DigiPREP KeyPad Controller



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Service Manual



Providing Innovative Solutions to Analytical Chemists



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Disclaimer: Products are supplied for laboratory use only and should not be used for any household, medical or therapeutic application. **SCP SCIENCE** presumes that only trained and qualified individuals, familiar with procedures suitable for the safe operation of these instruments, will handle them. Our customers are solely responsible for the safe operation, handling and use of these products.

CERTIFIED to comply with the following EMC and safety requirements standards: EN 55022 (1998), EN 61000-4-3 (1996), ENV 50204 (1995), EN 61000-4-6 (1996), EN 61000-4-2 (1995), EN 61000-4-4 (1995), EN 61000-4-5 (1995), and EN 61000-4-11 (1994). IEC 61010-1 and the IEC 61010-2-010, 2nd edition, 2001-02

MANUFACTURED IN CANADA





EU Users: Contact your local distributor for disposal instructions.



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INTRODUCTION

This manual is to be used by distributors and employees of **SCP SCIENCE** only. The *Digi***PREP** KeyPad Controller is used to control the *Digi***PREP** Digestion Systems (Jr, MS, LS, HP, HT).

WARRANTY

SCP SCIENCE warrants this product free from defect in workmanship and materials for one (1) year from date of purchase. **SCP SCIENCE** agrees to make every effort to supply products in merchantable condition and free from defects.

- **1.** The warranty period for *Digi***PREP** digestion systems is 12 months from the date of shipment from **SCP SCIENCE**.
- 2. DigiPROBE and DigiSET Probe are consumable products and carry a warranty only to the extent that they are functional on receipt.
- 3. As part of the Agreement between SCP SCIENCE and the Distributor, the distributor agrees to assume the responsibility to provide service for any *Digi*PREP digestion system sold by the distributor in the territory.

a. Warranty Period: Service parts required during the warranty period shall be provided to the distributor at no charge. Freight costs for the service parts shipped to the distributor will be borne by **SCP SCIENCE**. Transportation costs for returned instruments and parts are the responsibility of the distributor. Labour for repairs during the warranty period or post warranty period are the responsibility of the Distributor.

b. Alternative Service: In the event that the distributor wishes **SCP SCIENCE** to perform repair service on their behalf, the distributor shall return the instrument prepaid to the designated **SCP SCIENCE** Service Center. Charges for labour required to complete the

repairs will be chargeable to the distributor at **SCP SCIENCE**'s current rates. Parts required in the post warranty period will be charged according to the prevailing Service Parts Price List less distributor's discount. Transport charges for the instrument to be returned are the responsibility of the distributor.

c. Post Warranty Period: SCP SCIENCE agrees to supply required service parts at prices according to the prevailing Service Parts Price List less distributor's discount. The distributor agrees to pay freight charges for service parts purchased after the warranty period.

4. SCP SCIENCE reserves the right to request that failed parts be returned to a location specified by SCP SCIENCE, in which case freight charges shall be borne by the distributor. This clause shall apply irrespective of whether the unit is under warranty or not.

5. A *Digi*PREP digestion system that does not operate upon receipt ('out-of-box failure') may be returned to **SCP SCIENCE** with transport charges to the account of **SCP SCIENCE**. Note that the distributor must obtain a Return Material Authorization (RMA) number from **SCP SCIENCE** before shipping the instrument. **SCP SCIENCE** reserves the right to select the method of transport.

6. The distributor agrees to cooperate in all respects with SCP SCIENCE and will provide SCP SCIENCE with service failure information, serial numbers of the digestion block and/or controller, and any other service related information determined by SCP SCIENCE as being relevant to the repair of an instrument and to the improvement of the product.

7. An RMA # is required prior to returning any item to **SCP SCIENCE**.

8. SCP SCIENCE shall not be responsible for any damage or losses however caused, which may be experienced as a result of the installation or use of this product.

BASIC VERIFICATION LIST

1. Visual and physical inspection

- □ All parts are included.
- □ Power cord is fully inserted
- □ All connectors and cables are inserted accordingly
- □ The system powers up correctly
- □ Cable connector looks fine (not bent)

Comments and observations:

2. Display

- Touch Screen and LCD Backlight are working
- □ Banner Screen is appearing
- Main menu screen is appearing
- □ Fonts and video color are correct
- □ The touch Screen is sensing finger pressing.
- The touch screen has been calibrated (from the calibration screen)

Comments and observations:

3. Power Supply

- The Fuses are fine
- □ Power cables are correctly inserted (see page 26)

Comments and observations:

4. Heater Drive Circuit

- DigiPREP block is connected to the controller
- DigiPREP block is heating accordingly
- COM2' dongle is correctly inserted and passes ohmic check
- DigiPROBE is correctly inserted into its socket (N/A for HT)

Comments and observations:

5. CPU and general component verification

- □ Software runs accordingly
- Software version
- □ Fan is fixed accordingly
- Controller serial number

SYMPTOMS

The following symptoms must be verified before going into more detail.

- 1. The block is over shooting the set point temperature, and the temperature keeps climbing;
 - Check the Heater Drive Circuit
 - Ensure correct block has been selected. The voltage selector switch of the heating block is in the correct position.
- 2. The block is not heating;
 - Ensure the *Digi*SET dongle is installed.
 - The power cable is connected.
 - Ensure the Voltage Selector Switch of the heating block is at the appropriate voltage.
 - Verify that the 180°C NC Thermal Switch is closed.
 - Check resistance of heater according to the *Dig*iBLOCK size.
 - Verify the 450°C Thermostat is closed for HT.

- 3. The block is heating very slowly;
 - Ensure that the voltage selector switch of the heating block is at the correct position.
 - Ensure correct block has been selected.
- 4. No display and no back light;
 - Check fuse F1.
 - Check the 2 15A fuses inside the TS housing.

Symptoms	Reference
Operation LED not illuminated when power is on	Page 26, 28, 36
Digital screen (LCD) is malfunctioning	Page 36
LCD shows " <i>Digi</i> PROBE error"	page 28
KeyPad buttons are not functioning correctly	Page 34, 78
The controller is not functioning when power switch is on	Page 31
The <i>Digi</i> PREP block is not heating up	
The heating block is not reaching its temperature or vary	

FIGURE 1: SYMPTONS VS. DOCUMENT REFERENCES

CAUTIONS & NOTES

Cautions. warnings, and notes are included throughout this manual.

CAUTION

A caution is used to emphasize information pertaining to procedures that, if not strictly followed, may result in CAUTION damage or destruction to the instrument or improper instrument operation.

WARNING



NOTE

A warning is used to emphasize information about dangerous or WARNING hazardous conditions relating to the Δ operation, cleaning, or maintenance of the instrument that may result in personal injury.

NOTE

A note is used to emphasize procedures or conditions that may be misinterpreted or overlooked, and to clarify potentially confusing situations.

SAFETY INFORMATION

A minimum of safety considerations must be followed when working with the **DigiPREP** system in order to maintain good laboratory practice:

• Do not place *Digi***PREP** controller in a fume hood.

- Do not place the *DigiPREP* controller on a surface containing flammable material.
- DigiPREP block should be operated in a fume hood.
- DigiPREP controller must be plugged into a three-prong grounded outlet.

WARRANTY

SCP SCIENCE warrants this product free from defect in workmanship and materials for one (1) year from date of purchase.

- Should the unit malfunction, call SCP SCIENCE's service department (see page 88), or vour local distributor, and a service representative will instruct you on how to proceed.
- There are no user-serviceable parts in this unit. The warranty is void if the unit shows evidence of being tampered with, of being subjected to excessive moisture, heat or corrosion, or of other misuse.
- SCP SCIENCE shall not be responsible for any damage or losses however caused which may be experienced as a result of the installation or use of this product.
- This product is not warranted for, nor has it been tested for, use with perchloric acid. The user accepts all responsibility if this product is used with **perchloric acid**.

Symbol	Description	Symbol	Description
\vee	Voltage		Mains on
2	Alternating current	0	Mains off
А	Current		Attention, consult accompanying documents
Hz	Frequency	<u></u>	Caution, hot surfaces
F	Fast-acting fuse		Protective conductor terminal

COMPONENTS AND INSTRUMENT DESCRIPTION



- 1. Power light (LED)
- 2. LCD screen
- 3. KeyPad
- 4. Connection port for umbilical cord (to block)
- 5. Power cord receptacle
- 6. Power Switch
- 7. DigiSET connection port
- 8. Detachable Power Cord

UNPACKING



Retain all packing material in case you need to return the instrument to the manufacturer for service.

- 1. Verify that all components listed have been included:
 - DigiPREP keypad controller
 - Power cord
 - DigiSET dongle

Inspect the products for any shipping damage. If the instrument has been damaged in shipping, contact the freight carrier to report damage and to file a damage report. Also contact the **SCP SCIENCE** service department to report damage and to request service information (see page 88 for contact information).



If damage is noted, do not attempt to operate the instrument.

KEYPAD ICONS

Alarm Key: Press to toggle audible alarm on/off. LED flashes when alarm is set to on.



Target Temperature Key: Press to modify target temperature.

Target time Key: Press to modify or reinstate target time.



Enter key: Press to accept value(s)





Right Arrow Key: Press to move the cursor to the right.



INSTRUMENT OPERATION

The keypad controller uses different screens to access different functions.

Use the arrow keys to move the cursor on the screen, and press enter to accept your selection.

A "<" or ">" symbol displayed next to an item indicates that the current screen contains more items than can be shown. Use the arrow keys to move to the next item.

The system powers up on the Banner Screen.

SCREENS

BANNER SCREEN

SCP SCIENCE DigiPREP KeyPad X.X

The banner screen is displayed during power-up, it will change to the menu screen after a short delay.

MENU SCREEN

MENU OPERATION UTILITIES

From the menu screen, you can select either the 'OPERATION' screen or the 'UTILITIES' screen. From the 'UTILITIES' screen you can change the language, select the block model, and calibrate the system. The 'OPERATION' screen lets you set the block temperature and target time.

UTILITIES SCREEN

UTILITIES LANGUAGE SYSTEM

UTILITIES

< CALIBRATE

There are three options: LANGUAGE, SYSTEM, and CALIBRATE.



The calibration screen will be explained in the last point of this section.

LANGUAGE SCREEN



The language screen lets you select the display language.



Be careful not to select an unfamiliar language as it may be difficult to change back.

- En- English
- FR- French
- DE- German
- IT Italian ES- Spanish
- NL Dutch
- JP- Japanese (romanized)

Next, select which *Digi***PREP** system you are using. Your selection determines the correct set of PID values that the controller will use to ensure precise control of the temperature of the block:

SYSTEM SCREEN

SYSTEM					
JR	MS	LS	HP	HT	

JR- *Digi*PREP JR. (24 position- ambient to 180°C) MS- *Digi*PREP MS (48 position- ambient to 180°C)

- LS- *Digi***PREP**LS 72 position- ambient to 180°C)
- HP- *Digi*PREP HP (hot plate- ambient to 180°C)
- HT- *Digi*PREP HT (all HT models- ambient to 450°C)



The system will perform properly only if the correct block is selected.

The selection you make will be stored in the memory of the controller, so there is no need to visit this screen every time you use the system.

KeyPad Version 1.0

OPERATION PARAMETERS

Return to the menu screen, Select OPERATION and press enter.

> MENU **OPERATION** UTILITIES

The next screen will prompt you to enter the target temperature:

TARGET TEMPERATURE? 25 TO 180°C XXX.X

Using the number keys, enter the desired operating temperature. Press enter.

The next screen will prompt you to enter the target time:

	TARGET TIME?	
0 TO 999		XXX

The target time is the duration for which you want the system to hold the target temperature. If the alarm is activated, it will also use this time. The alarm will sound at the end of the time sequence. Enter the desired target time (in minutes) using the number keys and press enter to accept the selection.

From the next screen, you can choose whether or not you want the heater to remain on at the end of the target time.

	END OF TIME?	
HEATER	OFF	ON

Select OFF to turn the heater off at the end of the target time, and ON if you want the block to remain at the target temperature indefinitely. (Press enter to accept the selection)

RUN SCREEN

Once you are finished entering the operation parameters, the run screen will be displayed:

TEMPERATURE	95.0°C	
TIME	120:23	AL

The run screen displays the current temperature and time remaining. The temperature is displayed to the nearest 0.1 of a degree, and the time is displayed in minutes and seconds.

An asterisk will appear occasionally in the upper right corner of the display. This indicates that the heating element is firing.

If "AL" is displayed in the bottom right corner of the screen, the alarm is set to sound when the remaining time runs out. Pressing the alarm key will toggle the alarm off. You can also use the alarm key to silence the alarm.

To reset the timer, press the target time key to return to the target time screen.

CALIBRATION SCREEN

	CALIBRATION		
#POINTS		0	(0-5)

Selecting CALIBRATE from the utilities screen will bring you to the calibration screen, which is used to enter calibration infromation for the **DigiPROBE**.

Calibration is done by comparing the keypad display temperature to an NIST-calibrated (or similar) thermometer. The difference between the reading from the calibrated device and the keypad display temperature will be entered into the system.



Not all thermometers have the same response time.

Run the system using a **DigiPROBE** inserted in a **Digi**TUBE filled with water. On the keypad, press the target temperature key and set the target temperature to the temperature you wish to use as your setpoint.

Once the setpoint temperature is reached and both the keypad value and the reference value (from the calibrated thermometer) are stable, measure and record the reference temperature and the keypad display temperature. (Better accuracy is achieved if the values are taken from the same tube at the same time.) The difference between the two values will be entered into the system. Calculate the input value as follows:

 $T_{reference} - T_{keypad} = input value$

Repeat for up to five reference temperatures.

Next, re-access the calibration screen. (You may have to turn off and back on to access the utilities screen.) The calibration screen will prompt you to enter the number of calibration point measured:

Using the number keys, enter a vlue between 0 and 5. (Choosing "0" will clear all calibration data from the system.) Press enter. The number of points you select will appear as the title of the next screen. (This example will use a 1 calibration point.)

1 POINT			
SPT	0.0	DIFF	+0.0

Using the numeric keypad, enter the first calibration set point value ("SPT") and press enter. Next, enter the calculated error ("DIFF"): for a positive value, hold down the right-arrow key until the correct value is reached. For a negative value, hold down the left-arrow key until the correct value is reached. Press enter to save the values and exit the screen.



To return to the factory calibration or to clear all data from the keypad, choose the number of calibration points as "0" and press enter to make the selection.

SAFETY MESSAGES

During operation, the keypad controller monitors the system to detect potential problems.

If there is a problem, the alarm will sound and the controller will display a safety message. The controller will also suspend control of the block and the block will begin to cool down. To resume control of the block, press any key on the keypad.



The timer will continue to count down during this time.

POSSIBLE SAFETY MESSAGES

Overtemp. Protection – Check Block Temp.

This message will be displayed if the block or sample temperature overshoots the target temperature significantly.

Possible Causes:

- Samples were placed in a block that is too hot. Try allowing the block to cool to near-ambient temperature before beginning the next digestion.
- The voltage switch on the back of the block is set to the wrong position.
- An exothermic reaction occured.

Temperature Dropping – Check DigiPROBE

This message will be displayed if the sample block temperature is falling despite the controller attempting to heat it.

Possible Causes:

- The sample has evaporated.
- *Digi***PROBE** is not submerged into the sample sufficiently.

- *Digi***PROBE** is not in use but was not returned to its well.
- An endothermic reaction occurred.

Check DigiPROBE or DigiSET Dongle

This message occurs when the temperature is not changing and has not reached the set point.

Possible Causes:

- The *Digi***PROBE** is not in the sample.
- The *Digi*SET dongle is not connected.
- The *Digi*SET PROBE is connected but not in a sample.

Set point Exceeds Sample Boiling Point

These messages occur when the temperature has not reached the target temperature for an extended period of time.

Possible Causes:

- The target temperature entered is greater than the boiling point of the sample.
- The rate of evaporation of the sample is too high, causing evaporative cooling.



If you wish to boil your samples at a high rate, control the block temperature instead of the sample temperature. Remove the *Digi***PROBE** and install the *Digi***PROBE** dongle.

Temperature Unsteady – Check *Digi***PROBE**

This message occurs when the temperature varies too quickly.

Possible Causes:

- The *Digi*PROBE is being moved in and out of the sample repeatedly.
- The *Digi*PROBE is being moved in and out of the holding well repeatedly.
- The sample has evaporated.

PREVENTING SAFETY MESSAGES

To avoid receiving safety messages, keep the following tips in mind:

- When using the *Digi***PROBE**, place the tip of the **PROBE** about 1 mm from the bottom of the digestion vessel.
- Use watch glasses whenever possible.
- Use *Digi*TUBE racks whenever possible, as they will help insulate the block against unnecessary heat loss.
- Ensure that all samples are positioned correctly in the block before leaving the *Digi*PREP unattended.
- Do not remove the rack while the *Digi***PROBE** is in the sample. Remove the **PROBE** first, then the rack of samples.
- Return the *Digi***PROBE** back to its storage well when not in use.

DISABLING SAFETY MESSAGES

If you wish to operate the controller without safety messages, you can disable them by holding down the enter key while powering up the controller. To re-enable the safety messages, turn off the controller and then turn the power back on. Some methodologies have not been considered in creating safety messages, so it may be necessary to suspend the safety messages.

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Disabling the safety messages is not recommended.

DigiPROBE ERROR MESSAGES

Error messages pertaining to the *Digi***PROBE** are displayed on the run screen in the Temp field. If the field displays "ERROR" during a run, the system will stop heating. Power down the controller, check the connections, turn the power back on. (Remember that if you are not using the *Digi***PROBE**, the *Digi***PROBE** dongle must be connected.) If problem persists, consult the service department (see page 85).



Disconnecting or reconnecting the umbilical cable while the system is turned on, especially while the run screen is displayed, will likely result in permanent damage to the instrument.

DIAGNOSTICS TEST PROCEDURE

If you are having trouble with the **DigiPREP** controller, follow the steps below and contact the service department.

- 1. Shut off power to *Digi*PREP keypad.
- 2. Ensure that *Digi***PROBE** is installed and inserted into either the holding well or the sample. If you are not using *Digi***PROBE**, ensure that the dongle is connected.
- 3. Ensure that the umbilical cable is connected properly to the block and the controller.
- 4. Turn the power back on.
- 5. Is the blue LED light on? YES NO
- 6. Is the LCD backlight lit up? YES NO
- 7. If there is a problem with the LCD, describe

.....

the appearance of the LCD after booting: FAINT SQUARES BLANK

Please phone your **SCP** service department (see page 85) and report this information **before returning the product**. This will help our technicians determine the cause of the malfunction more quickly.

CLEANING

The keypad may be cleaned using a mild soap, water, and a clean cloth. Ensure that the controller is disconnected from the power supply. No organic solvents should be used as it may destroy the finish on the keypad mask. The system should not be immersed in any liquid.

SPECIFICATIONS DigiPREP KEYPAD

ENVIRONMENTAL

Relative humidity	30% to 80%
Altitude	Up to 2000m
Installation	Category II
Pollution	Degree 2
Ambient operating	-5 °C to 40 °C
temp.	

ELECTRICAL

Model	Keypad
Voltage	115/230V ±10%
Amperage	13 A
Frequency	50/60 Hz
Maximum operating temp.	85 °C



Line voltage fluctuations greater than 10% will affect instrument performance.

RoHs

	Toxic or hazardous substances and elements					
Part name	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr ⁶⁺)	Polybrominated Biphenyle (PBB)	Polybrominated Diphenyl Ether (PBDE)
Housing	0	0	0	0	0	0
Electronics	0	0	0	0	0	0
Display	0	0	0	0	0	0
Wiring Harness	0	0	0	0	0	0
Fasteners	0	0	0	0	0	0

O: Indicates that the toxic or hazardous substance contained in all the homogenous materials for this part, according to EIP-A, EIP-B, EIP-C, is below the limit requirement in SJ/T11363-2006.

X: Indicates that the toxic or hazardous substance contained in all the homogenous materials for this part, according to EIP-A, EIP-B, EIP-C, is above the limit requirement in SJ/T11363-2006.



Exploded View

Legend:

- 1. Rounded-Head Nylon Screw #6-32 x 1"
- 2. On/Off Switch
- 3. Dongle 2-Pin Female
- 4. Panel Lock Nut
- 5. Panel Mount Connector 7-Pin Male
- 6. Panel Mount Connector 2-Pin Male
- 7. Flat Head Nylon Screw #6-32 X 1 "
- 8. Voltage Selector Switch
- 9. Flat Washer, Nylon #6 Screw
- 10. LED

- 11. Nylon Nut #6-32
- 12. Stud #6-32
- 13. Brass Insert #6 Screw
- 14. LCD
- 15. Fish Paper
- 16. Nylon Stand-off #6-32 x ¼"
- 17. Bottom Kydex ¼"
- 18. Feet
- 19. Pan Phillips Head Tapping Screw #8 x ¾"

CONTROLLER GENERAL DESCRIPTION

The following figure shows a general block diagram of the KeyPad controller and all the interaction between components. Each part will be explained in details in a different section of the document.

The KeyPad controller system is composed of a keypad to enter information regarding set point temperature and controlling time to a CPU, which controls the *Digi***PREP** block (Jr, MS, LS, HP or HT).



FIGURE 5: GENERAL KEYPAD BLOCK DIAGRAM

LIGHT EMITTING DIODE (LED) & LCD

OPERATION LED NOT ILLUMINATED (BLUE) WHEN POWER IS ON.

- Ensure the power cord is fully inserted into its socket (see figure 2).
- Verify that the power switch is in the ON position.
- Remove the bottom plate by removing the four feet and verify that the front LED is connected to connector "J6" (see figure 6 for details).



FIGURE 6: LED CABLE POSITION

If the LED is not lit, please refer to the Power Circuit section before changing the LED.



Ensure hat the LED has not been connected in reverse, positive to negative.

DIGITAL SCREEN (LED) IS MALFUNCTIONING

• With the system powered up, verify that the following message is appearing for 5 seconds on the LCD screen.

SCP SCIENCE DigiPREP KEYPAD 10.0

- If the startup message is not appearing or strange characters are displayed replace the LCD monitor.
- After 5 seconds, the user should see the following

MENU OPERATION UTILITIES

• If not, remove the bottom plate by removing the 4 screws holding the feet in place and verify that the LCD ribbon cable is fully inserted into the J2 connector (see figure 7 for details).



FIGURE 7: LCD DISPLAY RIBBON CABLE POSITION

Legend 1. J2, LCD ribbon cable

If the LCD display is still not working, please refer to the CPU section before changing the *Digi*tal screen.

KEYPAD MALFUNCTION

The KeyPad is made of 16 independant switches. The information of a pressed button is sent to the CPU with help of a row and column detector. One should feel a "soft click" upon pressing a button.



FIGURE 8: KEYPAD ELECTRONIC DIAGRAM

FAILED KEYPAD BUTTONS



Please write down each failed button number in order to see if the problem is for a complete row or column or if it is for different row and column buttons

- In order to verify the buttons please reset the KeyPad controller (ON/OFF) and select the Operation section in the main menu.
- •A target temperature is now asked.
- •First, verify all *Digits*. Every time you press a button, you should see the corresponding number under the cursor.
- When it is done and all *Digits* are fine, enter 25. and press the ENTER key.
- •Enter "1" in the "Target Time" menu and press the ENTER key.
- •Now it is time to verify the ARROW keys.
 - Press the left and right arrow key a couple of times and see if the cursor switched from ON to OFF and so on.
- Select HEATER OFF and press ENTER (make sure *Digi*PREP is connected).
- •Enter a time scale of 1 minute and press enter.
- Press the ALARM, TARGET TEMPERATURE and TARGET TIME button one at a time and verify if they execute correctly the commands below:

ALARM

A small "AL" should appear on the LCD display.

TARGET TEMPERATURE

The target temperature menu should appear.

TARGET TIME

The target time menu should appear.

KEYPAD DIAGNOSTIC SECTION

To identify if the trouble is caused due to the keypad buttons or a faulty circuit, verify the impedance of the buttons that do not respond to the commands by measuring between the following pins of J8 (see figure 9):

Pin	1	and	pin	5	Button #3	
Pin	1	and	pin	6	Alarm Button	
Pin	1	and	pin	7	Button #2	
Pin	1	and	pin	88	Button #1	
Pin	2	and	pin	5	Button #6	
Pin	2	and	pin	6	Temperature setting bu	utton
Pin	2	and	pin	7	Button #5	
Pin	2	and	pin	88	Button #4	
Pin	З	and	pin	5	Button #9	
Pin	З	and	pin	6	Time setting button	
Pin	З	and	pin	7	Button #8	
Pin	З	and	pin	88	Button #7	
Pin	4	and	pin	5	Right shift button (>)	
Pin	4	and	pin	6	ENTER button	
Pin	4	and	pin	7	Button #0	
Pin	4	and	pin	88	Left shift button (<)	

If the buttons are OK:

•Pushed : Less than 200 ohms.

•Not pushed: less than 30 Mohms.

If all the values are correct, the circuit is faulty. Change the KeyPad PCB.



FIGURE 9 : PUSH BUTTON MEASURING LOCATION

Legend 1. J8 (pins 1 to 8)

> KeyPad 23 Version 1.0

UIPS POWER SUPPLY SECTION

The power section is rectifying and regulating power for different parts of the KeyPad controller. It is designated as a Universal Input Power Supply (UIPS) since it can operate within 100 - 260 VAC to output +12Vdc/0.8A. No selector switch is needed for 115 VAC or 230 VAC input supply. The +12Vdc voltage is then regulated to supply 5.0Vdc *Digi*tal and 50Vdc(AVCC) analog to the main circuits of the system.



*12 R. +12A 080 GND AGND

FIGURE 10: AC/DC CONVERTER

THE CONTROLLER IS NOT FUNCTIONING WHEN THE POWER SWITCH IS ON

- Ensure the power cord is fully inserted into its socket (see Figure 2).
- Unscrew the bottom plate by removing the 4 screws holding the feet in place.
- Verify that the F1 Fuse is ok. (see figure 11 and 12 for part location.)
 - •Replace by a 0.75A if necessary
- •Verify the 2 fuses along the KeyPad housing are ok.
 - •Replace them by a 15A if necessary.
- •Verify all the power cable connections.
 - •Green wire is connected with "Earth GND"
- Black wire of the filter is connected with the 15A fuse holder; the black wire from the fuse holder, with the power switch; the black wire of the power switch, to "HOT" pin.
- White wire of the filter is connected with the 15A use holder; the white wire from the fuse holder, with the power switch; the white wire of the power switch, to the "NEUTRAL" pin.
- •Use a multimeter to measure the following voltages (see figure 13):
- •Place the negative lead of the multimeter on TP1GND. Place the positive lead of the multimeter on TP1. You should measure about 160 Vdc for 120 Vac input supply or 300 Vdc for 240 Vac input supply. If the voltage is much lower, measure the voltage across the cathode and anode of diodes D3, D4, D5 and D6. You should read about 63Vdc for 120 Vac and 125 Vdc for 240 Vac. If not, replace the faulty diodes.

- Place the negative lead of the multimeter on TP2, which is the ground test point. Place the positive lead of the multimeter on TP3, which is the +12V test point. You should measure between 11.8 Vdc and 12.2 Vdc. If not, meausre the voltage across U1-1 and U1-2, and U1-4 and U1-3, you should read respectively 1.2V and 0.2 V. If not, replace U1.
- Measure the voltage across U3-1 and GND. You should read about 2.5 Vdc. If not replace U3.
- Place the negative lead of the multimeter on TP2 and the positive lead on TP4, which is the +5.0V test point. You should measure between 4.9 Vdc and 5.2 Vdc. If not replace U4.
- Place the negative lead of the multimeter on TP6, which is the analog ground test point. Place the positive lead of the multimeter on TP5, which is the AVCC test point. You should measure between 4.9 Vdc and 5..2 Vdc. If not, replace U5.



FIGURE 11: AC POWER CONNECTORS & FUSE F1 LOCATION

Legend

- 1. Fuse F1 (0.75A)
- 2. EARTH GND connector
- 3. NEUTRAL connector
- 4. HOT connector



Legend 1. Fuse 15A 2. Fuse 15A 3. AC Filter

FIGURE 12: AC FILTER AND 15A FUSES LOCATION



4. U1

HEATER DRIVE SECTION

This circuit controls the heater inside all types of *Digi***PREP** blocks. It consists of an opto-isolated triac driven circuit.



FIGURE 14: HEATER DRIVE CIRCUIT

THE DigiPREP BLOCK IS NOT HEATING UP

DigiPREP connection verification

- Ensure that the cable between the KeyPad controller and the heating block is correctly inserted on both sides.
- Verify that the voltage selector of the heating block is properly set.

COM2 dongle verification



FIGURE 15: DIGISET CONNECTOR LOCATION



When the **COM2** of the KeyPad controller is not connected to a *DigiSET* system, the port must be shorted.

- Make sure that sections 1 and 2 have been verified before continuing.
- Ensure that the *Digi*SET dongle is fully inserted into **COM2** port (see figure 2)
- If so, before opening the bottom plate, verify with a multimeter that the **COM2** dongle is shorted. If not, replace the part with a new one.
- If the dongle is ok, remove the bottom by removing the 4 screws that hold the feet in place. Check if the *Digi*SET cable (see figure 15 for position) is fully inserted.

Legend DigiSET connector

INTERNAL WIRING CONNECTION VERIFICATION

• After removing the bottom plate, verify the connectivity between the heating block external connector and the PCB (see figure 16).



FIGURE 16: HEATING BLOCK CONNECTOR LOCATION

Legend

- 1. Heater connector (Hot heating block)
- 2. Neutral connector (Neutral heating block)
- 3. Earth Ground

DIGISET VERIFICATION (ONLY IF APPLICABLE)

Make sure that the *Digi*SET is fully fonctional (see

DigiSET operation and service manual).

Opto-isolated Triac Driven circuit verification

Fan verification

- The fan should turn on at power-up. If it does not or if it does slowly, replace the fan and the triac. In both cases, it will cause the triac to be overheated and destroyed.
- To remove the fan, unscrew the 2 screws as shown in figure 17.



IGURE 17: FAN SCREWS LOCATION

Legend

1. Fan screws

Opto-isolator section verification

This test will confirm if the CPU is operating correctly.

- Remove the bottom plate
- Set the target temperature to 35°C and target time to 1 minute.
- After starting the system, turn the module upside down and see if the LED D9 (see figure 18 for position) is flashing.



Be very careful not to touch any components inside the KeyPad as it is running.



The block temperature must be lower than the set point temperature for the LED to flash.

- If the LED is not on, if possible, use and oscilloscope and verify if there is a pulsing signal on the trigger input (TP8), coming from the CPU. If there is no signal on TP8, please refer to the CPU section for more details. Otherwise, check the integrity of the LED and the transistor Q2 (see below).
- If there is a signal on TP8, the block temperature is below set point temperature, the *Digi*SET dongle and cable are installed correctly and the LED is ON or flashing, measure the voltage at TP9. It should be maximum 3Vdc. If it is higher or close to OVdc, change the opto-coupler U8.



FIGURE 18: OPTO-ISOLATOR U8, TEST POINTS AND LED D9

Legend 1. Test Point TP8 2. D9 SMT LED (green) 3. Test point TP9 4. U8

Q2 SWITCH (NPN BIPOLAR TRANSISTOR) VERIFICATION

- If the signal on TP8 coming from the CPU is on, the problem could be the bipolar transistor Q2.
- •Measure with a multimeter the voltage between Q2 collector pin 3 and GND. If the signal on TP8 is pulsing, Q2 should switch between 0.3V and a maximum of 4.7V. If TP8 is high, Q2 should be steady at 0.3V. If Q2 is OK in either case, the problem is probably the triac (see below)
- If the signal on TP8 is low and the LED is ON, then Q2 is defective.

D9 LED verification

If Q2 is good and the signal on TP8 is high or pulsing and the LED lights up or pulsing, the LED is OK. If not, D9 is defective.

TRIAC T1 verification

- The only way to see if the Triac is behaving correctly is by measuring between "HEATER connector" pin and "NEUTRAL" (see figure 19). Make sure that there is 120V/230V AC (toggling or not). Also refer to figure 20 for an example of what an be seen on a scope if the control is toggling.
- Make sure that the heating block temperature is lower than the set point temperature if you want the Triac to toggle.
- If the triac output remains low while it should toggle as shown in figure 20, replace the triac.



If you're using a scope, it **must** be isolated from the wall outlet.



FIGURE 19: HEATER DRIVE TEST PINS AND COMPONENTS LOCATION

Legend

- 1. Q2 pin 3 (collector)
- 2. HEATER pin (Hot)
- 3. NEUTRAL pin
- 4. T1, Triac



FIGURE 20: TRIAC OUTPUT WHEN HEATING SECTION IS FIRING

If all of those tests are correct, please refer to the *Digi***PREP** block service page 62 for more details.

A/D CONVERTER

The analog to *Digi*tal conversion is the feed back information coming from the block temperature sensor or from a *Digi***PROBE**. The CPU section handles this information in order to monitor and control the block temperature.

POSSIBLE A/D PROBLEM



If the *Digi***PROBE** is reading the wrong temperature, make sure that the *Digi***PROBE** itself is functional before looking at the converter circuit. This can be accomplished by measuring the resistance across pin 1 and 2 of the *Digi***PROBE** connec-

tor.

Typical 250C = 108 ohms.

RTD INPUT CONNECTION

- Visually inspect the external connection of the *Digi*PROBE.
- Unscrew the bottom plate by removing the 4 screws that are holding the feet in place. Make sure that the J9 connector is fullt connected with the header (see figure 21 for location). If it is, then start investigating the circuit as explained below.

A/D POWER AND CONNECTIONS

• Disconnect J9 from the board, then power up the controller. With the negative lead of a multimeter on TP6 and its positive lead on the test points below (see figure 22), you should read the following measurements:

ANALOG CIRCUIT MEASUREMENTS WITH J9 OPEN				
Test Point	Required Value			
TP7	5V			
TP11	5V			
TP10	1V			
TP12	OV			

• Now on J9, short pins 2 and 3, short pins 4 and 5 and insert a 200 ohms 1% precision resistor between pins 3 and 4, you should read the following measurements:

100 OHMS RESISTOR BETWEEN PINS 3 AND 4 OF J9					
Test Point	Required Value				
TP7	5V				
TP11	5V				
TP10	1V				
TP14	1.95V				
TP13	0.95V				
TP12	2.60V				

If you fail to get those values, the analog section is faulty; the KeyPad PCB must be replaced.



FIGURE 21: J9 CONNECTOR LOCATION

Legend

1. J9 header with RTD cable connection



FIGURE 22: A/D CIRCUIT TEST POINTS AND J9 LOCATION

Legend

- 1.
- 2. TP12 (Analog input to CPU)
- 3. TP13 (Differential voltage)
- 4. TP7 (5Vdc analog voltage)
- 5. TP6 (GND analog voltage)
- 6. TP10 (1Vdc reference voltage)
- 7. TP11 (RTD supply voltage)
- 8. TP14 (RTD signal voltage)
- 9. J9 header with RTD cable disconnected (pins 1 to 5)

A/D CONVERSION BEHAVIOR

- If all the previous measurements are correct, make sure that all the external components or instruments (snesors, **PROBE**, *Digi*SET, etc) and interconnection cables are properly connected.
- Reconnect cable J9 to its header and verify if the system is heating up accordingly and the block temperature feedback is correct.

CPU SECTION

The CPU section is basically the microcontroler PIC18F8722, U6 (see figure 23 for location)



FIGURE 23: CPU AND REFERENCE VOLTAGES LOCATION

Legend

- 1. Pin 3 of J1
- 2. Pin 1 of J1
- 3. Via to pin 27 of U6
- 4. Via to pin 26 of U6
- 5. Via to pin 25 of U6
- 6. U6, CPU

If anyof the sections 1 to 5 has been verified and a CPU problem is suspected then try the following sections.

LCD DISPLAY PROBLEM

If the section 1 has been fully investigated and the system is always returning to the default setup (EN language, default heating block type etc.), replae the KeyPad PCB.

A/D CONVERSION PROBLEM

If the section 5 has been fully investigated and the system does not provide the right temperature readings, verify the analog supply and the analog reference voltage of the microcontroller U6.

- With the negative lead of a multimeter on the via connected to pad C25-1 and its possible lead on the via connected to pd C25-2, you should read 5Vdc.
- With the negative lead of a multimeter on the via connected to pad C25-1 and its positive lead on the via connected to pin U6-27, you should read 5Vdc.

If those values are less than 4.8V, replace the KeyPad PCB.

CPU UNSTABLE

If CPU is resetting by itself, check pin 9 of U6. With the negative lead of a multimeter on pin 3 of J1 and its positive lead on pin 1 of J1, you should read a steady voltage value of at least 3.7 Vdc. If not, replace the KeyPad PCB.

DIGESTION BLOCKS DigiPREP (Jr, MS, LS, HP)



Instruction Manual

www.scpscience.com



Providing Innovative Solutions to Analytical Chemists

INTRODUCTION

*Digi***PREP** digestion blocks are designed for laboratory use in the digestion and evaporation of a variety of samples, primarily water, wastewater, soil, and sludge samples. *Digi***PREP Jr**, **MS**, **LS**, and **HP** blocks have a temperature range of ambient to 180°C.

*Digi***PREP** blocks require a *Digi***PREP** controller (keypad, colour touch screen, or PC Classic – sold separately) for operation.

DigiPREP blocks are designed to hold **DigiTUBE** sample digestion vessels. Optional accessories include **DigiPROBE** (used to monitor sample and/or block temperature) and **DigiSET PROBE** (used to monitor and shut off the heating system at a set sample volume level).

They are available in 50ml & 100ml format.



CAUTIONS AND NOTES

Cautions, warnings, and notes are included throughout this manual.

CAUTION



A caution is used to emphasize CAUTION information pertaining to procedures that, if not strictly followed, may result in damage or destruction to the instrument or improper instrument operation.

WARNING



NOTE

A warning is used to emphasize information about dangerous or hazardous conditions relating to the operation, cleaning, or maintenance of the instrument that may result in personal injury.

NOTE

A note is used to emphasize procedures or conditions that may be misinterpreted or overlooked, and to clarify potentially confusing situations.

WARRANTY

SCP SCIENCE warrants this product free from defect in workmanship and materials for one (1) year from date of purchase.

- SCP Should the unit malfunction, call SCIENCES's service department (see page 92), or your local distributor. and a service representative will instruct you on how to proceed.
- There are no user-serviceable parts in this unit. The warranty is void if the unit shows evidence of being tampered with, of being subjected to excessive moisture, heat or corrosion, or of other misuse.
- SCP SCIENCE shall not be responsible for any damage or losses however caused which may be experienced as a result of the installation or use of this product.
- ٠ This product is not warranted for, nor has it been tested for, use with perchloric acid. The user accepts all responsibility if this product is used with perchloric acid.

Symbol	Description	Symbol	Description
V	Voltage		Mains on
~	Alternating current	0	Mains off
A	Current	Â	Attention, consult accompanying documents
Hz	Frequency	<u></u>	Caution, hot surfaces
F	Fast-acting fuse		Protective conductor terminal
OPERATIONAL PRECAUTIONS

DigiPREP block must be connected to a controller that is properly grounded. In the event of an electrical short circuit, grounding reduces the risk of electrical shock by providing an escape wire for electrical current. **DigiPREP** controllers are supplied with an electrical cord that has a grounding wire with a grounding plug. Ensure that the plug is plugged into an outlet that has been properly installed and grounded. Consult a qualified electrician if there is any doubt about the existence of proper grounding at the outlet.

DigiPREP block is designed to be lifted from the bottom only. Ensure that the controller is disconnected prior to moving the block. Do not attempt to lift the block by the top white trim as damage may result.

*Digi***PREP** blocks are elevated-temperature digestion systems with exposed hot surfaces. Be careful around the instrument when it is in operation.

SAFETY INFORMATION

A minimum of safety considerations must be followed when working with *Digi***PREP** low temperature blocks in order to maintain good laboratory practice:

- Do not place the *Digi***PREP** blocks on a surface containing flammable material.
- *Digi***PREP** block requires a clearance of three inches (7.5cm) on all sides.
- *Digi***PREP** block should be operated in a fume hood.
- Do not place the *Digi*PREP controller in a fume hood.
- *Digi***PREP** system must be plugged into a three-prong grounded outlet

INSTALLATION

UNPACKING



Retain all packing material in case you need to return the instrument to the manufacturer for service.

- 1. Verify that all components listed have been included:
 - DigiPREP block •
 - Operation manual •
 - DigiPROBE dongle •
 - **DigiTUBE** rack
 - •Jr: 1 rack
 - •MS: 2 racks
 - •LS: 3 racks
 - •HP: 0 racks

NOTE

Optional items, such as glass, quartz, calibrated or non-calibrated digestion tubes may have been included in the shipment. Carefully check the packing list(s) and the contents of shipping cartons to verify that all items listed are included. Please notify SCP SCIENCE or your local distributor of any discrepancies.

Inspect the products for any shipping damage. If the instrument has been damaged in shipping, contact the freight carrier to report damage and to file a damage report. Also contact the SCP SCIENCE service department to report damage and to request service information (see page 88 for contact information).



SETTING UP

Place the **DigiPREP** block in a fume hood. The controller must not be placed in the fume hood. With the controller's power switch in the "off" position, do the following:

• Verify that the voltage selector at the back of the DigiPREP block is properly set. (Typically 115 for North America, and 230 for Europe.)

 Connect the block's umbilical cable to the controller.



Disconnecting or reconnecting the umbilical cable while the controller is WARNING turned on, especially while it is on the RUN screen, will likely result in permanent damage to the instrument.

- · Connect the power cord to the back of the controller.
- Connect the **DigiSET** (or **DigiSET** dongle) to the back of the controller.
- Connect DigiPROBE (or DigiPROBE dongle) to the back of the block.



If you are not using the *DigiPROBE* or DigiSET, the dongles must be connected; otherwise, an error message may be displayed.

- Insert the glass well liner into the DigiPROBE well. (Small hole near right of block)
- If you are using **DigiPROBE**, insert the **PROBE** into the well liner.

The system is now ready to be plugged in and turned on. Please see your controller manual for operation instructions.

OPERATION WITH PROBES

Digi**PROBE**

DigiPROBE (optional) may be used with **DigiPREP** system to monitor and control the sample temperature (when placed in the sample) or the block temperature (when placed in the storage well located on the block).





When using the DigiPROBE with the DigiPREP HP, a flat-bottomed, conical flask is recommended for best results.

Install the **PROBE** in the port marked 'DigiPROBE' on the back of the DigiPREP block. If using to monitor and control the heating of the block via the sample temperature, insert the **PROBE** end into a control sample with the **PROBE** holder supporting the DigiPROBE. (The 010-500-036 PROBE holder is used with 50ml DigiTUBEs and 010-501-036 is used with 100ml DigiTUBEs and a 6"(15 cm) PROBE. The 010-500-037 PROBE holder is used with glass digestion tubes and a 10" (25 cm) PROBE.)

If using to monitor & control the block temperature, place the DigiPROBE in the storage well, located at the rear right corner of the graphite block. Ensure that there is a glass liner (catalogue number 010-500-041) in the well.



The control sample should be a typical digestion sample. The tip of the **DigiPROBE** should be approximately 1 mm from the bottom of the digestion vessel.



Serious temperature overrun may occur during digestion if the DigiPROBE **CAUTION** is not in an appropriate sample or the storage well. Always place the DigiPROBE in the storage well when not in use.

DigiPROBE can be calibrated with DigiPREP controllers or the PC Classic controller (with Go2Temp software). Please see your controller manual for calibration instructions.

Digi**SET**

DigiSET (optional) can be used with all DigiPREP low temperature systems to monitor and suspend the heating cycle at a pre-set sample volume level.

DigiSET PROBE is connected to the DigiSET unit and 'COM 2' from DigiSET unit is connected to the 'COM 2' of the controller with the supplied cable. Please consult the *DigiPREP* controller manual for more detailed instructions.



DigiPREP JR, MS, LS, HP BLOCK DESCRIPTION

DigiPREP Jr



DigiPREP MS





DigiPREP LS





- 1. *Digi*PROBE connection port
- 2. Umbilical cable connects to controller
- 3. *Digi*PROBE storage well
- 4. Voltage selector switch (115V or 230V)
- 5. *Digi***PROBE** dongle (4 pin male)
- 6. 24-position *Digi*TUBE rack (MS:2, LS:3, JR:1)

CLEANING



If the surface is still hot, contact with liquid may create steam that can scald you. It is important to allow the instrument to cool before cleaning.

CLEANING OF MINOR SURFACE SPILLS

Turn off the system and disconnect the block from the *Digi***PREP** controller. Allow the block to cool. Sponge up any excess liquid, dilute the area with clean water, and wipe dry with a paper towel.

CLEANING OF DIGESTION WELLS

Turn off the system and disconnect the system from the block controller. Allow the block to cool before proceeding further.

Suction the solution out of the well(s) with an eye dropper, squeeze bottle, or pipette. Dilute any remaining spillage with water, two or three times, and suction as much solution out as possible. Sponge the remaining residue with a paper towel. Allow the system to dry completely before plugging into a power outlet. Observe good labatory practices by wearing gloves to preform the above task.

CLEANING MELTED PLASTIC FROM WELLS

Heat the block to 160°C. Using a pair of needle-nose pliers, carefully pinch and gently pull the softened plastic residue from inside the well. If it is difficult to remove the melted plastic increase the block temperature by 5°C.

CLEANING OF A MAJOR SPILL

If a solution has run down below the white top ring and under the block, turn off the system and unplug the block from the power source. Allow the block to cool before proceeding further. The block must be disassembled, cleaned, and thoroughly dried prior to running again.



Please consult the service department for help if required.

In order to access the block, you must first remove the white top ring. This step will be different depending on the model of your *Digi***PREP** block. To determine the model of your block, first turn the unit onto its side and check the bottom for an aluminium key.

1. If your *Digi*PREP block has an aluminium key:

Insert the aluminium key into one of the slots located on the bottom of the unit beside the rubber feet. Gently push the aluminium key into the slot until the white top ring begins to lift. Repeat the process for the three remaining slots, and return the aluminium key to the base of the unit. (If the aluminium key is missing, a substitution such as a flat-head screwdriver may also work.)

2. If your *Digi*PREP block does not have an aluminium key:

The white top ring is held in place by plastic spring clips inside the housing at all four corners. Release the clips by gently lifting the corners of the white top ring until it becomes free. If it does not remove easily, insert a flat-blade screwdriver between the white top ring and the outer Kydex skin. Gently twist the screwdriver to pry the white top ring off at all four corners.

Next, use tweezers or pliers to gently remove the insulation from the sides of the block. (If a replacement set of insulation is required, contact the service department.)

The graphite block is held into place by four mounting bolts located on the bottom of the unit. Turn the unit upside-down onto a soft surface, being careful not to scratch the Teflon coating on the graphiteblock. Using a flat-blade screwdriver, remove the plastic cover plates. Next, using an Allen wrench (6mm or ¼ inch), remove the mounting bolts. Finally, lift the housing up from around the graphite block. (Lift gently as there is wiring attached to the graphite block.)

You may now clean any affected parts with a damp cloth. Gloves and a lab coat are strongly recommended. (Be careful not to pinch the wires between the graphite block and other components.) To assemble repeat in reverse order.

Before reassembling, make sure that the Teflon sheet is adhered to the block, that the heater is secured in place, and that the aluminium plate is placed over the insulation. Also ensure that all components are dry prior to reassembling.

SPECIFICATIONS DigiPREP HP, MS, JR, LS

Environmental

Relative humidity	30% to 80%
Altitude	Up to 2000m
Installation	Category II
Pollution	Degree 2
Ambient operating	-5°C to 40°C
temp.	



NOTE

The main supply cord is constructed of heat-resistant material and should only be replaced by an equivalent or better cord.

Line voltage fluctuations greater than 10% will affect instrument performance.

Electrical

Model	DigiPREP HP / MS	Digi PREP Jr	Digi PREP LS
Voltage	115/230V ±10%	115/230V ±10%	230V ±10%
Power	925W	725W	2665W
Frequency	50/60 Hz	50/60 Hz	50/60 Hz
Ambient operating temp.	Ambient to 180°C	Ambient to 180°C	Ambient to 180°C

RoHs

Toxic or hazardous substances and elements							
Part name	Lead Mer- Cadmi- ler (Pb) (Hg) (Cd)		Hexava- lent Chro- mium (Cr ⁶⁺)	Polybrominat- ed Biphenyle (PBB)	Polybromi- nated Diphenyl Ether (PBDE)		
Housing	0	0	0	0	0	0	
Graphite Block	0	0	0	0	0	0	
RTD probe	0	0	0	0	0	0	
Over temperature sen- sor	0	0	0	0	0	0	
Heater	0	0	0	0	0	0	
Umbilical Cord & wiring	0	0	0	0	0	0	
Voltage Selector	0	0	0	0	0	0	
Fasteners	0	0	0	0	0	0	

O: Indicates that the toxic or hazardous substance X: Indicates that the toxic or hazardous substance contained in all the homogenous materials for this contained in all the homogenous materials for this part, according to EIP-A, EIP-B, EIP-C, is below part, according to EIP-A, EIP-B, EIP-C, is above

the limit requirement in SJ/T11363-2006.

OPTIONS	
Catalogue Number	Description
010-500-014	DigiSET (115V/230 V)
010-500-031	DigiNAC top
010-500-033	Dig/VAC blower unit
010-500-035	DigiPROBE holder for DigiTUBEs
010-500-039	DigiPREP Fume Hood
010-500-049	DigiPREP Fume Hood II
010-500-051	Dongle for <i>Digi</i> SET port (2-pin female)
010-500-059	DigiPREP Fume Hood to fit LS
010-500-205	<i>Digi</i> PREP MS, 50ml 115V/230V
010-500-210	DigiPREP LS, 50ml
010-505-052	Dongle for <i>Digi</i> PROBE port (4-pin male)
010-505-015	DigiPROBE for use with DigiTUBEs (6inch/15cm)
010-505-016	DigiPROBE for use with 100 ml glass tubes (10 inch / 25cm)
010-505-041	DigiPROBE storage wells for HP
010-505-205	<i>Digi</i> PREP Jr, 50ml, 24 pos. 115V/230V
010-505-230	DigiPREP HP, 50ml, 115V/230V

ACCESSORIES 50ML

Catalogue Number	Description
010-500-019	DigiPROBE watch glasses (25)
010-500-023	24-position rack (for MS, LS), 50ml
010-500-026	DigiTUBE storage rack , 50ml (5/pk)
010-500-041	Glass storage well (10/pk)
010-500-066	Teflon digestion tubes, 65 ml (6/pk)
010-500-068	Borosilicate glass tubes, 225 mm, 100 ml (6/pk)
010-500-069	DigiPREP LS start-up kit, 50ml
010-500-081	Disposable watch glasses (1000/pk)
010-500-224	Umbilical Cord Extension, 2 meter
010-500-227	Umbilical Cord Extension, 1 meter
010-500-230	DigiFILTER manifold
010-500-261	DigiTUBEs with RackLock feature, 50 ml (750/pk)
010-500-262	DigiTUBEs with RackLock feature, shrink-wrapped (30x25)
010-505-021	24-position rack (for <i>Digi</i> PREP Jr), 50ml
010-505-023	24-position 2-tier rack for 100 ml borosilicate glass tubes
010-505-052	DigiPREP MS start-up kit
010-505-066	DigiPREP Jr start-up kit

ACCESSORIES 100ML

Catalogue Number	Description
010-501-010	DigiPROBE Holder, for 100ml tubes
010-501-014	DigiSET for DigiPREP 100ml (115V/230V)
010-501-020	DigiSET PROBE Holder
010-501-028	Foam Storage Rack 100 ml (pk/5)
010-501-060	Caps, Blue for 100ml <i>Digi</i> TUBEs (pk/100)
010-501-081	Disposable Watch Glass, 100ml (p500)
010-501-115	DigiPROBE, 6" for 100ml
010-501-210	<i>Digi</i> PREP Jr, 100ml, 12 Pos (115V/230V)
010-501-215	Start up Kit for 100ml <i>Digi</i> PREP Jr
010-501-230	<i>Digi</i> PREP MS, 100ml, 30 Pos (115V/230V)
010-501-235	Start up Kit for 100ml <i>Digi</i> PREP MS
010-501-250	DigiPREP LS, 100ml (230v)
010-501-255	Start up Kit for 100ml <i>Digi</i> PREP LS
010-501-261	<i>Digi</i> TUBE, 100ml,with RackLock (pk300)
010-501-262	DigiTUBE, 100ml, with RackLock/No Caps (pk300)
010-501-263	<i>Digi</i> TUBE, 100ml, with no RackLock (pk300)
010-501-264	DigiTUBE, 100ml, with no RackLock, No Caps (pk300)
010-501-510	Rack for <i>Digi</i> PREP Jr, 100ml
010-501-530	Rack for <i>Digi</i> PREP MS, 100ml
010-501-550	Rack for <i>Digi</i> PREP LS, 100ml



ELECTRICAL SCHEMATIC - DigiPREP Jr, MS, LS, HP

SCP SCIENCE

SAMPLE DIGESTION SYSTEMS

DigiPREP HT



Instruction Manual

www.scpscience.com



Providing Innovative Solutions to Analytical Chemists

INTRODUCTION

DigiPREP HT is a high temperature digestion block capable of heating to 450°C. **DigiPREP HT** is available in four styles; **DigiPREP HT** 250 with 10 or 20 positions which are used with 250ml digestion tubes; **DigiPREP HT** 100 with 10 or 40 positions which are used with 100ml tubes. Digestion tubes are also available calibrated. They may be made of borosilicate glass or made of quartz. The assembly, installation and operation of each of these blocks is quite similar; the main difference is the number and volume of digestion tubes they hold.

The heating cycle is controlled by a Colour Touch Screen or KeyPad controller. One should refer to the controller manual for the correct setup and its operations. It is important that the controller be set to the **'HT'** block setting from the **'UTILITIES'** screen of the controller in use. This will ensure optimal heating control of the block.

*Digi***PREP HT** typically comes with a manifold, insert rack, and related accessories for performing high temperature digestions (up to 450°C). The SiC coated graphite block, and Teflon coated components, are meant to handle the harsh environment of the laboratory. The system should provide many years of continued service with minimal maintenance.

It is understood that the operator of this equipment is qualified to do so. If training is required please contact your local distributer or the main office of **SCP SCIENCE**.

CAUTIONS AND NOTES

Cautions, warnings, and notes are included throughoutthis manual.

CAUTION



A caution is used to emphasize information pertaining to procedures that, if not CAUTION strictly followed, may result in damage or destruction to the instrument or improper instrument operation.

WARNING



A warning is used to emphasize information about dangerous or hazardous conditions WARNING relating to the operation, cleaning, or maintenance of the instrument that may result in personal injury.

NOTE

NOTE

A note is used to emphasize procedures or conditions that may be misinterpreted or overlooked, and to clarify potentially confusing situations.

WARRANTY

SCP SCIENCE warrants this product free from defect in workmanship and materials for one (1) year from date of purchase.

- SCP Should the unit malfunction. call SCIENCES's service department (see page 92), or your local distributor. and a service representative will instruct you on how to proceed.
- There are no user-serviceable parts in this unit. The warranty is void if the unit shows evidence of being tampered with, of being subjected to excessive moisture, heat or corrosion, or of other misuse.
- SCP SCIENCE shall not be responsible for any damage or losses however caused which may be experienced as a result of the installation or use of this product.
- This product is not warranted for, nor has it been tested for, use with perchloric acid. The user accepts all responsibility if this product is used with perchloric acid.
- The controller must be placed outside the fume hood.

Symbol	Description	Symbol	Description
V	Voltage		Mains on
~	Alternating current	0	Mains off
A	Current	Â	Attention, consult accompanying documents
Hz	Frequency	<u></u>	Caution, hot surfaces
F	Fast-acting fuse		Protective conductor terminal

OPERATIONAL PRECAUTIONS

DigiPREP HT must be grounded. In the event of an electrical short circuit, grounding reduces the risk of electrical shock by providing an escape wire for electrical current. **DigiPREP HT** is supplied with an umbilical cord that has a ground wire that is connected through the controller to earth ground. Ensure that the plug is plugged into an outlet that has been properly installed and grounded. Consult a qualified electrician if there is any doubt about the existence of proper grounding at the outlet.

DigiPREP HT is designed to be lifted from the bottom only. Ensure that the controller is disconnected prior to moving the system. Do not attempt to lift the system by the top white trim or the 'U' channel as damage may result.

*Digi***PREP HT** is an elevated-temperature digestion system with exposed hot surfaces. Be careful around the instrument when it is in operation.

*Digi***PREP HT** digestion block should be operated in a fully functional fume hood.

SAFETY INFORMATION

A minimum of safety considerations must be followed when working with the *DigiPREP* HT in order to maintain good laboratory practice:

- Do not place the *DigiPREP* **HT** on a surface containing flammable material.
- *Digi***PREP HT** requires a clearance of 3 inches on all sides.
- DigiPREP HT must be operated in a fume hood.
- Do not place the *Digi*PREP controller in a fume hood.
- *Digi*PREP HT is connected to a *Digi*PREP controller.
- *Digi***PREP HT** requires 230V ± 10% three-prong grounded outlet.

DigiPREP HT BLOCK DESCRIPTION



- 1. Exhaust manifold module
- 2. Dual-zone Tube Rack
- 3. Umbilical cable (to connect to controller)
- 4. Digestion Tubes

Unpacking



Retain all packing material in case you need to return the instrument to the manufacturer for service.

- 1. Verify that all components listed have been included:
 - DigiPREP HT system
 - Operation manual
 - Exhaust Manifold
 - Dual-Zone Tube Rack
 - Rack and Manifold support
 - Thumb screws (6pc)
 - Drip tray
 - Exhaust connection hose
 - Water Jet
 - Boiling Rods

- 5. Drip Tray
- 6. Thumb Screws (6)
- 7. Dual **PROBE** Connection (option)
- 8. Glass Water Jet



Optional items, such as glass, quartz, calibrated or non-calibrated digestion tubes may have been included in the shipment. Carefully check the packing list(s) and the contents of shipping cartons to verify that all items listed are included. Please notify **SCP SCIENCE** or your local distributor of any discrepancies.

Inspect the products for any shipping damage. If the instrument has been damaged in shipping, contact the freight carrier to report damage and to file a damage report. Also contact the **SCP SCIENCE** service department to report damage and to request service information (see page 88 for contact information).



If damage is noted, do not attempt to operate the instrument.

ASSEMBLY

Assemble the *Digi*PREP HT system following the step listed below.



Set the block proportion of the *Digi***PREP HT** with the back sitting towards the front edge of a lab bench.



Insert the aluminum 'U' support into the 2 square holes found in the top white ring, with thread holes facing towards back



Insert and tighten two thumb screws through the skin, and into the thread holes of the aluminum 'U' support.



Insert the right and left rack support panels. The short 90 degree bend goes toward the back of the system. The cut outs should be placed facing up as shown in the picture. Use 2 thumb screws to hold each of the panels in place.

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The Dual-Zone Tube Rack may be placed on the system. The first set of cut outs is to support the Dual-Zone Tube Rack when it is in the cooling position. The second set supports the Exhaust Manifold module. The manifold may be placed on the top two upper cut outs; this is the resting place of the manifold when not in use.

The drip tray is shown in place. It may be stored on top of the Teflon manifold when not in use.

Connect the black tubing to the Teflon drain tubes of each of the manifold drains from the top part of the 'Y' connectors.

The long black tubing is connected to the bottom of the last 'Y' connector. One 'Y' is supplied for the HT 250-20 and 3 'Y' are supplied for the HT 100-40 position. (As shown in picture). The HT 100-10 and HT 250-10 position Teflon manifolds are connected directly to the black exhaust tubing. The Teflon manifold may have 1, 2, or 4 drain tube connections. The end of the long black drain tube connects to the water jet (supplied with system) or the Universal Fume Scrubber (UFS option)

*Digi***PREP HT** system may now be placed in the fume hood.

The picture shown on the left shows a typical digestion set up, the insert rack with digestion tubes in place, lowered onto the graphite heating block, the Teflon manifold has been lowered onto the tubes, the exhaust tube is connected to a vacuum system for the removal of the unwanted fumes.







Next, ensure that *DigiPREP* controller is set to the correct settings for controlling *DigiPREP* block in use. (**HT** for all of *DigiPREP* **HT** high temperature digestion blocks) With the controller's power switch in the "off" position, verify the following:

- Voltage selector switch on the back of the controller is properly set to 230 volts. (The Colour Touch Screen & KeyPad do not have a voltage selector
- Connect the blocks umbilical cord to the controller.



Disconnecting or reconnecting the umbilical cable while the controller is turned on, especially while it is on the **RUN** screen, will likely result in permanent damage to the instrument.

- Connect the power cord to the back of the controller.
- Connect the *DigiSET* dongle to the back of the controller.
- NOTE

DigiSET is not typically used with the **DigiPREP HT** Digestion blocks. The system is now ready to be plugged in and turned on. Consult the controller manual for programming and operation instructions.

DUAL PROBE OPTION

The dual **PROBE** may be retrofitted in the field or may have come factory installed. This option allows the lab to verify the *Digi***PREP HT** block temperature independently of the *Digi***PREP** Controller used. The dual **PROBE** contains two separate RTDs in one sheath; one sensor is connected through the umbilical cord to the *Digi***PREP** controller to monitor and control the block temperature. The second RTD **PROBE** is connected to the 2 pin connector on the back of the DigiPREP HT system to allow for the monitoring of the precision of block controller display temperature. (Or the correct size hole may be made to house the panel mount connector for field installation). The 2 pin female connector on the back of the DigiPREP HT system is supplied with a mating cable with two bare ends. This cable is to facilitate the connection of the second **PROBE** sensor to an instrument capable of reading a 100Ω RTD. If an Ohm meter is being used, the typical value at 100°C is 138.5 Ω , and for 380°C the resistance value is 240.13 Ω (see table page 61.) It is recommended to use a certified controller capable of measuring a temperature from 100 ohms platinum RTD. (0.00385 factor)

The tolerance of the temperature **PROBE**s used on the *Digi***PREP HT** systems is of a 'Class A' specifications. A typical variation at 100°C is \pm 0.15°C and at 400°C is \pm 0.95°C.

Parts for the Dual **PROBE** Option (field installation) complete with mating cable.





HEAT DEFLECTOR ASSEMBLY



1) If evaporation times are too long, Heat Deflector shields may be installed (option product number 010-520-032) They push into place as shown in the following instructions.



2) Install heat deflector as shown. Lips on side & bottom.

3) Push heat deflector in and flush at bottom.



5) Place fingers through holes in top of rack to reach heat deflector.



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REFERENCE DATA

RTD Resistance vs. temperature tables for IEC 60751 100 Ohm Platinum RTDs with temperature Coefficient of 0.00385-Ref. 54

(°C)	0	1	2	3	4	5	6	7	8	9
(0)	100.00	100.39	100.78	101.17	101.56	101.95	102.34	102.73	103.12	103.51
(10)	103.90	104.29	104.68	105.07	105.46	105.85	106.24	106.63	107.02	107.40
(20)	107.79	108.18	108.57	108.96	109.35	109.73	110.12	110.51	110.90	111.28
(30)	111.67	112.06	112.45	112.83	113.22	113.61	113.99	114.38	114.77	115.15
(40)	115.54	115.93	116.31	116.70	117.08	117.47	117.85	118.24	118.62	119.01
(50)	119.40	119.78	120.16	120.55	120.93	121.32	121.70	122.09	122.47	122.86
(60)	123.24	123.62	124.01	124.39	124.77	125.16	125.54	125.92	126.31	126.69
(70)	127.07	127.45	127.84	128.22	128.60	128.98	129.37	129.75	130.13	130.51
(80)	130.89	131.27	131.66	132.04	132.42	132.80	133.18	133.56	133.94	134.32
(90)	134.70	135.08	135.46	135.84	136.22	136.60	136.98	137.36	137.74	138.12
(100)	138.50	138.88	139.26	139.64	140.02	140.39	140.77	141.15	141.53	141.91
(110)	142.29	142.66	143.04	143.42	143.80	144.17	144.55	144.93	145.31	145.68
(120)	146.06	146.44	147.19	147.57	147.94	148.32	148.32	148.70	149.07	149.45
(130)	149.82	150.20	150.57	150.95	151.33	151.70	152.08	152.45	152.83	153.20
(140)	153.58	153.95	154.32	154.70	155.07	155.45	155.82	156.19	156.57	156.94
(150)	157.31	157.69	158.06	158.43	158.81	159.19	159.55	159.93	160.30	160.67
(160)	161.04	161.42	161.79	162.16	162.53	162.90	163.27	163.65	164.02	164.39
(170)	164.76	165.13	165.50	165.87	166.24	166.61	166.98	167.35	167.72	168.09
(180)	168.46	168.83	169.20	169.57	169.94	170.31	170.68	171.05	171.42	171.79
(190)	172.16	172.53	172.90	173.26	173.63	174.00	174.37	174.74	175.10	175.47
(200)	175.84	176.21	176.57	176.94	177.31	177.68	178.04	178.41	178.78	179.14
(210)	179.51	179.88	180.24	180.61	180.94	181.34	181.71	182.07	182.44	182.80
(220)	183.17	183.53	183.90	184.26	184.63	184.99	185.36	185.72	186.09	186.45
(230)	186.82	187.18	187.54	187.91	188.28	188.63	189.00	189.36	189.72	190.09
(240)	190.45	190.81	191.18	191.54	191.90	192.26	192.63	192.99	193.35	193.71
(250)	194.07	194.44	194.80	192.16	192.52	195.88	196.24	196.60	196.96	197.33
(260)	197.69	198.05	198.41	198.77	199.13	199.49	199.95	200.21	200.57	200.93
(270)	201.29	201.65	202.01	202.36	202.72	203.09	203.44	203.80	204.16	204.52
(280)	204.88	205.23	205.59	205.95	206.31	206.67	207.02	207.38	207.74	208.10
(290)	208.45	208.81	209.17	209.52	209.88	210.24	210.59	210.98	211.31	211.66
(300)	212.02	212.37	212.73	213.09	213.44	213.80	214.15	214.51	214.86	215.22
(310)	215.57	215.93	216.28	216.64	216.99	217.35	217.70	218.05	218.41	218.76
(320)	219.12	219.47	219.82	220.18	220.53	220.88	221.24	221.59	221.94	222.29
(330)	222.65	223.00	223.35	223.70	224.06	224.41	224.76	225.11	225.46	225.81
(340)	226.17	226.52	226.87	227.22	227.57	227.92	228.27	228.62	228.97	229.32
(350)	229.67	230.02	230.37	230.72	231.07	231.42	231.77	232.12	232.47	232.82
(360)	233.17	233.52	233.87	234.22	234.56	234.91	235.26	235.61	235.96	236.31
(370)	236.65	237.00	237.35	237.70	238.04	238.39	238.74	239.09	239.43	239.78
(380)	240.13	240.47	240.82	241.17	241.51	241.86	242.20	242.55	242.90	243.24
(390)	243.59	243.93	244.28	244.62	244.97	245.31	245.66	246.00	246.35	246.69

TYPICAL HEATING RATES FOR DigiPREP HT

1st Step

When programming the first 'time to temperature' and the 'time at temperature' cycle, it is assumed that the *Digi***PREP HT** will begin the cycle from ambient temperature. To enter the 'Time to Temperature' for the first step is a simple matter of using the graph below.

Example:

Heat a *Digi*PREP HT block from 25°C (ambient) to 300°C.

Solution:

From the graph, draw a line from 300°C across to the curve representing the voltage that the *Digi***PREP HT** is connected to. (208 V is typical in North America, 230 V in typical Europe). Draw a line down from this point to the Time Scale. Time to Temperature = at least 25 minutes.

2nd Step

When programming the additional ramp and soak cycles, the Time to Temperature will depend on the last temperature reached – i.e. the previous setpoint. This becomes more complex, as the heating rates for the *Digi***PREP HT** depend on both the Setpoint temperature and the Δ T. Two equations are needed:

Equation 1: $\Delta T = T_{\text{final}} - T_{\text{initial}}$ Equation 2: Time to Temperature = ΔT / rate

HT Typical Heating Rates (°C/min) vs Setpoint temperature and ∆T								
∆ T (°C)	Setpoint Temperature							
	25-50 50-225 225-350 350 +							
0-25	1	3	2	2				
25-200	-	20 min	4	3				
200-325	8 4							
325-425	-	-	-	5				

HT- Typical Time to Temperature



Example:

On the second ramp and soak cycle, heat the *Digi*PREP HT to 300°C, assuming that the first Setpoint temperature was 200°C.

Solution:

Calculate ΔT . $\Delta T = T$ final-Tinitial

=second set point - first set point =300°C - 200°C=100°C

To determine the rate from the HT Typical Heating Rates chart, use the '25 to 200' row because Δ T is within this range. Use the '225-350' column since the second set poitn is 300°C.

The table recommends a heating rate of at least $4^{\rm o}\text{C/min}.$

Time to Temperature $=\Delta T \div rate$

=100 / 4 = 25 min

Therefore, a minimum of 25 minutes is required.

3rd Step

Example:

On the third ramp and soak cycle, heat the *Digi*PREP HT to 380°C. The second Setpoint temperature was 300°C (from the previous example)

Solution:

Calculate Δ T. Δ T=Tfinal-Tinitial =third set point - second set point =380°C - 300°C=80°C

To determine the rate from the '**HT** Heating Rates' chart, use the '25 to 200' row because Δ T is within this range. Use the '350+' column since the second setpoint is 380°C.

The table recommends a heating rate of 3°C/min Time to Temperature $=\Delta T \div$ rate =80 / 3 = 26.6 min

Therefore, use a 'time to temperature' of 27 minutes.

METHOD DEVELOPMENT FOR DIGESTING SAMPLES

A typical H_2SO_4 digestion program is as follows. Suitable boiling chips or the supplied boiling rods should be used to prevent bumping during the digestion procedure.

Step 1

Set point Temperature is 150°C Time to Temperature 45 minutes Time at Temperature is 60 minutes.

Step 2

Set Point Temperature is 380°C Time to temperature is 45 minutes Time at Temperature is 30 minutes

If the sample contains water, the water must be evaporated off prior to proceeding to Step 2. If this is not done then severe bumping may occur.

The amount of vacuum pulled on the manifold should be sufficient to prevent fume from escaping from the tube. The incoming air will promote reflux, as this is a necessary step to wash down the walls of the tubes to ensure complete digestion of the sample.

If bumping occures at the set point temperature then the temperature should be lowered by 5° C. If bumping does not occur at set point temperature then the temperature may be raised by 5° C to help speed up the rate of evaporation.

The amount of TKN digestion reagent in the sample will have an impact on the boiling point of the sample. Blank samples will not evaporate at the same rate as sample with solids.

At the end of Step 1 the sample should resemble a black liquid. It should contain about 10-15% of the volume of the starting sample if it was a liquid sample to start with.

If the sample is dry at this step. More sulphuric acid needs to be added to the TKN digestion reagent.

Step 2 is the digestion step that completes the destruction of organic nitrogen bonds. The solution at the end of this step should be a clear coloured liquid. If black spots remain in thesolution then the digestion time needs to be extended. If the solution in the tube turns to a solid at room temperature more sulphuric acid needs to be added to the TKN digestion reagent.



The Dual-Zone tube rack should be lifted at the end of the digestion step to allow the tubes to cool as shown in the picture (right). It is not necessary to place tubes in all positions during a digestion.

CLEANING



If the surface is still hot, contact with a liquid may create steam that can scald you. It is important to allow the instrument to cool before cleaning.

Cleaning of minor surface spills

Turn off the system and unplug the *Digi***PREP HT** from the power source. Allow the system to cool. Sponge up any excess liquid, dilute the area with clean water, and wipe dry with a paper towel.

Cleaning of digestion wells

Turn off the system and unplug the *Digi***PREP HT** from the power source. Allow the system to cool before proceeding further.

Suction the solution out of the well with an eye dropper, squeeze bottle, or pipette. Dilute any remaining spillage with water, two or three times, and suction as much solution out as possible. Sponge the remaining residue with a paper towel. Allow the system to dry completely before powering up.

Cleaning of a major spill

If a solution has run down around and below the graphite digestion block, turn off the system and unplug *Digi***PREP HT** from the power source. Allow the system to cool before proceeding further. *Digi***PREP HT** must be disassembled, cleaned, and thoroughly dried prior to running again.



Please consult the service departmentfor help if required.

In order to access under the block, first remove the exhaust manifold and the insert rack from the two-tier upright. Then remove the 'U' channel and the white top ring. To do so, remove the two thumb screws from the back of the system that holds the 'U' support with the two side panels connected. Lift the 'U' channel straight up and set off to the side.

To remove the block and inner heater pan, turn the unit upside-down onto a soft surface, a piece of cardboard is fine to do this on. Remove the four locking nuts from the bottom of the support pan and lift up on the outer housing. Lift gently as the over temperature protection device and temperature sensor are attached to the graphite block through the side of the inner heater pan. The RTD probe and over temperature bulb may be gently removed from the graphite block. Caution should be exercised so not to pinch the over temperature gas line. Access is now available for cleaning the inner pan and other affected areas.

The coated block surface may be cleaned with a mixture of 100ml $\mathrm{HNO}_{\rm 3}$ and 25ml HF in a litre of DI water.

The Teflon Exhaust manifold may be rinsed with tap or DI water after each run. Place the manifold, tube adapter side down to drain and dry. It is fine to run water through the manifold without disassembling for cleaning purposes.

SPECIFICATIONS DigiPREP HT

ENVIRONMENTAL

Relative humidity	30% to 80%
Altitude	Up to 200m
Installation	Category II
Pollution	Degree 2
Ambient operating temp.	-5°C to 40°C

ELECTRICAL

Model	Digi PREP HT
Voltage	230V ±5%
Power	3362W 40 and 20 posi- tion
Power	3000W / 10 position
Internal thermal fuse	Manual reset above 450°C
Frequency	50/60 Hz
Ambient operating temp.	Ambient to 450°C



The main supply cord is constructed of heat-resistant material and should only be replaced by an equivalent or better cord.



Line voltage fluctuations greater than 10% will affect instrument performance.

RoHs

	Toxic or hazardous substances and elements									
Part name	Lead (Pb) Mer- cury (Hg)		Cadmium (Cd)	Hexavalent Chromium (Cr ⁶⁺)	Polybrominat- ed Biphenyle (PBB)	Polybrominated Diphenyl Ether (PBDE)				
Housing	0	0	0	0	0	0				
SiC Block	0	0	0	0	0	0				
RTD probe	0	0	0	0	0	0				
Over temperature sensor	0	0	0	0	0	0				

O: Indicates that the toxic or hazardous substance contained in all the homogenous materials for this part, according to EIP-A, EIP-B, EIP-C, is below the limit requirement in SJ/T11363-2006.

X: Indicates that the toxic or hazardous substance contained in all the homogenous materials for this part, according to EIP-A, EIP-B, EIP-C, is above the limit requirement in SJ/T11363-2006.

ACCESSORIES and OPTIONS DigiPREP HT 100 10 OR 40 POSITION

Catalogue Number	Description
010-520-010	DigiPREP HT 100-40 Teflon coated Insert Rack
010-520-011	Digestion tubes (100 ml), borosilicate uncalibrated
010-520-032	Heat Deflector for HT Insert Rack
010-520-039	Cooling Finger for HT 100 600mm long
010-520-085	Digestion tube Quartz uncalibrated
010-520-111	Digestion Tube, Calibrated at 25ml and 50ml
010-520-115	Digestion Tube, Calibrated at 25ml and 75 ml
010-520-211	Insert Rack HT 100-10, Teflon Coated
010-520-215	Manifold HT 100-10 position
010-520-310	Dual Probe for HT field installable
010-520-318	DigiPREP HT Ball-Glass Condensor for 100ml Digestion Tubes
010-520-322	DigiPREP Quartz Ball Condensor for 100ml Digestion tubes

DigiPREP HT 250 10 OR 20 POSITION

Catalogue Number	Description
010-520-030	DigiPREP HT 250 Teflon coated Insert Rack
010-520-031	Digestion Tube, borosilicate uncalibrated
010-520-032	Heat Deflector for <i>Digi</i> PREP HT Insert Rack
010-520-087	Digestion Tube, Quartz, uncalibrated
010-520-131	DigestionTube, Calibrated at 50ml and 100ml
010-520-133	Digestion tube, borosilicate Calibrated at 25ml and 50ml
010-520-250	Exhaust Manifold Rack, <i>Digi</i> PREP HT 250-20 position
010-520-253	Exhaust Mainfold, <i>Digi</i> PREP HT 250-10 position
010-520-312	DigiPREP HT 250 Ball Glass Condensor
010-520-316	Cooling Finger for <i>Digi</i> PREP HT 250 (100mm long) for use with 010-520-320
010-520-320	DigiPREP HT Digestion tube, 250ml, with Socket Joint Tube

ELECTRICAL SCHEMATIC – DigiPREP HT



DigiPREP JR BLOCK DESCRIPTION



- 1. *Digi***PROBE** Connector-Connection port for *Digi***PROBE**. *Digi***PROBE** will allow direct monitoring and control based on actual sample temperature. *Digi***PROBE** Dongle must be installed to run the *Digi***PREP Jr** without the *Digi***PROBE** option.
- 2. Cable Connector Connection port for the *Digi*PREP Jr umbilical cable to the controller.
- Power Switch/ Power Cord Receptacle On/Off switch – contains circuit breaker and receives the female end of the power cord.
- DigiSET Connector Connection port for DigiSET. DigiSET will automatically shut off the digestion block when a pre-set

sample volume is reached. *Digi*SET dongle must be installed to run *Digi*PREP **Jr** without the *Digi*SET option.

- 5. *Digi***PREP** Controller *Digi***PREP** Jr is designed to be used with *Digi***PREP** KeyPad* or Touch Screen* controller (*Sold separately)
- 6. *Digi***PROBE** (Option) To monitor and control sample or block temperature.
- 7. *Digi***PROBE** Storage Well Use with replaceable glass liner.
- 8. Voltage Selector Switch Select appropriate voltage. If 115 V is showing, system is running at 115 volts.

DigiPREP SPARE PARTS LIST

DigiPREP JR(010-505-205)

- 1. **P200** CPVC Corian top support
- 2. C403 Label: DigiPREP Jr
- 3. C401 Label: SCP SCIENCE
- 4. S129 Housing for *Digi*PREP Jr
- 5. M113 Screw for CPVC Corian top support
- 6. S104 Harness, umbilical cord (Jr, HP, MS, HT)

BOTTOM OF DigiPREP JR

- 1. M180 Screws to secure feet (all *Digi*PREP systems)
- 2. M173 Rubber feet (all *Digi*PREP systems)
- 3. C584 Label: DigiPROBE
- 4. E346 RTD panel connector
- 5. S104 Harness, umbilical cord (Jr, HP, MS, HT)
- 6. M109 Teflon hole plugs

TOP VIEW: EXPOSED

- 1. **P200** CPVC Corian top support
- 2. **C176** RTD
- 3. **S129** Housing for \mathbf{Jr} unit
- 4. E346 RTD panel connector
- 5. S104 Harness, umbilical cord (Jr, HP, MS, HT)







SIDE VIEW: EXPOSED

- 1. W137 Old-style thermal switch 180C
- 2. E239 Voltage selector switch
- 3. E353 Heater pad
- 4. G103 Graphite block (coated)
- 5. C176 RTD thermal sensor
- 6. J111 Insulation, Jr, 10-pc. set

Other miscellaneous parts

A352 Aluminium plate-Secures bottom insulation

C161 Hot label for Corian top-possible hot surfaces

P340 White Corian top

S121 HEATER HARNESS JR

- 1 E353 Heater 115V/230V 48" Lead UL (Jr)
- 2 **E106** Thermal protection relay
- 3 **E239** Voltage selector
- 4 **P149** Teflon tape 0.003 x 7.5 x 11
- 5 G103 Graphite block grade HLM (Jr), coated





DigiPREP MS BLOCK DESCRIPTION



- DigiPROBE Connector Connection port for DigiPROBE. DigiPROBE will allow direct monitoring and control based on actual sample temperature. DigiPROBE Dongle must be installed to run the DigiPREP MS without the DigiPROBE option.
- 2. Cable Connector Connection port for the *Digi*PREP MS umbilical cable to controller.
- 3. Power Switch/ Power Cord Receptacle On/Off switch – contains circuit breaker and receives the female end of the power cord.
- 4. *Digi*SET Connector Connection port for *Digi*SET. *Digi*SET will automatically

shut off the digestion block when a pre-set sample volume is reached. *Digi*SET dongle must be installed to run *Digi*PREP MS without the *Digi*SET option.

- 5. **DigiPREP** Controller **DigiPREP MS** is designed to be used with **DigiPREP** KeyPad* or Touch Screen* controller (*Sold separately).
- 6. *Digi***PROBE** well Use with replaceable glass liner.
- 7. Voltage Selector Switch-Select appropriate voltage. If 115 V is showing, system is running at 115 volts.

DigiPREP MS (010-500-205)

- 1 P200 CPVC Corian top support
- 2 C632 Label: DigiPREP MS
- 3 C401 Label: SCP SCIENCE
- 4 S124 Housing for *Digi*PREP MS
- 5 M113 Screw for CPVC Corian top support
- 6 S104 Harness, umbilical cord (Jr, HP, MS, HT)

BOTTOM OF DigiPREP MS

- 1 **M180** Screws to secure feet (all *Digi***PREP** systems)
- 2 M173 Rubber feet (all DigiPREP systems)
- 3 C584 Label: DigiPROBE
- 4 E346 RTD panel connector
- 5 S104 Harness, umbilical cord (Jr, HP, MS, HT)
- 6 M109 Teflon hole plugs

Other miscellaneous parts (MS)

- A191 Aluminium plate Secures bottom insulation
- C161 Hot label for Corian top Informs users of possible hot surfaces
- P149 White Corian top Fits MS, HP, classic *Digi*PREP systems
- J112 Insulation set Insulates the heating block
- C176 RTD Returns temperature signals





S125 HEATER HARNESS (MS, HP)

- 1 E391 Heater 115V/230V (MS, Classic, HP)
- 2 **E106** Thermal protection relay
- 3 E239 Voltage selector
- 4 **P147** Teflon tape 0.003 x 13.25 x 17.25
- 5 G102 Graphite block grade HLM (MS), coated



DigiPREP HP BLOCK DESCRIPTION



- DigiPROBE Connector Connection port for DigiPROBE. DigiPROBE will allow direct monitoring and control based on actual sample temperature. DigiPROBE Dongle must be installed to run the DigiPREP MS without the DigiPROBE option.
- 2. Cable Connector Connection port for the *Digi*PREP MS umbilical cable to controller.
- Power Switch/ Power Cord Receptacle On/Off switch – contains circuit breaker and receives the female end of the power cord.
- 4. *Digi*SET Connector Connection port for *Digi*SET. *Digi*SET will automatically

shut off the digestion block when a pre-set sample volume is reached. *Digi*SET dongle must be installed to run *Digi*PREP MS without the *Digi*SET option.

- 5. *Digi*PREP Controller *Digi*PREP MS is designed to be used with *Digi*PREP KeyPad* or Touch Screen* controller (*Sold separately).
- 6. *Digi***PROBE** well Use with replaceable glass liner.
- 7. Voltage Selector Switch-Select appropriate voltage. If 115 V is showing, system is running at 115 volts.

DigiPREP HT BLOCK DESCRIPTION



- 1. Exhaust Manifold Module.
- 2. Dual Zone Tube Rack
- DigiPREP Controller DigiPREP HT is designed to be used with DigiPREP Touch Screen* or KeyPad* controller (*Sold separately)
- 4. Umbilical Cable to connect to controller.
- 5. Glass Digestion Tubes 40 / 100 ml glass tubes or 20 / 250 ml glass tubes are included with the *Digi*PREP HT.



Old format *Digi***BLOCK** umbilical cords are only 7 pins. The footprint size is approximately the same as that of a *Digi***PREP** Dongle. If the instrument has 9 pins on the umbilical cord, please refer to figure

DigiPREP HT (010-500-205)

1 **C582** Thermostat – Panel Mounted

Other Miscellaneous Parts

- C560 RTD Sensor HT RTD Sensor 90 degree bend
- E667 Heater for HT Used in both 100 and 250 models
- **G502** Graphite Block 250ml HT only
- **G501** Graphite Block 100ml HT only
- P616 White Corian TopFits both 250 and 100 HT models
- **S127** House for HT Used in both 250 and 100 HT models
- C398 DigiPREP HT Label for front of instrument
- **S128** Heater pan Assembly Used in both 250 and 100 HT models



DigiPREP LS SPARE PARTS LIST



- **C176** RTD Returns temperature signals
- C630 Label, *Digi*PREP LS Attached to front of instrument
- P200 Corian Ring Support All DigiPREPs
- M113 Screw-Corian Ring Support All Corian Ring supports
- P249 Corian Ring For LS unit only
- **E550** Power Cord Switch 15A Switch and line filter combo
- **\$183** Umbilical Harness All *Digi*BLOCK Models
- E106 Thermo Protection Relay Protects from over temperature

- **G108** Graphite LS block coated Teflon coated LS block
- M180 Screws to Secure Feet All blocks except COD
- M173Rubber feet for all blocks All blocks exceptCOD
- E357 Heater 220V Heater for DigiPREP LS
- J123 Insulation Set LS Only
- A106 Aluminum Plate, LS Only
- E346 RTD Panel Connector Dongle port, all *Digi*PREP blocks
- P192 Teflon Tape Fits only on LS blocks

SPARE PART LIST

SCP Part #	PART DESCRIPTION	MANUFACTURER #
E600	Buzzer	CCG-1206
E190	Capacitor, 470 pF	A471K15X7RH5TAA
E191	Capacitor, 2770 uF, 35V	ELXY350ELL272ML40S
Exxx	Capacitor, 470 uF, 10V	UVR1A471MED
E186	Capacitor, 10nF, 1KV	5GAS10
E189	Capacitor, 470 pF	ECK-DNA471MB
E601	Capacitor, 100 pF	ECK-ANA101MB
E145	Capacitor, 47 nF	2222 338 14473
E184	Capacitor, 10 uF, 450V	UVZ2W100MHD
E185	Capacitor, 22 uF, 450V	UVZW220MHD
E188	Capacitor, 10uf, 50V	UVZ1H100MDD
E603	Schottky diode	MBR360RL
E604	Diode, 200V, 600W	P6KE200ARL
E194	Diode, 1000V, 1A	1N4007G-T
E337	Fuse, 0.75A, 250V, fast blow, 1/4 x 1 1/4	313.750HXP
E209	Fuse, 15A/250 fast blow	BK/ABC-15-R
E902	Housing 3-pin W/R	22-01-2037
Exxx	Housing 8-pin, 1.25mm	51021-0800
E201	Inductor, 1500 uH, High current	4590R-155K
E203	Inductor, 3.3 uH, radial	RL622-3R3K-RC
E607	Inductor, 25 mH min., 120 K Ω @ 200KHz	BU16-2530R7BL
E175	Resistor, 33 Ω	CFR-25JB-33R
E311	Resistor, 4.7K Ω	CFR-12JB-4K7
E176	Resistor, 100 Ω, 1/2W	CFR-50JB-100R

SCP PART #	PART DESCRIPTION	MANUFACTURER #
E174	Resistor, 47 Ω , 1/4 W	CFR-25JB-47R
Exxx	Trimpot, 5 K Ω , 1/2 W	PV36W501C01B00
E608	Resistor, 360 Ω , 1/2 W	CFR-50JB-360R
E609	Resistor, 75 Ω , 1/2 W	CFR-50JB-75R
E611	TRIAC 600V 25A to 220AB	BTA24-600BW
E199	Transformer, 28V A @1- -kHz, 4KV	CSM 2010-083
E204	Optocoupler, DIP, 70V/50mA, 5Kv	H11A817A
E198	IC Switcher Off-line, 8DIP, 700V	TNY268P
E197	Reference regulator, TO- 92. adjustable, 2.5V-36V	LM431LP
E631	Regulator LDO 3.3V to 220	LM3940IT-3.3
Exxx	IC Reg Pos 100MA 3.3V to 92	L78L33ACZ
E612	Optocoupler High Volt- age	MOC3163M
E769	Fan, 5Vdc/0.19A	CR0405HB-G70
E225	Switchdraft Panel Mt. 2 Pin Male	EN3P2M
E226	Switchcraft Cord, 2 Pin Female	EN3C2F
Exxx	5.7" Display Module	51-0001-03
010-505-052	<i>Digi</i> SET Dongle (4 Pin male)	
010-500-051	<i>Digi</i> PROBE (2 Pin Male)	
HEATER VERIFICATION



DigiPREP DISMANTLING PROCEDURES

This section deals with dismantling the unit to gain access to the components inside. There have been several electrical revisions to the *Digi***PREP** systems. If you do not find instructions for your model, continue reading.

REMOVING THE CORIAN RING

1. Turn the *Digi*PREP Block on its side to obtain the key



- If you find an aluminium T: Continue to step 2.
- If you don't find an Aluminium T: The Corian ring is designed to lift off the top of the instrument manually. Pull up gently on each corner until the top lifts off, and continue to **'Removing the graphite block'**.

2. Insert the key into one of the slots located beside the rubber feet.



3. Push the aluminium T into the slot until the Corian ring begins to lift.



4. Repeat process for the three remaining clips, and return the aluminium key to the base of the unit.



If you are missing your aluminium key, a substitution such as a flat head screwdriver will also work.

REMOVING THE GRAPHITE BLOCK

Please ensure you have removed the Corian ring before removing the block.

1. Flip the unit upside-down on a soft surface and remove the 4 black caps.



3. Gently lift the Kydex skin from the graphite block. Unscrew the voltage selector switch so that you have more freedom of movement when performing maintenance on the block.



DigiPREP TESTS AND REPLACEMENT PROCEDURES

2. Using a 3/16-inch (4.5mm) Hex key, remove the 4 screws and washers that secure the graphite block to the instrument housing.



VOLTAGE SELECTOR SWITCH, E239



The voltage selector switch has 6 connections: 1, 1a, 1b, 2, 2a, and 2b.

The following table shows what each terminal **OVER-TEMPERATURE PROTECTION DEVICES** connects to:

-	
1	Red Wire: Connects to pin 9 on the umbilical cord
1 a	White wire: Connects to neutral of the heater pad
1b	Parallel Connection: Between jumper from 2a and black heater wire (live)
2	Parallel Connection: Black heater wire (live) and over-temperature protection switch
2a	Jumper from 2a to 1b and Black heater wire (live)
2b	No connection





E106 – New format

Instruments with the E106 installed are serial numbers JR46040231 forward. MS46040120 forward, and HP03050060 forward, and all LS blocks.

How to replace an E106

The E106 is mounted onto the side of the block with two Phillips-head screws. There is no polarity to this device - simply connect one end to the wire that runs to pin 2 of the voltage selector switch, and the other end to the wire that runs to pin 7 of the umbilical cord.

W137 – Old format

Instruments with the W137 installed are serial numbers JR46040231 and earlier, MS46040120 and earlier, and HP03050060 and earlier. No LS blocks have this device installed.

How to replace a W137

The W137 is a cylindrical device that inserts into the block itself. This model does not have quick disconnects and must be soldered and isolated with shrink wrap tubing to ensure a secure connection. Like the E106, there is no polarity to this devicesimply connect one end to the wire that runs to pin 2 of the voltage selector switch, and the other side to pin 7 of the umbilical cord

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To verify the over temperature protection switch is closed, measure between pin 7 and pin 9: this should return a resistance based on the resistance of the heater mat (see table on page 88).

UMBILICAL CORDS, S104

The S104 umbilical harness is the power, and communication medium between the block and the controller. There are two formats of umbilical cords: the new version includes Jr blocks with s/n JR640404137 forward, HP Blocks with s/n 9241030022 forward, MS blocks with s/n MS45030019 forward, and any LS block. Any previous serial numbers have the old format umbilical harness.

New-style umbilical harness tests



- 1. Place the multi-meter on the continuity setting.
- 2. Measure between pin 2 and the graphite block. This should return continuity. Ensure you pick a spot that is not covered with Teflon.
- 3. Measure between pin 2 (ground) and each pin individually. No pins should return continuity.
- 4. Measure between pin 4 (EX+) and pin 6 (M+). This should return continuity.
- 5. Measure between pin 1 (EX-) and pin 3 (M-). This should return continuity.

6. Measure between pin 7 (L) and pin 9 (N). This should return a resistance based on the following table:

MODEL	VOLTAGE SELECTOR SWITCH POSITION	RESISTANCE
Digi PREP Jr	115V 230V	$18\Omega \pm 2\Omega$ $71\Omega \pm 2\Omega$
DigiPREP MS	115V 230V	$15\Omega \pm 2\Omega$ 57 $\Omega \pm 2\Omega$
Digi PREP HP	115V 230V	$15\Omega \pm 2\Omega$ 57\Omega \pm 2\Omega
DigiPREP LS	230V	$20\Omega \pm 2\Omega$
DigiPREP HT	230V	$16\Omega \pm 2\Omega$

- Measure between pin 6 on the umbilical cord (M+/EX+) and pin 1 of the dongle port. This should return continuity.
- Measure between pin 3 on the umbilical cord (M-/EX-) and pin 3 of the dongle port. This should return continuity.

Old-style umbilical harness tests

Instruments with the old-style umbilical harness are for Junior blocks with s/n JR640404136 and earlier, HP blocks with s/n 9241030021 and earlier, and MS blocks with s/n MS45030019 and earlier. Please note this style is discontinued and can no longer be purchased. All LS blocks have the new form of umbilical cord.



- 1. Set your multi-meter to continuity.
- Measure between pin 4 (ground) and the graphite block. This should return continuity. Ensure you measure in a location that is not covered with Teflon coating.
- 3. Measure between pin 4 (Ground) and each pin individually. No continuity should be detected between them.
- 4. Measure between pin 1 (EX+) on the umbilical cord and pin 1 of the dongle port. This should return continuity.
- 5. Measure between pin 7 (EX-) on the umbilical cord and pin 3 of the dongle port. This should return continuity.
- 6. Measure between pin 6 (M+) on the umbilical cord and pin 2 of the dongle port. This should return continuity.
- 7. Measure between pin 5 (M-) on the umbilical cord and pin 4 of the dongle port. This should return continuity.
- 8. Measure between pin 2 (N) and 3 (L) on the umbilical cord. This should return a resistance based on the table on page 85.

INTERNAL RTD, C176

The internal RTD is a variable resistor whose value changes as a function of temperature. By determining the change in resistance, the controller's programming is able to determine the temperature of the block to a very accurate degree (within 0.1 degrees).

At room temperature, 21 degrees Celsius, the internal RTD (C178) returns a value of approximately 108 ohms.

To measure the value of the internal RTD, insert the 4-pin *Digi***PREP** dongle into the block's port. For new models, measure between pin 1 and pin 4 of the umbilical cord. For older models, measure between pin 6 and pin 5 of the umbilical cord.

If you cannot read a resistance, visually inspect the wires running from the *Digi***PREP** dongle port to the RTD, as well as the wires from the port to the umbilical cord.



To determine which style of umbilical cord you have, please review the schematics and serial numbers listed on pages 80 and 81.

HEATING PAD TESTING PROCEDURES

The main methods for testing heater pads for malfunctions are through resistance checks and visual inspections.

To measure the resistance of the heater: for new umbilical cord models, measure between pin 7 and pin 9. For old umbilical cord models, measure between pin 2 and pin 3.



To determine which style of umbilical cord you have, please review the schematics and serial numbers depicted on pages 80 and 81.

The following table displays the resistance values of functioning heaters:

MODEL	VOLTAGE SELECTOR SWITCH POSITION	RESISTANCE
Digi PREP Jr	115V 230V	$18\mathbf{\Omega} \pm 2\mathbf{\Omega}$ $71\mathbf{\Omega} \pm 2\mathbf{\Omega}$
DigiPREP MS	115V 230V	$15\mathbf{\Omega} \pm 2\mathbf{\Omega}$ $57\mathbf{\Omega} \pm 2\mathbf{\Omega}$
Digi PREP HP	115V 230V	$15\mathbf{\Omega} \pm 2\mathbf{\Omega}$ $57\mathbf{\Omega} \pm 2\mathbf{\Omega}$
DigiPREP LS	230V	$20\Omega \pm 2\Omega$
Digi PREP HT	230V	$16\Omega \pm 2\Omega$



Resistance of the mat will change depending on the voltage setting.

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HEATING PAD INSPECTION PROCEDURES

If you notice that the heater mat's resistance is higher than normal, it is likely that there is physical damage done to the heater. The following are pictures of a defective heater:



The above picture is of damage to a heater caused by a manufacturing defect. When acid causes a heater malfunction, it typically leaves white residue around the burn mark. This burn mark has no acid residue around it; it is therefore a manufacturing defect.



The above picture is of damage caused by an acid spill that has leaked under the graphite block and eaten away at the heater. Notice the white acid residue. Damage such as this is not covered under warranty as it is caused by an acid spill or sample boil-over.

HEATER REPLACEMENT PROCEDURES

1. Cut the three heater wires that join the heater to the voltage selector switch and umbilical cord.



The above picture is of damage caused by an acid spill that has leaked under the graphite block and eaten away at the heater. Notice the white acid residue. Damage such as this is not covered under warranty as it is caused by an acid spill or sample boil-over or not cleaning a major spill promptly.



2. Peel the heater off of the graphite block and ensure there is a Teflon sheet between the heater and the graphite block. Check the integrity of the Teflon sheet. Clean any particles off the surface with alcohol.



3. Apply silicon sealant to the Teflon sheet.



4. Using a smooth but rigid piece of material, spread the silicon sealant evenly so that a thin layer covers the surface where the heater will rest.



5. Place the new heater on the surface of the Teflon sheet and remove any air bubbles between the Teflon sheet and the heater by planing a smooth but rigid piece of material across the surface.



 Reconnect the wiring of the new heater to the wires originally cut in section 1; there is no polarity to the black wires as they are AC. Use the following table to connect the correct colors to the correct locations:

1a	White wire Connects to neutral of the heater pad		
1b	Parallel connection Between jumper from 2a and black heater wire (live)		
2	Parallel connection Between black heater wire (live) and over-temperature protection switch		

7. Check the resistance of the heater between pin 7 and pin 9 to ensure that the heater has been properly reconnected. Consult the following table of resistances to ensure the correct values:

MODEL	VOLTAGE SELECTOR SWITCH POSITION	RESISTANCE
Digi PREP Jr	115V 230V	$18\mathbf{\Omega} \pm 2\mathbf{\Omega}$ $71\mathbf{\Omega} \pm 2\mathbf{\Omega}$
DigiPREP MS	115V 230V	$15\mathbf{\Omega} \pm 2\mathbf{\Omega}$ $57\mathbf{\Omega} \pm 2\mathbf{\Omega}$
Digi PREP HP	115V 230V	$15\mathbf{\Omega} \pm 2\mathbf{\Omega}$ $57\mathbf{\Omega} \pm 2\mathbf{\Omega}$
DigiPREP LS	230V	$20\Omega \pm 2\Omega$
DigiPREP HT	230V	$16\Omega \pm 2\Omega$

DigiPREP DONGLE TESTING PROCEDURES

Ensure the dongle is functioning correctly, by measuring continuity across pins 3 and 4, and pins 1 and 2 of the dongle. If no continuity is detected, the dongle is defective and must be replaced.

DigiPROBE TESTING PROCEDURES

Measure between pins 1 and 3 of the probe: it should measure a value of 108 ohms. All other connections should not return values.

DigiPREP TROUBLESHOOTING

DigiPROBE ERROR DISPLAYING ON CONTROLLER

- 1. Perform the dongle test on page 88.
- 2. Perform the internal RTD test on page 86.
- 3. Perform the umbilical cord test on page 85.
- 4. Verify resistance of the *Digi*PROBE.
- 5. If problem persists, service on the controller is needed.

SYSTEM FUNCTIONAL WITH DONGLE BUT NOT WITH DigiPROBE

- 1. Perform the umbilical cord test on page 85 and ensure pins 2 and 4 are not connected to the umbilical cord. This problem is typically caused by having the dongle port wired up in reverse.
- 2. Perform the *Digi*PROBE test on page 89.

HEATER DOES NOT HEAT UP, TEMPERATURE DISPLAYS BUT DOES NOT CHANGE

- 1. Ensure the umbilical cord is fully inserted into the controller.
- 2. Ensure 'COM 2' dongle is installed correctly
- 3. Ensure the voltage selector switch is properly positioned.
- 4. Perform the heater tests on page 86 and if problems are found perform the replacement procedures on page 87.
- 5. If no problems are found, test the solid-state relay in the controller.

HEATER CANNOT ACHIEVE DESIRED TEMPERATURE, BUT CONTINUOUSLY TRIES TO RAMP

- 1. Ensure the umbilical cord is fully inserted into the controller.
- 2. Ensure the voltage selector switch is properly positioned.
- 3. Perform the heater tests on page 86. If problems are found, perform the replacement procedures on page 87.

HEATER CANNOT ACHIEVE DESIRED TEMPERATURE, STOPS HEATING TOO EARLY AND BEGINS TO COOL

- 1. Ensure the umbilical cord is fully inserted into the controller.
- 2. Ensure the dongle port is tight.
- 3. Perform the over-temperature protection device replacement instructions on page 84.

HEATER IS OVERSHOOTING TEMPERATURE

- 1. Ensure the 4-pin dongle is completely fastened to the *Digi*PREP digestion block.
- 2. Perform the internal RTD test on page 86.
- 3. Verify the solid-state relay on the controller.
- 4. Perform replacement procedures for the voltage selector switch on page 84.

CONTROLLER TEMPERATURE FLUCTUATES BETWEEN IMPOSSIBLE VALUES

- 1. Ensure the dongle is completely fastened to the *Digi*PREP digestion block.
- 2. Visually inspect the dongle receptacle on the block for damage.
- 3. Perform the internal RTD test on page 86.
- 4. Perform umbilical cord tests on page 85.

CONTROLLER TEMPERATURE FLUCTUATES AROUND SET POINT

- 1. Ensure the dongle is completely fastened to the *Digi*PREP digestion block.
- 2. Visually inspect the dongle receptacle on the block for damage.
- 3. Perform the internal RTD test on page 86.

BREAKER SWITCH ON CONTROLLER TRIPS ON THE START OF DIGESTION

1. Perform the over-temperature protection device replacement instructions on page 84. It is possible for the W137 to short to the block, which may cause the solid-state relay to become defective.





KeyPad Version 1.0

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NOTES

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