

SCP SCIENCE

Providing Innovative Solutions to Analytical Chemists

MiniWAVE

User Manual



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Racks

Complete Rack 75 ml

Cal. Quartz Vessels
Includes 6 Calibrated Quartz Vessels
Cat. # 010-600-009



Complete Rack 75 ml

Teflon® Vessels
Includes 6 PFA Vessels
Cat. # 010-600-010



Rack for 75 ml Vessels

May be used with Quartz
or PFA vessels
Cat. # 010-600-013



Quartz Vessels

75 ml Quartz Vessels

Calibrated at 45 and 50 ml
(Qty: Pack of 6)
Cat. # 010-600-071



Teflon® Vessels

75 ml Teflon® Vessels

Uncalibrated vessels
(Qty: Pack of 6)
Cat. # 010-600-073

Support Sleeves

For 75 ml Teflon® Vessels
(Qty: One Pack of 6)
Cat. # 010-600-074



Accessories

Support Table

To stage up to 2 Modules
with controller for easy
insertion of Racks (Qty: 1)
Cat. # 010-600-014



Weighing Support

Required to support
the Microwave Vessel
(Qty: One)
Cat. # 010-600-110



Venting Tool

Required to manually release the safety
pressure cap after digesting samples.
(Qty: One)
Cat. # 010-600-070



Teflon® Mixing Caps

For Microwave vessels
(Qty: Pack of 6)
Cat. # 010-600-100



Teflon® Caps

For quartz vessels
(Qty: Pack of 6)
Cat. # 010-600-060



Teflon® Caps

For Teflon® vessels
(Qty: Pack of 6)
Cat. # 010-600-061



Teflon® Plunger Liners

For Microwave vessels
(Qty: Pack of 6)
Cat. # 010-600-032



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Disclaimer: Products are supplied for laboratory use only. **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.

MinWAVE CERTIFIED to comply with the following EMC and safety requirements standards:

EN61326-1 : 2013 : EN 61000-4-2: 2009, EN 61000-4-3: 2006 +A1: 2007, +A2: 2010, EN 61000-4-4:2012, EN 61000-4-5: 2006, EN 61000-4-6: 2009, EN 61000-4-11: 2004, EN61000-3-2:2006 +A1:2009 +A2:2009, EN61000-3-3:2008, CISPR 11: 2009 +A1:2010 and FCC 47 CFR Part 18 Subpart C, CSA C22.2: CSA SPE 1000 and UL1010-1: NEC code 2011.

Power Density Test/Report: According to 21 CFR Par 1030.10 C) 1,2,3 and IEC 61010-1 Clause 12.4 ICES-001, CISPR11, EN55011 and EN61326-1.

MANUFACTURED IN CANADA



CE



EU Users:
Contact your local
distributor for disposal
instructions.



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Contents

	Racks.	3		Logout Tab	23
	Quartz Vessels.	3			
	Accessories	3			
	Teflon® Vessels.	3			
	Power and Connections	3			
1	<i>Introduction</i>	6	6	<i>Cleaning / Maintenance of System</i>	24
	Unpacking	6		Cleaning of Vessels	24
	Inspection	6		Cleaning of Teflon® Liners, Caps and Safety Pressure Caps	24
	Instrument Description	6		Pressure	24
				Cleaning the Cavity	24
				Cleaning the screen of the Controller	24
2	<i>Installation</i>	7	7	<i>Warranty & Safety Information</i>	25
				Toxic or hazardous substances and elements	26
3	<i>Cautions, Notes and Symbols</i>	8	8	<i>Specifications</i>	27
	Cautions, Warnings and Notes are included throughout this manual	8		Modular Indicator	28
				Running display messages	29
4	<i>Racks & Vessels</i>	9	9	<i>Troubleshooting</i>	30
				Safety Messages.	30
5	<i>Operation</i>	10			
	Software	11			
	Module Tab	12			
	Digestion Tab	16			
	Methods Tab	17			
	Reports Tab	19			
	Utilities Tab	20			
	Diagnostic Tab	22			
	Operation.	22			

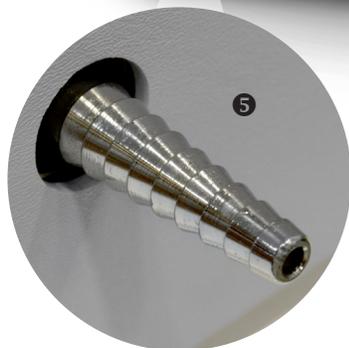
MiniWAVE microwave digestion system

- ❶ On/Off switch
- ❷ Power cord connection C19 Receptacle
- ❸ USB-A connection
- ❹ Fume exhaust connection
- ❺ Compressed Air connection



Controller

- ❹ On/Off switch
- ❷ Power cord connection
- ❸ USB-B connection
- ❹ Ethernet connection



USB Connection Cable



Power Supply

1 Introduction

MinWAVE microwave digestion system is a top-loading, compact, microwave digestion system consisting of a touch screen controller and up to four digestion inter-connecting modules. Each module is able to digest up to six samples simultaneously. Three IR sensors located on the side walls monitor sample temperature. With its unique design, microwave energy is distributed throughout the digestion chamber to provide reproducible results sample to sample. Ideal for environmental, agricultural, petroleum, geological and biological samples.

Unpacking

The system consists of a controller, module and racks for digestion samples.

Weight and Size:

Module: 30kg (65 lbs), 43 cm (16.8 in.) x 33 cm (13.0 in.) x 47 cm (18.5 in.)

Controller: 4kg (9 lbs), 30 cm (12.0 in.) x 26 cm (10.3 in.) x 23 cm (9.1 in.)

MinWAVE is easy to install, unpack the module and place it on a table top at a convenient height for easy rack insertion. Set the controller near the module and connect them together with the USB cable provided. Connect the power cable to each of the units, finish reading the manual prior to continuing. Connect an air supply to modulate sample temperature during the digestion. The compressed air is also use to facilitate fast cooling of the samples.

Inspection

Ensure all of the parts are included in the packaging. There may be some accessories that have been packaged in the same box as the **MinWAVE**. If damage is observed, contact the service department (see page 3 for contact information).

Instrument Description

This manual covers the use and operation of **MinWAVE**:

The touch screen controller may be used up to 4 **MinWAVE** modules simultaneously. The system is fully functional with one module and controller. Additional modules may be added as workload increases. Using two or more modules, one may run completely different sample types on each module using sample specific operating conditions. One module can process six samples at a time.

2 Installation

MinWAVE should be installed on the lab table that provides easy access considering the height of the lab's operators. Or, a customized **MinWAVE** cart to fit up to 2 Modules & 1 Controller (010-600-014) is available.



The exhaust vent of the **MinWAVE** must be connected to a laboratory exhaust system with a Positive Pull 40 cfm (1.1 cmm) or more to prevent noxious fumes from entering the lab.

Installation Location

To install **MinWAVE** select a location that:

1. Is in close proximity to lab exhaust (a proper laboratory fume hood).
2. Provides a minimum clearance of 6 in. (15 cm) space in the back and 2 inches from each side.
3. Provides close access to a properly grounded electrical outlet.
4. **MinWAVE** should be operated on a stabilized constant voltage AC power supply, and the voltage must be within +/-5% of the specified level.
5. Compressed air supply must be dry and oil free (5 Atms or 80 psi).



It is important to ensure that the exhaust hose is connected to laboratory exhaust.

Precautions to Avoid Possible Exposure to Excessive Microwave Energy

- a. Do not attempt to operate this instrument with the lid open since open-lid operation can result in harmful exposure to microwave energy. It is important not to defeat or tamper with the safety interlocks.
- b. Do not operate the instrument if it is damaged.
- c. The instrument should not be adjusted or repaired by anyone except properly qualified service personnel.
- d. Do not operate the microwave digestion system without a rack with samples in the cavity.
- e. You should never defeat or tamper with the safety interlocks.
- f. If the **MinWAVE** is used in a manner not specified by the manufacturer, the protection provided may be impaired.

3 Cautions, Notes and Symbols

Symbol	Description	Symbol	Description
V	Voltage		Mains on
~	Alternating current	0	Mains off
A	Current		Attention, consult accompanying documents
Hz	Frequency		Protective conductor terminal
F	Fast-acting fuse		

Cautions, Warnings and Notes are included throughout this manual



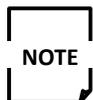
CAUTION

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



WARNING

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.

4 Racks & Vessels

Racks are dedicated to 75 ml digestion vessels. The rack should be used for either quartz vessels or Teflon® vessel and not a mixture of each. A rack is assembled by placing the digestion vessel in the microwave tube extender and placing the bottom of the digestion vessel or Teflon® sleeve support on the tube support on the bottom or the rack. The safety pressure cap is tightened by hand until the bottom of the Safety Pressure Cap is snug against the top of the plunger liner.



Never use a quartz or a quartz Teflon® vessel sleeve which appears cracked or damaged!



Excessive tightening is not required and may cause damage. Only a snug fit is required.

After weighing the sample in a quartz vessel and adding acid, place the Teflon® cap on top of the vessel then place the plunger liner on top of the Teflon® cap. The Teflon® cap seals on the intersection of the quartz vessel and tapered edges of the Teflon® cap. The Teflon® cap is held into place when the Safety Pressure Cap is screwed into place.



Place the vessels in the '*MiniWAVE* Rack'.

Place the vessel in microwave tube extender and place under the safety Pressure Cap. Hold the vessel by hand during the process.

Tighten the safety pressure cap until the bottom of the cap is snug plus an 1/8 of a turn. Or use the torque wrench accessory #010-600-090 set at 14 in/lbs.

The rack needs to be aligned with the rotating mechanism on the lid. Place tube position 1 towards the front of the cavity.



Tubes may vent if the digestion temperature is above 200 °C.



Always hold the vessel during insertion into and removal from the rack. There is a possibility that vessels may fall. Always allow the vessels to cool prior to venting and wear appropriate eye protection and gloves prior to performing this operation. This should only be done in a fume hood.



Remove and rinse the Teflon® caps with plunger liner. Using the vessel volume calibration lines, samples can be normalized directly in the vessel.

5 Operation

Compressed Air Requirements

At least 5 bar (80 psi) of pressure is required, with a flow rate of 1.5 Cubic meters per minute (50 cfm). The maximum pressure to the system is 7.5 bar (110 psi). When the digestion is complete the system open the primary electronic air valve to rapidly cool the digestion vessels. The cooling rate is approximately 3.5 minutes from 180 °C to 70 °C for 10 mls of sample. At the same time a baffle in the exhaust tube opens under software control to ensure the proper air flow for the quantity of air being induced into the cavity.



Always use the preset pressure regulator provided.



The end point cooling temperature is not user definable. It is possible to open the lid after the digestion stops, but the rack will could still be hot to warm. One may run 6 vessels at the same time or less than 6 by placing them symmetrically in the rack. Deselect the channels to monitor the temperature on the digestion tab of the software.

Start

1. Connect a **MiniWAVE** digestion module to a **MiniWAVE** controller using a USB cable provided.
2. Plug the controller to the appropriate wall receptacle (100-240V).
3. Plug the module into the correct wall receptacle for either 115V or 230V.
4. Power up the controller.
5. Power up the module to start the system. The LED indicator on the front panel will change and then register a number between 1 and 4. This number represents the module number in Module.
6. Compressed air is connected to the back of the each Module for fast cooling.

Before Digestion

1. Placing rack into cavity

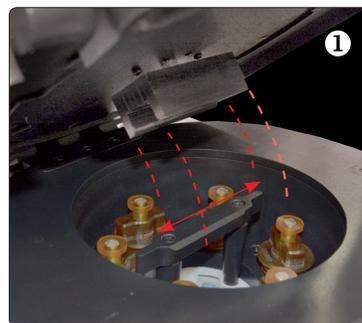
When loading a rack into **MiniWAVE** cavity, it is necessary to ensure that the rack handle is aligned with the groove in the cover plate motor. Typically if the rack is placed in the system with rack position 1 in front the rack will align easily.



If a rack is not placed correctly in the cavity the lid will not close properly.

2. Top cover closing and locking

The cover plate closes by rotating towards the cavity. Rotate the locking mechanism forward to lock the lid in place. Two interlocks will be engaged to allow the system to digest samples. The opening handle should click into place when closed completely. The system will not operate if the cover is not closed completely.



Software



MiniWAVE software has been designed with 3 levels of password protection. This allows the lab administrator permission to assign levels of accessibility.

User Level is access into the operation software with different level of capabilities as listed below

User Name is the listed below as or may be changed in the Utilities tab

Password is listed in the chart below or may be changed in the Utilities tab

Shutdown is used to leave the program all together

Reboot is used to reboot the software after an upgrade of software.

Tab	Button	USER LEVEL		
		Administrator	Operator	Service
Module	Re-Scan	Y	Y	Y
	Start Digestion	Y	Y	Y
Digestion	Operational after the 'Start Digestion' button is pressed			
Methods	Stop	Y	Y	Y
	Delete	Y	N	Y
	New	Y	N	Y
	Copy	Y	N	Y
	Edit	Y	N	Y
Reports	view	Y	Y	Y
	Delete	Y	N	Y
	Save to USB	Y	Y	Y
Utilities	Calibration	Y	N	Y
	Users	Y	N	Y
	-User Group	Y	N	Y
	-Change Password	Y	N	Y
	-Add new user	Y	N	Y
	-Delete selected user	Y	N	Y
	Settings	Y	N	Y
	Network - Apply	Y	N	Y
	Report - day change	Y	N	Y
	Update	Y	N	Y
Diagnostic	CommView	Y	Y	Y
	Operation	N	N	Y
	Refresh Legend	Y	Y	Y
Logout	View	Y	Y	Y
	Exit	Y	Y	Y
	Reboot	Y	Y	Y
	Shutdown	Y	Y	Y
User Passwords		admin	user	root
		zxc	asd	secret

Module Tab

Module-1	Digestion	Methods	Reports	Utilities	Diagnostics	Exit
Rack of Module-1						
Tube	Sample ID	Exist	Rack Name:			
1	32 Characters for description	<input checked="" type="checkbox"/>	MiniRack			
2	alpha	<input checked="" type="checkbox"/>				
3	numeric	<input checked="" type="checkbox"/>				
4	123 ABC	<input checked="" type="checkbox"/>				
5		<input checked="" type="checkbox"/>				
6		<input checked="" type="checkbox"/>				
		<input checked="" type="checkbox"/>				
Method: USEPA 3015A		Vessel Type: Quartz				
System Status						
Total Connected Module : 4		Re-Scan		Start Digestion		
Total Digesting Module : 0						

During the digestion, each of the vessels are being monitored for temperature and the average sample temperature is used to control the **MinWAVE**. If there is a significant temperature difference for one vessel either higher or lower than the other vessels for a certain time, the system will stop the digestion and identify the suspected position.

Select the **Method** from the pull down tab under method. The system will use the parameters defined in the method to digest the samples. The system displays the Module (**Module -1**) which is being controlled. The module itself will have a flashing number on the front of the system to indicate which module is being operated. **Vessel Type** must be selected from the list, Quartz for quartz digestion vessels and Teflon for Teflon® vessels in quartz sleeves. This ensures the correct temperature algorithm is used to control the digestion temperature.

Re-Scan is used to update the controller when new modules are connected. The controller can monitor and control up to 4 modules simultaneously. This only needs to be done at initial installation and after any disconnection of the module. The controller assigns module numbers which are then accessed in the **Reports** and **Utilities** tabs.

Once the method and vessel type has been selected, place the rack in Cavity, close the lid and press **Start Digestion**.

To maneuver from Module to Module press the **Module-1** button once to move to **Module-2** and twice to move to **Module-3**. It will only maneuver between the modules that are connected.

Rack Name maybe modified by highlighting the cell and type the new name. The keyboard will appear once the cell is accessed.

Module-1	Digestion	Methods	Reports	Utilities	Diagnostics	Exit
----------	-----------	---------	---------	-----------	-------------	------

Rack of Module-1

Tube	Sample ID	Exist
1	Position 1	<input checked="" type="checkbox"/>
2		<input type="checkbox"/>
3		<input type="checkbox"/>
4		<input type="checkbox"/>
5		<input type="checkbox"/>
6		<input type="checkbox"/>

Rack Name:

Method: Vessel Type:

To run less than 6 vessels, un-tick the check mark for the position not being run. If running one sample the check mark should correspond to the actual sample in the rack (i.e. if sample in Position 1 un-tick all the mark except position 1).

In case of running 2 vessels:

The vessels should be placed in the rack in a symmetrical way (i.e. Positions 1 and 4, positions 2 and 5, Positions 3 and 6) also un-tick the positions not being run.

Module-1	Digestion	Methods	Reports	Utilities	Diagnostics	Exit
----------	-----------	---------	---------	-----------	-------------	------

Rack of Module-1

Tube	Sample ID	Exist
1	Position 1	<input checked="" type="checkbox"/>
2		<input type="checkbox"/>
3		<input type="checkbox"/>
4	Position 4	<input checked="" type="checkbox"/>
5		<input type="checkbox"/>
6		<input type="checkbox"/>

Rack Name:

Method: Vessel Type:

System Status

Total Connected Module : 4

Total Digesting Module : 0

Module-1	Digestion	Methods	Reports	Utilities	Diagnostics	Exit
----------	-----------	---------	---------	-----------	-------------	------

Rack of Module-1

Tube	Sample ID	Exist
1		<input type="checkbox"/>
2	Position 2	<input checked="" type="checkbox"/>
3		<input type="checkbox"/>
4		<input type="checkbox"/>
5	Position 5	<input checked="" type="checkbox"/>
6		<input type="checkbox"/>

Rack Name:

Method: Vessel Type:

System Status

Total Connected Module : 4

Total Digesting Module : 0

Module-1	Digestion	Methods	Reports	Utilities	Diagnostics	Exit
Rack of Module-1						
Tube	Sample ID	Exist	Rack Name:			
1	Position 1	<input checked="" type="checkbox"/>	MiniRack			
2		<input type="checkbox"/>				
3	Position 3	<input checked="" type="checkbox"/>				
4		<input type="checkbox"/>				
5	Position 5	<input checked="" type="checkbox"/>				
6		<input type="checkbox"/>				
6		<input type="checkbox"/>				
Method: USEPA 3015A		Vessel Type: Quartz				
System Status						
Total Connected Module : 4		Re-Scan		Start Digestion		
Total Digesting Module : 0						

In case of running 3 vessels:

Vessels should be placed in the rack symmetrically (i.e. Position 1, 3 and 5 or Position 2, 4 and 6).

Be sure to un-tick the samples not being placed in the rack.

Module-1	Digestion	Methods	Reports	Utilities	Diagnostics	Exit
Rack of Module-1						
Tube	Sample ID	Exist	Rack Name:			
1		<input type="checkbox"/>	MiniRack			
2	Position 2	<input checked="" type="checkbox"/>				
3		<input type="checkbox"/>				
4	Position 4	<input checked="" type="checkbox"/>				
5		<input type="checkbox"/>				
6	Position 6	<input checked="" type="checkbox"/>				
6		<input type="checkbox"/>				
Method: USEPA 3015A		Vessel Type: Quartz				
System Status						
Total Connected Module : 4		Re-Scan		Start Digestion		
Total Digesting Module : 0						

Module-1	Digestion	Methods	Reports	Utilities	Diagnostics	Exit
----------	-----------	---------	---------	-----------	-------------	------

Rack of Module-1

Tube	Sample ID	Exist
1	Position 1	<input checked="" type="checkbox"/>
2	Position 2	<input checked="" type="checkbox"/>
3		<input type="checkbox"/>
4	Position 4	<input checked="" type="checkbox"/>
5	Position 5	<input checked="" type="checkbox"/>
6		<input type="checkbox"/>

Rack Name:

Method: Vessel Type:

System Status

Total Connected Module : 4
Total Digesting Module : 0

In case of running 4 vessels:

Vessels should be loaded symmetrically too (i.e. Positions 1, 2, 4 and 5 or Positions 2, 3, 5 and 6).

Similar to the cases specified before, be sure to un-tick the empty positions.

Module-1	Digestion	Methods	Reports	Utilities	Diagnostics	Exit
----------	-----------	---------	---------	-----------	-------------	------

Rack of Module-1

Tube	Sample ID	Exist
1		<input type="checkbox"/>
2	Position 2	<input checked="" type="checkbox"/>
3	Position 3	<input checked="" type="checkbox"/>
4		<input type="checkbox"/>
5	Position 5	<input checked="" type="checkbox"/>
6	Position 6	<input checked="" type="checkbox"/>

Rack Name:

Method: Vessel Type:

System Status

Total Connected Module : 4
Total Digesting Module : 0

Module-1	Digestion	Methods	Reports	Utilities	Diagnostics	Exit
----------	-----------	---------	---------	-----------	-------------	------

Rack of Module-1

Tube	Sample ID	Exist
1	Position 1	<input checked="" type="checkbox"/>
2	Position 2	<input checked="" type="checkbox"/>
3		<input type="checkbox"/>
4	Position 4	<input checked="" type="checkbox"/>
5	Position 5	<input checked="" type="checkbox"/>
6	Position 6	<input checked="" type="checkbox"/>

Rack Name:

Method: Vessel Type:

System Status

Total Connected Module : 4
Total Digesting Module : 0

In case of running 5 vessels it is very important to un-tick the empty position.

Digestion Tab

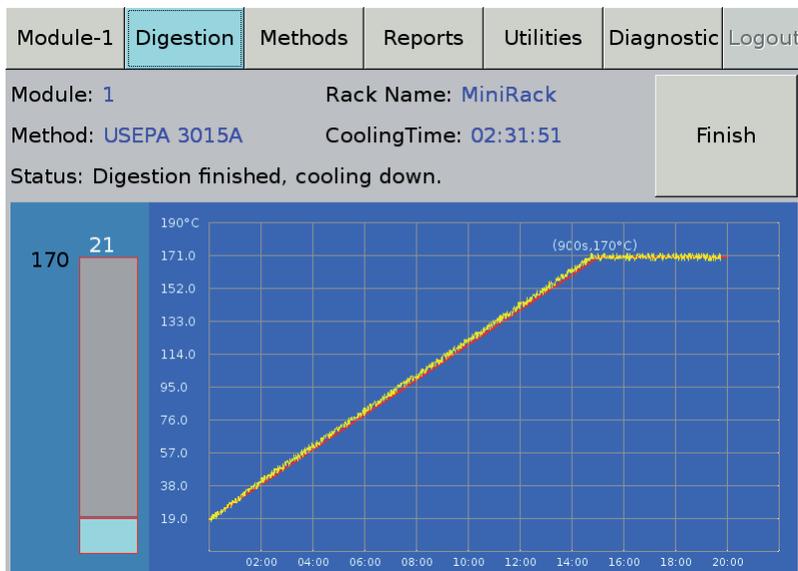


During the digestion this screen informs the operator of the progress of the digestion.

The digestion tab only becomes active when once the **Start Digestion** is pressed. The button only starts the digestion for the module of the number in the Module tab. It will be either -1, -2, -3, or -4. The Green LED on the front of the **MiniWAVE** module will start to flash the appropriate number once this button has been pressed.

The **Stop** button stops the digestion of the module list to on the **Module-2** tab.

The line in the bar graph is in yellow when the digestion is coming to temperature. The black number (175 in picture above) represents the set point temperature and the white number is displayed the current average temperature (21). When the set point temperature is reached the bar graph turns green for the hold time of the method selected. The bar graph turns blue when the method has reached the end of time. This graphical representation is shown in real time. The temperature displayed is the average of the total vessels being digested.



When the method is complete, the **Finish** button is pressed to complete the transfer of data to the reports page for archiving.

Press the **Finish** button to allow the module to run the next set of samples. The information is then stored on the controller on for future retrieval from the **Reports** tab.

Methods Tab

This tab lists all of the factory and user programmed methods. Highlight a programmed method and then select one of the active action buttons at the bottom.

Module-1	Digestion	Methods	Reports	Utilities	Diagnostic	Logout
----------	-----------	----------------	---------	-----------	------------	--------

USEPA 3052 USEPA3052-HCl USEPA3052-HF USEPA3052mix HighOrg USEPA 3015A USEPA3015AHCl USEPA 3546 MiniWAVE	Name: MiniWAVE Created Time: Thu 03 Jul 2014 02:10:29 PM Last modification: Thu 03 Jul 2014 02:10:29 PM Description:
---	---

Delete	New	Copy	Edit	View	Save to USB
--------	-----	------	------	------	-------------

Name:	Reagents		
Description:	Name	Vol(mL)	Add
			Delete
			Edit

Method parameters			
	Time to Temp(min)	Temp(°C)	Time at Temp(min)
<input checked="" type="checkbox"/> 1			
			Add

Save	Cancel	Save to USB
------	--------	-------------



The maximum recommend temperature for digestions is 200 °C. This is for all vessels Teflon® and quartz vessels. If this temperature is exceeded there is a highly possibility of venting due to pressure achieved in by using mineral acids in a digestion. HCl and H₂O₂ create more pressure at lower temperatures.



Warranty is not covered due to venting when method temperature exceeds 200 °C.

Name is the method selected from the left hand side list. Some methods are factory programmed and cannot be deleted but may be copied and modified as required.

Created Time is a time stamp from when the method was saved

Last Modification is the time stamp after any modifications were made and re-saved

Description is extra information that was added during the method creation on the methods page.

Press **New** to create a new digestion procedure

Delete is used to delete the method completely. This can only be done in the Service and Administrator access levels.

Copy allows a factory programmed method or a user method to be copied. The method name must be changed to be saved

Edit allows a user defined method to be modified when done in the service or administrator access level

View allows any operator to view the parameters in any method

Save to USB save the method to an installed USB stick on the back of the controller.

Name is a required field to be filled out as method are stored by name.

Description is a field for extra information. This information is stored and timed stamped until the method is completely deleted. Modifications can be made and the time stamp will updated.

Methods Tab

The screenshot shows the 'Methods Tab' interface. At the top, there is a 'Name' field containing 'Test2' and a 'Description' field containing 'test2'. Below this is the 'Reagents' section, which is a table with columns 'Name' and 'Vol(mL)'. The first row is highlighted in grey and contains '1' in the first column, 'Methanol' in the second, and an empty field in the third. A dropdown menu is open over the 'Methanol' cell, listing 'HCl', 'Methanol', 'HNO3', 'H2O', and 'Water'. To the right of the table are three buttons: 'Add', 'Delete', and 'Edit'. Below the reagents section is the 'Method parameters' section, which is a table with columns 'Time to Temp(min)', 'Temp', and 'Time at Temp(min)'. There are two rows, both with checkboxes in the first column. The first row has '1' in the second column and '150' in the third. The second row has '1' in the second column and '200' in the third. An 'Add' button is located at the bottom right of this section. At the very bottom of the interface are three buttons: 'Save', 'Cancel', and 'Save to USB'.

Name is used for information purposes only. Select from the pull down tab for a list of reagents listed. Vol (ml) (highlighted grey) is for information purposed on a numeric value maybe added here.

Add allows the selection of reagent used in the method being programmed.

This is only for information purposes. Input the volume or the mass used.

Add allows for the 2nd or 3rd reagent used for the method to be added.

By pressing **Edit** in Reagents a new window will appear that used to add a new reagent not on the list

Delete is used to remove a reagent from the list

Add in **Method Parameters** is used to add a 2nd or 3rd temperature profile of 'time to temperature' and 'time at temperature'. The set point temperature must also be inputted.

Save is used to save the method

Cancel will return to the main page without saving the values

Save to USB will save the information on a USB stick if one is installed in the 5th USB connector on the back of the controller. It saves the information in PDF format.

Add moves the inputted information from the right hand side to the left hand side. This makes this information available from the pull down tab on the **Methods** creation tab.

Delete removes the highlighted reagent from the Left hand side list.

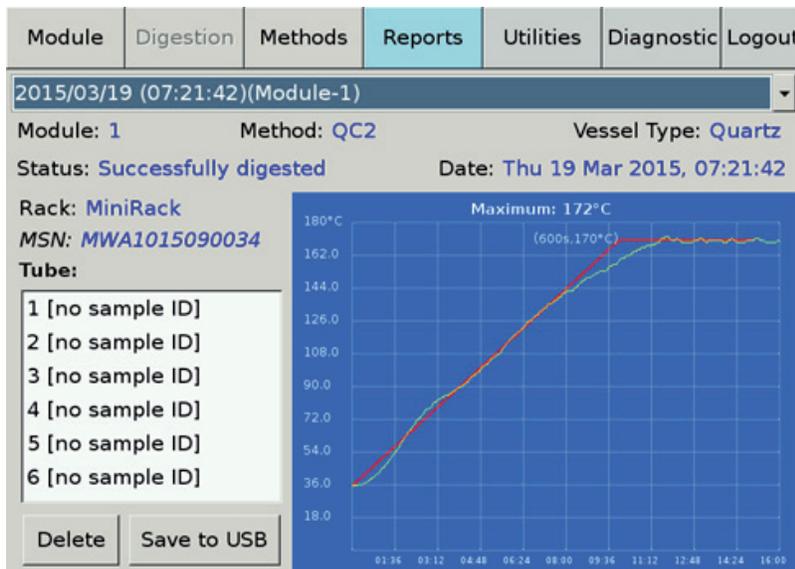
OK returns the operator to the method page and saves the inputted or deleted information

Cancel returns the operator to the methods page without saving.

The screenshot shows the 'Reagents List' dialog box. On the left is a list box containing the following items: 'HCl', 'Methanol', 'HNO3', 'H2O', 'Water', and 'toluene'. On the right is a 'Reagent' field, which is currently empty. Below this field are four buttons: 'Add', 'Delete', 'OK', and 'Cancel'.

Reports Tab

Lists all of the information inputted or generated during the digestion process.



The graphical representation provides a historic data of the digestion using the average temperature profile of the digestion run. Time is listed in minutes and temperature in degrees Celsius.

Module is the module in which the digestion was completed in. **Method** is the method that was selected from the method list used to complete the digestion

Vessel Type is either Quartz or Teflon® used in the rack for the digestion

Status lists the completion of the method or other safety messages of problems during the run

Rack is the name of the rack and is user definable on the Module tab. **Tube** is the ID of the sample inputted prior to starting the digestion on the Module-1 tab

Delete is used to delete the report from the reports file

Save to USB allows one to save the digestion report on a USB stick in PDF format for archiving

MSN (Module Serial Number) Is the actual serial number of the module the digestion was run on.

Utilities Tab

Calibration Tab

Calibration is used to review the calibration data, and to re-calibrate IR temperature sensor during a preventative maintenance program. The calibration is a five point calibration which is done automatically with an **SCP SCIENCE** calibration tool. Please refer to the Calibration instruction manual to calibrate the IR (thermopile) sensors.

Module-1	Digestion	Methods	Reports	Utilities	Diagnostic	Logout					
Calibration	Users	Settings	Update								
P0:	32843	P1:	32821	P2:	33056	P3:	33551	P4:	34214	P5:	35568
	Thermopile1	Thermopile2	Thermopile3								
P0	32832	32554	32839								
P1	32706	32689	32730								
P2	32969	33016	32882								
P3	33556	33762	33223								
P4	34296	34676	33666								
P5	35908	36715	34618								
Read New Data		Read from Module		Send to Module		Save		Save to USB			

Read New Data is used to start the calibration procedure when the equipment is connected

Send To Module is used to update the CPU on the module after verification of the software

Save to USB is used to download the current information to a USB stick.

Save is used to save the data in controller

User Tab

Module-1	Digestion	Methods	Reports	Utilities	Diagnostic	Logout
Calibration	Users	Settings	Update			
user	User's group Operator ▼					
admin	Default operator login					
tester						
art						
Change password						
Delete selected user			Add new user			

User's Group is used to select the user group, either 'operator' or 'administrator', from the pull down menu

Change Password is used to set and change password for individuals

Delete Selected User highlight the user to be deleted and press the **Delete Selected User** button

Add New User follow the prompts on the display to add a new user in the appropriate user group

Settings

This page is used to set the date and time for the appropriate geographic location.

Module-1	Digestion	Methods	Reports	Utilities	Diagnostic	Logout
Calibration Users Settings Update						
Network Configuration type <input type="radio"/> DHCP <input checked="" type="radio"/> Manual IP Address: 192.168.0.1 Network Mask: 255.255.255.0 Default Gateway: 192.168.0.1 DNS: 192.168.0.1 <input type="button" value="Apply"/>			Date and Time Year: 2014 Month: July Day: 03 Hour (24h): 14 Minute: 45 <input type="button" value="Refresh"/> <input type="button" value="Apply"/>			
Language English <input type="button" value="Apply"/>			Reports Delete reports older than 10 days <input type="button" value="Delete All Now"/>			

Date and Time allows the administrator to change the date and time for the time zone where the system is being operated

Refresh allows the operator return to the original setting if **Apply** had not been pressed

Apply is used to save the changes made

Delete All Now deletes all the reports stored

Language is not operation at this time

Network is implemented but not turned on at this time as one requires a software program to pass through your fire wall. Please contact **SCP SCIENCE** for further information



The number of days should be customized as per protocol for a specific laboratory's data storage.

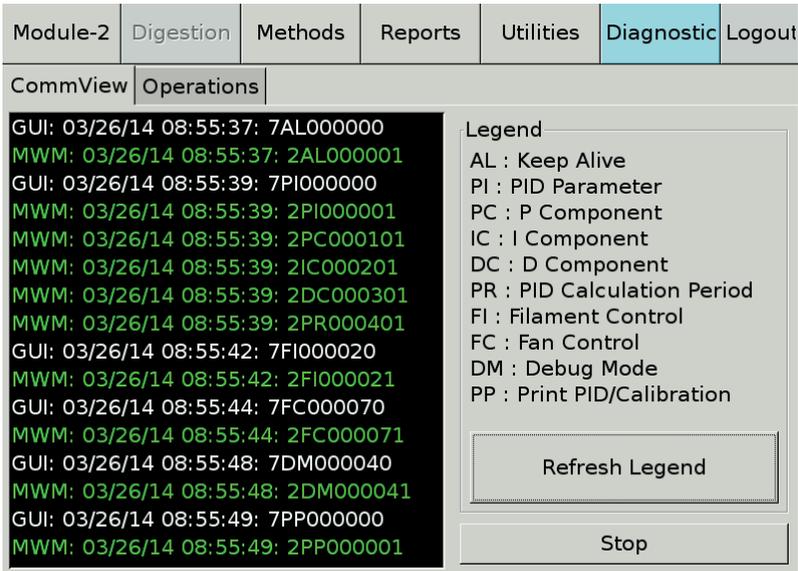
Update

Module-2	Digestion	Methods	Reports	Utilities	Diagnostic	Logout
Calibration Users Settings Update						
MiniWAVE GUI Current Version: 1.0.3 Build date: Thu 20 Mar 2014 16:00:33 EDT <input type="button" value="Update from server"/> <input type="button" value="Update GUI from USB"/>						
MiniWAVE Microcontroller Current Version: 00.0 <input type="button" value="Update from server"/> <input type="button" value="Update MC from USB"/>						

Update from Server is used to update the software from the server if the system has been configured to connect to the internet

Update GUI from USB is used to update the software from a USB stick. A pre loaded USB may be connected to any of the open USB ports on the back of the controller

Diagnostic Tab



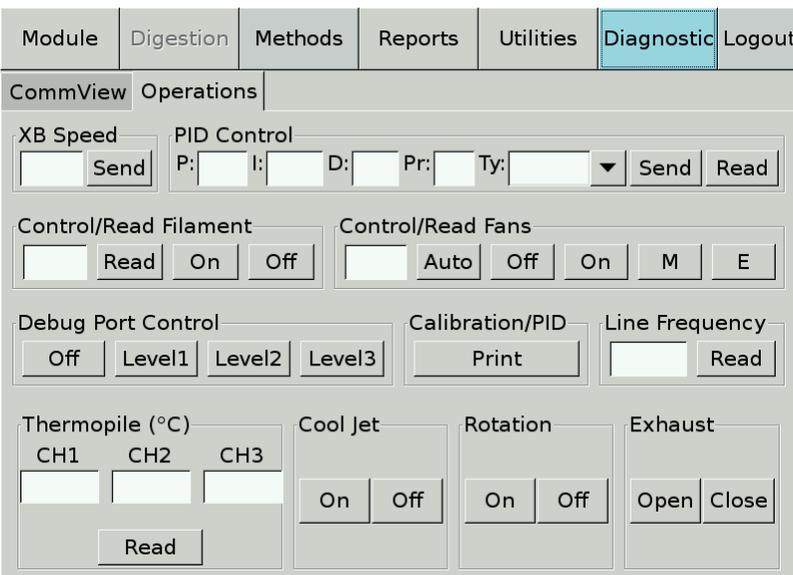
CommView is used to validate the communication between controller and module

Operations is only available to service personnel. This tab is not functional if a digestion is in progress

Refresh Legend is used to pull all of the communication protocols from the modules to help debug a problem. This will be used by factory trained service people to diagnose problems on the Module

View and **Stop** is to suspend the acquisition of data

Operation



The commands on this tab are to be used by factory trained personnel only with the exception of reading the IR temperature sensor when the unit is not performing a digestion

XB Speed Control is used to run the exhaust fan. Programmed in percent of full speed

PID Control is used to query the current PID values

Control/Read Filament is used to query the magnetron filament power

Control/Read Fans is used to turn the fans on for testing after servicing

Calibration/PID is used for debugging in manufacturing

Cool Jet is used to turn the cool jet On and Off for testing

Rotation is used to turn the rotatory motor on and off for testing

Exhaust is used to open the exhaust for testing

Line Frequency is used to query the connected power line frequency. Used if time to temperature problems are suspected

Read Temperature (°C) is used to query the current IR temperature reading. Only works when the module is not being operated

Logout Tab

Use this tab to safely shut down the controller at the end of each day.

Tube	Sample ID	Exist
1		<input checked="" type="checkbox"/>
2		<input checked="" type="checkbox"/>
3		<input checked="" type="checkbox"/>
4		<input checked="" type="checkbox"/>
5		<input checked="" type="checkbox"/>
6		<input checked="" type="checkbox"/>

System Status
 Total Connected Module : 2
 Total Digesting Module : 0

Exit returns one back to the main screen where user level is selected

Open Desktop is used to access the BIOS of the operating software and to calibrate the touch mask of the controller

Reboot reboots the system and returns one to the main screen

Shutdown closes the software program safely and powers down the controller

6 Cleaning / Maintenance of System

Cleaning of Vessels

The quartz and Teflon® vessels may be washed in a lab dishwasher or soaked overnight in diluted HNO₃. The quartz outer support of the Teflon® vessels may be washed in the dishwasher or soaked in acid. All vessels should be dry prior to its use in the microwave. Quartz vessels that show cracks or chips must not be used.

Cleaning of Teflon® Liners, Caps and Safety Pressure Caps

Teflon® caps should be replaced when they show signs of wear. To determine if the Teflon® cap is overused: Place the Teflon® cap on the quartz tube and if the bottom portion of the top ring of the cap touches the tube, the cap should be replaced. The caps may be soaked in 5% or 10% HNO₃ solution over night., Then rinsed in distilled water and dried in an oven at 103 for a a few hours or over night.

Pressure

Safety Caps have been calibrated to appropriate settings at the factory. Calibration settings of the Safety Pressure cap can only be adjusted at the factory. They can be validated in the field with our Field pressure testing unit. It is highly recommended that Safety Caps be tested every 6 months.



Safety Pressure Cap can be calibrated only by SCP SCIENCE's trained service personnel.

Cleaning the Cavity

Under normal operating conditions, if a tube vents during the digestion, the fumes are typically whisked away by the exhaust blower. If the rack is wet when it is removed from the cavity, then inside of the cavity should be checked and wiped dry with a dry paper towel while wearing the appropriate safety gloves and safety glasses.

If a vessel has accidentally ruptured in the cavity, carefully remove the broken quartz parts by hand. The liquid may be cleaned up with a paper towel, then damp wipe the inside of the cavity. The cavity has been coated with Teflon®.



Always wear safety gloves and safety glasses when cleaning a wet cavity.
Wear appropriate safety gear if the tube has vented or cracked while using HF.

Cleaning the screen of the Controller

Wipe with a clean damp cloth to remove fingerprints and dust monthly.



The system has not been tested with perchloric acid. It is not recommended to use perchloric acid.

7 Warranty & Safety Information

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

1. Should the unit malfunction, please contact SCP SCIENCE's Service Department or your local distributor for further instructions.
2. There are no user-serviceable parts in this unit. The warranty is void if the instrument shows evidence of tampering or is subjected to excessive moisture, heat, corrosion or other misuse.
3. SCP SCIENCE shall not be responsible for any damage or losses, however caused, which may be experienced as a result of the improper installation or misuse of this product.
4. 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.

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



Do not place the **MiniWAVE** on a surface containing flammable material.

MiniWAVE requires a clearance of minimum 6 in. (15 cm) space in the back towards the wall.

MiniWAVE must be connected to an lab exhaust system. (minimum draw of 40 cfm).

MiniWAVE system must be plugged into a three-prong grounded outlet.

Only use provided USB cable.

MiniWAVE must not be placed in a fume hood for its operation. This will void the warranty.

Operating the module inside a fume hood voids the warranty.

Always wear safety glasses when handling samples.

Never use quartz vessels if they appear cracked or damaged.

Never tamper with the calibration settings of the safety caps. These have been pre-calibrated to appropriate settings in the factory.

Do not operate digestion above 200 °C as venting may occur.

The **MiniWAVE** is an elevated-temperature digestion system with exposed hot surfaces. Be careful around the instrument when it is operated.

Toxic or hazardous substances and elements

Part name	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr ⁶⁺)	Polybrominated Diphenyl Ether (PBDE)
Skins	○	○	○	○	○
Frame	○	○	○	○	○
Electronic boards	○	○	○	○	○
Feet	○	○	○	○	○
Wiring Harness	○	○	○	○	○
Motors	○	○	○	○	○
Gear Boxes	○	○	○	○	○
Fasteners	○	○	○	○	○
HV boards	○	○	○	○	○
Magnetrons	○	○	○	○	○
Applicators	○	○	○	○	○
Co-axial cable	○	○	○	○	○
Touch Screen	○	○	○	○	○
Ribbon Cables	○	○	○	○	○
Housings	○	○	○	○	○

○: 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.

×: 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.

8 Specifications

Environmental

Relative Humidity	30% to 80%
Altitude	up to 2000 m
Installation	Category II
Pollution	Degree 2
Ambient Operating Temperature	-5 °C to 40 °C

Safety

EMC Tested and Approved

- o EMC Emissions and Immunity Tested covering: ICES-001, CISPR11, EN55011 and EN61326-1

Product Safety *

- o Certified UL 61010-1
- o Certified CSA NEC code 2011

Radiation Hazard

- o Power Density Tested according to 21 CFR Par 1030.10 C) 1,2,3 and IEC 61010-1 Clause 12.4
- o 21 CFR1030 report filed for FDA

Electrical

*Min*WAVE Module

Voltage	110 and 220 volts
Current	100~125VAC, 50/60Hz, 13A, Uses a C19 detachable power cord 200~240VAC, 50/60Hz, 7A, Uses a C19 detachable power cord
Watts	1000

Compressed Air or Inert Gas 90 psi at 50 cfm particle free and dry

*Min*WAVE Controller 8.4" TFT LCD, 5 USB ports

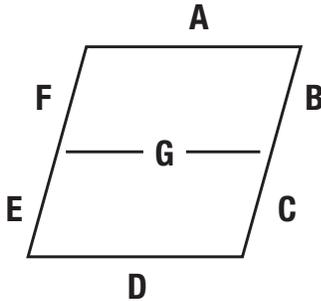
Voltage	110 and 240 volts, 50/60Hz
Current	2A Max,
Power	47W Max

MinWAVE Modual Indicator

The information of this document pertains to firmware version 3.0.0 and up

Symbol conventions

A 7-segment display has the following descriptors:



To describe the animation pattern, the segment sequence will be written as "A-B-C-D-E-F" for example: this pattern is repeated during the ramp stage.

System booting

When the power is applied to the system, the letters H,E,L,L,O are displayed as a segment test indication. Those letters use all indicator segments so if this message is not seen at power-up, there could be a segment malfunction. There is no self-detection for correct segments drive so the user only can see an indicator fault.

After this message, the system tests many hardware peripherals and the following error messages could be seen:

- LE: Line frequency Error -> there is no AC signal activity detected
- CE: Calibration Error -> Calibration tables are empty or inconsistent
- tE<n>: Thermopile Error for location <n> -> Data read is inconsistent
- HE1: Home Error 1 -> Exhaust Door Homing failed
- HE2: Home Error 2 -> Rack Rotation Homing failed

This is followed by the firmware version (3 digits)

Finally the Unit Number is displayed and stays until a digestion starts.

Running display messages

DURING OPERATION THE FOLLOWING MESSAGES CAN BE SEEN:		
	Message	Description
1	Idle state	In the system idle state, the unit number is steady on the indicator.
2	Digestion initialization	The digestion starts by heating the magnetron filament and waiting for stabilization. The unit number will flash while in this phase.
3	Ramping stage	During the temperature ramping stage, an animation is visible on the indicator: a rolling pattern made of the sequence of segments A-B-C-D-E-F and repeated.
4	Holding stage	The hold phase has another animation pattern: alternating between two symbols: a 'u' and a 'n' meaning that hold temperature over/under shoot is meant to be under tight control. The segments sequence is ABF-CDE and repeats.
5	Digestion fail	If any critical anomaly shows during digestion, the digestion has to be halted. In addition to the controller display emergency message, the message 'F' 'a' 'i' 'l' is sent on the indicator.
6	Explosion	In the event of an explosion, a flashing 'H' (for Halt) signals the user that it occurred and the digestion is stopped.
7	Digestion done	When the digestion succeeds, the message 'd' 'o' 'n' 'e' appears on the indicator.
8	Cooling phase	A big flashing 'C' indicates the cooling operation in progress.

9 Troubleshooting

Safety Messages

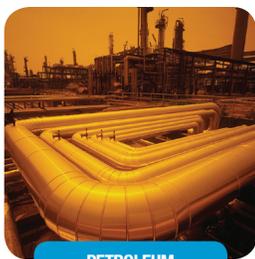
Safety messages may occur during system operation due to a variety of conditions as included below. For further assistance, consult your lab manager or **SCP SCIENCE** Service Department or your local distributor.

LIST OF WARNING AND SAFETY MESSAGES			
	Message	Description	Action
1	Module-1 USB was unplugged.	Either the USB cable was physically unplugged or Module-1 has a problem.	Stop digestion. Try to re-run.
2	Module-1 has Calibration Table Error.	Calibration table is either corrupted or blank.	Try to send calibration table from screen to module.
3	The line voltage of Module-1 is out of range.	Power line has a problem.	Digestion stops. Check power line voltage.
4	The line frequency of Module-1 is out of range.	Power line has a problem.	Digestion stops. Check power line frequency.
5	Module-1 has Filament problem.		Digestion stops.
6	Module-1 has High Voltage problem.		Digestion stops.
7	Module-1 has IR Sensors COM problem.	Module-1 has internal communication problem.	Digestion stops.
8	Module-1 has IR Sensors Error.	Problem of Infrared sensor.	Digestion stops.
9	Module-1 detected excessive vibration.		Digestion stops.
10	Module-1 magnetron overheated.		Digestion stops.
11	Module-1 digestion timed out.		Digestion stops.
12	Module-1 temperature is too high for tube-2.		Digestion stops.
13	Module-1 temperature is too low.		Digestion stops.
14	IR communication problem for Channel #2.	Channel #2 has IR communication problem.	User decides to continue or stop digestion.
15	IR Sensor error for Channel #2.	Channel #2 has IR sensor error.	User decides to continue or stop digestion.

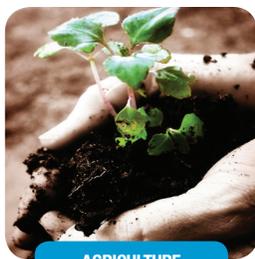
16	Temperature is too low for Channel #2.		Digestion stops
17	Channel #2, possibly has Tube Sealing issue.		User decides to continue or stop digestion.
18	Magnetron of Module-1 is approaching overheat!		User decides to continue or stop digestion.
19	Screen lost Keep Alive from Module-1!	Either Module-1 stopped working or communication problem.	User decides to continue or stop digestion.



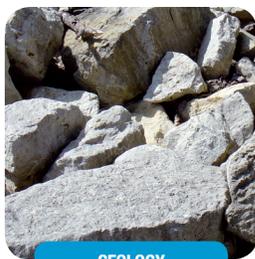
If the reason for the safety message is unclear contact **SCP SCIENCE** Service Department or your local distributor.



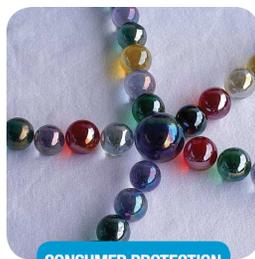
PETROLEUM



AGRICULTURE



GEOLOGY



CONSUMER PROTECTION



ENVIRONMENT

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