SAKURA®

Tissue-Tek® DRS 2000

Automatic Slide Stainer

Operating Manual

IMPORTANT NOTICE

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Manufactured for:
Sakura Finetek U.S.A., Inc., Torrance, CA 90501 U.S.A.
Sakura Finetek Japan Co., Ltd., Tokyo, 103-0023, Japan
Sakura Finetek Europe B.V., /5-1 > S >imebk ^^k abk Ofgk) K I

Made in Japan

0000030-01 Rev.E

TABLE OF CONTENTS

INTRODUCTION

Section 1

General Description

The Tissue-Tek® DRS™ 2000 Automatic Slide Stainer is an automated, random-access stainer which carries out multiple staining protocols simultaneously . The DRS 2000 (Fig 1-1) features a two-level design which ef ficiently moves slides to various solutions for optimal performance.

The DRS 2000 software is programmable for up to twenty different staining methods, accommodating routine H & E, gyn, non-gyn, and a variety of special stains or any other user-defined protocol. The operator can program the instrument to begin staining in either a batch or continuous mode. The batch mode does not allow another process run to start until the previous run has finished. In continuous operation, the user may add basket sets in a random-access mode, maximizing efficiency and throughput.

The DRS 2000 consists of four major components:

- **the control panel**, through which all operations are controlled
- **two-levels of solution reservoirs** including wash stations and one dryer station located on the lower level
- **the robotic arm**, which is the transport mechanism for the slide baskets
- **fume control system**, which uses an activated carbon filter, for ef fectively removing harmful vapors from inside the instrument

To begin a staining process, the operator places up to two slide baskets into a designated start station located on the lower portion of the instrument. Either a batch or continuous mode and the desired method may be selected. The robotic arm picks up the basket set and sequentially moves the baskets to the programmed stations. In the continuous mode, as new baskets are added, the robotic arm will pick up these additional baskets and move them to their programmed stations accordingly. The closed-system design, along with the ventilation system, ensure an essentially fume-free environment outside of the DRS 2000.

Figure 1-1
Front view of the DRS™ 2000
(cover closed)

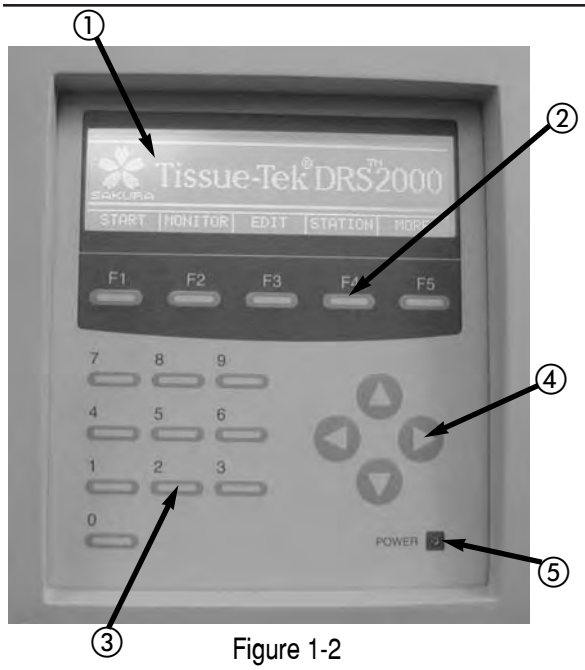


Figure 1-2

Physical Characteristics

Control Panel (Figure 1-2)

The control panel contains the screen display ① and the keypad which the operator uses to communicate with the instrument software. The keypad consists of five function keys ②, numeric keys ③, arrow keys ④, and a power ON indicator ⑤. The online display of fers the operator visual information about the status of current operations.

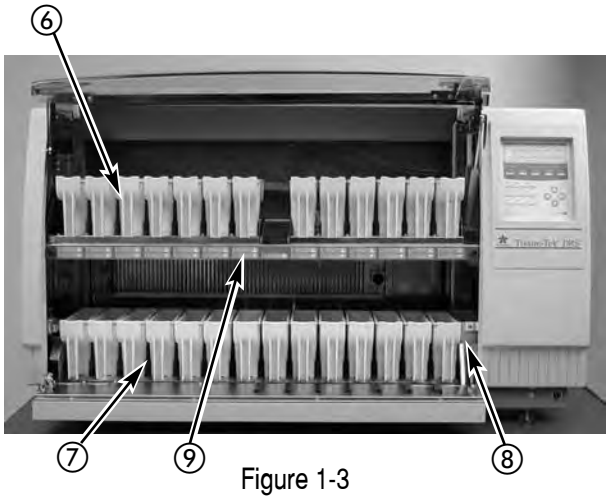


Figure 1-3

Reagent Reservoir Compartment (Figure 1-3)

The reagent reservoirs are arranged on a two-level design. There are thirteen reservoirs positioned on the upper level ⑥ and fourteen on the lower level ⑦, plus one drying station ⑧. The lower level accommodates all wash, start, and end stations. A maximum of five and a minimum of two wash stations can be used at one time, depending on the desired set-up. One or two start stations and up to three end stations may be set as desired. Each reservoir has an individual lid and handle for ease of filling and transporting. The reagent capacity is 650 mL; however , two lines molded on the inside of the reservoirs designate either 650 mL or 620 mL. The minimum volume of solution needed for two full slide baskets is 620 mL. Numbers located on the platform dividing the levels identify the appropriate stations ⑨.

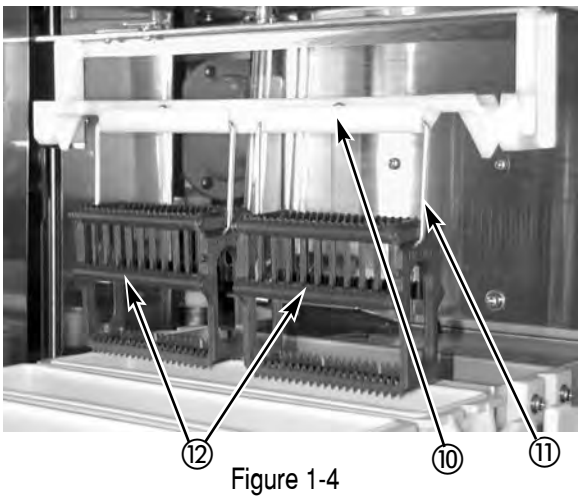


Figure 1-4

Robotic Arm (Figure 1-4)

The robotic arm can accommodate up to two baskets ⑫ of twenty slides each, at one time. Each basket is secured on an adapter ⑩ by a metal hook ⑪. The function of the robotic arm is to move slide baskets to specific stations based on the user-defined programs. The arm moves on an x and z axis and ef ficiently carries baskets to the programmed stations.

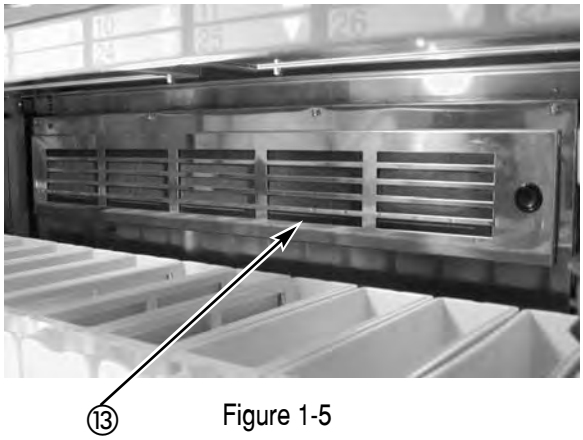


Figure 1-5

Fume Control (Figure 1-5)

The activated carbon filter is part of an ef fective fume control system ⑬. As air circulates throughout the inside of the instrument, fumes generated from various solutions are captured and extracted by the carbon filter . The fume control housing can be accessed through the lower level of the instrument, behind the reagent reservoirs. A gasket and protective cover secures the filter and provides adequate venting of fumes. It is recommended that the carbon filter be replaced after two weeks with routine operation of the stainer.

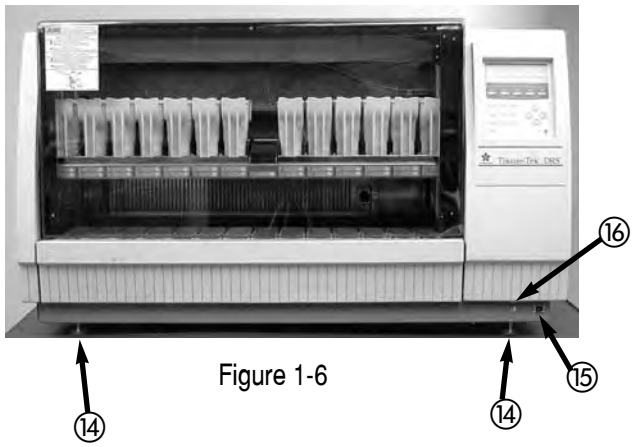


Figure 1-6

Leveling Feet/Casters (Figure 1-6)

The DRS 2000 has four adjustable feet ⑭ at each corner of the instrument to ensure proper leveling. Using two people, gently tilt the instrument onto one side and rotate the leveling caster clockwise to decrease the height of the instrument and counterclockwise to increase the height. Check all leveling casters to ensure proper positioning of the instrument.

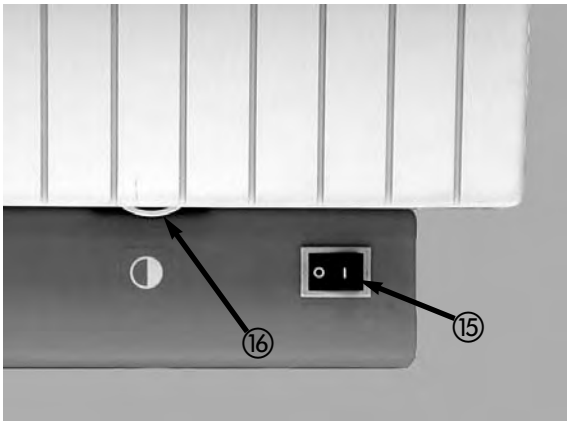


Figure 1-7

Power Switch (Figure 1-6, Figure 1-7)

The power switch ⑮ is located on the lower , right side of the instrument. When the switch is moved to the ON position the green light on the display panel is illuminated.

Brightness/Contrast Dial (Figure 1-6, Figure 1-7)

This dial ⑯ controls the brightness and the contrast of the control panel screen.

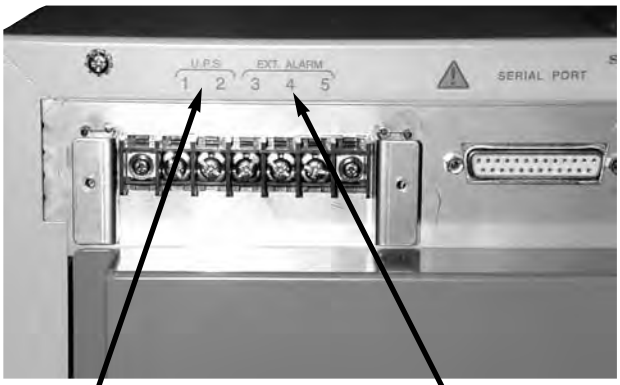


Figure 1-8

External Connection Terminals (Figure 1-8)

The DRS 2000 has the ability to be connected to an uninterruptible power supply unit (UPS) ⑰ and/or an external alarm device ⑱ (Not supplied with the instrument). See page 2.7 for a description of installation procedures.

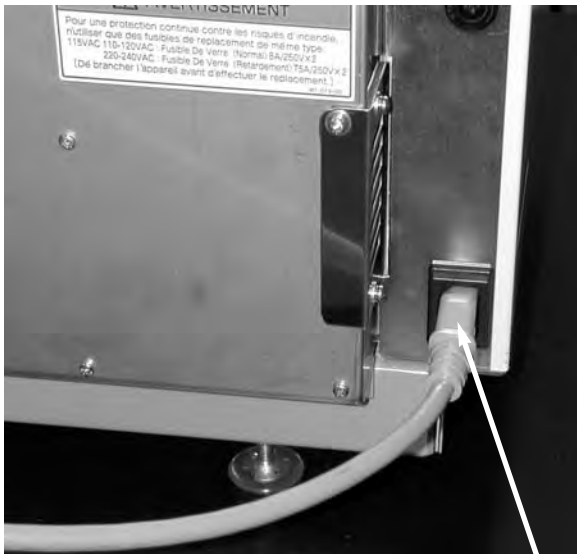


Figure 1-9

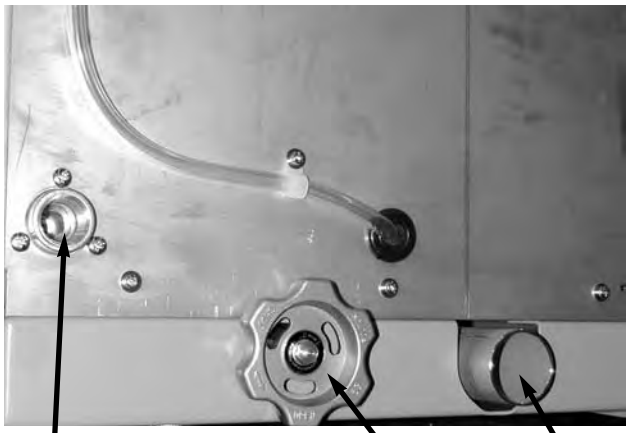


Figure 1-10

Rear of Instrument (Figure 1-9, Figure 1-10)

The rear of the DRS 2000 shows the inlet for the power cord ⑲ on the bottom, right-hand side of the instrument (1-9). The other end of the cord attaches to an appropriate AC electrical outlet. The water supply port ⑳ and the water supply adjustment valve ㉑ are both located on the left-hand side of the instrument (Fig. 1-10). The adjustment valve is used to increase or decrease the pressure of the water flowing to the instrument. The drain hose port ㉒ allows for suf ficient draining of the DRS. A water supply hose and drain hose are provided in the accessories for initial setup.

Principles of Operation

The DRS 2000 is an automated slide stainer designed for use in both the histology and cytology laboratories. Its operations include staining of tissue sections mounted on glass slides, frozen specimens, and cellular specimens, either non-gynecological or gynecological.

A microprocessor is responsible for controlling the movement of the robotic arm. It carries the slide baskets to the appropriate stations, designated by the programs saved in memory.

Twenty user-defined programs, performing up to fifty steps each, can be set and stored in memory. The operator also has the flexibility of creating user-defined names for both solution and stain methods to personalize all staining operations.

The staining operations can be performed in either a batch or continuous mode.

In a continuous mode of operation, the user has the ability to program one of three options at each station for optimum accuracy.

Exact [●]**:** Staining time for that step will be performed exactly as programmed.

Delta [▲]**:** Staining time may be extended to some degree but no more than 20% longer than the programmed time.

Infinite [∞]**:** Staining time for that step may be extended indefinitely.

The above accuracy settings allow the software to determine time critical steps and move baskets as efficiently as possible. Consistent stain quality results from this flexibility. Each station can also be individually set for agitation. Agitation is referred to as a gentle up and down movement of the robotic arm in a reagent reservoir . (Under the utilities function, speed, frequency , and amplitude of agitation can be selected). The [MIX+] key enables the operator to set the agitation ON or OFF for each station. The user can also choose an enhanced wash option at any station. An enhanced wash can be set to avoid excess staining after a high concentration solution is used. These key features enable the user to edit a program to best meet their individual staining needs.

The solution, wash, start, and end stations can be configured in various arrangements. However , start, end, and wash stations may only be set on the lower level of the instrument. A dryer , fixed at the lower , right corner of the instrument, can be set at the desired temperature in order to dry slides and remove residual paraf fin prior to staining. Upon completion of staining methods, the operator is alerted by an audible alarm to remove the baskets from the end station(s).

Safety Features

- The DRS 2000 is designed to ef fectively remove fumes generated from harmful solutions. It uses an activated carbon filter to purify the air that it releases from within the instrument.
- Access to the upper level of the stainer is prohibited during staining by the instrument cover . If the cover is opened during operation, the audible alarm sounds and a message appears to close the cover. This protects the operator and the robotic arm from potential harm.
- The instrument contains an alarm that sounds whenever there is an error condition that stops or interrupts operation.
- The instrument will alert the operator with an audible alarm when any of the end stations are full and the next basket is waiting to complete its run.
- The DRS 2000 software contains various messages that inform the user of its current status.
- If a solution has exceeded its use limit, a message will appear to inform the user to change the solution(s) after all staining runs are completed.

Specifications

Power Required:

North America
Model Number: 4929 115 VAC ±10%, 5.0 amps, 60 Hz

Europe
Model Number: 4930 220/240 VAC ±10%, 0.3 amps, 50/60 Hz
4931 220/240 VAC ±10%, 2.5 amps, 50/60 Hz (with dryer)

Dimensions:

Width—115.0 cm (45 in.)
Height—66.0 cm (26 in.)
Depth— 49.0 cm (19 in.)

Weight:

101 kgs (223 lbs)

Operating Conditions:

Temperature — 10° C to 40° C (50° F to 104° F)
Relative Humidity — 30% to 85% (noncondensing)
Atmospheric Pressure — 70 to 106 KPa
(10.15 to 15.37 psi)

Capacity/Fill Volumes:

Solution Reservoirs (total) — (26)
Wash Reservoirs — (5)
Dryer Stations — (1)
Fill level/solution reservoirs — 620 - 650 mL

Batch Operation:

Up to 40 glass slides in two baskets
(2 baskets = 1 basket set)

Continuous Operation:

Basket sets can be continually loaded on demand as the start station(s) are available for loading.

Programs/Methods:

Up to 20 programs can be stored in memory
Up to 50 steps can be programmed for each method

Solution Names:

Up to 100 solution names can be stored in memory

Staining Method Names:

Up to 50 staining method names can be stored in memory

Facilities:

Water Supply: Tap water
Water Pressure:
Dynamic Pressure: 0.098 to 0.441 MPa
(approx 1.0 to 4.5 kgf/ cm^2)
Max. Static Pressure: 0.833 MPa
(8.5 kgf/ cm^2)
Water Temperature:
Less than 30°C (86° F) [not freezing]
Drain Type:
Method — Gravity drain
Capacity — More than 15 liters (3.96 gal)/minute

Safety Standards:

Complies with: UL 3101-1, 1st ed.
CAN/CSA-C22.2 No. 1010.1-92
EN 61010-1:93- A1:92 + A2:95
European standards for CE Marking.

INSTALLATION

Section 2

General Information

This section provides information on selecting a proper location, unpacking, and installing the T issue-Tek® DRS™ 2000 Automatic Slide Stainer . A T issue-Tek® instrument representative or a certified Biomedical Equipment Technician should perform the installation. The instrument must be installed correctly to ensure proper operation and service. Read this complete Operating Manual before attempting to operate the instrument. Follow all instructions carefully.

The DRS 2000 is a precision instrument and must be handled accordingly. Rough handling or dropping of the instrument will disturb or damage internal components. Always handle the instrument with care.

Environmental Factors

Environmental factors influence the selection of a proper location for the DRS 2000. As with all sensitive electronic instruments, prolonged exposure to excessive humidity and temperature should be avoided. T emperature and humidity should be held relatively constant to obtain the highest degree of operating stability. The ambient temperature range for operating the instrument is 10° C to 40° C (50° F to 104° F). The ambient operating humidity range is between 30% to 85% relative humidity.

Locate the instrument in a well-ventilated area, avoiding exposure to corrosive vapors or temperature extremes. Avoid proximity to direct sunlight, open windows, ovens, open flames, hot plates, radiators, and dry ice baths. A void proximity to any instrument that consumes a high voltage or large current, including large refrigerators and ovens. The bench must have a firm level surface capable of supporting at least 130 kgs (287 lbs.) of weight. Be sure the instrument will be located near a power source that meets the electrical requirements (voltage and amperage) specified on the rating label located on the rear of the instrument. The power receptacle must be grounded and should be a clean, noise-free, dedicated line. The water supply port is located on the back of the instrument at the lower left corner . The location of the DRS 2000 should be positioned to the left of the external water source making certain the water supply hose can be properly connected to the instrument and external water supply.

Unpacking

1. Unpack the instrument by removing the large nails along the bottom of the shipper , then lift the shipper of f the pallet. Remove all unpacking materials and accessory boxes prior to moving the instrument off the wooden base.

   CAUTION: The instrument is very heavy and large; therefore, it is strongly recommended that it be lifted and transported by *at least* two people.

2. After the instrument is unpacked, it is suggested that the power cord, water supply hose, and drain hose be secured at the rear of the instrument before placing on a bench or counter top. (Refer to page 2.5, Instrument Setup, for detailed instructions).

3. ***Carefully*** lift it into place on a firm, level surface in the designated work area. Be sure that each leveling foot fully contacts the benchtop and that each foot has been properly adjusted insuring that the instrument is level. Turning the height adjustment feet clockwise will lower the level and turning the feet counterclockwise will increase the level of the instrument.

   WARNING: PLACE THE INSTRUMENT IN A WELL VENTILATED AREA.

4. Remove all packing material from inside the instrument. Make certain that all styrofoam is removed from around the base of the robotic arm. (Refer to page 2.6, Step 5., for instructions on removing the bracket from the robotic arm).

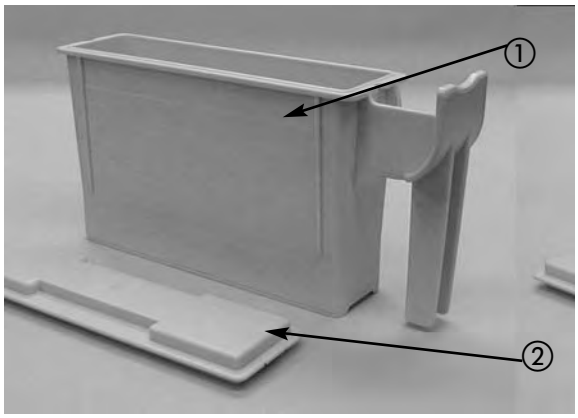
5. The accessory box includes all items necessary for routine operation. Please verify that all of the following accessories are included with the instrument. Refer to the next two pages for a photo of each accessory.

   - Reagent reservoirs — 26
   - Wash reservoirs — 5
   - Reagent trays (for upper level) — 2
   - Reagent tray (for lower level) — 1
   - Wash reservoir grommets — 10 (5 installed)
   - Wash station plug — 3 (2 installed)
   - Wash nozzle — 5 (3 installed)
   - Reservoir lids — 26
   - Lid for drying station — 1
   - Slide baskets — 6
   - Basket hooks — 6
   - Basket adapters — 3
   - Drain hose — 1
   - Drain hose clamp — 1
   - Drain elbow assembly— 1
     (includes drain elbow, connecting hose, and two connecting hose clamps)
   - Water supply hose set — 1
     (includes drain hose, washer/filter, and washer)
   - Activated carbon cartridge filter — 1
   - Filter gasket and metal cover — 1 each
   - Fuse — 1
   - Power cord — 1
   - Labels (Start, End, and PE)
   - Operating Manual — 1
     (including Warranty Registration Card — U.S. customers only)

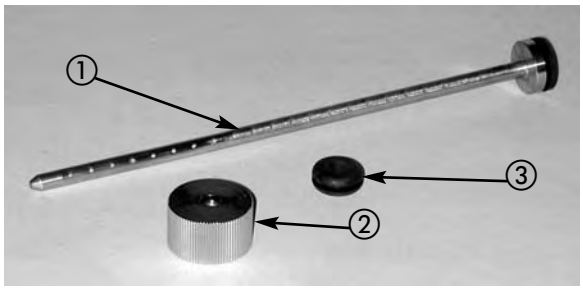
If any of these items are missing, contact your Customer/Product Support Representative at Sakura Finetek at (800) 725-8723.

If there is any visible shipping damage to the instrument or any item, immediately file a complaint with the carrier , then notify Sakura directly.

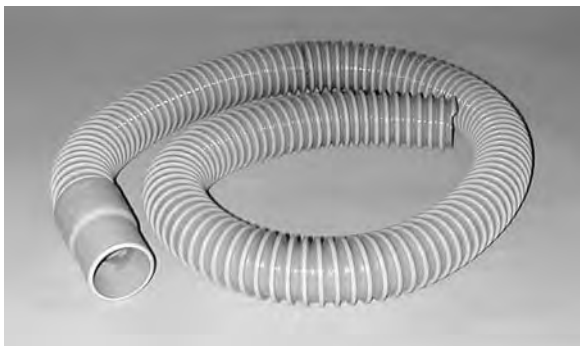
Accessories



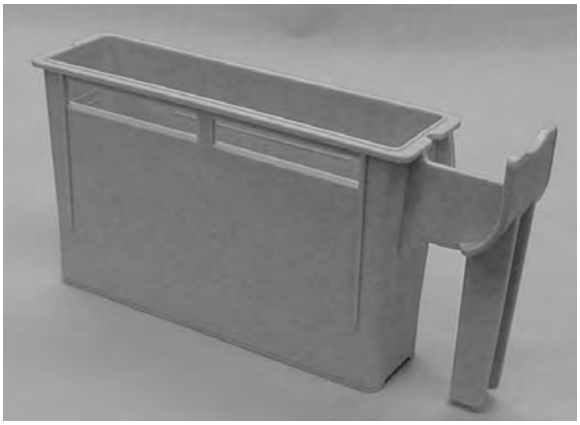
① Reagent Reservoir - 26
② Reagent Reservoir Lid - 26



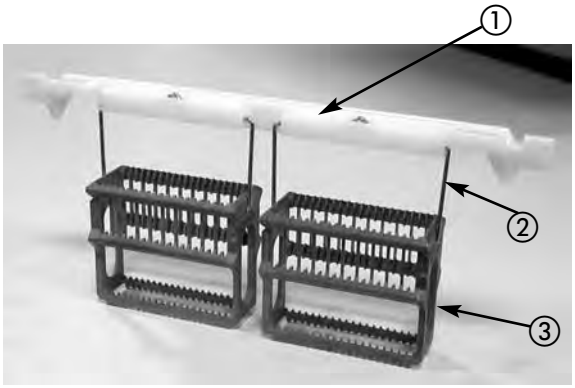
① Wash Nozzle - 5
② Wash Cap - 3
③ Wash Reservoir Grommet - 10



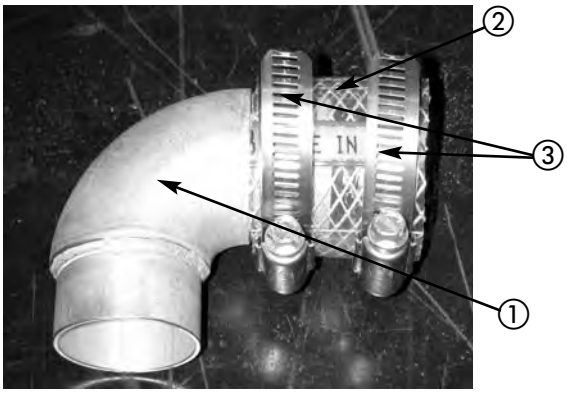
Drain Hose - 1



Wash Reservoir - 5



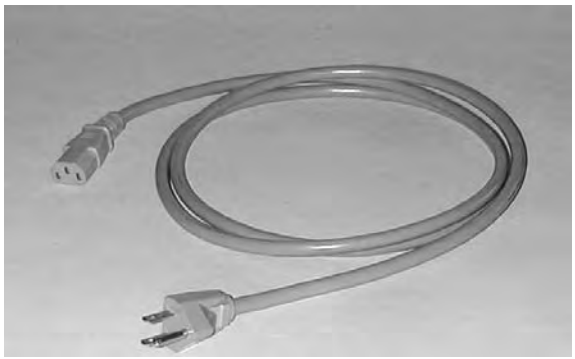
① Basket Adapter - 3
② Basket Hook - 6
③ Slide Basket - 6



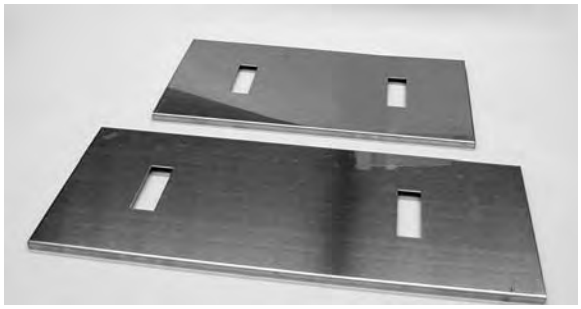
Drain Elbow Assembly
① Drain Elbow
② Connecting Hose
③ Connecting Hose Clamps

INSTALLATION

Water Supply Hose Set -1
(includes drain hose, washer/filter, and washer)



Power Cord - 1

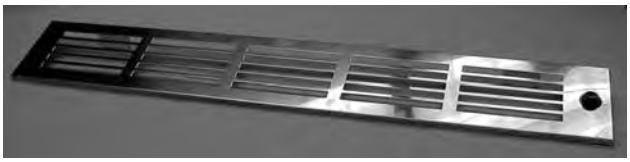


Reagent Trays (for upper level) - 2

Reagent Tray (for lower level) - 1

Activated Carbon Filter Cartridge -1

Filter Gasket for Carbon Cartridge - 1



Metal Cover for Carbon Cartridge -1

Drain Hose Clamp - 1

Instrument Setup

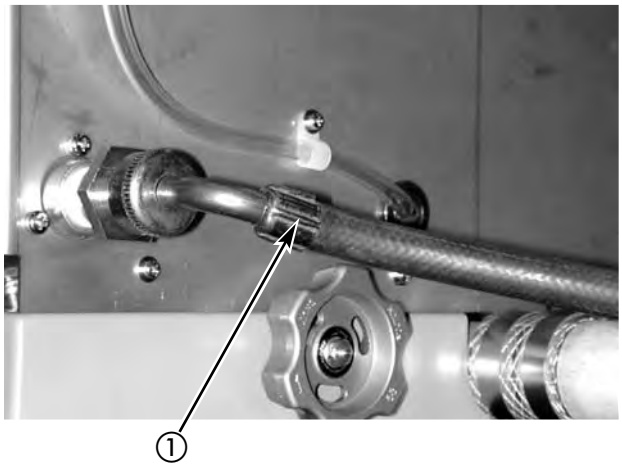
For ease of installation, the power cord, water supply hose, and drain hose should be secured at the rear of the instrument prior to placing on a bench or countertop.

CAUTION: The robotic arm is secured at the lower left side of the instrument by a metal bracket and must be removed before turning on power.

1. Locate the serial number label found on the left side of the instrument, next to the power cord. Write the installation date and instrument serial number on the Warranty Registration Card found in the front section of this manual. Completely fill out the Warranty Registration Card and mail it back to Sakura for registration. The warranty is valid from 1 year after the date of installation.
2. Before attaching the water supply hose ① to the instrument, place the plain washer in the curved end of the hose and place the screen washer (screen first) in the straight end of the water supply hose. Next, connect the preassembled water supply fitting to the instrument, which is located at the rear, left side of the unit. The water supply hose may now be placed on the fitting and secured. The other end of the hose should be securely fixed to a faucet or water source at the customer location.

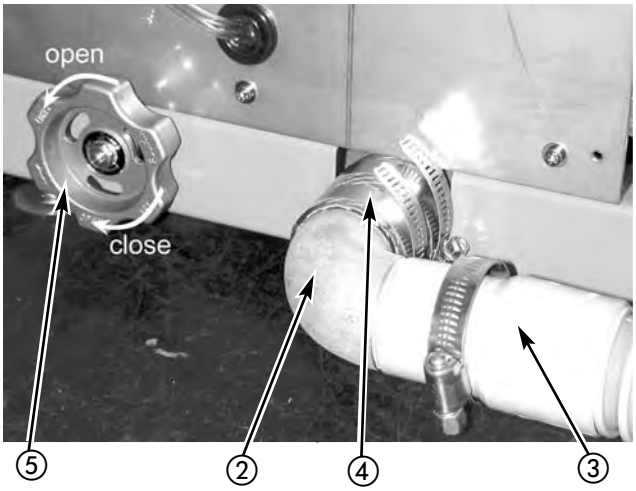
   CAUTION: When installing the water supply hose, make sure it is securely connected to the instrument and the faucet. Failure to do so may allow water pressure to loosen the connection and cause overflow.

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



3. To install the drain hose, place the drain hose assembly ② onto the drain port and tighten the connecting hose clamps to ensure hose clamps ④ are properly seated. Next, the drain hose ③ can be attached to the drain hose assembly ensuring the clamped end of the hose attaches to the elbow. Tighten the clamp by using a phillips screwdriver. The other end of the drain hose should be routed to a floor or sink drain which is capable of draining at a rate of 15 liters (or 4 gallons) per minute.

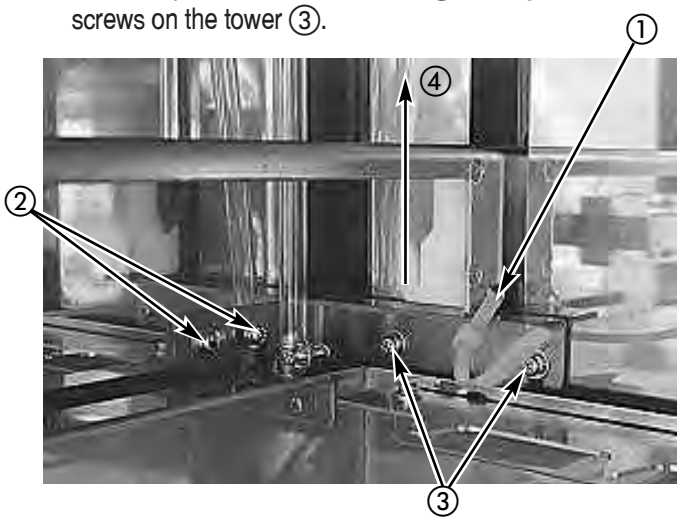
   CAUTION: Make sure that the entire length of the drain hose is lower than the instrument drain port. It should be straight and not twisted or looped. Do not extend the drain hose by coupling it with another hose. The end of the drain hose should be at least 4 inches (100 mm) or higher from the water surface in the floor or sink drain.



4. In order for water to begin flowing to the wash reservoirs, the water supply knob ⑤ must be opened. Turning the knob counterclockwise will open the valve and clockwise will close the valve. When adjusting the water flow for the first time, please follow the guidelines below:

Number of wash stations used	Number of turns
5	3 turns
4	2 turns
3	1/2 turn
2	1/4 turn

5. To release the robotic arm, cut the tie wrap and gently raise the arm ①. Completely remove the two screws securing the bracket to the left wall ②. Next, loosen the two screws securing the bracket to the tower ③. Lift the bracket upward then remove it ④. Retighten the two screws on the tower ③.



6. The three metal trays enclosed in the accessory box fit securely on both the right and left side of the upper level and along the lower level. When installing the tray on the lower level, insert it below the protruding wash nozzles with the black plastic arrows facing toward you. These trays ensure the proper placement of the solution reservoirs. Insert them so that the edges are facing down.
7. The activated carbon cartridge, filter gasket, and metal cover can be installed in the lower , rear section of the DRS 2000. Make sure that the robotic arm is positioned all the way to the right of the instrument over station 27. Release the metal cover in the rear of the unit by pressing the black button on the right. The carbon cartridge can be installed, making sure that the filter gasket is placed onto the filter housing first, then the filter and the metal cover last. To secure in place, put the left end of the filter and metal cover in first, then secure the right side by pressing on the black button.
8. The solution reservoirs may be placed in the upper and lower sections of the instrument. The wash reservoirs are pre-set on the lower level. To change a wash station to/from a solution station, please refer to Section 3, page 3.3. Check to be sure all reservoirs are properly seated. Labels on the upper level designate each station number. Start and end labels are included in the accessory box and should be placed on the lower , inside door once all start/end stations have been determined.
9. The solution reservoirs can now be filled with the desired reagents. A molded line on the inside of each container designates the proper fill level. The lower line (620 mL) can be used as a fill line if two baskets of forty slides will always be run. The higher line designates 650 mL and should be used to ensure adequate solution levels if only one basket is usually run.
10. If the power cord is not already attached, plug the instrument power cord into the DRS, located on the rear , lower right corner of the instrument and the other end into a dedicated, grounded electrical power source of the proper voltage and amperage.
11. Move the power switch, located at the bottom right side below the keypad, to the ON position. A small green light on the control panel will illuminate. W ater is introduced into the instrument for one minute upon power up if the water supply hose is properly attached to the instrument external water source, and if the water flow adjustment valve is in the open position.

    NOTE: If water is leaking, close the faucet and the valve and verify the connections again.
12. The screen on the control panel will display the initial Main Menu screen.

Main Menu Screen

External Connection Terminals and Options

If desired, the DRS 2000 may be connected to an uninterruptible power supply unit and to an external alarm device, (not supplied with instrument).

1. Connection to an uninterrupted power supply unit (UPS)

To connect the UPS unit, connect the power failure input terminals of the instrument to the output terminals of the UPS using a biaxial cable (20 A WG, approximately 3 meters in length). Next, plug the instrument power cord into the power output receptacle of the UPS. Turn on the instrument power switch, and then change the [UPS Connect] default in the System Setup screen from [NO] to [YES].

When the instrument detects a power failure signal coming from the UPS, it operates as follows:

- The instrument will continue normal operation for 5 minutes after receipt of the power failure signal; however, the heater of the drying station will be disabled.
- If power is restored within 5 minutes, the instrument will continue normal operation. The drying station will then be operational again.
- If the power failure continues over 5 minutes, the instrument will stop operation while all basket sets are immersed in their respective stations.

The UPS should have the following specifications:

- Back-up capacity: 200 VA, more than 10 minutes
- Power failure output terminal: Non-voltage relay output, or open collector transistor output
  During power on: Short signal
  During power off: Open signal

2. Connection to an External Alarm Device

If an operational error occurs, the instrument sends an alarm signal to an external alarm device through the external alarm output terminals. The external alarm device connected to these terminals must be able to meet the following specifications:

- The external alarm device must have its own power source
- Rated voltage: 30 Vrms., less then 60VDC (24VDC is recommended)
- Rated current: more than 10mA, less than 1A
- Connecting cable: Biaxial cable, approx. 10 meters in length, 20 AWG
- Output terminal structure: Non-voltage relay (C contact)

The instrument can transmit the following error signals to the external alarm device:

ERROR NO. 1	[System Error]
ERROR NO. 2	[Power Failure]
ERROR NO. 3	[Memory Error]
ERROR NO. 10	[WARNING: Close the cover. Pressing exit will abort all runs. Press resume to continue staining.]
ERROR NO. 11	[Robotic arm does not work normally . Refer to the manual.]

Status of output terminal circuit:

Terminal	Normal Condition	Error Output Conditions
3-4	Short	Open
3-5	Open	Short

3. Duct Connection Adapter (optional)

The optional duct connection adapter (part number A-AK23-0631-01) is designed to connect the instrument to an external air duct in order to exhaust the fumes. The outer diameter of the adapter is 38 mm.

If the duct from the instrument to the air connection adapter and the air duct is used, a ventilation fan can be installed, which is external to the instrument, for more effective fume control in the laboratory.

Precautions

There are several precautions that must be observed before operating this instrument.

1. Check the fill level of each solution reservoir to ensure the specified volumes. Overfilling the reservoirs may cause an overflow and too little solution volume may be insufficient for adequate staining.
2. Check that the water supply and drain hose are properly attached. The water supply hose should be securely connected to the water supply port on the rear, left side of the instrument and the faucet connection at the sink. The drain hose should be connected to the instrument at the rear, left side and checked to be sure it is draining properly. If the drain hose is not installed correctly , water may overflow inside the instrument.

   Verify the following:

   — the full length of the drain hose should be lower than the drain port

   — the drain hose should be straight, not twisted

   — the end of the drain hose should be at least **4** inches or higher from any fluid surface in the sink or drain
3. Check to be certain that the bracket, securing the robotic arm is removed and the arm can move freely throughout the instrument.

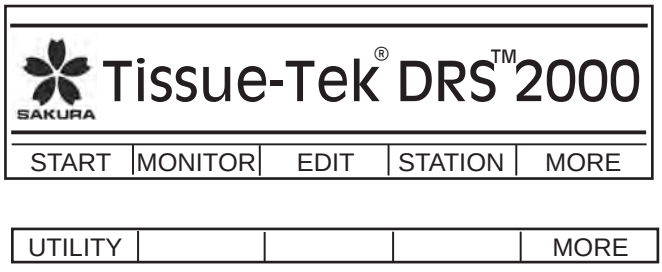
General Information

The Tissue-Tek® DRS™ 2000 Automatic Slide Stainer contains software that can be customized for the routine work and procedures performed in the laboratory . This section explains the various operating modes and provides information on customizing the software. Many of the procedures in this section will be used upon initial installation. However , detailed information on the progression of screen displays and prompts is given here; therefore, this section should be read thoroughly before beginning routine operation. Once you are familiar with this information, Section 4, Routine Operations, can be used as a quick reference guide for everyday use.

When the DRS 2000 instrument is first turned on, the Main Menu is displayed. The Main Menu screen is the central screen from which all set up, programming, and utility functions are accessed. T wo groups of functions are accessed through the Main Menu. Pressing the [MORE] key allows the operator to access both groups.

The [START] function key accesses the Start Process screen, which allows the user to select a method and begin staining. Once the method has started, the Process Monitor screen appears on the display , which indicates where each basket set is located. The [MONIT OR] key cannot be activated from the Main Menu screen unless the instrument is actively staining. The [EDIT] key accesses the Staining Method List screen. Through this screen, names can be added/deleted and methods can be programmed. The [STATION] key allows the operator to choose user-defined and/or factory set solutions. In this screen, the user can verify or modify the solution names and verify or reset the solution usage counters. Pressing [MORE] accesses the second group of functions.

The only function keys on the second group of keys are the [UTILITY] and the [EXIT] key . The [UTILITY] key accesses the Utility Function Selection screen, where the instrument default parameters can be changed and the error records can be checked. It also enables the operator to set up the solution configuration from the Station Configuration screen. When pressed, the [MORE] key will return again to the first set of functions.



Main Menu Screen

Station Configuration

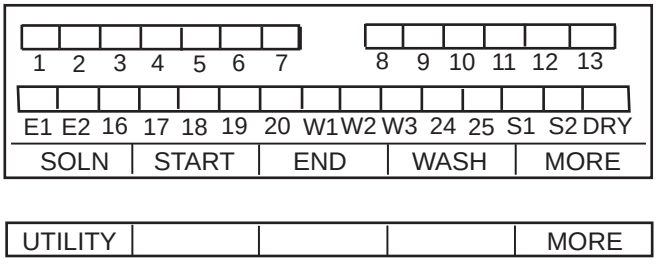
The Station Configuration screen allows the operator to set all solution, wash, start, and end stations, including the programmed end. The programmed end station is a user-defined end station which may be set on the lower level of the DRS 2000 and may be programmed at any station other than a wash station.

Setting a Start, End, Solution, or Wash Station

To set a Start, End, or Wash station:

1. Press the [MORE] function key from the Main Menu to access the [UTILITY] key. Then press the [UTILITY] key and the [SETUP] key to display the message, "INSTRUMENT SETUP."
2. Press the [STATION] key which will display the Station Configuration screen. The cursor will initially be on the station labeled "E" (end station) at station 14. The arrow keys on the keypad will move the cursor to any desired station location on the upper or lower level; however all start, end, and wash stations must be positioned on the lower level of the instrument.

If you would like to change the factory set positions in the station configuration, use the arrow keys to move to the desired station location and press the function key(s), [START], [END], [SOLN], [WASH], and/or [PGM END] to complete the solution arrangement. The [PGM END] key can be accessed by pressing the [MORE] key from the Station Configuration screen.



Station Configuration Screen

NOTE: The new configuration must be saved before exiting.

NOTE: Start and end stations S1 and E1 will always occupy the lower station number and S2 and E2 will occupy the higher station number. Default settings for start stations are S1 at station 26 and S2 at 27. Default settings for END stations are E1 at station 14 and E2 at 15.

NOTE: A minimum of one and a maximum of two start/end stations may be set. Start/end stations may only be set on the lower level.

NOTE: A minimum of two and a maximum of five wash stations may be set. If you want to reconfigure the wash stations, you must also do a hardware change in order to either convert a wash station to a solution station, or a solution station to a wash station. (Refer to page 3.3 for detailed instructions).

Setting a Programmed End Station

A programmed end (PE) station may be set on the lower level to allow the operator to set up a user-defined end station in addition to the fixed end station(s). The programmed end may be used for the purpose of running special stains and/or deparaffinizing.

To position a programmed end Station:

1. Press [MORE] to choose the programmed end from the Station Configuration screen. Use the arrow keys to select the desired station location and press [PGM END].

   NOTE: The programmed end does not need to be used; however, if you choose to edit a method with a programmed end station, it must first be set up in the Station Configuration screen. Once a PE station is set, that station cannot be used for anything other than a PE station.

2. After the desired configuration is achieved, press the [SAVE] function key. The station configuration will be saved in memory.

   The start/end and PE labels provided as an accessory item may be placed on the inside of the lower door accordingly.

The following section provides some corrective procedures and explains display messages pertaining to the station configuration process.

- If the station configuration is incomplete, a message will appear to alert you of an error so that you may modify the configuration.

  For instance, if there are no programmed wash stations, a display message will appear: "A MINIMUM OF TWO WASH STATIONS MUST BE PROGRAMMED ". Pressing the [EXIT] key will return you to the Station Configuration screen and allow you to verify and correct solution arrangement.

- If there are already edited staining programs in memory, and the new station configuration is incompatible with any of them, the following message will appear:

  "THE NEW SOLUTION CONFIGURATION IS INCOMPATIBLE WITH AT LEAST ONE EXISTING PROGRAM. PRESS EXIT TO RECONFIGURE, VERIFY TO VIEW OR DELETE TO DELETE THESE PROGRAMS."

3. Pressing [EXIT] will enable you to modify the existing station configuration, [VERIFY] allows you to view the staining programs which will be deleted and [DELETE] will delete those programs which are incompatible with an existing program. If the [DELETE] key is pressed, the station configuration is then replaced according to the modification. The display will return to the System Setup Selection screen.

Converting a wash station to/from a solution station

Once you have selected the desired station configuration, you may or may not need to make changes to remove the factory set wash stations. The wash stations are set at station positions 21, 22, and 23. Wash stations may only be set at station positions 21 to 27. A maximum of five and a minimum of two may be used at one time.

To transform a wash station to a solution station:

1. Remove the wash reservoir(s) from the lower level. Turning the wash cap counter-clockwise, remove the wash nozzle and gasket from the instrument. Replace the wash nozzle with a wash station plug, and secure the plug and gasket in place using the wash cap. Next, place a solution reservoir at that position.

To transform a solution station to wash station:

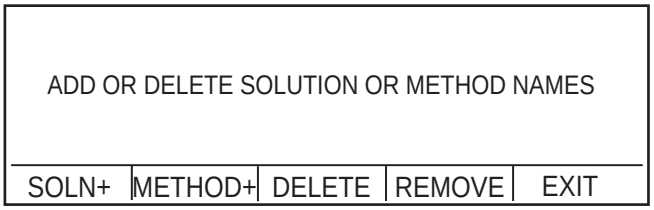
2. Follow the procedure in reverse order. Turning the wash cap counter-clockwise, remove the wash cap, wash station plug, and gasket. Replace the wash station plug with the nozzle and secure all items in place. Install a wash reservoir at this station.
3. Verify that the station configuration on the display monitor reflects the proper wash station positions.

Adding a Solution or Staining Method Name

This procedure allows you to create and enter user-defined solution or method names.

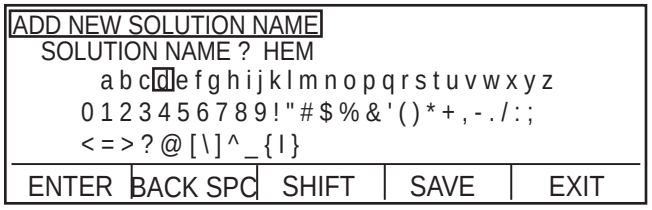
To edit a solution or method name:

1. From the Main Menu, press the [EDIT] key . Press the [MORE] key to access the second group of function keys. The [NAMES] key, will allow you to add or delete solution or method names.
2. Press the [NAMES] key to add a solution or method name.
3. Press [SOLN+] or [METHOD+] to edit names.



Name Creation Selection Screen

4. Select each character by using the arrow keys to move the cursor to the desired letter , number or symbol and press [ENTER]. The character will appear next to the Solution/Method name at the top of the display.



Solution Name Creation Screen

5. The [BACK SPC] key will delete the last character entered. The [SHIFT] key will convert the highlighted character to either upper or lowercase.

   NOTE: The space in front of the letter "a" is used to create a space in the text.
6. Press the [SAVE] key after all characters have been entered. The new solution or staining method name(s) are saved into memory and will be recalled when assigning solutions and editing programs. Pressing [EXIT] will return you to the Name Creation Selection screen and pressing [EXIT] sequentially will return you to the Main Menu.

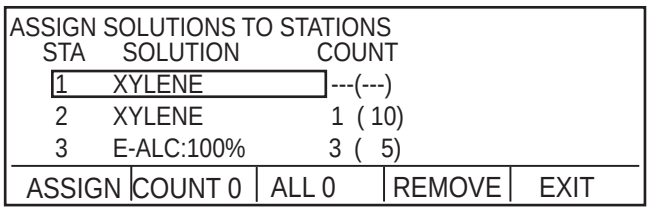
Deleting a Solution or Staining Method Name

To delete an unwanted solution or staining method name:

1. Press [DELETE] from the Name Creation screen. Next, press the [SOLN-] or [METHOD-] key relevant to the name(s) you wish to delete.
2. The display will either read, "DELETE SOLUTION NAME" or "DELETE METHOD NAME."
3. Using the up and down (▲ ▼) arrow keys, move the cursor to highlight the name(s) to be deleted and press the [DELETE] key. To confirm, press [YES] or [NO].
4. Pressing [EXIT] sequentially will return you to the Main Menu.

Assigning Solution Positions

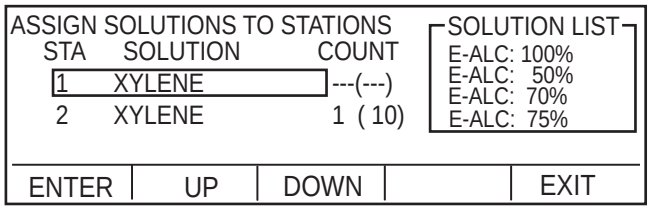
From the Solution Configuration screen, you can assign or modify solutions in the setup configuration. The solutions stored in memory, either user-defined or factory set, will be recalled when assigning solutions. You may also use this screen for solution management. The "COUNT" column in this display allows you to set the number of times you would like each station to be used. The first number under the count column identifies the "set" number. The number in parenthesis increases each time that specific solution is used. The instrument will keep track of the number of uses and will alert you when a station needs to be changed. This function can be on or off for each station. The symbol, "_ __" indicates this function is not being used at a given station.



Solution Configuration and Usage Count Screen

To set solution positions:

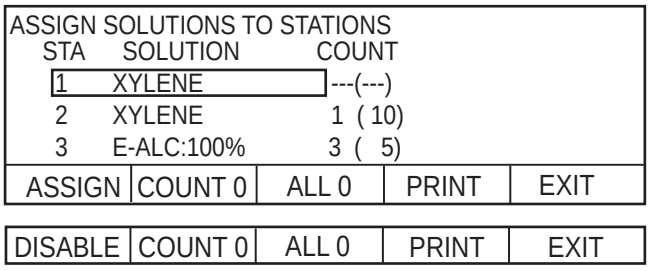
1. From the Main Menu, press the [ST ATION] key. The display will read, "ASSIGN SOLUTIONS TO STATIONS." Move the cursor to the desired station number by using the up and down arrow keys and press [ASSIGN]. The Solution Name Selection screen will appear and the solution list will appear as a window in the upper right corner of the display.



Solution Name Selection Screen

2. Using the arrow keys, scroll through the solution list and select the desired solution for a station by pressing [ENTER]. The solution name will appear under the column marked "SOLUTION". You may use either the up or down arrow keys or FUNCTION keys to scroll through the Solution selection list.

3. To set the solution usage limit, move the cursor to the "Count" column by using the right arrow key . Enter a desired number of times you would like that specific solution used. You may select a range of (1-999) by using the numeric keys. If the solution management option is not needed, press the [DISABLE] key to change the numbers in the "Count" column to [---(---)]. The Solution management option will be disabled for each station displaying [---(---)]. Pressing the [EXIT] key will return you to the Main Menu



Solution Configuration and Usage Count Screen

NOTE: The function key [COUNT 0] will reset the number **at that station** to 0. The [ALL 0] key will reset **all** stations to 0.

4. When a solution has reached its usage limit, the message, "A SOLUTION HAS REACHED ITS USE LIMIT. PLEASE CHANGE THE SOLUTION AFTER ALL STAINING RUNS HAVE ENDED" will appear. You may change the appropriate stations and reset the "COUNT" column for each station by pressing [COUNT 0]. If you do not reset the count column, after the next staining run is completed, you will be prompted again to exchange solutions after all runs have ended.

NOTE: Many internal components of the DRS 2000 are made of stainless steel. These components have a protective coating which is resistant to most solvents and reagents used in histological and cytological staining procedures. Iodine, by nature, will penetrate the protective coating and allow corrosion to occur . To enhance the life of the DRS 2000 instrument and its components, the **use of iodine or any other halogen salt is not recommended**.

Editing a Staining Method

This section describes the process of creating and editing a staining method. The edit mode allows you to set up a staining method to best meet your needs by allowing you to program times, agitation, and other options to enhance stain quality. Before editing a method, the station configuration and solution assignment needs to be set up. Please refer to pages 3.2 and 3.4 to complete these procedures if they have not already been completed.

To edit a staining program:

1. From the Main Menu, press [EDIT]. The display will read: "SELECT STAIN METHOD." Any method showing an asterisk "*" next to the name means that it has already been edited and saved in memory.

   NOTE: If you are editing a method for the first time, the only "*" method will be the factory set HE(Sakura) method.

2. Move the cursor to the desired method name by using the up and down arrow keys and press [EDIT]. The Staining Program Editing screen is displayed. (If you wish to create a new staining method name, please refer to page 3.4, Adding a Solution or a Staining Method Name.

STP	STA	SOLUTION	TIME	MIX
8	10	E-ALC	00'30"	+
9	11	XYLENE	02'00"	*
10	12	XYLENE	03'00"	+
11	13	DISTILLED WATER	02'00"	+
12	E*	END STATION	__'__"	

EXACT	MIX +	WASH	END	MORE

Staining Program Editing Screen

3. Once the edit screen is displayed, use the arrow keys to move the cursor to the desired step and the numeric keys to enter the number of the station position. When a station number is entered under the column labeled "STA", the corresponding solution from the solution list will automatically appear.

   NOTE: To program a W ash, Dryer, End, or PE station, use the function keys labeled [W ASH], [DRYER], [END], and [PE]. Use the [MORE] key to access these functions.

4. The time may be set from (00'01 to 99'99) for each station. Set the desired time using the numeric keys, press [MORE], then [SAVE].

5. The "MIX" column is used to set agitation or an enhanced wash at that specific station. Press the [MIX+] key to display the character "+" to choose agitation at that specific station or "*" to choose an enhanced wash at that station. If nothing is displayed, neither agitation or an enhanced wash will take place.

Explanation of Function Keys (for the Edit Screen)

The [EXACT] function key is used for the purpose of establishing critical and non-critical process times for a specific step. Its main purpose is to create flexibility in process times which ultimately increase throughput. Each time the [EXACT] key is pressed, the symbol in front of the time in the "TIME" column will change from [●] to [▲] to [∞], then will cycle back through the sequence.

EXACT [●]: The process time at that step will be performed exactly as programmed.

DELTA [▲]: The process time for that step may be extended to some degree but by no more than 20%.

INFINITE [∞]: The process time at that step may be extended indefinitely to provide maximum flexibility.

If there are no time critical steps, the infinite [∞] symbol may be used at all stations for optimum throughput. Exact [●] should only be used when the time for a specific solution should not be modified. The delta [▲] symbol should be used when a time for a specific station can be lengthened for no more than 20% of its programmed time.

The [MIX+] key offers three options:

① If the [+] symbol is shown, the instrument will agitate in that station based on the parameters set under the [UTILITY] function. Mix amplitude, frequency , and speed can be programmed under the [UTILITY] function.

② If the [*] symbol is displayed, that indicates that the Enhanced Wash feature is set for that step. The Enhanced Wash feature can be used to avoid excess staining when using highly concentrated solutions. Under the [UTILITY] function you may also set the enhanced wash frequency and speed.

③ The blank field [ ] indicates that neither mixing or an enhanced wash will be carried out.

Copying a Staining Method

To copy one Staining Method in order to create a new method, follow the procedure below:

1. From the Main Menu press [EDIT]. The Staining Method List screen is displayed.

2. Use the arrow keys to select the stain method name you would like to copy from, then press [COPY].

3. The display will read, "SELECT STAIN METHOD TO COPY TO." Use the arrow keys to scroll down and select the method you would like to copy to and press [ENTER].

4. To verify, press [ENTER].

5. To modify the copied method, press [EDIT] and follow edit procedures on page 3.6.

6. Press [EXIT] to return to the Main Menu.

Utility Operations

The [SETUP] function key under utility operations of fers the user a wide range of user-selected features, which enhance stain quality. The error log may also be accessed under [UTILITY] by pressing the [ERR LOG] key.

1. The [UTILITY] function key can be accessed by pressing the [MORE] key from the Main Menu. The functions under [SETUP] enable you to set up parameters for all programs which enhance staining operations.

2. Press in sequence [UTILITY] ➔[SETUP] ➔[MODE].

   The Default Parameters screen appears and listed are the following default settings:

1.	MIX AMPLITUDE	25 mm
2.	MIX FREQUENCY	3 times
3.	MIX SPEED	3
4.	BASKET LIFTING SPEED	1
5.	DRYER TEMPERATURE SET	65°C
6.	WATER WASH CYCLE TIME	1min 00 sec.
7.	ENHANCED WASH FREQUENCY	3 times
8.	ENHANCED WASH SPEED	5
9.	UPS CONNECT	NO
10.	KEY SOUND	YES
11.	PRINTER BOX CONNECT	NO

3. Move the cursor to the parameter you would like to change by using the up and down arrow keys, then press the [SELECT] key. The parameter options will appear in a window in the upper right corner of the display.

4. To modify the parameters, move the cursor to the desired parameter setting by using the up and down arrow keys and press [ENTER]. The default parameter will change to the selected option. Follow this procedure for each parameter you wish to change. After all parameter changes have been made, press the [EXIT] key . A message will appear, "DO YOU WANT TO SAVE SYSTEM SETUP?" Press the [YES] key to confirm, to cancel, press the [NO] key. Pressing [EXIT] sequentially will return you to the Main Menu.

A description of the parameters and their allowable ranges are as follows:

MIX AMPLITUDE:

The travel distance of the robotic arm during the up and down movement of the mixing cycle.
Range: 10/15/20/25/30 mm.

MIX FREQUENCY:

The number of times the robotic arms moves up and down during each mixing cycle. Range: (0-10) times.

MIX SPEED:

The speed at which the robotic arms move up and down during mixing. Range: (1-5). (1, slowest - 5, fastest)

BASKET LIFTING SPEED:

The speed at which the instrument lifts the basket set from the solution reservoir. Range: (1, slowest - 5, fastest)

DRYER TEMPERATURE SET:

The drying station temperature, which can be input by the numerical keys. Range: (30-65°C in 1° increments)

WATER WASH CYCLE TIME:

The length of time the water flow to the wash stations continues after the baskets(s) have left the wash station. Range: (minimum: 30 seconds, maximum: 1 minute and 30 seconds in 1 second increments)

ENHANCED WASH FREQUENCY:

The number of times the robotic arm moves up and down during each enhanced wash cycle. Range: (1, slowest - 5, fastest)

ENHANCED WASH SPEED:

The speed at which the robotic arm moves up and down during the enhanced wash. Range: (1, slowest - 5, fastest)

UPS CONNECT:

This indicates whether or not the Uninterrupted Power Supply (UPS) is connected to the instrument. Range: Yes/No

NOTE: The UPS connect parameter needs to be set at [NO] if there is no UPS connected to the instrument. If [YES] is set, the instrument will enter into the power outage operation mode regardless if a power outage actually happened.

KEY SOUND:

The operator can select between silent operation or an audible signal whenever a key is pressed. Range: Y es (audible)/No (silent).

Error Log

The [UTILITY] function key can also be used to view any errors that may have occurred during staining. The Error Code Log will display a code, which is identified by a number, and will provide a brief description of the problem.

If an error has occurred, you can access this display and refer to the Troubleshooting Chart, beginning on page 5.1, to review a description of the problem and a possible remedy . The error codes can be cleared out of the log by pressing the [CLEAR] key.

Routine Operation

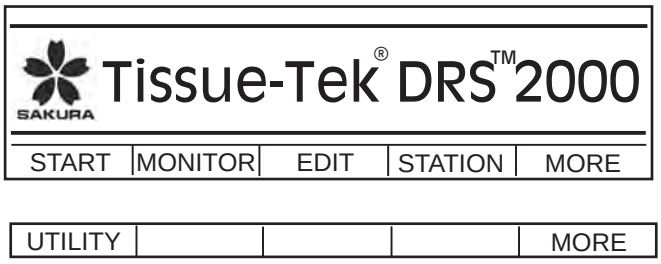
This section describes the basic procedures necessary to operate the DRS 2000. T o program a staining method or edit an existing program, refer to Section 3, Explanation of Software.

Starting a Staining Process

1. Before starting a run, verify the following:
   - The water supply and drain hose are securely connected
   - The robotic arm is free to move
   - The cover and the lower door are properly closed.

   CAUTION: Check that the water supply hose and the drain hose are not kinked and that all connections are secure.

2. Turn the power switch to "I" position. The Main Menu screen will appear.



Main Menu

3. Open the water faucet at the sink connection to enable the flow of water to the instrument.

To manually open the wash valve to each wash reservoir, please follow the procedure below:

1. Press the [MORE] key from the Main Menu to access the second group of function keys and then press the [UTILITY] key. The Utility Function Selection screen will be displayed.

2. Press the [SETUP] key and then the [W ASH ON] key . The Water Flow Confirmation screen will appear.

3. The water begins flowing into the wash stations and the water supply time begins counting when the " VALVE IS OPEN" message is displayed.

4. When the water begins flowing through the rectangular rim of the wash reservoirs, the valve can be turned of f by pressing [CLOSE]. When the [CLOSE] key is pressed, the valve shuts off and the water stops flowing to all wash stations. Once the adjustment is completed, pressing the [EXIT] key twice will again return you to the Main Menu.

Starting a Staining Program in the Continuous Mode

To begin a staining method in the Continuous Mode follow the steps below:

1. Press the [ST ART] key from the Main Menu. Place the basket set to be run in the appropriate Start Station labeled, S1 or S2.

2. If the " BATCH" message is displayed on the monitor as follows: "MODE: BATCH", pressing [MODE] key will change "BATCH" to " CONTINUOUS" and toggle between the two, each time it is pressed. In order to run baskets is a continuous mode, "CONTINUOUS" must be displayed

3. If the desired method is not currently displayed at the top of the screen, press the [METHOD] key to view your options. Use the arrow keys to scroll through the list of methods then press [SELECT] to choose the program you wish to run. T o start the desired method press the [START] key. The robotic arm will pick up the basket set and move it to the first programmed station.

   NOTE: The [MODE] key cannot be selected while the instrument is in operation. All baskets must be removed before changing modes.

Starting a Staining Program in Batch Mode

To begin a method in the Batch Mode, follow the steps below:

1. Press the [ST ART] key from the Main Menu. Place the basket set to be run in the Start Station labeled, S1.

2. Press the [MODE] key to display: "MODE: BATCH" at the bottom right side of the Start Process screen.

The robotic arm gives priority to only one basket set. When staining in the batch mode, you may not add additional basket sets until each run is completed. The total length of time it will take to run one basket set in a batch mode is completely dependent on the times programmed for that specific protocol. If you would like to begin staining in the batch mode of operation, you may choose a specific start step to begin. From the Start Process screen:

1. Press the [STEP] key.

2. Use the arrow keys to scroll to the desired start step for that run, open the door and cover, place the basket set in the desired start step, close the door and cover and press [START].

In batch mode operation, the stainer will accommodate up to 40 slides/run, one basket set.

Operations During Processing

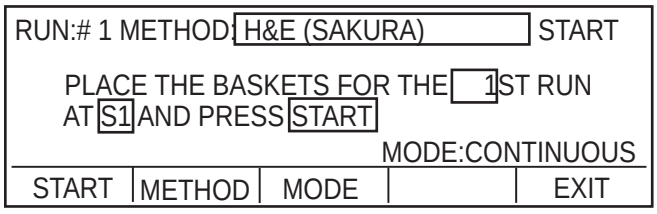
Adding Basket Sets

This section describes how to add additional baskets during staining. The [MODE: CONTINUOUS] indication must be displayed at the bottom right side of the Start Process screen. This indicates that the instrument is currently in the continuous operation mode which allows the operator to add more baskets.

To add a basket to the stainer:

1. Press the [ADD] key from the Process Monitor screen. The run # and method will be displayed on the first line. The message reads, "PLACE THE BASKETS FOR THE 1ST RUN AT S1 AND PRESS START." If you wish to change the method, press the [METHOD] key and select the desired method to be run.

NOTE: If a key is not pressed within 30 seconds, the display automatically returns to the Process Monitor screen.

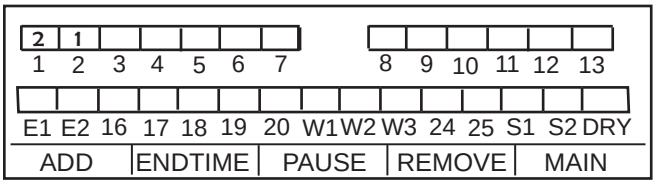


2. To add a basket, open the lower door by pressing on the left side of the door and place the basket set in the appropriate start station. It is not necessary to open the cover. Close the door and press the [START] key if the desired method is already displayed. Pressing [START] will resume operation and the display will return to the Process Monitor screen. The process run number of the added basket set will appear at the appropriate station position.

Monitoring a Staining Process

During the staining process, the Process Monitor screen is displayed. The Process Monitor is a visual display which identifies where all staining runs are located at any given time. From the Process Monitor screen the operator can make various selections. Additional basket sets maybe added, end times for each run may be verified or runs may be aborted. Pressing [MAIN] will return you to the Main Menu where you may perform other operations.

Each basket set will be moved through the stainer according to the specific staining method selected. A run number is associated with each basket set and as the robotic arm moves the basket, the run number will appear in the correct station position displayed on the Process Monitor screen. The Process Monitor will be continually displayed while staining is occurring.



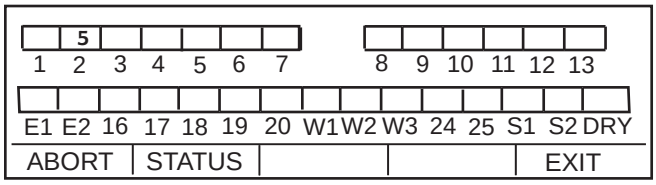
Process Monitor Screen

Interrupting or Canceling a Staining Process

From the Process Monitor screen, the operator may choose to interrupt or cancel a staining run. During process interruption, the robotic arm will not move. The interruption should be as short as possible to avoid af fecting stain quality if multiple staining programs are in progress.

To interrupt a staining run:

1. Press [PAUSE] from the Process Monitor screen. (If the robotic arm is moving, the message, "PLEASE WAIT" will appear. When the robotic arm has stopped, the Process Cancellation screen will be displayed.) From this screen, the operator has three options, pressing [EXIT] will return you to the Process Monitor screen and staining will resume, pressing [ST ATUS] will provide an endtime report of a specific run in progress and pressing [ABORT] will cancel a staining run.



Process Cancellation Screen

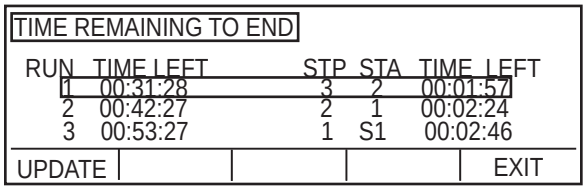
2. To obtain a status report of a specific process run, use the arrow keys to highlight that run number and press the [STATUS] key. A screen will be displayed indicating the run number, staining method name, and the time left to complete the process in hours, minutes and seconds. (If the selected staining process has already been finished, [00:00:00] will be displayed.) Pressing the [EXIT] key will return you to the Process Cancellation screen.

3. To cancel a staining run, highlight the run number using the arrow keys and press the [ABOR T] key from the Process Cancellation screen. A display message will appear, "DISCONTINUE THE FOLLOWING RUN?" With the selected run number , station number and stain method identified. Pressing [YES] will cancel the run highlighted. Pressing [NO] will return you the previous screen and [EXIT] will return you to the Process Monitor screen. The [ABORT] key should only be used if the operator wishes to discontinue a specific run. The arrow keys, in this case, are used to highlight the desired run number which will be deleted.

If a staining run was aborted, the basket set will need to be removed from either the upper or lower level of the instrument. The displayed message may read, "PLEASE OPEN THE DOOR AND THE COVER." The Process Monitor screen will automatically appear after the basket has been removed for confirmation of removal. V erify that the cursor highlights the correct station position and press the [CONFIRM] key. The display will return again to the Process Cancellation screen or to the Main Menu if there are no other baskets currently staining.

Checking the Endtime for a Staining Run in Progress

While a staining run is in progress, the operator can check the time left for that run and get an estimated time for completion. By pressing the [ENDTIME] key from the process monitor, the screen will display the run number for each program currently running and the estimated time remaining to complete the process in hours, minutes, and seconds. The staining step, position, and the time left for completion in that specific station is also displayed.



Endtime Screen

NOTE: The clock is not a real-time clock. Y ou may press the [UPDATE] key which will update the times left for each run.

End of a Staining Process

When a staining process is completed, the message "THE STAIN PROCESS COMPLETED. PLEASE REMOVE THE BASKET FROM E1, E2, OR PE" is displayed and an audible tone is triggered. The Process Monitor screen will automatically appear after 15 seconds. The End Station, (E1) and or (E2) or (PE) is highlighted.

1. Remove the basket set from the (E1), (E2), or (PE) End Station. You will need to press the [CONFIRM] key to verify removal of the basket set.

If there are other staining programs in progress, the display returns to the Process Monitor screen and the stainer resumes operation of remaining runs. If no other staining programs are in process, the display will return to the Main Menu screen.

The "END OF RUN" audible tone is triggered once a run is completed and has entered either the PE station or one of the end stations. The alarm will beep for ten seconds and continues every 30 seconds until the basket is removed.

To change the alarm to a single beep, please perform the following steps:

1. If the instrument is not operation turn the power to the OFF position.

2. Press and hold the "0" key while turning the power ON.

3. Select "1. PROPERTIES"

4. Select "4. MISCELLANEOUS"

5. Select [CONTINUOUS] or [SINGLE] by using the arrow keys; confirm by pressing [MEMORY].

6. Turn the power to the OFF position. In the continuous mode, the alarm will beep for 10 seconds in 30 second intervals. The single mode will alarm for 10 seconds and stop. It is necessary to remove the basket(s) when the stain process has ended.

TROUBLESHOOTING

Section 5

General Information

This section helps the operator identify instrument malfunctions, their probable causes, and corrective actions that can be taken to remedy the problem. If the malfunction listed in the troubleshooting section is observed, follow the instructions given in the REMEDY column. If you have difficulties in resolving the problem or if the problem is beyond the scope of this manual, contact Sakura Finetek for technical support.

The following Troubleshooting Chart lists the warning messages and error codes that could occur during operation of the Tissue-Tek® DRS™ 2000 Automatic Slide Stainer. Possible problems could be electrical, mechanical, or operational. Probable causes and recommended remedies are also included so that many isolated problems can be quickly corrected.

If additional assistance is required concerning an instrument problem, or if the problem cannot be isolated or is beyond the scope of this manual, please contact Sakura Finetek U.S.A. for technical support. You can reach the Customer/Product Support Department by calling toll free 1-800-725-8723, option 2 (U.S. only). If located outside the U.S., contact the nearest Tissue-Tek® distributor or representative for information and assistance.

TROUBLESHOOTING CHART

PROBLEM	POSSIBLE CAUSE	REMEDY
If a UPS is connected, the instrument has received a power failure signal from it.	Power Out Signal	The instrument will continue operation for five minutes since the UPS supplies back-up power; however, no heat will be supplied to the drying station. If the power failure lasts for over five minutes, the instrument will stop. If the UPS is connected, wait until the power is restored. If the UPS is not connected, the [UPS Connect] parameter needs to be changed to [No] in the Default Parameter screen.
Display does not light up. Instrument does not operate.	Power switch is off. Power cord is not plugged in. Defective power source.	Move the switch to the "I" position. Plug the cord into power source. Check the laboratory breaker or receptacle.
Display is too dark or too bright.	Brightness of display is not properly adjusted.	Adjust the display to the desired brightness level. Use the brightness adjustment dial on the front, right side of the instrument above the power switch.
Staining process does not start. (Robotic arm does not move.)	Cover and/or lower door is open or not properly closed. Error Message [Power Out Signal] is displayed.	Close the cover and/or the lower door completely. If the UPS is connected, power failure has occurred. Staining cannot begin until power is restored. If the UPS is not connected, the [UPS Connect] default is set to [YES]. Change the [UPS Connect] default value to [NO].
Robotic arm suddenly stopped and an audible alarm sounded.	Robotic arm hit an obstacle. Solution reservoirs are not properly installed.	Remove or adjust the obstacle. Level solution reservoirs and place them in the proper position.
Solution or water leaks from the instrument.	The drain hose is occluded or bent. The drain hose is higher than the drain port of the instrument. The drain hose is twisted or looped. Water supply stainer connection is not properly sealed.	Remove any bends or kinks in the hose. Place the hose lower than the drain port, and position it straight. Tighten the water supply strainer. If solution still leaks, the strainer may have a defective gasket. Contact the Sakura Customer/Product Support Department.
Wash reservoir does not fill to the proper level. Water flow is not sufficient.	Defective rubber grommet. The water faucet is closed. The water supply adjustment valve is closed.	Replace the grommet. (Product code 4985) Open the water faucet. Open the water supply adjustment valve.
Water flow is not sufficient.	Low water supply pressure. Clogged screen filter in supply hose.	Check the water supply pressure, 0.098 to 0.441 MPa (1.0 to 4.5 kgf/cm^2) is required for adequate water supply pressure, (dynamic pressure). Clean filter screen.

ERROR CODE	DESCRIPTION	POSSIBLE CAUSE	REMEDY
1	SYSTEM ERROR	A control error has occurred. The instrument will immediately stop operation.	Turn off instrument power. Call and inform the Sakura Customer/Product Support Department.
2	POWER FAILURE	The power supply was shut down due to a power failure or the power cord was disconnected.	When power is restored, the robotic arm will move to its home position and the operation will stop. Follow these steps: 1. (Over station 27) P ower failed for only a short period of time, the operator can decide to continue the staining process at the point where the interruption occurred. 2. To continue the process where the instrument was interrupted, press the [RESUME] key. The staining process will resume. 3. To cancel the process, press the [EXIT] key. To confirm, press [YES] or [NO], then the “All Basket Removal Confirmation” screen will appear. Remove all the basket sets from the instrument, and press the [EXIT] key. The robotic arm will move to the center of the instrument and the Main Menu screen will be displayed.
3, 5, 6	MEMORY ERROR	The instrument memory has been corrupted. The instrument will immediately stop operation. Any of Error Codes 3, 5, or 6 will appear in the upper right hand corner of the display which relate to the cause of the memory malfunctions.	Service is required. Call and inform the Sakura Customer/Product Support Department.
4	BATTERY LOW	The voltage of the memory back-up is low.	The battery will need to be changed. Call Sakura Customer/Product Support. Although the instrument will continue operation, failure to replace the battery may induce a memory loss when the instrument is turned off or if power failure occurs. Pressing the [EXIT] key will allow operation to resume.

TROUBLESHOOTING

ERROR CODE	DESCRIPTION	POSSIBLE CAUSE	REMEDY
11-15	ROBOTIC ARM MALFUNCTION	The robotic arm does not operate as expected.	The instrument will immediately stop. An error code from Code 11 to 15 will appear in the upper right hand corner of the display according to which sensor has detected a failure. Follow the steps below: 1. Open the lower door (and the cover, if needed). Look inside the instrument for an obstacle to the robotic arm movement and remove it if necessary. Close the cover and lower door and press the [RESUME] key. After the instrument performs the recovery operation, the staining process will resume. 2. If the same error message occurs again, press the [EXIT] key. The "All Basket Removal Confirmation" screen will appear. Remove all the basket sets from the instrument and press the [EXIT] key. The robotic arm will move to the center of the instrument and the Main Menu screen will be displayed. 3. If the error message does not disappear, the driving mechanism or the position detection mechanism of the robotic arm may possibly be at fault. Call and inform the Sakura Customer/Product Support Department.
30	SENSOR OPEN	The thermal sensor for the drying station does not function.	The instrument will operate normally except that no heat will be applied to the drying station. Call and inform the Sakura Customer/Product Support Department.
31	SENSOR SHORT	The thermal sensor for the drying station is short circuited.	Call and inform the Sakura Customer/Product Support Department.
32	TEMPERATURE LOW	The drying station cannot reach the set temperature.	Call and inform the Sakura Customer/Product Support Department.
33	TEMPERATURE HIGH	The drying station temperature has exceeded the set value.	Call and inform the Sakura Customer/Product Support Department.
34	DRY FAN STOPPED	The drying station fan has stopped operating.	The instrument will operate normally except that no heat will be applied to the drying station. Repair will be required. Call and inform the Sakura Customer/Product Support Department.
50	FUME FAN STOPPED	The ventilation fan has stopped.	The instrument will continue operation except that the fan will not run Since there is no ventilation inside the instrument, service is required. Call the Sakura Customer/Product Support Department.

CARE OF THE INSTRUMENT

General Maintenance

Keep the exterior of the DRS 2000 free from dust. Do not use solvents of any kind on the front of the control panel; however, if disinfection of the keypad is desired, 70% to 85% ethanol or isopropanol can be wiped on and allowed to air dry. The plastic cover may be cleaned with a glass cleaner and soft cloth.

Daily Maintenance

Exterior/Interior Surfaces

Daily clean the control panel, plastic, and painted areas by wiping with a clean cloth. Clean the interior of the solution area by wiping with a clean cloth.

Bi-monthly Maintenance

Replacement of the Activated Carbon Filter

It is recommended that the activated carbon filter be changed after two weeks or sooner if fume monitoring reveals elevated reagent vapors.

Keep the filter in place even if there is an internal duct system attached.

To replace the activated carbon filter , follow these instructions:

1. Turn the power of f by pressing the “O” side of the power switch.
2. Open the lower door first and then the cover and remove all the solution reservoirs in the lower section of the stainer.

   NOTE: Label the reservoirs so that you can place them back in their original positions.

3. Pull each wash reservoir gently toward you to drain any water in the reservoir then remove all wash reservoirs.
4. Move the robotic arm to the right side of the instrument with enough care to prevent it hitting on the solution reservoirs in the upper section.
5. Release the filter cover by pressing on the black cover button while holding the filter cover with your left hand, slide the filter cover slightly to the left and remove it.
6. Remove the activated carbon filter from the instrument and dispose of it properly.
7. Unpack the new activated carbon filter and reinstall the filter gasket and the new filter.
8. Hang the left end of the filter cover on the cover hook of the instrument and lock the filter cover by pressing on the black cover button.
9. Return all reservoirs to their original positions, then close the cover and the lower door.

Monthly Maintenance

Drying Station

The drying station should be cleaned once a month or more often as needed.

1. Turn the power of f by pressing the “O” side of the power switch. The power switch is located on the front side of the instrument to the right of the lower door . Open the lower door first and then the cover. Wait until the temperature of the drying station has reached a comfortable level, then take out the inner lining of the drying station.
2. Remove the residue from the inner lining by washing with water and air drying. Return the inner lining to the inside of the drying station and verify that the raised portion of the liner is facing the right hand side of the drying compartment.

Solution Reservoirs and Slide Baskets

The solution reservoirs and slide baskets should be washed with tap water or a mild detergent once a month. If you have difficulty in removing stains and residue from dried reagents, soak first in a commercially available chemical cleaning detergent or bleach solution and then rinse with a mild detergent and water . Cleaning reservoirs and slide baskets monthly will help keep these items free from permanent stains. Always use the same reservoir for a given solution to avoid contamination.

CARE OF INSTRUMENT

Reservoir Trays

The reservoir trays should be cleaned once a month. T urn power off by pressing the "O" side of the power switch.

NOTE: If the robotic arm is interfering with the cleaning procedure gently move the robotic arm out of the way , **only if the power is off**.

Open the lower door first and then the cover . Carefully remove all the solution reservoirs from the instrument.

NOTE: Be sure to label the reservoirs in order to put them back in their original position once the cleaning procedure is complete.

Pull each wash reservoir gently toward you to drain out the water and then remove all solution reservoirs from the lower section. The lower reservoir tray can be removed by gently lifting the front edge with both hands and sliding the tray away from the front of the instrument. Remove the left and right reservoir trays from the upper section. Clean the reservoir trays and the inside of the upper and lower compartments by wiping with a clean wet cloth. Reinstall the reservoir trays in the upper and lower compartments. The lower reservoir tray can be reinstalled by gently placing the tray under the wash nozzles and sliding the tray toward the front of the instrument. Return the solution reservoirs and the wash reservoirs to their original positions. Close the cover first and then the lower door.

Water Supply Strainer

The water supply strainer should be cleaned once a month. You will need a toothbrush and a wrench to perform this procedure.

1. Close the external water supply faucet. Failure to close the water faucet before attempting to clean the strainer may cause spillage. Turn the power off by pressing on the "O" side of the power switch. T urn the fastener 90 ° counterclockwise to release the drain receiver. Pull out the drain receiver toward you. Using a wrench if necessary , remove the strainer by turning it counterclockwise. Use a cloth to avoid spilling water from the strainer . Wash the mesh portion of the strainer in water using a toothbrush to dislodge particles.
2. To reattach the strainer , turn it clockwise and tighten it by using your hand only. Fit the drain receiver into the drain port of the reducing valve. At this time, the fastener has to be held in an "open" position. T urn the fastener 90 ° clockwise to lock the drain receiver . Open the water faucet and turn the instrument on.

   CAUTION: Failure to close the external water supply faucet before attempting to clean the strainer may cause spillage.

   NOTE: For a more thorough cleaning, use an ultrasonic bath if available. Attach the strainer by turning it clockwise and tighten it by using your hand only.

   NOTE: If there is water a leak at the strainer connection, tighten it using a wrench. If the leak is still present, contact the Sakura Customer/Product Support Department as the sealing gasket may be damaged.

SERVICE AND REPLACEMENT PARTS

Section 7

Service Information

When you have a problem with the instrument

When problems arise during operation of the T issue-Tek® DRS™ 2000 Automatic Slide Stainer, first refer to Section 5, Troubleshooting. A void problems by carefully following proper operating and cleaning procedures. If the problem cannot be solved and an instrument failure is apparent, our Technical Support Staff is available to assist you.

Before calling for technical support, note the instrument's serial number and any error codes. Be sure that you know the details of the problem you are experiencing. This information will help the T echnical Specialist to identify the probable cause of your instrument malfunction.

Where to Call for Service

If located within the United States, contact the Customer/Product Support Department of Sakura Finetek U.S.A., Inc. by calling toll free:

1-800-725-8723, option 2

In countries other than the United States, contact the nearest authorized T issue-Tek® instrument distributor or representative for service information and assistance.

Accessories and Replacement Parts

Please use the following product codes to order replacement accessories. Replacement of the battery should be done by a qualified service technician only

CAUTION: When replacing parts, only use the recommended parts. The use of non-compatible parts may cause instrument malfunction.

Accessories

Description	Product Code	Quantity
Activated Carbon Filter	2008	2/case
Water Supply Hose	2208	Each
Slide Basket	4768	10/case
Solution Reservoir	4974	Each
Wash Reservoir	4975	Each
Reservoir Lid	4976	Each
Basket Hook	4977	Each
Basket Adapter	4978	Each
Wash Station Plug	4979	Each
Drain Hose	4981	Each
Wash Reservoir Grommet	4985	Each
Six- Reservoir Lid	4986	Each
Seven- Reservoir Lid	4993	Each

Qualified Service Technician Replacement Parts

Description	Product Code	Quantity
Battery Unit	F51-074-00	Each

STAINING RECORD

Sample Staining Record

On the following page is an example page for keeping a record of your staining programs and progress. It is highly recommended that you keep records of your individual programs and notes. Make copies of the blank staining record for your laboratory use.

The page for recording staining progress is intended only as a guide; modify it as necessary to satisfy the individual needs of your laboratory.

Staining Record

SAKURA DRS™ 2000 STAINING RECORD

Laboratory: Method Name:

1	2	3	4	5	6	7

8	9	10	11	12	13

14	15	16	17	18	19	20	21	22	23	24	25	26	27	
E1	**E2**						**W**	**W**	**W**			**S1**	**S2**	**DRY**

STAIN PROCEDURE

STEP	STATION	SOLUTION	TIME(min:sec)	Accuracy	Mix	EnhancedWash
1	S	Start Station	- - : - -			
2						
3						
4						
5						
6						
7						
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