If a concentration value was to be assigned, the numeric keys would be used. Example: If the value of 100% was to be assigned to Xylene, the numeric key "1" would be pressed followed by pressing numerical key "0" twice. Pressing the ENTER key would input the value into memory.

The cursor moves to a position under [SET], the message column displays "Enter Maximum Usage: [1-99, OFF]." If the Xylene in Reagent Reservoir #1 is to be used ten (10) times before being replaced, enter the value "10" by using the numeric keys. Press numeric key "1" followed by numeric key "0". Press the ENTER key. If the operator does not wish to assign a value to establish the maximum amount of uses, then press [CL/OFF] and the ENTER key.

The cursor will move to the next station under the [Code] column.

Programming the Solution for Station #1 is now complete. Repeat this same procedure for stations #2 to 19 to complete SOLN-LIST 1.

If an error has been made in programming the Solution List, use the  arrow keys to move the cursor to the position to be corrected. Press the [CL/OFF] key and enter the correct information.

Note: If the STOP key is pressed the contents of that line will be erased.

PROGRAMMING STAINING SEQUENCES

Selection of the Program Edit Menu

From the MAIN MENU select [2. Edit Programs] by pressing the numeric key "2" and then pressing the ENTER key. The display shown below will be shown on the Control panel if a program had been input previously.

[Edit]	---	Program	1	---	SOLN-LIST	1
Step	Sta	Solution	Con	Time	Hold	
1	1	XYLENE	%	5'00"	Off	
2	2	XYLENE	%	0'30"	Off	
3	3	ABS ETOH	%	0'30"	Off	
4	4	ABS ETOH	%	0'30"	Off	
5	5	ABS ETOH	%	0'00"	Off	
Message: Select Program No. (1-16)						

The cursor will appear to the right of Program (Program XX). The message Select Program (1-16), will be displayed on the message line

Note: When assigning the Program No., it should be the same number as was used when programming the Solution List (previous section).

Use the numeric keys (0-9) to input the Program Number. Example: To input Program No. "1", press the numeric key "0" followed by numeric key "1". Press the ENTER key to enter program number into memory.

If an error is made during the selection of the Program No., the cursor may be moved to the right by using the (>) key and then input the correct program number.

When a Program has been selected, the contents (if previously used) will appear on the control panel screen. When being programmed for the first time, END will be displayed for Step 1.

If the Program has been used before, the entire contents of the program for all stations, can be erased by pressing the STOP key.

Before beginning the programming function, locate the Staining Record Chart used when placing the Solution identification into memory.

The cursor will appear under the [STA] column for Step #1. Use the numeric keys to enter the solution reservoir number. Example: Step #1 Station #1*, using the numeric keys press the numeric key "0" followed by numeric key "1". Press ENTER.

When ENTER is pressed, the contents of the Solution List for Station #1 are also displayed under the [Solution] and [Con] columns.

Next input the staining time. Once the station number has been input, the cursor moves under the [Time] column and the Message line displays "Enter Time. (00'00"-99'59")".

Example: To enter 12 min. 30 sec. the operator would enter the minutes and seconds consecutively using the numeric keys. Press numeric key "1" followed by numeric key "2" followed by numeric key "3" followed by numeric key "0". Press the ENTER key.

Programming "Hold Mode"

Once the operator has programmed the staining time and entered it into memory, the cursor will automatically move to a position under the [HOLD] column. The message line will read "SELECT HOLD (ON/OFF)". Press either the ON or OFF key; press the ENTER key to program the use or deletion of HOLD.

To complete the programming procedure for all steps of the staining procedure, repeat the above programming instructions for each step. If corrections to the program are required, the cursor may be moved to the desired position using the  arrow keys. After the final step of the staining procedure has been programmed and entered into memory, [END] must appear under the Solution Column. If not, use the arrow key to move the cursor to the next line.

Programming Agitation

The agitation frequency and the speed of the slide carrier during agitation can be programmed by the operator.

After the operator has programmed all of the steps required to complete the staining procedure, the cursor may be moved to the position [Agitation Time Interval: 01"] by using the  arrow key. The message line will display "Enter Interval (0-10, OFF)."

Example: Certain types of tissue, i.e., brain, require very gentle agitation to prevent the sections from becoming dislodged from the slide. Therefore, a gentle agitation speed is required, i.e., one movement every 10 seconds.

Using the numeric keys, press the numeric key "1" followed by numeric key "0". Press ENTER.

Note: If no agitation is desired the Operator would press the OFF key and then press ENTER. No agitation during staining would result.

Programming Slide Carrier Movement

The speed of the slide carrier during agitation may be programmed by the operator.

The cursor will automatically move to a position under the numeric in the notation "Agitation Speed:2". The message line will display "Select Agitation Speed.(1-2)".

If a slow speed is desired choose "1"; if a faster speed is desired, choose "2". Press the appropriate numeric key followed by ENTER to input to memory.

Program Verification

Once the complete program has been entered into memory and the Operator would like to review the input data to verify accuracy and completeness, this may be accomplished by pressing the  keys until the complete program has been reviewed.

If inaccurate information has been input, use the arrow keys to move the cursor to the desired position and correct the information by pressing the [CL/OFF] key then enter the correct data and press the ENTER key.

If the program is acceptable, press the EXIT key to return to the Main Menu. The EXIT key may need to be pressed several times to reach the Main Menu.

Placement of the Slide Carriers

The DRS-601 Automatic Slide Stainer is capable of staining up to sixty (60) slides at one time. This is accomplished by hanging up to three (3) slide carriers on the Robotic Arm. Each carrier can accommodate up to twenty (20) slides.

Note: If less than 20 slides are to be stained, arrange the slides in such a manner so as to "balance" the slide basket. If only one slide carrier is being used, hang the carrier from the center of the Robotic Arm.

Help Screen

When in the EDIT mode, the HELP Screen can be displayed by pressing  and then by pressing the  arrow key. The following display will appear:

[Edit-Help]	
Open Help Window	: (*) + (Left)
Print	: (*) + (Down)
Insert Step	: (*) + (On)
Delete Step	: (*) + (Off)
Duplicate Step	: (*) + (Up)
Open Window Copy	: (*) + (1)
Select Soln List	: (*) + (2)

AUTOMATIC OPERATION

To start automatic operation, return the display to the Main Menu by pressing the EXIT key. If the instrument has just been turned ON the Main Menu will automatically be displayed.

Select [1. Start Process] from the Main Menu by pressing the numeric key #1, then press ENTER. The display shown below will appear.

[Process]	3:50 pm
Experiment	00000000
Program	1
Start Step	1
(Station No. 1 XYLENE	%)
Message: Enter Experiment No.	
Warning:	

Batch or Experiment Number

The cursor will appear to the far right hand side of [Experiment 00000000]. The operator may assign a batch number/experiment number having up to eight digits. To program this batch number, the numeric keys are used.

Example: Batch No 01099101 (Jan. 9, 1991 First Staining Run). Using the numeric keys, press numeric key "0", followed by numeric key "1" followed by numeric key "0" followed by numeric key "9" followed by numeric key "9" followed by numeric key "1" followed by numeric key "0" followed by numeric key "1" Press ENTER for storage in memory.

Selection of Program Number

Anyone of sixteen programs may be selected. The display shown on the message center reads [Select Program No (1-16)]. Using the numeric keys, input the program number desired and push ENTER. The program selection is placed in memory.

Selection of Start Step

The cursor will automatically move beside the display [Start Step 1]. The message line will show [Select Start Step No. (1-22)].

For most routine staining procedures the staining procedure will begin in Station #1. Using the numeric keys press the numeric key "1". Press ENTER.

The instrument will then quiz the operator via the line whether or not automatic operation is to begin. [START? Yes=Start No=Exit].

Automatic Operation

Extreme care must be taken not to touch or interfere with the movement of the Robotic Arm during automatic operation. Do not attempt to remove reagent reservoirs or hang or remove slide carriers once automatic operation begins. To temporarily suspend operation, press the STOP key. To resume automatic operation, press the START key.

Note: If for any reason the Robotic Arm is accidentally moved in any direction once the power switch has been turned ON, the orientation of the Robotic Arm will be disrupted. Do Not Attempt to Use the Instrument! Damage May Result.

To reorient the Robotic Arm, turn the Power Switch OFF; wait 10 seconds and then turn the power switch ON. The Robotic Arm will automatically reorient itself.

The display shown below is typical of the display shown on the control panel during routine automatic operation.

[Edit]			--- Program		1 ---	3:50 pm	
Step	Sta	Solution	Con	Time	Hold		
1	1	XYLENE	%	1'12"	Off		
Message:							
Warning:							

Suspension of Automatic Operation

The procedures outlined below should only be followed when the STOP key has been pressed or when HOLD is displayed in the upper left hand corner of the display. The display shown below illustrates the [Hold] Mode.

[Hold]			--- Program 1 ---		3:50 pm	
Step	Sta	Solution	Con	Time	Hold	
1	1	XYLENE	%	1'12"	Off	
			--- Hold Operation ---			
			1. Up			
			2. Home			
			3. Down			
Message:		Select Function (1-8) and Start				
Warning:						

Note: When the STOP key is pressed to enter the [Hold] mode, a period of 10 seconds is allowed for selection of a menu action. If no selection is made within 10 seconds, processing will resume.

The Hold Mode is usually a programmed event designed to interrupt the staining cycle to allow the operator to review staining intensity or cellular differentiation of the staining program.

The cursor will automatically appear under the numeric value (1) next to the UP indication. To lift the slide carriers from the reagent reservoirs press the ENTER key. The Robotic Arm will lift the slide carriers out of the reservoir and remain stationary. The slide carriers can be removed and the slides examined. After examination, hang the slide carriers on the Robotic Arm. To restart the staining cycle, press the START key. Automatic operation will begin.

Completion of the Staining Cycle

At the completion of the programmed staining cycle, the display shown below appears on the Control Panel and simultaneously a buzzer sounds signaling the end of the staining cycle.

[Process]	Program 1 Completed	3:50 pm
--- Operation ---		
1. Up		
2. Home		
Message: Select Function (1-2)		
Warning:		

The operator should thoroughly read the Control Panel making certain that no error codes or messages appear next to the Warning Indication. EXAMPLE: [Power Out Occurred]. If a power failure occurred during automatic staining, this error code would appear. Depending on the duration and at which station the power outage occurred the specimens may or may not be stained correctly.

Note: Pressing the STOP key will turn the buzzer off.

Removal of the Slide Carriers

The cursor will appear as shown [1, Up] on the control panel. If the ENTER key is pressed, the Robotic Arm will lift the slide carriers out of the reagent reservoir and remain stationary. The display will return to the Main Menu.

Returning Robotic Arm to Home Position

The Main Menu must be displayed. If it is not, press EXIT key until it appears. Select [4. Manual Operation] from the Main Menu by pressing the numeric key "4" and pressing

ENTER. The following is displayed.

[Manual Operation]	3:50 pm
1. Wash (20) 2. Wash (21) 3. Up 4. Down <u>5.</u> Go home position	
Message: Select Menu. (1 - 5)	

Select [5. Go Home Position] by pressing numeric key "5" and pressing ENTER key. The Robotic Arm will move to a position centered over Rinse Station #20. To return to the Main Menu, press EXIT.

At the end of each day, after all the work has been completed or over weekends or holidays when the stainer will not be used, perform the following steps:

Turn the Power Supply Switch OFF.

Turn the dedicated water supply faucet OFF.

Drain Rinsing Stations #20 and #21. Water may be completely drained by lifting the Rinsing Reservoirs up slightly.

Place lids on all reagent reservoirs.

If the instrument is not to be used for a long period of time, remove the power cord from the wall receptacle.

Cautions During Use

Please observe the following procedures during the use of this instrument. Failure to do so can cause problems during the automatic operation.

1. Do not allow any physical objects to be placed within the range of movement of the slide carrier.
2. Do not touch the slide carrier while it is in motion.
3. Keep the surfaces of the instrument clean. Do not use water to clean the surfaces or splash water or solutions on the instrument. Do not place the instrument in direct sunlight.
4. Do not manually move the slide carrier when the power is ON.
5. Remove all solution reservoir lids and any other obstacles to motion of the carrier before the power is turned ON.
6. Be certain that the solution reservoirs and their contents are correctly matched to the program prior to the start of automatic operation.
7. When the instrument power is turned OFF, the edited programs are retained in memory by use of an internal back-up battery. If the battery energy is depleted, the programs can be lost. A written record of all programs is recommended.
8. The external water faucet should be turned OFF whenever the laboratory personnel are not present.
9. Do not remove the outside panels of the instrument. only technically qualified personnel should attempt to do so after contact with the manufacturer.
10. Certain solutions may cause corrosive action on component parts of this instrument. Please contact Sakura Finetek USA or your Sales Representative if questions arise.
11. If possible Please do not locate the right side of this instrument next to a sink. Splashing of water could cause electronic malfunctions during use of the instrument.

REAGENT QUALITY CONTROL PROGRAM

The DRS-601 Automatic Slide Stainer permits the operator to monitor the number of times a specific reagent is used and alert the operator when it is time to change the reagents. If the number of times that a reagent is used exceeds the SET number of times entered in the SOLN-LIST for a program, then the following display will be shown to alert the operator to change solutions when a process START is attempted. If the operator chooses not to replace solutions at this time, the START key can be pressed and the process will begin.

[Process]	3:50 pm
Experiment	00000000
Program	1
Start Step	1
(Station No. 1 XYLENE	%)
Message:	Enter Experiment No.
Warning:	Exchange Solution

The Exchange Solution Menu can be entered by pressing ENTER. The following display will then be presented.

[Process]	--- Exchange Solution ---	3:50 pm
1. Over-used Solutions		
2. All Solutions		
	--- Over-used Station ---	
1, 5,		
Message:	Exchange ? (yes = On, no = Start)	

The Operator has three basic options with regard to the replacement of reagents.

1. Exchange only those reagent stations shown on the display.
2. Exchange all reagents.
3. Override the recommended exchange instructions and proceed with an additional staining cycle.

If only those reagent stations shown on the display are to be exchanged, the operator must press the numeric key "1" and then press (./ON). This will reset the counter for those specific stations only.

If all reagent stations are to be replaced the operator must press the numeric key "2" and then press (./ON). This will reset the counters for all reagent stations.

If the operator chooses to override the exchange request, then START can be pressed and the process will begin.

PROBLEM DETERMINATION

Messages and Warnings

If the contents of the Message and/or Warning lines are different from the contents displayed normally, examine the following list which gives details and actions to be taken.

Home NG (error ***)

Normally, when the power is turned on, the slide carrier moves to the standard position. The above message is displayed when the slide carrier fails to locate the standard position. Turn off the power. Check to see that there is no obstacle to the carrier movement by manually moving the carrier; then turn on the power supply. If the above message is repeated a problem is present in the unit. For details, refer to the Error Number List.

Message: Push any key
Warning: Error ***
Stopped Motor

This type of error may occur when normally operating the carrier in the course of automatic or manual operation. The actions to be taken depend on the Error number. Refer to the Error Code List.

Low Voltage Battery

When the unit is turned OFF or a power failure occurs, the Solution Lists and Staining Programs are held in memory by a battery. This message means that the battery energy has been depleted. Exchange of the battery is necessary. Contact the distributor. If a new battery is not installed, the Solution Lists and Programs will have to be reprogrammed.

Exchange Solution

This message indicates that certain solutions should be changed. Change the indicated solutions before performing the next staining program and reset the use counters.

Power Out Occurred

This message is displayed during automatic operation and at the time the process is completed indicating that a power outage occurred during automatic operation. After the power is restored, the process is immediately restarted, but the staining of specimens may be incorrect depending on the processing station at the time of the power outage or on the power outage period. Consequently specimen examination is necessary.

NOTE: If the power switch is turned OFF during automatic operation, the instrument judges that a power outage occurred and returns to automatic operation when the power switch is turned on. Consequently, STOP the automatic operation before turning the power switch OFF.

Auto Restart Failed

This message indicates that the instrument tried but failed to automatically restart the staining process when the power was restored. If this message is displayed, take out specimens immediately and manually complete the staining process from the next step, or reassign the start step for automatic operation and then complete the process starting from the new START step.

Missing Position

If an error occurs during return to the original position of the slide carrier, the carrier location indicates that the instrument missed the standard position. This message is displayed during automatic or manual operation. Turn the power OFF? then determine the cause of the problem and correct according to the instructions. Turn the power ON to check for correct operation.

Error Motor Control Board

An electrical problem occurred; turn the power OFF immediately.

The following messages are displayed at the time that automatic operation is started:

No Programming

This indicates that automatic operation cannot take place since a program has not been entered into memory at the indicated program location. Assign a number to the program.

Illegal Program No.

The assigned program number is incorrect Enter the correct program number.

Illegal Start Step

The displayed step number to start automatic operation is incorrect. Enter the correct step number.

Found Illegal Step No. **

This indicates there is an error in the program. Edit and correct the program.

Diagnostics

If [6.Diagnostics] is selected on the Main Menu display, the following is displayed.

[Diagnostics]					
Error	Step	Sta	Remain	Date	
10	1	1	0' 30"	8:45	am
118	8	5	1' 15"	9:15	am
---end---					
Message:					

An error number is shown when an error has occurred. This information is cleared when the automatic operation starts. When an error occurs, main errors are displayed at the time of occurrence. This is used to check for other errors.

If the staining process cannot be carried out due to an error, refer to page 32 Messages and Warnings. If corrective actions cannot be taken after referring to these pages, please contact us.

If [—end—] is not displayed, there is further information. Check other information by the arrow key (▲ or ▼). Press the EXIT key, to return to the Main Menu.

Error Code List

Code Number	Explanation
1 2 3	Motor Control Impossible.
4	Attempted to perform carrier movement after an error occurs. (Caused by the previous error).
5	An Emergency Stop was instituted using the STOP key while returning to the original position. (It is necessary to turn the power supply OFF and ON).
6	Internal switches are not properly set.
7	When starting forward/backward and left/right movement, the carrier is unable to move upward or downward when not positioned at the upper limit. Position slippage occurred due to external force. (Turn power supply OFF and ON again). If this error occurs frequently, there is a possibility of internal problems.
10	The instrument detected a power outage during the staining process and performed a restart of automatic operation. This error code will also occur if the power switch is turned OFF during the staining process.
11	During automatic operation, the restart process could not be carried out after restoration of power.
118 218 318	Motor drive was turned OFF since no rotation was detected during normal movement.
128 228 328	Motor drive was turned OFF during return of carrier to the original position. No movement resulted due to external force or an obstacle. NOTE: After removal of the obstacle, turn the power supply ON again). If operation is not obtained, an internal problem may have occurred.
136 236 336	The carrier movement exceeds its limit (during return to the original position), or the original position sensor signal was not generated.
103 203 303	The carrier attempted to move to a position without success.
Other Codes	If other codes are displayed, internal problems are possible.

Operator Troubleshooting

If an error or problem cannot be cleared after use of the following check list, contact Sakura Finetek USA Inc.

No display. Instrument is not actuated.	1. Is the power supply lamp illuminated? 2. Is the power supply cord properly connected? 3. Are other electrical appliances functional?
No water is supplied.	1. Is the flow regulating valve closed? 2. Is the main tap water faucet closed? 3. Is the water supply hose connected? 4. Is any noise made when the wash stations are turned ON/OFF using MANUAL control? If nothing changes after checking the above points, contact the manufacturer with information on the problem.
Insufficient cleaning because of insufficient water supply to washing stations after wash is turned on.	1. Has the flow rate been adjusted? If the supply time is still too short after external adjustment, contact the distributor since an internal switch change may be required. (The water supply time after washing is factory set for one minute.)
Water stays in the instrument without being drained off.	1. Is the drain hose crimped? 2. Is the instrument drain port clogged? 3. Is the drain hose position higher than the bottom of the tray?
An error code occurs during staining or when the power is turned ON.	Refer to the Error Code List.
Edited Solution List and Staining Program are not displayed.	1. Is the [Low Battery Voltage] warning displayed? Contact the manufacturer; the internal memory back-up may need replacement.
Water leaks.	1. Are the connecting hoses for water supply and drainage properly connected?



Staining Program Examples

Step	Station	Solution	Con	Time
1	1	Xylene		5 min.
2	2	Xylene		1 min.
3	3	Abs. Etoh		30 sec.
4	4	Abs. Etoh		30 sec.
5	5	Etoh	95%	30 sec.
6	Wash	Water		2 min.
7	12	Di-Water		30 sec.
8	18	Hematoxylin		2.5 min.
9	Wash	Water		1 min.
10	6	HCL/Etoh	0.5%	5 sec.
11	Wash	Water		2 min.
12	12	Di-Water		2 min.
13	11	Etoh	95%	10 sec.
14	17	Etoh	95%	10 sec.
15	16	Eosin Y		1 min.
16	10	Etoh	95%	30 sec.
17	9	Etoh	95%	30 sec.
18	15	Abs. Etoh		30 sec.
19	14	Abs. Etoh		30 sec.
20	8	Xylene		1 min.
21	7	Xylene		1 min.
22	13	Xylene		1 min.

Note: *Alternatively you may use Gills #3 Hematoxylin for 1.5 minutes (90 seconds)*

Results: *Nuceli - Blue Cytoplasm - varying shades of pink-orange RBCs - Red.*

Service and Replacement Parts

To avoid problems which could arise during operation of the Sakura DRS-601 Automatic Slide Stainer, carefully read and follow the instructions in this manual

If a mechanical problem cannot be solved and an instrument failure is apparent, contact Sakura Customer Service at (310) 539-5441 or contact your Sakura Regional Sales Specialist. To order accessory items or parts, contact your Baxter Scientific Products Sales Representative.

Before calling for instrument service, collect the information stated in the following Pre-Service Checklist. This information will help the Customer Service Representative identify the probable cause of your instrument malfunction.

Serial Number: _____

Date of Installation: _____

Model Number: _____

1. Is the power cord plugged into the receptacle?
2. When the Power Switch is turned on, is the Display Panel illuminated and are the Mode lights lit?
3. Has the line fuse been checked and replaced if defective?
4. What Error Code(s), if any, are indicated on the Control Panel?
5. Are all the lids removed from the staining reservoirs?
6. Are all the staining reservoirs "seated" properly?
7. In the event of drainage problems, is the drain hose kinked or blocked in any way?
Is the drain hose lower than the instrument?
8. Was the staining cycle interrupted for any reason after Start had been pushed?
9. Was there a power failure during operation?

Accessory Items

Description	Sakura Product Code	Baxter Catalog Code
DE-3 Fume Hood	2202	S7641-2
Staining Reservoirs (Plastic)	2203	S7641-3
Slide Carrier (20 Slide Capacity) Package/10	2204	S7640-15
Activated Carbon Filter	2008	S7640-12
Lid, Stain Reservoir	2205	S7640-16

Manufacturer's Warranty

Sakura Finetek U. S. A., Inc. warrants to the original owner that this instrument is free of defects in materials and workmanship for a period of one (1) year from the date of purchase. Sakura Finetek U. S. A., Inc. will at its discretion, replace the instrument or provide, without charge to the customer, parts and labor necessary to repair the instrument.

This warranty is subject to the following exceptions and limitations:

1. A 90 day warranty only be extended for consumable parts and/or accessories.
2. This warranty does not cover damage which occurs in transit or damage which results from alteration, accident, misuse or abuse. Damage caused while the instrument is in the possession of the customer not resulting from defects in materials or workmanship, or damage caused by accident or tampering with this product, or by other than normal use or defects or damage resulting from repairs performed during the warranty period by service personnel other than authorized service personnel are not covered by this warranty.
3. Sakura Finetek U. S. A., Inc. reserves the right to make changes in the design of the instrument and is without obligation to incorporate such changes into previously manufactured instruments.

Disclaimer of Warranties

THIS WARRANTY IS EXPRESSLY MADE IN LIEU OF ANY AND ALL OTHER WARRANTIES EXPRESSED OR IMPLIED INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR USE.

Limitation of Liability

In no event shall Sakura Finetek U. S. A., Inc. be liable for indirect, special or consequential damages, even if Sakura Finetek U. S. A., Inc. has been advised of the possibility of such damages.

For warranty service, purchaser must contact the Customer Service Department by calling (310) 539-5441 for assistance and/or instructions for obtaining repair of this instrument.