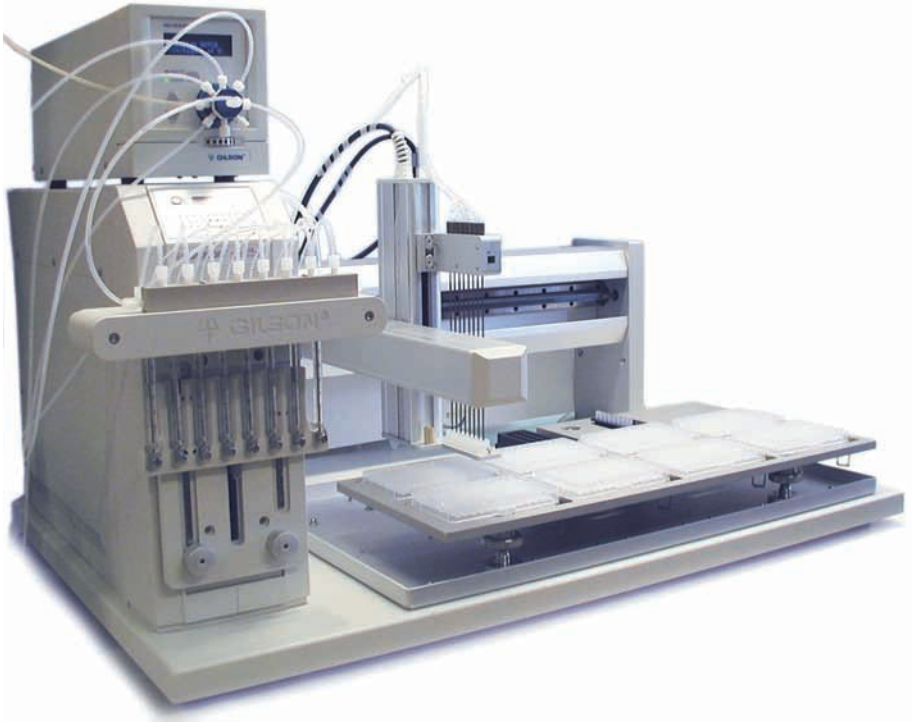
Ettan™ Digester

Operating Instructions

Original instructions



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1 Introduction

Purpose of this manual

The *Operating Instructions* provide you with the instructions needed to install, operate and maintain the product in a safe way.

Prerequisites

In order to operate Ettan Digester safely and according to the intended purpose the following prerequisites must be met:

- You should be acquainted with the use of general laboratory equipment and with handling of biological materials.
- You should understand the concepts of electrophoresis.
- You must read the Safety Instructions in Chapter 2 of these Operating Instructions.
- The system should be installed according to the instructions in Chapter 3 of these Operating Instructions.

In this chapter

This chapter contains important user information and a general description of Ettan Digester and its intended use.

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1.1 Important user information

Read this before operating the product

All users must read the entire *Operating Instructions* before installing, operating or maintaining the product.

Always keep the *Operating Instructions* at hand when operating the product.

Do not operate the product in any other way than described in the user documentation. If you do, you may be exposed to hazards that can lead to personal injury and you may cause damage to the equipment.

Intended use

Ettan Digester is designed to digest whole proteins in polyacrylamide gel pieces, then extract the resultant peptides prior to analysis by MALDI-TOF mass spectrometry.

Ettan Digester is intended for research use only, and shall not be used in any clinical procedures, or for diagnostic purposes.

Safety notices

This user documentation contains safety notices (WARNING, CAUTION, and NOTICE) concerning the safe use of the product. See definitions below.

WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury. It is important not to proceed until all stated conditions are met and clearly understood.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. It is important not to proceed until all stated conditions are met and clearly understood.

NOTICE

NOTICE indicates instructions that must be followed to avoid damage to the product or other equipment.

Notes and tips

Note: *A note is used to indicate information that is important for trouble-free and optimal use of the product.*

Tip: *A tip contains useful information that can improve or optimize your procedures.*

Typographical conventions

Software items are identified in the text by ***bold italic*** text. A colon separates menu levels, thus ***File:Open*** refers to the ***Open*** command in the ***File*** menu.

Hardware items are identified in the text by **bold** text (for example, **Power**).

1.2 Regulatory information

This section lists the directives and standards that are fulfilled by Ettan Digester.

Manufacturing information

The table below summarizes the required manufacturing information. For further information, see the EC Declaration of Conformity (DoC) document.

Requirement	Content
Name and address of manufacturer	GE Healthcare Bio-Sciences AB, Björkgatan 30, SE 751 84 Uppsala, Sweden

Conformity with EU Directives

This product complies with the European directives listed in the table, by fulfilling the corresponding harmonized standards.

A copy of the EC Declaration of Conformity is available on request.

Directive	Title
2006/42/EC	Machinery Directive (MD)
2004/108/EC	Electromagnetic Compatibility (EMC) Directive
2006/95/EC	Low Voltage Directive (LVD)

International standards

Standard	Description	Notes
EN 61010-1, IEC 61010-1, UL 61010-1, CAN/CSA-C22.2 No. 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use	
EN 61326-1	EN 61326-1 EMC emissions and immunity requirements for electrical equipment measurement, control and laboratory use	Harmonized with 2004/108/EC

Standard	Description	Notes
EN-ISO 12100	Safety of machinery - General principles for design - Risk assessment and risk reduction	Harmonized with 2006/42/EC

FCC statement

Ettan Digester complies with FCC 47 CFR Part 15b.

Note: *This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.*

CE marking

CE

The CE marking and the corresponding EC Declaration of Conformity is valid for the instrument when it is:

- used as a stand-alone unit, or
- connected to other products recommended or described in the user documentation, and
- used in the same state as it was delivered from GE, except for alterations described in the user documentation.

Regulatory compliance of connected equipment

Any equipment connected to Ettan Digester should meet the safety requirements of EN 61010-1/IEC61010-1 or relevant harmonized standards and should be installed and used according to the manufacturer's instructions. Within the European Union, connected equipment must be CE-marked.

1.3 Instrument

About this chapter

This chapter contains a general description of Ettan Digester.

General description

The Ettan Digester instrument is designed to digest whole proteins in polyacrylamide gel pieces, then extract the resultant peptides prior to analysis by MALDI-TOF mass spectrometry. When used in conjunction with Ettan Spot Picker, the samples can be tracked (in a microplate) from spot excision through the digestion process. Samples are processed in 96-well microplates. Up to 4 microplates (384 samples) can be simultaneously digested.

System components

The Ettan Digester system comprises the following:

- The Ettan Digester instrument:
  - 8-needle Liquid handler
  - 8-channel valve
- Ettan Digester Control Software
- PC
- Protective hood (optional)

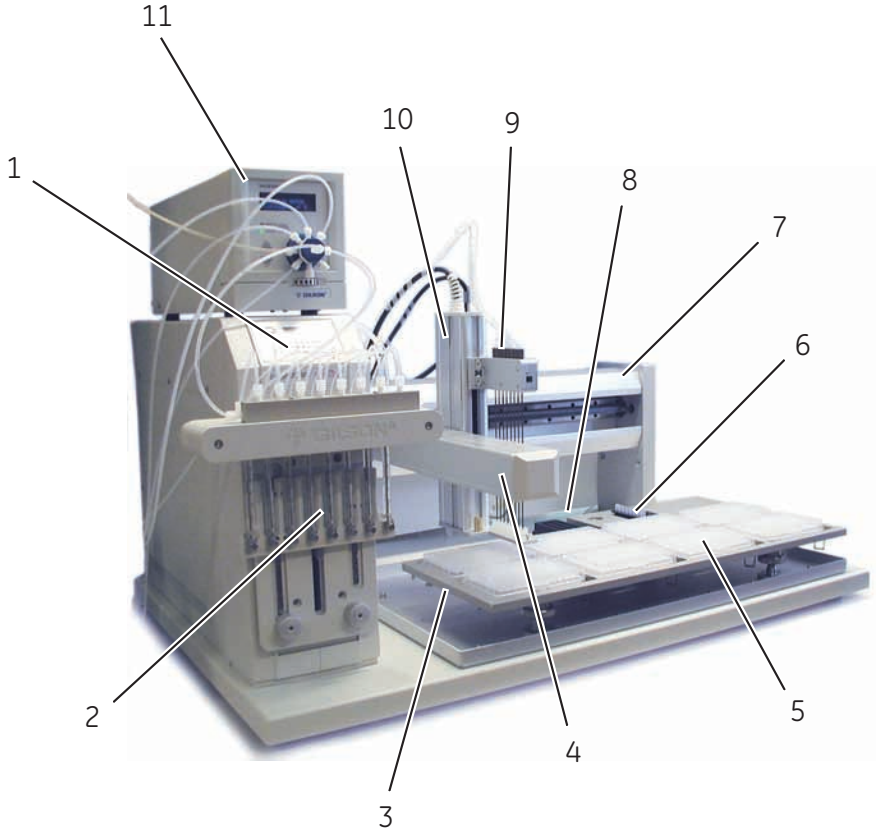
Ettan Digester technique

Ettan Digester is a robotic system designed to prepare gel plugs for enzymatic digestion of proteins and subsequent extraction of peptides. The instrument has a sample needles head that can move in the X, Y and Z directions.

The sample needles head is connected to an 8-channel multi-probe dilutor. An 8-channel valve with a common outlet is used to select the different liquid solvents.

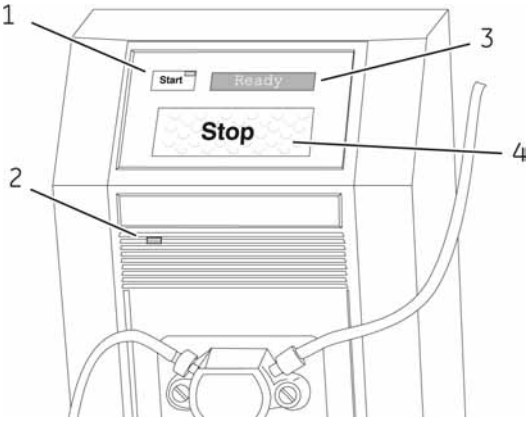
The rinse station has two positions for rinsing; one for shallow rinsing of the needles, and one for deep rinsing. The shallow rinse station is used for all rinse procedures except the rinse following after enzyme dispense.

System description



Part	Description	Part	Description
1	Front panel	7	X-arm
2	Multi-probe dilutor	8	Rinse station
3	Base plate	9	Sample needles head
4	Y-arm	10	Z-arm
5	Microplates	11	8-channel valve
6	Enzyme container		

Front panel



Part	Description
1	**Start** button
2	Power light indicator
3	LED display
4	**Stop** button

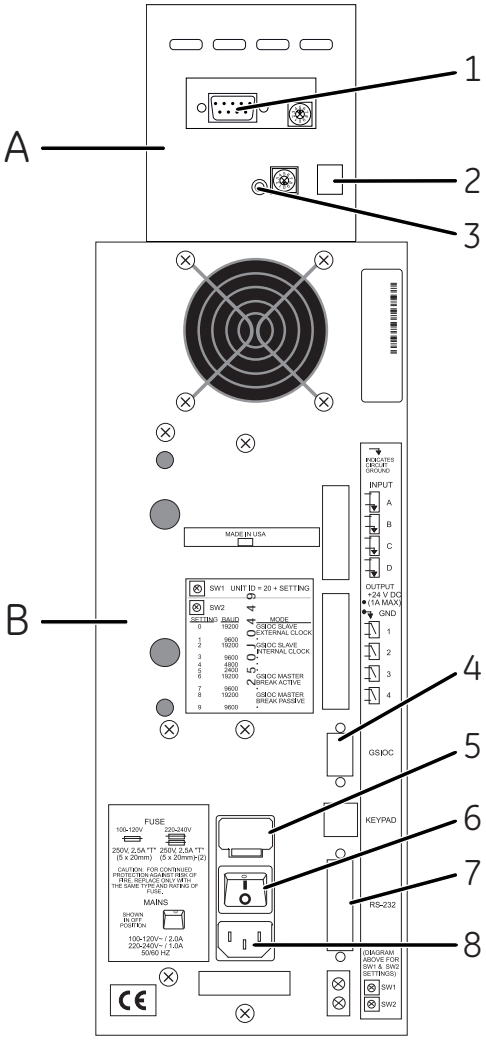
Indicators on the front panel

Indicator	Color	Function
Power (unmarked)	green	Lights when mains power is connected to the instrument and the Power switch on the rear panel is on (in the **I** position).
Start	yellow	Lights when the **Start** button is pressed to home the picker head.
LED display	yellow text	Shows the current status of the Ettan Digester and any error codes as they are encountered.

Buttons on the front panel

Button	Function
Start	When the **Start** button is pressed, the multiple probe head moves to home position. The yellow LED lights as long as the button is pressed. The **Start** button can be used to home the multiple probe head when the Liquid handler is first powered up or when the motors for the multiple probe head have been relaxed.
Stop	When this button is touched, the instrument immediately ceases movement and all motors are de-energized. When the **Stop** button is pressed, the yellow LED in the **Start** button is turned off. Note that the **Stop** button is very sensitive, do not touch it unnecessarily during a run.

Electrical and communication connections



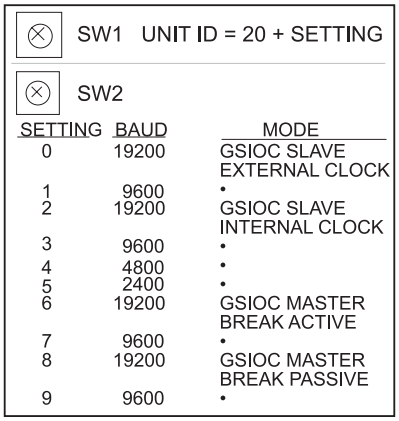
Part	Description
A	8-channel valve
1	**GSIOC** port for connection to Liquid handler
2	Power inlet, 24V DC
3	**ROTATE/HOME** (Contact Connection) - not used

Part	Description
B	Liquid handler
4	**GSIOC** port for connection to 8-channel valve
5	Mains fuse drawer
6	Power switch
7	**RS-232** port for connection to PC
8	Power inlet

Connecting the PC

Connect the supplied communication cable between the **RS-232** connector on the Liquid handler and the **COM1** port on the PC.

Communication settings label



Check that the switches **SW1** and **SW2** are set as shown below.

Switch	Label	Value
	**SW1**	Unit ID = 22
	**SW2**	Baud rate = 19200 Mode = **GSIOC** Master

1.4 Control software

Ettan Digester Control Software is a complete software for control and supervision of Ettan Digester. The software runs under Microsoft® Windows® operating system.

For more information about Ettan Digester Control Software, refer to *Ettan Digester Instrument Handbook* or *Ettan Digester User Manual*.

1.5 User documentation

User documentation	Content
Ettan Digester Operating Instructions (this manual)	All instructions needed to operate the instrument in a safe way, including brief system description, installation, and maintenance.
Ettan Digester User Manual	Detailed system description. Comprehensive user instructions, method creation, operation, advanced maintenance and troubleshooting.
Ettan Digester Instrument Handbook	Provides technical information and basic operating instructions for the system. In addition, maintenance schedules, instructions for troubleshooting and user maintenance are included.
EC Declaration of Conformity for Ettan Digester	Document whereby the manufacturer ensures that the product satisfies and is in conformity with the essential requirements of the applicable directives.

2 Safety instructions

About this chapter

This chapter describes safety compliance, safety labels, general safety precautions, emergency procedures, power failure and recycling of Ettan Digester system.

In this chapter

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2.1 Safety instructions

Introduction

Ettan Digester system is powered by mains voltage and handles liquids that may be hazardous. Before installing, operating or maintaining the system, you must be aware of the hazards described in this manual. Follow the instructions provided to avoid personal injury or damage to the equipment.

The safety precautions in this section are grouped into the following categories:

- General precautions
- Using flammable liquids
- Personal protection
- Installing and moving the instrument
- System operation
- Maintenance

General precautions

WARNING

Do not operate the product in any other way than described in the Ettan Digester user documentation.

WARNING

Only properly trained personnel may perform operation and user maintenance of the product.

WARNING

Do not use any accessories not supplied or recommended by GE.

WARNING

Do not use Ettan Digester if it is not working properly, or if it has suffered any damage, for example:

- damage to the power cord or its plug
- damage caused by dropping the equipment
- damage caused by splashing liquid onto it

WARNING

The instrument covers must not be opened by the user. The instrument contains electrical circuits which can give a lethal electric shock. Service and planned maintenance shall be performed by personnel authorized by GE.

CAUTION

Waste tubes and containers must be secured and sealed to prevent accidental spillage.

Using flammable liquids

WARNING

Fire Hazard. Before starting the system, make sure that there is no leakage.

WARNING

A fume hood or similar ventilation system shall be installed when flammable or noxious substances are used.

Personal protection

WARNING

Always use appropriate Personal Protective Equipment (PPE) during operation and maintenance of this product.

WARNING

Hazardous substances and biological agents. When using hazardous chemical and biological agents, take all suitable protective measures, such as wearing protective glasses and gloves resistant to the substances used. Follow local and/or national regulations for safe operation and maintenance of Ettan Digester.

WARNING

Spread of biological agents. The operator has to take all necessary actions to avoid spreading hazardous biological agents. The facility must comply with the national code of practice for biosafety.

Installing and moving the instrument

WARNING

Supply voltage. Before connecting the power cord, make sure that the supply voltage at the wall outlet corresponds to the marking on the instrument.

WARNING

Protective ground. The product must always be connected to a grounded power outlet.

WARNING

Power cord. Only use power cords with approved plugs delivered or approved by GE.

WARNING

Access to power switch and power cord with plug. Do not block access to the power switch and power cord. The power switch must always be easy to access. The power cord with plug must always be easy to disconnect.

CAUTION

Heavy object. Ettan Digester weighs approx. 40 Kg. Two people are required to lift the instrument.

NOTICE

Do not use the X- or Y-arms as handles when moving the Ettan Digester. Always lift the instrument from the base.

NOTICE

If an Ettan Digester configured for 100–120 V is connected to 220–240 V, the instrument can be severely damaged. Make sure that the correct fuse drawer for the voltage range is installed.

NOTICE

Any computer used with the equipment must comply with IEC 60950 and be installed and used according to the manufacturer's instructions.

System operation

WARNING

Hazardous biological agents during run. When using hazardous biological agents, run ***System CIP*** and ***Column CIP*** to flush the entire system tubing with bacteriostatic solution (e.g. NaOH) followed by a neutral buffer and finally distilled water, before service and maintenance.

WARNING

Avoid spilling liquids on the body of the instrument. If large volumes of liquid have penetrated the casing of the instrument and come into contact with the electrical components, immediately switch off the instrument and contact an authorized service technician.

WARNING

Over-pressure. Never block the outlet tubing with, for instance, stop plugs, since this will create over-pressure and might result in injury.

WARNING

Use ONLY Tubing kits supplied by GE to ensure that the pressure specifications of the tubing are fulfilled.

WARNING

Under no circumstances should you place hands or fingers underneath the sample probe during instrument operation. The sample probe has the capacity to puncture skin.

CAUTION

The needles will move over the entire working area of the Liquid handler. Remove all loose items placed on the Ettan Digester unit.

CAUTION

Moving parts. When Ettan Digester begins the homing process, the needles, syringes and X/Y/Z arm will all move. Make sure that you are clear of all these moving parts to avoid any risk of injury.

NOTICE

Always verify all positions (plates, rinse stations, enzyme holder) on the instrument using ***System Setup*** after performing the ***Home phase*** operation.

NOTICE

Be careful when moving the sample needles. If the needles hit an obstacle, the motor will shut off immediately to avoid serious damage to the instrument. However, the needles themselves may become damaged if they impact on an obstacle.

Maintenance

WARNING

Do not remove the main cover of the instrument. There are no user-serviceable components inside, and you can be exposed to high voltage.

WARNING

Disconnect power. Always disconnect power from the instrument before replacing fuses.

WARNING

For continued protection from fire hazard, replace only with same type and rating of fuse.

WARNING

Only spare parts and accessories that are approved or supplied by GE may be used for maintaining or servicing the product.

WARNING

Hazardous chemicals during run. When using hazardous chemicals, flush the entire system tubing with distilled water, before service and maintenance.

CAUTION

To avoid injury while changing any parts on the pump unit, always press the **Stop** button on the instrument front panel and disconnect from the main power after lowering the syringe. When work is complete, re-connect to the power supply and click the **Initialize instrument** button to home the syringe.

CAUTION

Always shut down Ettan Digester and the PC before disconnecting or connecting cables.

NOTICE

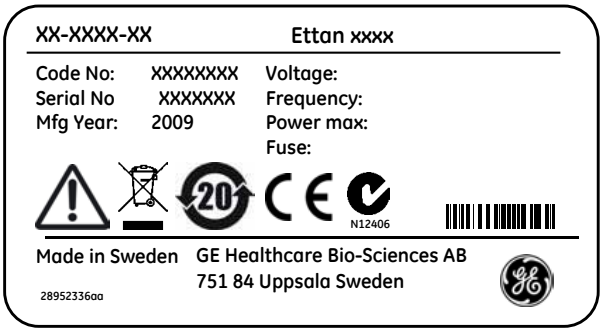
Cleaning. Keep the instrument dry and clean. Wipe regularly with a soft damp tissue and, if necessary, a mild cleaning agent. Let the instrument dry completely before use.

2.2 Labels

This section describes the safety labels and labels concerning hazardous substances that are attached to the Ettan Digester system. For information about marking of the computer equipment, refer to the manufacturer's instructions.

Labels on the instrument

The illustration below shows an example of the identification label that is attached to the Ettan Digester instrument.



Symbols used in safety labels

Label	Meaning
	**Warning!** Read the user documentation before using the system. Do not open any covers or replace parts unless specifically stated in the user documentation.
	The system complies with the requirements for electromagnetic compliance (EMC) in Australia and New Zealand.
	Risk for body parts getting caught between two parts of the system. Care must be taken to avoid injury.

Label	Meaning
CE	The system complies with applicable European directives.

Labels concerning hazardous substances

Label	Meaning
	This symbol indicates that the waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of equipment.
	This symbol indicates that the product contains hazardous materials in excess of the limits established by the Chinese standard SJ/ T11363-2006 Requirements for Concentration Limits for Certain Hazardous Substances in Electronics.

2.3 Emergency procedures

This section describes how to do an emergency shutdown of the Ettan Digester system. The section also describes the result in the event of power failure.

Emergency procedures

In an emergency situation, do as follows to stop the run:

Step	Action
1	In the event of an emergency, press the **Stop** button on the Ettan Digester front panel. The instrument immediately ceases movement and all motors are de-energized.
2	If required, press the power switch to the 0 position.
3	Turn off the 8-channel valve by pulling the power plug from the power socket/outlet.

Power failure

Power failure to...	will result in...
Ettan Digester	• The run is interrupted immediately, in an undefined state. • The data collected up to the time of the power failure is available in Ettan Digester Control Software
Computer	• The Ettan Digester Control Software computer shuts down in an undefined state. • The run is interrupted immediately, in an undefined state.

The result of a power failure depends on which unit that is affected.

Restart procedure

In the event of system shutdown due to power failure, emergency stop or process interruption, malfunctions must be rectified before the Ettan Digester is restarted.

To restart the Ettan Digester, follow the start-up instructions in *Section 4.2 Starting the instrument, on page 52*.

2.4 Recycling information

The equipment shall be decontaminated before decommissioning and all local regulations shall be followed with regard to scrapping of the equipment.

Disposal, general instructions

When taking Ettan Digester out of service, the different materials must be separated and recycled according to national and local environmental regulations.

Recycling of hazardous substances

Ettan Digester contains hazardous substances. Detailed information is available from your GE representative.

Disposal of electrical components

Waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of equipment.

2.5 Declaration of Hazardous Substances (DoHS)

Introduction

The following product pollution control information is provided according to SJ/T11364-2006 Marking for Control of Pollution caused by Electronic Information Products.

根据SJ/T11364-2006《电子信息产品污染控制标识要求》特提供如下有关污染 控制方面的信息

Symbols used in pollution control label

电子信息产品污染控制标志说明

Label	Meaning
	This symbol indicates the product contains hazardous materials in excess of the limits established by the Chinese standard SJ/T11363-2006 Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products. The number in the symbol is the Environment-friendly Use Period (EFUP), which indicates the period during which the toxic or hazardous substances or elements contained in electronic information products will not leak or mutate under normal operating conditions so that the use of such electronic information products will not result in any severe environmental pollution, any bodily injury or damage to any assets. The unit of the period is "Year". In order to maintain the declared EFUP, the product shall be operated normally according to the instructions and environmental conditions as defined in the product manual, and periodic maintenance schedules specified in Product Maintenance Procedures shall be followed strictly. Consumables or certain parts may have their own label with an EFUP value less than the product. Periodic replacement of those consumables or parts to maintain the declared EFUP shall be done in accordance with the Product Maintenance Procedures. This product must not be disposed of as unsorted municipal waste, and must be collected separately and handled properly after decommissioning.

Label	Meaning
	该标志表明本产品含有超过SJ/T11363-2006《电子信息产品中有毒有害物质的限量要求》中限量的有毒有害物质。标志中的数字为本产品的环保使用期，表明本产品在正常使用的条件下，有毒有害物质不会发生外泄或突变，用户使用本产品不会对环境造成严重污染或对其人身、财产造成严重损害的期限。单位为年。 为保证所申明的环保使用期限，应按产品手册中所规定的环境条件和方法进行正常使用，并严格遵守产品维修手册中规定的期维修和保养要求。 产品中的消耗件和某些零部件可能有其单独的环保使用期限标志，并且其环保使用期限有可能比整个产品本身的环保使用期限短。应到期按产品维修程序更换那些消耗件和零部件，以保证所申明的整个产品的环保使用期限。 本产品在使用寿命结束时不可作为普通生活垃圾处理，应被单独收集妥善处理

List of hazardous substances and their concentrations

产品中有毒有害物质或元素的名称及含量

Indication for each major part if substance exceeds limit

Value	Meaning
O	Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006. 表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006 标准规定的限量要 求以下
X	Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006. • Data listed in the table represents best information available at the time of publication 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006 标准规定的 限量要求 • 此表所列数据为发布时所能获得的最佳信息

List of hazardous substances

Component name 部件名称	Hazardous substance 有毒有害物质或元素					
	Pb 铅	Hg 汞	Cd 镉	Cr6+ 六价铬	PBB 多溴联苯	PBDE 多溴二苯醚
Ettan Digester[1]	X	O	O	O	O	O

1 The product has not been tested as per the Chinese standard SJ/T11363-2006 Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Product.

3 Installation

The Ettan Digester system is installed and tested by GE service personnel after delivery. This chapter provides instructions for reinstallation, if you should need to move the instrument to another location.

Any equipment connected to Ettan Digester must fulfill applicable standards and local regulations.

For detailed information on installation, see *Ettan Digester Instrument Handbook*.

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3.1 Site requirements

Introduction

NOTICE

If an Ettan Digester configured for 100–120 V is connected to 220–240 V, the instrument can be severely damaged. Make sure that the correct fuse drawer for the voltage range is installed.

Site requirements

Before installation or moving Ettan Digester, check that the new location fulfils the site requirements listed below.

Parameter	Requirement
Electrical power	• 100-120 V~ ±10% 50/60 Hz, single phase • 220-240 V~ ±10% 50/60 Hz, single phase
Ambient temperature	+15°C to +32°C
Placement	Place the instrument on a stable and level laboratory bench.
Humidity	Maximum relative humidity 80% (non-condensing).
Location	Indoor use only.

Note: *Ensure easy access to the mains power switch on the rear panel of the instrument.*

3.2 Unpacking

- Check the equipment for damage before starting assembly and installation.
- Document any damage and contact your local GE representative.

Remove straps and packing material and stand equipment upright before starting installation.

3.3 Transport

CAUTION

Heavy object. Ettan Digester weighs approx. 40 Kg. Two people are required to lift the instrument.

NOTICE

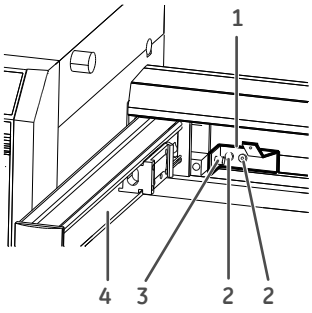
Do not use the X- or Y-arms as handles when moving the Ettan Digester. Always lift the instrument from the base.

Relocation

Follow the instructions below to move the system to another room:

Step	Action
1	Shut down the Ettan Digester and the PC.
2	Disconnect all cables.
3	To prevent mechanical damage, install the armlock securing the Y-arm, see *Installing the mechanical armlock, on page 38*.
4	Carefully place the instrument, the PC and the monitor on a trolley.
5	Move the system to the new location.

The mechanical armlock



Part	Function
1	Armlock
2	Securing screws
3	Tensioning screw
4	Y-arm

Installing the mechanical armlock

Follow the instructions below to install the armlock.

Step	Action
1	Mount the tensioning screw that immobilizes the Y-arm.
2	Mount the two securing screws that hold the armlock in place.

3.4 Reinstalling the Ettan Digester

Place the instrument

Step	Action
1	Select a place for the Ettan Digester where it is possible to access the mains power switch on Liquid handler.
2	Remove the armlock.

If you need to reinstall the Ettan Digester Control Software, see *Section 3.7 Reinstalling the Ettan Digester Control Software, on page 48*.

Power-up check

To verify the function of the Ettan Digester at the new location:

Step	Action
1	Switch on the mains power at the rear of Liquid handler and make sure that the 8-channel valve is receiving power through a dedicated 24V DC adapter.
2	Check that the Power indicator lights up.
3	Switch on the mains power to the PC.
4	To start the Ettan Digester Control Software, select ***All Programs:GE Healthcare:Ettan Digester Control Software*** from the Windows ***Start*** menu.
5	Click on ***OK*** in the ***Homing*** screen to start the homing procedure, where the Ettan Digester Control Software needles move to home position.
6	From the service window under ***Tools/Service***, run the ***Home Phase***.

Shutdown

Follow the instructions below to shut down Ettan Digester and Ettan Digester Control Software.

Step	Action
1	Close down the Ettan Digester Control Software by choosing ***File:Exit***.
2	Switch off mains power on the Liquid handler.

3.5 Connections

Communication

Connect the Ettan Digester according to the electrical drawings in *Electrical and communication connections, on page 15*.

Ensure that Ettan Digester Control Software is installed on the computer. For further information on software installation, see *Section 3.7 Reinstalling the Ettan Digester Control Software, on page 48*.

NOTICE

Any computer used with the equipment must comply with IEC 60950 and be installed and used according to the manufacturer's instructions.

Electrical power

Connect the power cord to a grounded power outlet specified in *Section 3.1 Site requirements, on page 35*.

During the original installation, the Ettan Digester is configured for one voltage range by installing the appropriate fuse drawer. Before reinstalling the instrument, make sure that the correct fuse drawer is installed for the mains voltage at the new location. If you need to change the mains voltage configuration, see instructions in *Replacing the mains fuses, on page 83* for installing mains fuses.

Hardware setup

Before using Ettan Digester for the first time, the system setup must be verified. The system setup is performed at two levels.

1 Hardware alignment, see *Section 3.6 Hardware alignment, on page 42*.

2 System setup from Ettan Digester Control Software, *Section 4.3 Starting the control system, on page 53*.

The system setup should also be verified:

- If any moving parts (such as the probe needles) have been replaced.
- If a new version of Ettan Digester Control Software has been installed.
- After a power failure.

- If Ettan Digester has been moved to a new location.
- After running the ***Home phase*** tool.

3.6 Hardware alignment

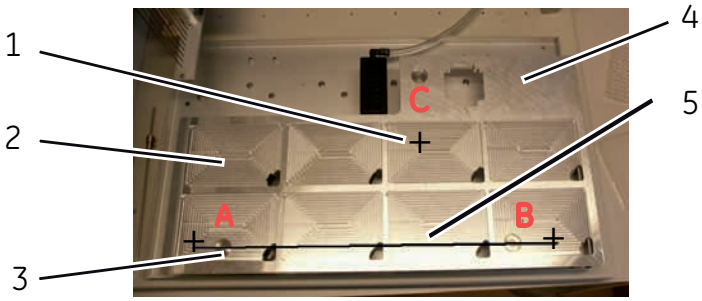
At first the hardware has to be aligned, i.e. the base plate has to be aligned with the X/Y-arm, and the sample needles have to be aligned with the base plate. These steps are performed before the instrument power is turned on and the Ettan Digester Control Software is started.

Base plate alignment overview

The base plate rests on three adjustable supports. The leftmost support (marked A in the following figure) shall not be adjusted to ensure that the height of the base plate is not altered. The height of the supports can be adjusted by turning the thumb-wheel after loosening the screw in the center of the support.

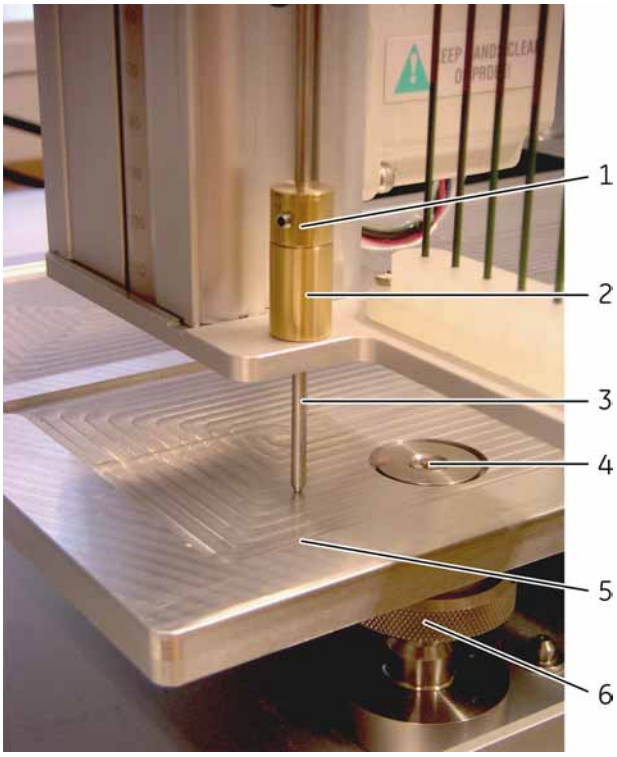
Main parts of the base plate assembly

The base plate with level adjustment supports A-C, the 'tilt axis', and the calibration tool positions marked:



Part	Function
1	Position for calibration tool (3 positions) (+)
2	Microplate groove (8 positions)
3	Adjustment support A
4	Base plate
5	Tilt axis

The calibration tool assembly



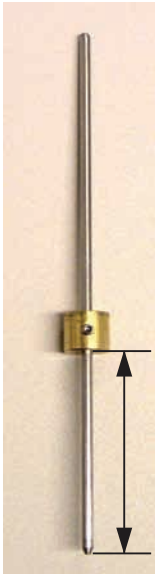
Part	Function
1	Calibration tool
2	Calibration tool holder
3	Calibration rod
4	Locking screw
5	Base plate
6	Thumb-wheel

Base plate alignment procedure

The base plate alignment procedure consists of 2 steps:

- Calibrating the height of the Z-arm.
- Adjusting the height of support B and C.

Calibrating the height of the Z-arm

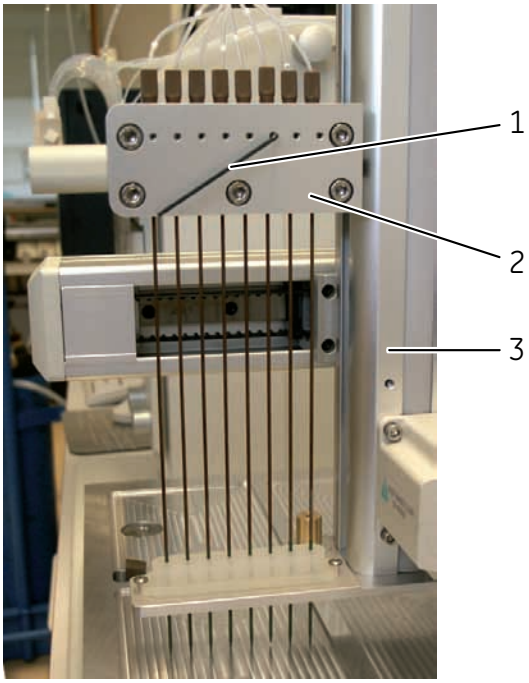
Step	Action
1	Make sure that the mains power is turned off.
2	Loosen the screws that lock adjustment supports A and B.
3	Move the Z-arm so that the calibration tool holder is above and approx. 5 cm to the left of adjustment support A.
4	Insert the calibration tool in its holder and loosen the screw so that the calibration rod can move freely and rests on the base plate at the 'tilt axis' Main parts of the base plate assembly on *Base plate alignment overview, on page 42*. ***Note:*** *The flat end of the calibration rod shall be towards the base plate surface.*
5	Secure the screw again to establish the height of the Z-arm above the base plate. The distance to the base plate is now given by the locked calibration tool is used when adjusting support B and C. 
6	Remove the calibration tool from the holder.

Adjusting the height of support B and C

Step	Action
1	Move the Z-arm to a position close to adjustment support B along the 'tilt axis'.
2	Insert the calibration tool again and check that its tip is somewhere along the 'tilt axis'.
3	Turn the thumb-wheel on support B so that the calibration tool rests simultaneously with its tip on the base plate and with its brass bushing on the calibration tool holder on the Z-arm.
4	Remove the calibration tool from the holder.
5	Move the Z-arm so that the locking screw on support B can be tightened.
6	Move the Z-arm to the position on the microplate groove in front of the support C, see *Base plate alignment overview, on page 42*, and insert the calibration tool again.
7	Adjust the height of support C.
8	Remove the calibration tool and tighten the screw of support C.

Needle height alignment

The second step in the hardware setup is to align the individual sample needles to the previously aligned base plate. Each needle has its own retaining screw in the needle head and can therefore be adjusted individually.

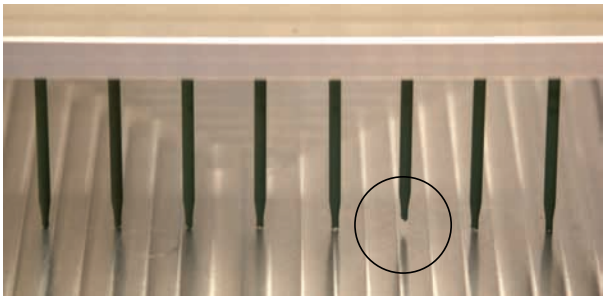


Part	Function
1	Allen key, 1.5 mm
2	Needle head
3	Z-arm

Needle alignment procedure

Step	Action
1	Make sure that the instrument power is turned off.
2	Loosen the eight hex screws that locks the needles (see *Needle height alignment, on page 46*).

Step	Action
3	Manually move the Z-arm to a position of one of the microplate grooves on the base plate.
4	Lower the needle head so that the needles touch the base plate lightly, see figure below.



Note:

The third needle from the right needs adjustment.

5	Lock all the needles in position by tightening the hex-screws. Make sure that all of them are still touching the base plate.
6	Raise the needle head and move the X/Y-arm to the home position.

The tips of the needles are now aligned to the base plate.

The instrument power can now be turned on, and the remaining steps of system setup can be performed from within the instrument control software.

3.7 Reinstalling the Ettan Digester Control Software

The instrument is shipped with all necessary software installed. If Ettan Digester Control Software has to be re-installed (for example after a hard disk failure), follow the steps below.

Installation procedure

Perform the procedures in this order:

- Installing Instrument software
- Installing Ettan Digester Control Software

For more information, refer to *Ettan Digester Instrument Handbook*.

3.8 Spare parts and accessories

For correct up to date information on spare parts and accessories visit:
www.gelifesciences.com/2DE

4 Operation

About this chapter

This chapter contains information on how to operate Ettan Digester.

WARNING

For relevant safety warnings and cautions, refer to *Section 2.1 Safety instructions , on page 20*.

In this chapter

Section	See page
4.1 Operation overview	51
4.2 Starting the instrument	52
4.3 Starting the control system	53
4.4 Setting up a run	57
4.5 Editing a method	59
4.6 Preparations before start	66
4.7 Performing a run	70
4.8 Procedures after a run	74
4.9 Software tools	75

4.1 Operation overview

The typical workflow in Ettan Digester, after turning on the system, can be divided into the following steps:

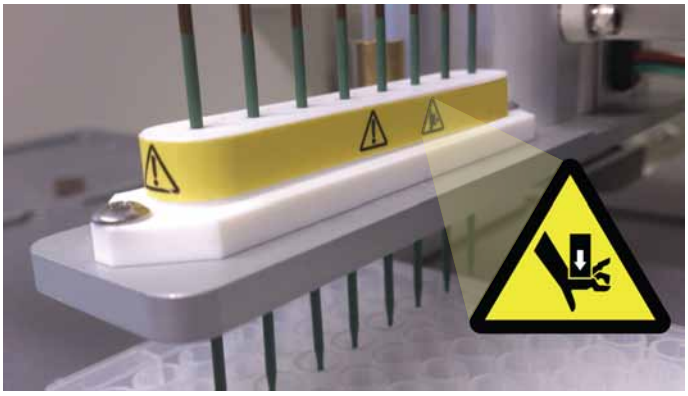
Step	Action
1	Assigning the valve positions
2	Choosing method parameters
3	Preparing the system before start
4	Choosing type of run mode
5	Performing the digestion run

Refer to *Ettan Digester User Manual* for digestion protocols.

4.2 Starting the instrument

WARNING

Under no circumstances should you place hands or fingers underneath the sample probe during instrument operation. The sample probe has the capacity to puncture skin.



Step	Action
1	Turn on the 8-needle Liquid handler by pressing the Power switch to the **I** position.
2	Turn on the 8-channel valve by inserting the power plug into the power socket/outlet.

4.3 Starting the control system

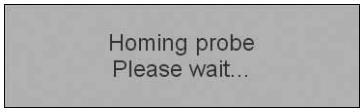
Step	Action
1	Turn on the monitor, computer and optional printer according to the manufacturer's instructions. Wait for the computer to start up.
2	Start the Ettan Digester Control Software from the Windows ***Start*** menu, ***All Programs:GE Healthcare:Ettan Digester*** *Result:* • A splash screen appears for a few seconds while the program is starting. The splash screen shows the software version number as well as copyright information. • After the splash screen an instrument initialization dialog appears:

Step	Action
3	Click ***OK*** to start the ***Homing*** procedure.

> **CAUTION**
>
> **Moving parts.** When Ettan Digester begins the homing process, the needles, syringes and X/Y/Z arm will all move. Make sure that you are clear of all these moving parts to avoid any risk of injury.

Result:

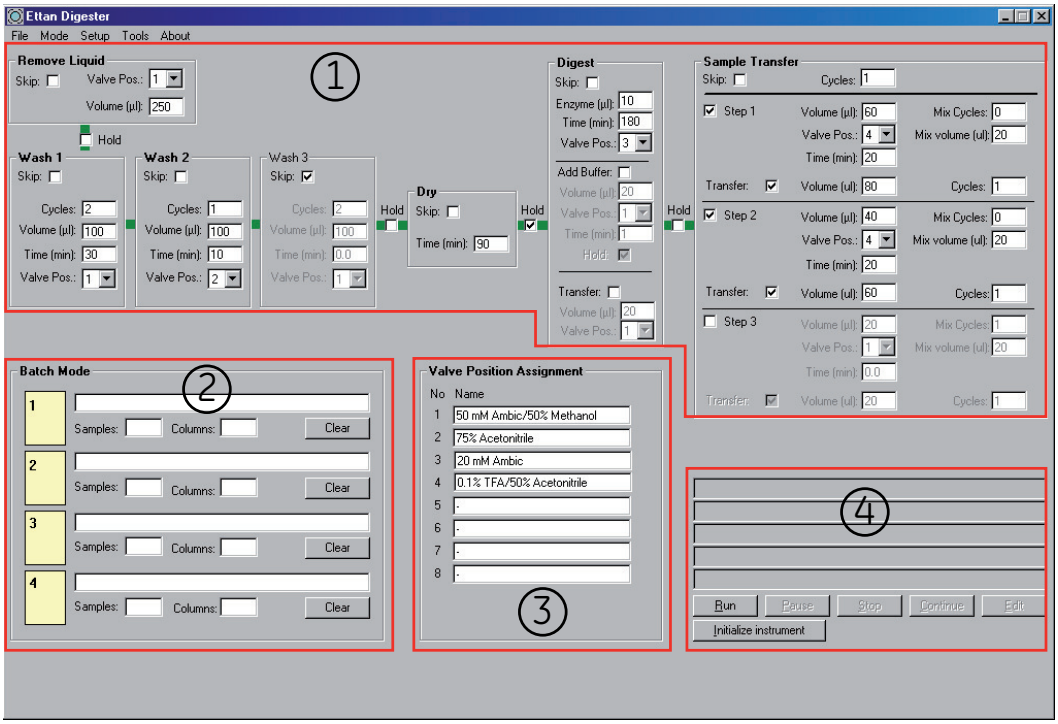
1



2

3 Ettan Digester Control Software main window is shown with the default method parameters loaded. For more information on default methods, see *Saving a method, on page 57*.

Ettan Digester Control Software main window



Item	Description
1	Method setup
2	Run mode setup
3	Buffer line/valve assignment
4	Run control and instrument status information (for more details see *Section 4.4 Setting up a run, on page 57*)

The main window menu bar contains the following menus:

Menu	Description
File	This menu is used to load/save methods and to quit the Ettan Digester Control Software.
Mode	This menu is used to switch between batch and manual mode.

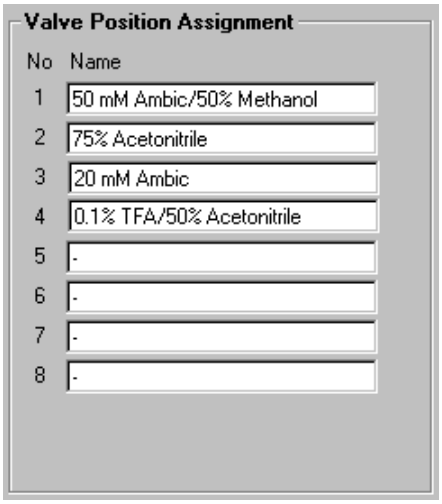
Menu	Description
Setup	This menu contains only one item, ***System Setup***, which opens the ***System Setup*** window.
Tools	From this menu it is possible to view methods, output files, prime Ettan Digester, show system information and perform basic maintenance tasks.
About	This menu shows the splash screen and copyright information.

For detailed information about the main window menu bar, refer to *Ettan Digester User Manual*.

4.4 Setting up a run

Assigning the valve positions

All of the steps in the digestion process have a specific valve position that they use. The buffer that flows from each valve position can be designated in the ***Valve Position Assignment*** area of the main window. This information is saved along with a method, prompting the user to place buffer lines into the appropriate solutions.



Saving a method

Once a method has been defined in the main window, it may be saved, to be accessed easily at a future date.

Step	Action
1	Choose ***File:Save Method***. *Result:* A ***Save*** dialog box appears.
2	Enter a suitable file name for the method. Click ***Save***. *Result:* The method is saved with a `*.dig` file extension.

Saving a default method

It is possible to save the method on display in the main window as the default method. This method will automatically be displayed in the main window the next time the Ettan Digester Control Software is started.

Step	Action
1	Choose ***File:Save Method***. *Result:* A message box asks for confirmation to over-write the default method.
2	Click to confirm. *Result:* The file is now automatically saved with the file name `default.dig`.

Opening a method

To open a previously saved method file follow the steps below:

Step	Action
1	Choose ***File:Save Method***. *Result:* An ***Open*** dialog box appears.
2	Locate the required method file. Click ***Open***. *Result:* The method appears in the main window.

4.5 Editing a method

The method that is displayed in the main window is the method that will be used when the ***Run*** button is pressed. It is therefore important to ensure that the method is correct before setting the instrument running.

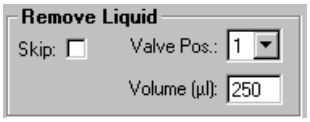
There are a number of method steps that will run in the order shown in the table below. It is possible to skip any number or combination of these steps during the method.

Method step		Description
Remove liquid		Removes a liquid left with the plug after spot picking.
Wash 1, 2, 3		Destains and equilibrates the plug prior to enzyme addition and digestion.
Dry		Waiting time to let the gel plug dry before digestion to enhance enzyme entry into the plug.
Digest	***Enzyme***	Trypsin added to the gel plug.
	Add Buffer	Possibility to add more/different buffer.
	Transfer	A sample of the digestion mix may be transferred directly to extract plate and taken for analysis.
Sample Transfer	***Step 1, 2, 3***	Active extraction can be used to extract peptides from gel plug. At any stage, sample may be removed from sample plate to extract plate to analysis.
Hold		There are also four ***Hold*** check boxes in the method setup. When the method reaches a ***Hold*** that has been checked, Ettan Digester will go into an indefinite pause until the ***Continue*** button is pressed.

Each step of the method run is explained in more detail in the following sections.

Remove liquid

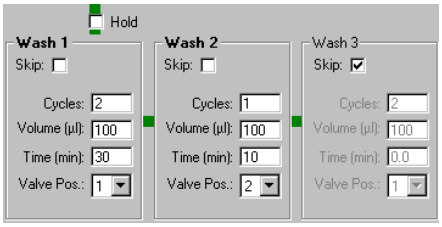
This method step removes any liquid left in the microplates from spot picking.



Software command	Description
Skip	Skips/includes the remove liquid step.
Valve Pos	Sets the valve position used as wash and hydraulic liquid when aspirating liquid from the wells.
Volume	Sets the volume to remove from each microplate well. Valid range is 0 to 350 µl.

Wash 1, 2 and 3

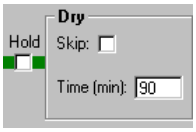
The wash steps are used primarily to destain the gel plugs. Each wash step may use a different liquid and can be repeated up to 10 times. An optional ***Hold*** check box may be selected to pause the instrument between the ***Remove Liquid*** and ***Wash*** step.



Software command	Description
Skip	Skips/includes the wash step. Each step may be skipped/included individually. ***Note:*** *The step is skipped if the box is selected.*
Cycles	Selects the number of cycles to perform the individual wash steps.
Volume	Selects the volume of wash liquid to dispense into each well.
Time	Selects the time to incubate the gel plug in the wash liquid before removing it from the well.
Valve Pos	Selects which valve position to use when dispensing wash liquid.

Dry

This is the step after washing. An optional ***Hold*** check box may be selected to pause the instrument between the ***Wash*** and ***Dry*** step.



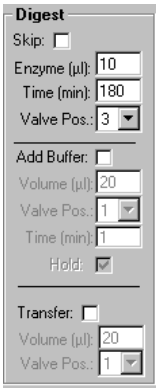
This step is used for drying the gel plugs before adding enzyme. This step may be done in one of two ways:

- Using a liquid with high content of organic solvent (e.g. 100% Acetonitrile) as final wash protocol and then leaving the microplates in situ on Ettan Digester and allowing them to air dry. Typical drying time is 60 to 90 minutes depending on local temperature and humidity conditions (1 mm gel thickness)
- Perform drying in external drying equipment, for example a vacuum centrifuge.

Software command	Description
Skip	Skips/includes the dry step. ***Note:*** *The step is skipped if the box is selected.*
Time	Selects the time to wait for the gel plugs to dry. It is possible to abort drying (by pressing the ***Continue*** button) if manual inspection of the microplates shows that the gel plugs have been dried sufficiently.

Digest

This is the step after the drying step. An optional ***Hold*** check box may be selected to halt the instrument between the ***Dry*** and ***Digest*** step.



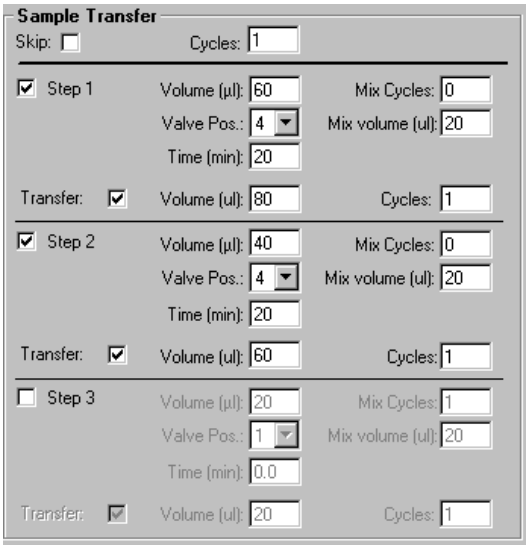
In this step, enzyme is added to the gel plugs. If the enzyme is added in an inactive form, it may be activated by adding an appropriate buffer. It is also possible to transfer all or a portion of the digest solution from the sample plate to the extract plate.

Software command	Description
Skip	Skips/includes the entire digest step.
Enzyme	Selects the volume of enzyme to add to each well. The enzyme may be added in a buffer where the enzyme is active (such as 20 mM ammonium bicarbonate for Trypsin) or in a buffer which keeps the enzyme inactive (such as 1mM HCl).
Time (Enzyme)	Selects the incubation time after adding enzyme to all wells. This is most important when the enzyme is being added to the gel plugs in a buffer that renders the enzyme inactive. The time set here is the time that the gel plugs will have to fully rehydrate with the enzyme.
Valve Pos. (Enzyme)	Selects the buffer liquid to use as hydraulic liquid when enzyme is transferred from the enzyme container to the wells. If the enzyme is being added to the gel plugs in an inactive form, then it is important that the enzyme solution is not contaminated with an activating buffer.

Software command	Description
Add Buffer	Skips/includes additional buffer. If the enzyme has been added to the gel plug in a solution where it is already activated, then there is no need to add further activating buffer. ***Note:*** *If this check box is selected, then buffer will be added to the gel plug.*
Volume (Add Buffer)	Selects the volume of buffer liquid to add to each well.
Valve Pos. (Add Buffer)	Selects which valve position to use when adding enzyme buffer.
Time (Add Buffer)	Selects the incubation time for digestion.
Transfer	Skips/includes transfer of digest from sample to extract plate.
Volume (Transfer)	Sets the volume of liquid to transfer from sample plate wells to extract plate wells. ***Note:*** *If this check box is selected, then sample will be transferred to the extract microplate.*
Valve Pos. (Transfer)	Selects the hydraulic liquid when moving digest from the sample plate to extract plate.

Sample transfer

This is last step. An optional ***Hold*** check box may be selected to pause the instrument between the ***Digest*** and ***Sample Transfer*** step.



In this step, peptides are extracted from the gel plugs after the enzyme reaction. The extraction process is performed in the sample plate. The resultant peptide solution can then either be left in the sample plate or transferred to the extract plate.

Software command	Description
Skip	Skips/includes the entire sample transfer step.
Cycles	Selects the number of times to repeat the entire sample transfer process.
For the individual transfer steps, the following parameters may be specified:	
Step 1, 2, 3	Skips/includes the step (each step 1, 2 and 3 may be skipped/ included individually). ***Note:*** *In this case, checking the check box will cause the step to be performed.*
Volume (Add)	Selects the volume of buffer to add to the gel plug.
Valve Pos.	Selects which buffer to add.

Software command	Description
Time	Sets the incubation time after adding liquid.
Mix Cycles	Selects a number of mix cycles. Along with the mix volume setting, this is used to mix the combination of liquids in the microplate well. If no mixing is required, set this value to 0.
Mix volume	Sets the volume of liquid to be displaced during each mix cycle.
Transfer	If this box is checked, a specified volume of liquid will be transferred from the sample plate to the extract plate.
Volume	Sets the volume of liquid to transfer from sample to extract plate.
Cycles	Selects the number of cycles that the individual extract steps will perform.

4.6 Preparations before start

Solutions

It is recommended that each solution to be used during digestion is filtered through a sterile 0.2 µm filter into a clean bottle, recently rinsed with Milli-Q™ (or equivalent). This will greatly reduce the risk of dust (and therefore keratins) being present in the digestion mix and being visible on the mass spectrometry spectrum.

It is also necessary to ensure that there is sufficient solution present for the gel plugs to be processed. The following formula may be used to calculate the minimum volume of solution required for a digestion run (all values in µl).

Wash buffers:

4000 × (Number of priming strokes)

+[(Dispense volume × 8) × (Columns to run) × (Number of cycles)]

= Total volume used during method (µl)

Enzyme buffer and Sample transfer (extract) buffers:

4000 × (Number of priming strokes)

+[(Dispense volume × 8) × (Columns to run)]

+ 2 × [(Rinse volume × 8) × (Number of rinse strokes) × (Columns to run)]

= Total volume used during method (µl)

This volume represents the minimum volume of each buffer that will be consumed during the digestion method. A greater volume than this will be required to cover the airstone on the end of each buffer line and for priming the system.

Enzyme volume

The enzyme volume required to run a batch will be calculated by the software and presented to the user when the Start button is activated, see *Section 4.7 Performing a run, on page 70*.

The volume is calculated according to the following formula:

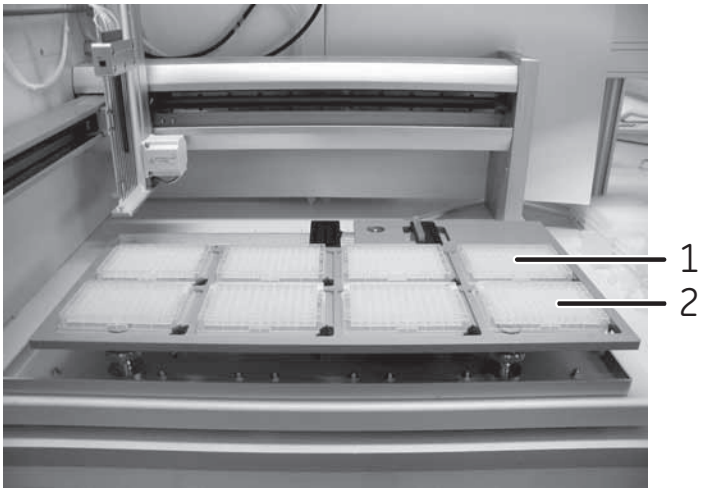
Min. volume for Enzyme vessel (µl):
[(Enzyme volume × 8) × Columns to run] × Enzyme volume + 500]

Min. volume for Enzyme tube (µl):
(Enzyme volume × Columns to run) + Enzyme volume

Placing microplates

All microplates on Ettan Digester should be placed on the position plate so that column 1 is facing the left (see also the diagram in the ***System Setup*** window, accessed from the ***Setup*** menu). If the sample microplates have an adhesive aluminium lid on them, this should be removed prior to digestion.

The sample in well A1 of sample plate 1 will be digested and the peptides extract will be placed into well A1 of extract plate 1, well B1 of sample plate 1 will be extracted into well B1 of extract plate 1, and so on. It is therefore recommended that the extract plates are labelled prior to placing them on Ettan Digester so that the user is able to easily discriminate samples.

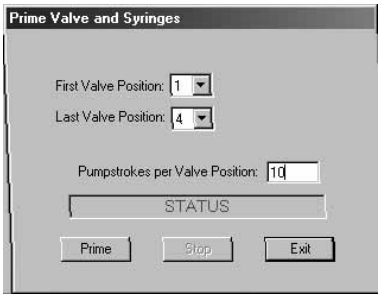


Item	Description
1	Sample microplates
2	Extract microplates

Priming the system

To ensure that no air is present in the tubing and that all tubing seals are correctly fitted, it is recommended that complete priming of the system is performed before each method run.

Step	Action
1	Place each buffer line into the appropriate solution.

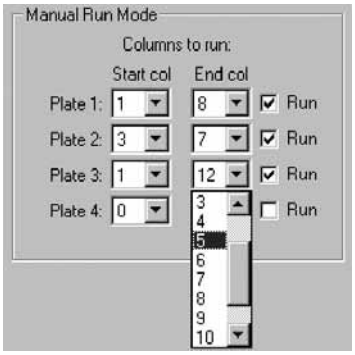
Step	Action
2	Select ***Tools:Prime***. *Result:* The ***Prime Valve and Syringes*** dialog opens. 
3	Select the first and last valve positions that are to be used during the intended protocol.
4	In ***Pumpstrokes per Valve Position***, enter the number of priming strokes (10 priming strokes are recommended) for each valve.
5	Click ***Prime***.
6	Click ***Stop*** to interrupt the priming.
7	Click ***Exit*** when the priming is complete.

Selecting Run mode

Once a method has been set in the main window, it is necessary to define the wells to be digested and the number of microplates to be processed. This can be done in batch fashion, or manually selected. Which process is used depends on the run mode chosen in the ***Mode*** menu. Choosing the different mode options will alter the appearance of the main application window in the lower-left corner.

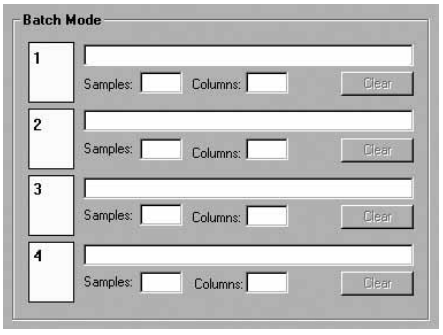
Manual Mode

To include a plate location in a digestion run, select the ***Run*** box. Once a plate has been included, it is possible to set the start and end column for the plate.



Batch Mode

When the ***Batch Mode*** has been selected, click in the large yellow boxes (***1***, ***2***, ***3*** and ***4***) to load the picker results file, which will specify the number of wells in the microplate to be processed.



After clicking on the yellow box, an ***Open*** dialog box will appear. Locate the file that corresponds to the microplate in that position and click ***Open***. The file created by Ettan Spot Picker has the extension `*.apb`.

Once a plate file has been opened, Ettan Digester Control Software will automatically calculate the number of wells, and therefore, columns to be processed on that microplate.

4.7 Performing a run

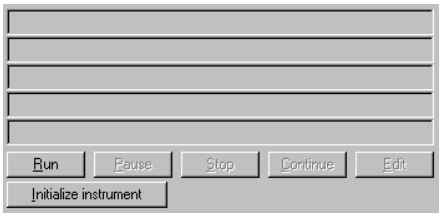
Final checks before start

Once a method has been defined or opened and the run mode for all the plates to be processed has been correctly set, it is wise to make the following final checks:

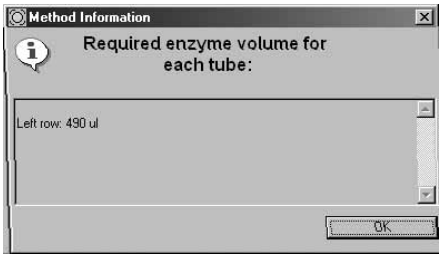
- Check that the buffer lines are all in the correct solutions.
- If there are air-bubbles in any of the buffer lines, it is recommended to prime those buffer lines.
- Check that there is sufficient of each buffer for the defined digestion protocol.
- Check that all microplates are correctly positioned.
- Check that there is nothing that will interfere with the movement of either the sample needles or the syringes.

Starting a run

Start the method by clicking ***Run***. Once the instrument is running, it becomes impossible to edit the method. There is one exception to this that is described in *Hold and edit, on page 72*.

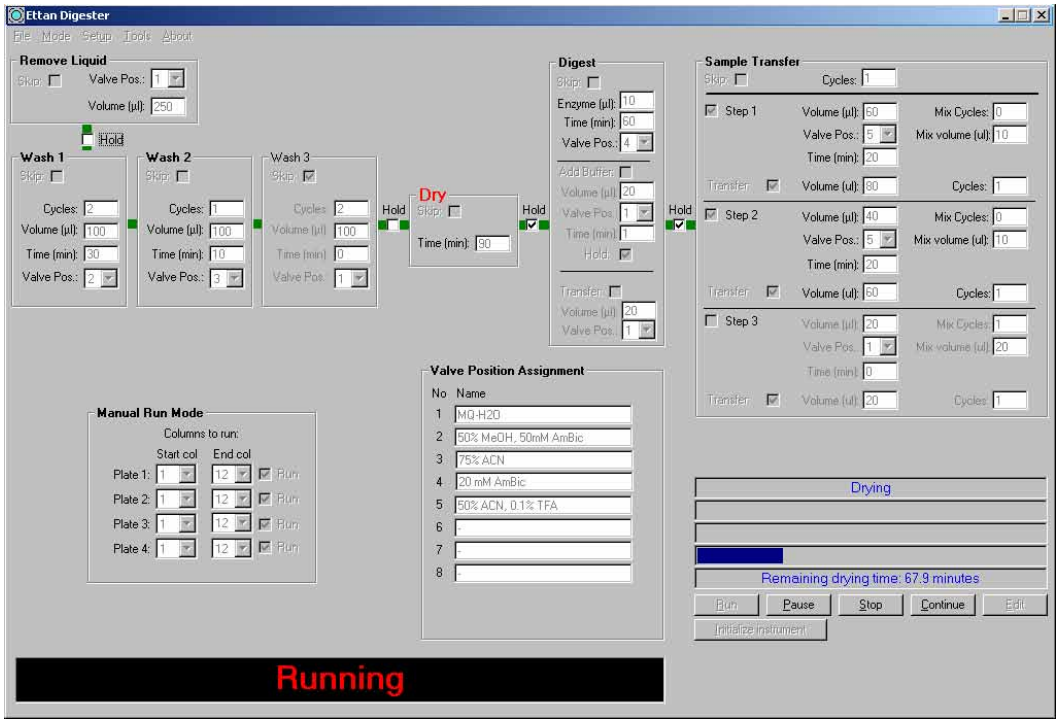


As soon as ***Run*** is pressed a message is shown stating how much enzyme that is needed.



Monitoring a run

It is possible to track the progress of the method when the instrument is running. The method step currently in progress will be shown in a larger, red font.



Detailed information on the progress and status of the method is also displayed above the ***Run/Pause/Stop*** buttons.

Stopping or pausing a run

Once the method is running, two buttons will become available, ***Pause*** and ***Stop***.

If the ***Pause*** is clicked, the system will complete the current movement and pause. Click the ***Continue*** button again to resume the method.

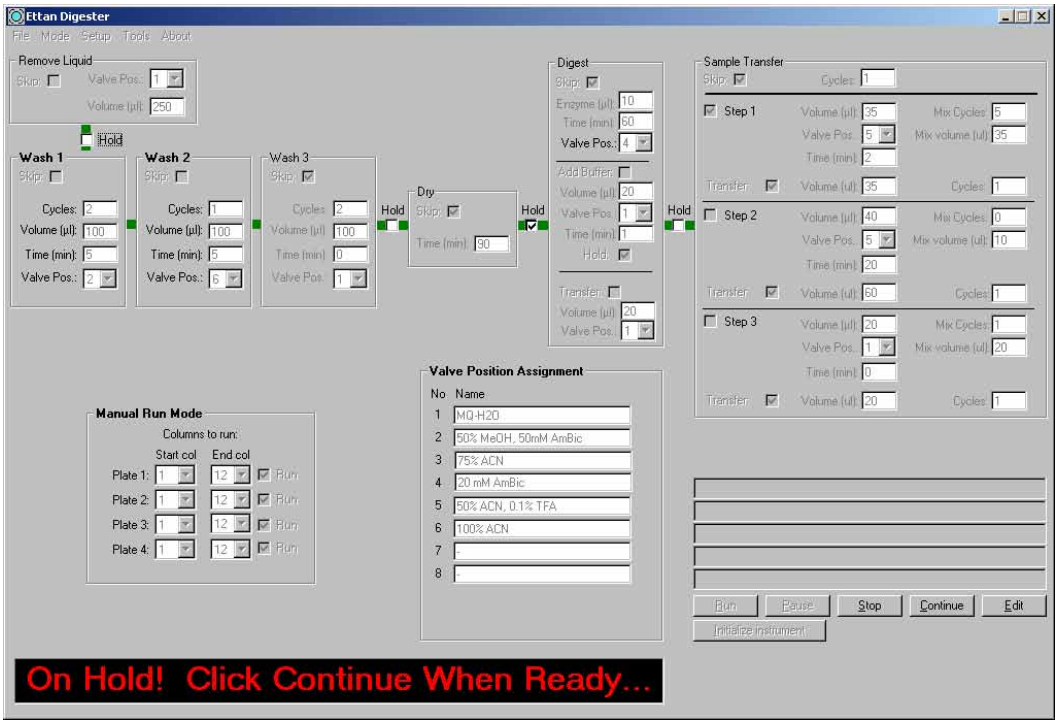
To abort the current method, click the ***Stop*** button. The current batch run will be aborted and the system re-initialized.

Note: *After a stop, it is not possible to resume the batch run.*

Hold and edit

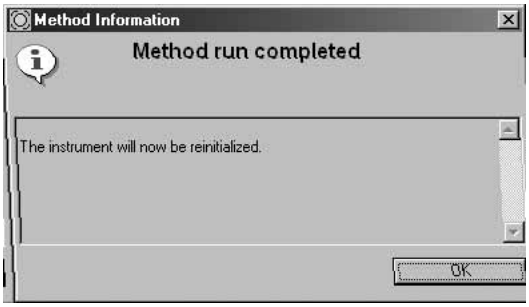
The ***Hold*** check boxes makes it possible to pause the method between most steps. While the system is on hold, it is possible to edit parts of the method that have not yet run. When the method progress reaches a hold step, this will be shown in large, red letters. The ***Edit*** button will become active. Clicking ***Edit*** will unlock the method parameters for editing. When ready, click ***Continue*** to resume the method.

If the method reaches a hold, but editing is not required, simply click ***Continue*** to resume method progress.



End of method

When the method has finished running, the following message box will appear:



Click ***OK*** to re-initialize the instrument.

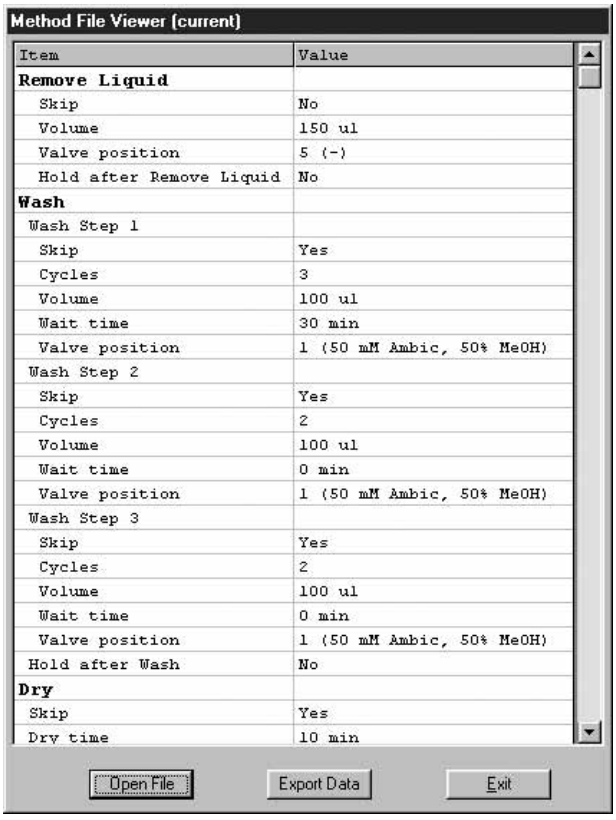
4.8 Procedures after a run

When the run is finished, remove the extract plates from Ettan Digester. Cover the extract plates with a sealing foil and store the plates at -15°C to -30°C until analysis.

4.9 Software tools

Method file viewer

To review a method and/or export the method to a text (ASCII) file, choose the menu bar command ***Tools:Method viewer***. The ***Method File Viewer*** window opens.

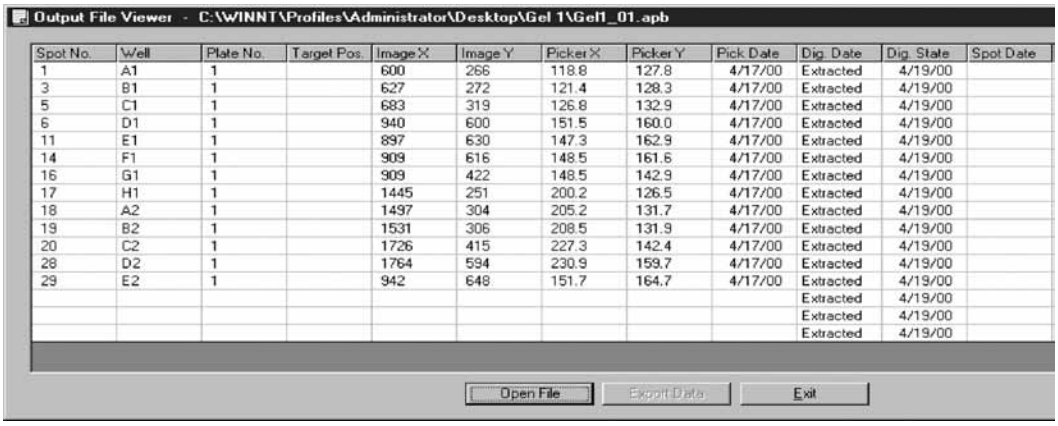


The current method in the main application window will automatically be displayed in the ***Method File Viewe***r window. Click ***Open File*** to view another method than the current. The method will load and display in the ***Method File Viewer*** without changing the method currently in the main application window.

Click ***Export Data*** to export the method to a text file. This text file may be viewed in a number of word-processing software packages. The first 6 lines in the exported file contain information about Ettan Digester Control Software (version number) and when the method was exported. The method itself is in plain text. Click ***Exit*** to close the ***Method viewer***.

Output file viewer

To view output files from a batch run (or before including them in a batch run), choose the menu bar command ***Tools:Output File Viewer***. The ***Output File Viewer*** window opens.



Spot No.	Well	Plate No.	Target Pos.	Image X	Image Y	Picker X	Picker Y	Pick Date	Dig. Date	Dig. State	Spot Date
1	A1	1		600	266	118.8	127.8	4/17/00	Extracted	4/19/00	
3	B1	1		627	272	121.4	128.3	4/17/00	Extracted	4/19/00	
5	C1	1		683	319	126.8	132.9	4/17/00	Extracted	4/19/00	
6	D1	1		940	600	151.5	160.0	4/17/00	Extracted	4/19/00	
11	E1	1		897	630	147.3	162.9	4/17/00	Extracted	4/19/00	
14	F1	1		909	616	148.5	161.6	4/17/00	Extracted	4/19/00	
16	G1	1		909	422	148.5	142.9	4/17/00	Extracted	4/19/00	
17	H1	1		1445	251	200.2	126.5	4/17/00	Extracted	4/19/00	
18	A2	1		1497	304	205.2	131.7	4/17/00	Extracted	4/19/00	
19	B2	1		1531	306	208.5	131.9	4/17/00	Extracted	4/19/00	
20	C2	1		1726	415	227.3	142.4	4/17/00	Extracted	4/19/00	
28	D2	1		1764	594	230.9	159.7	4/17/00	Extracted	4/19/00	
29	E2	1		942	648	151.7	164.7	4/17/00	Extracted	4/19/00	
									Extracted	4/19/00	
									Extracted	4/19/00	
									Extracted	4/19/00	

Click ***Open File*** to import a plate file.

Click ***Export Data*** to write the file in plain text format.

As well as data about the picking of the spots from the gel, this file also contains information regarding the digestion status (***Dig. State***) of the gel plug. The information displayed shows the last step of the digestion process that was completed for each gel plug. This feature can be used to track the status of microplates only part way through the digestion process. If, for example, the plugs in a microplate had only been washed and then stored until digestion, when the tracking file is loaded back on, the software will notify the user that these samples had been washed already.

Click ***Exit*** to close the ***Output File Viewer*** window.

5 Maintenance

About this chapter

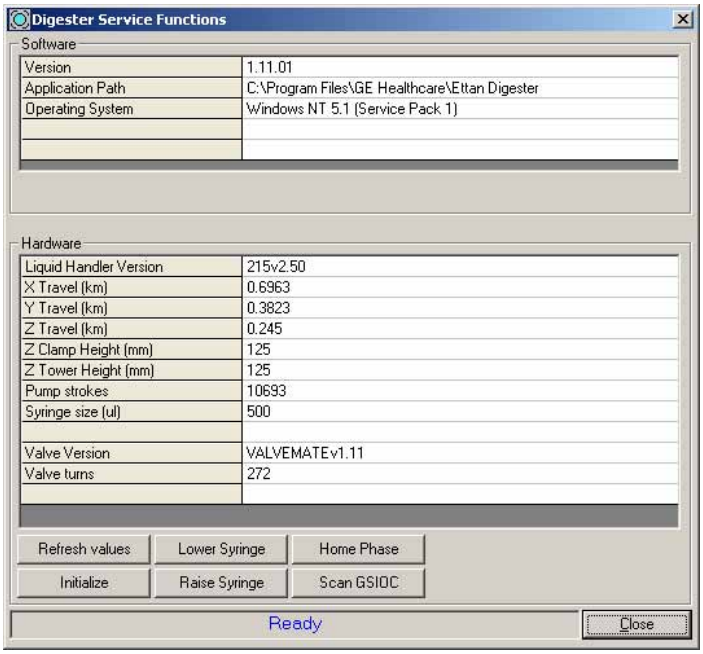
This chapter provides instructions for user maintenance and service operations, and a schedule for preventive maintenance.

In this chapter

Section	See page
5.1 Service	78
5.2 Replacement procedures	81
5.3 Cleaning before planned service	86

5.1 Service

To view system information and perform basic maintenance tasks, choose the menu bar command ***Tools:Service***. The ***Digester Service Functions*** window opens. This function will display information about the software and hardware in the Ettan Digester Control Software system.



Software information

Information	Description
Version	The software version number.
Application path	Shows where Ettan Digester is installed.
Operating System	The operating system version.

Hardware information

Information	Description
Liquid handler version	The instrument hardware version.
X Travel (km)	The total distance travelled in the X (left/right) direction.
Y Travel (km)	The total distance travelled in the Y (forward/ backward) direction.
Z Travel (km)	The total distance travelled in the Z (up/down) direction.
Z Clamp Height	Shows how the Z arm is mounted on the Y-arm.
Z Tower Height	Shows the height of the Z arm.
Pump strokes	Shows how many times the pump has performed a stroke.
Syringe size	The size of each of the installed syringes.
Valve version	The hardware version number of the 8-channel valve unit.
Valve turns	Shows how many times the 8-channel valve has turned.

Service functions

From the ***Digester Service Functions*** window, it is also possible to perform basic maintenance tasks.

Refresh values	Updates the hardware information.
Initialize	Homes the Liquid handler probe and 8-channel valve.
Lower syringe	Lowers all the syringes to their lowest possible value. This function is useful when replacing syringe pistons or seals.

CAUTION

To avoid injury while changing any parts on the pump unit, always press the **Stop** button on the instrument front panel and disconnect from the main power after lowering the syringe. When work is complete, re-connect to the power supply and click the **Initialize instrument** button to home the syringe.

Raise syringe: Raises the syringes to their maximum height.

Home phase: If a home phase error occurs when initializing the system, run this tool to correct the problem. It is also recommended that the Home Phase tool is run after the instrument has been moved.

CAUTION

The needles will move over the entire working area of the Liquid handler. Remove all loose items placed on the Ettan Digester unit.

NOTICE

Always verify all positions (plates, rinse stations, enzyme holder) on the instrument using ***System Setup*** after performing the ***Home phase*** operation.

Scan GSIOC: Checks the communication link between PC and instruments. If either the Liquid handler or 8-channel valve are not found, check the connections between PC and instruments.

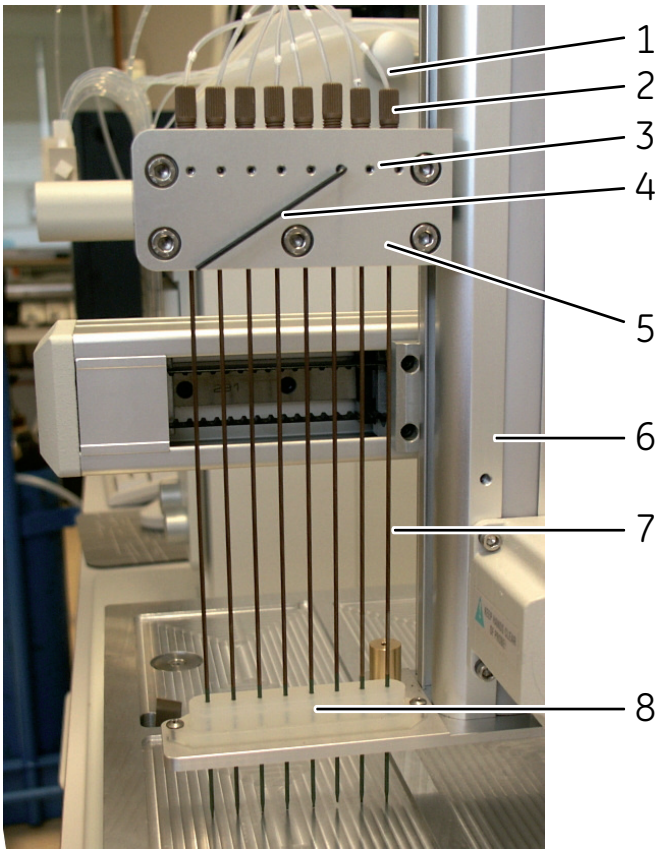
5.2 Replacement procedures

Ettan Digester Control Software should be installed by GE service personnel. However, during the use of the instrument, some components may need to be replaced/added to the machine.

Sample needles replacement

To replace the sample needles, do as follows:

Step	Action
1	Turn off mains power to Ettan Digester and disconnect the mains power cord from the power outlet.
2	Loosen the eight hex stop screws with an 1.5 mm Allen key, see figure below.
3	Replace the sample needles as follows:
4	Loosen and remove the retaining nuts on top of the needle carrier.
5	Remove the worn needles.
6	Carefully insert the new needles.
7	Let the needles drop down through the holes in the needle guide.
8	Attach the retaining nuts with its tubing.
9	Finger tighten the retaining nuts.
10	For alignment instructions, refer to *Ettan Digester Instrument Handbook*.



Part	Function
1	Tubing
2	Retaining nut
3	Hex stop screw
4	Allen key, 1.5 mm
5	Needle head
6	Z-arm
7	Sample needles
8	Needle guide

Note: *Be careful not to lose the tubing end ferrules.*

Replacing the mains fuses

A blown fuse may indicate the existence of another problem in the instrument. If the replacement fuse blows, don't try others. Contact your local GE representative.

WARNING

Disconnect power. Always disconnect power from the instrument before replacing fuses.

WARNING

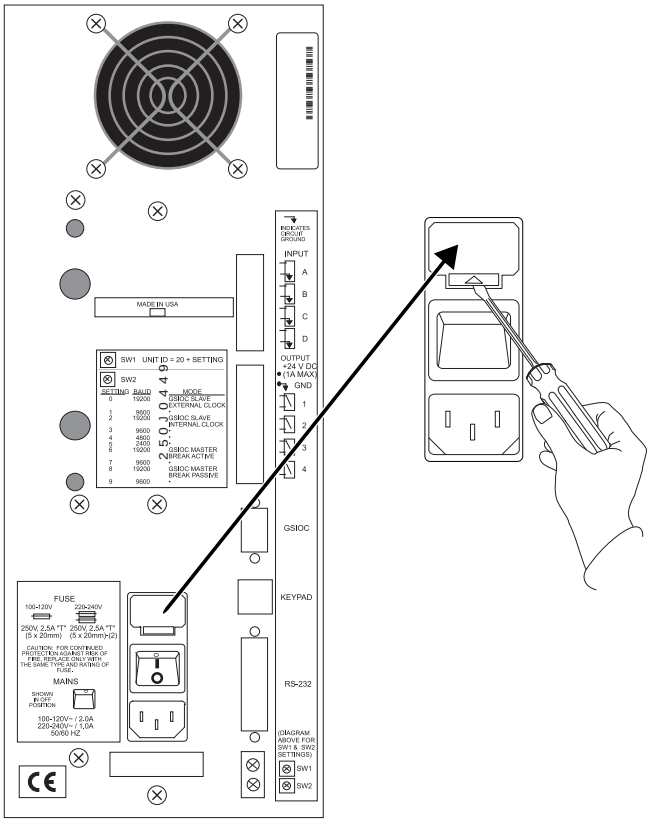
For continued protection from fire hazard, replace only with same type and rating of fuse.

To replace the Liquid handler mains fuses:

1 Disconnect the mains power cord from the power outlet and from the rear panel socket.

2 Locate the fuse drawer on the rear panel.

3 Insert a small screwdriver into the notch next to the fuse drawer.



4 Twist the screwdriver to open and remove the fuse drawer.

The Liquid handler fuse drawer contains one 2.5 A “T” slow-blow fuse (5 x 20 mm size) for a 100-120 voltage selection. It contains two 2.5 A “T” fuses for a 220-240 voltage selection.

5 Remove the old fuse(s) and insert the new fuse(s).

6 Insert the fuse drawer into its receptacle on the rear panel.

Buffer tubing

The lines that supply buffer to the 8-channel valve unit may require replacement. To install/replace a buffer line, simply screw the plastic nut around the line into the appropriate position on the 8-channel valve unit. It is recommended that PTFE tape is used to ensure an airtight buffer line. Once the line is attached to the buffer 8-channel valve, attach the frit filter to the buffer end and place into buffer.

Note: *Now test that the seal between the nut and the 8-channel valve is airtight by priming that valve position. If air bubbles are seen in the line that runs from the 8- channel valve from to the syringe assembly, this indicates that the seal is not completely air tight*.

It is recommended that each of the buffer lines is primed (refer to *Ettan Digester User Manual*) in turn with water. This process allows the user to determine which buffer line corresponds to which valve position. The buffer lines can then be labelled so that the buffer line can be placed into the correct buffer during a method run.

5.3 Cleaning before planned service

Cleaning before planned maintenance/service

To ensure the protection and safety of service personnel, all equipment and work areas must be clean and free of any hazardous contaminants before a Service Engineer starts maintenance work.

Please complete the checklist in the *On Site Service Health and Safety Declaration Form* or the *Health and Safety Declaration Form for Product Return or Servicing*, depending on whether the instrument is going to be serviced on site or returned for service, respectively.

Copy the form you need from *Section 7.1 Health and Safety Declaration Form, on page 94* or print it from the PDF file available on the User Documentation CD.

6 Troubleshooting

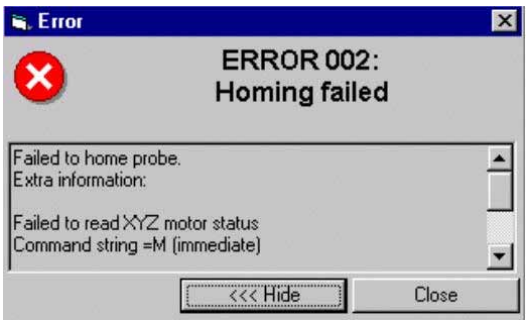
Introduction

This chapter provides basic diagnostic and troubleshooting guides. The diagnostic guide is based on the error messages that are displayed by Ettan Digester Control Software (see *Diagnostics, on page 87*). The basic troubleshooting guide focuses on error symptoms related to instrument operation (see *Troubleshooting, on page 91*).

For errors related to method runs, refer to the Troubleshooting chapter in *Ettan Digester User Manual*.

Error messages

The following figure shows an example of an error message. It is possible to hide/show details about the message by pressing the ***Hide/Details*** button. The detailed information may be useful if GE support assistance is required. Note that all of the details may not be visible. Use the scrollbar to view the complete details of the message if that is the case.



Diagnostics

Error number	Details/Possible cause	Corrective action
001	Failed to reset the instrument.	Check instrument connection cable from the PC to the Gilson 215. Ensure that the instrument is switched on.

Error number	Details/Possible cause	Corrective action
002	***Homing*** failed. Failed to home Gilson 215 probe.	Check instrument connection cable from the PC to the Gilson 215. Check that nothing is blocking the probe.
003	***Homing*** failed. Failed to home Gilson 215 probe. The X-axis '***Home Phase***' is invalid	Run the ***Home Phase*** tool in the Service function. If that fails, use the ***Home Phase*** tool in the Gilson 215 Setup Utilities.
004	***Homing*** failed. Failed to home Gilson 215 probe. The X and Y-axis ***Home Phase*** is invalid.	Run the ***Home Phase*** tool in the ***Service*** function. If that fails, use the ***Home Phase*** tool in the Gilson 215 ***Setup Utilities***
005	***Homing*** failed. Failed to home Gilson 215 probe. The X and Y-axis ***Home Phase*** is invalid.	Run the ***Home Phase*** tool in the ***Service*** function. If that fails, use the ***Home Phase*** tool in the Gilson 215 Setup Utilities.
006	***Homing*** failed. The Gilson 215 dilutor homing failed.	Check instrument connection cable from the PC to the Gilson 215. Check that the syringes are installed properly.
007	Move failed. Target outside travel range. The Gilson 215 probe failed to move to a location on the instrument because it was outside the probe travel range.	Use ***System Setup*** to change X/Y/Z locations to valid values (see *Ettan Digester Instrument Handbook*).
008	***STOP*** pressed. The ***STOP*** button on the front panel was pressed.	The ***STOP*** button stops the Gilson 215 probe and dilutor immediately. Restart the software to re-initialize the instruments.

Error number	Details/Possible cause	Corrective action
009	Move Failed. Failed to move Gilson 215 Probe.	There might be a problem with the instrument hardware. Try to restart the software and instruments. If the problem persists, contact GE.
010	Move Timeout. A timeout occurred when trying to move the Gilson 215 Probe (after 10 seconds).	There might be a problem with the instrument hardware. Try to restart the software and instruments. If the problem persists, contact GE Service.
011	Dilutor operation failed.	There might be a problem with the instrument hardware. Try to restart the software and instruments. If the problem persists, contact GE Service.
012 013 014	Dilutor timeout. A timeout occurred when trying to move the Gilson 215 Dilutor (after 30 seconds).	Try to change dilutor flow rates. A very low flow rate may cause the dilutor to move too slow. If the problem persists, contact GE Service.
015	No connection. Failed to read syringe contents.	Check instrument connection cables and reinitialize the instrument.
016	No connection. Failed to read probe X/Y location.	Check instrument connection cables and reinitialize the instrument.
017	No connection. Failed to read probe Z location.	Check instrument connection cables and reinitialize the instrument.
018	No connection. Failed to read hardware version information from the Gilson 215.	Check instrument connection cables and reinitialize the instrument.
019	No connection. Failed to read Gilson 215 Dilutor maximum flow rate.	Check instrument connection cables and reinitialize the instrument.

Error number	Details/Possible cause	Corrective action
020	No connection. Failed to read Gilson 215 Probe X/ Y/Z travel range	Check instrument connection cables and reinitialize the instrument.
021	No connection. Failed to reset the 8-channel valve (**VALVEMATE**).	Check instrument connection cables. Note that the 8-channel valve (**VALVEMATE**) is connected from the Gilson 215 unit.
022	No connection.	Make sure the valve is installed properly and that instrument cables are correctly connected.
023	Set valve pos. Failed to home the 8-channel valve (**VALVEMATE**) valve.	If it is possible to set the valve position manually (on the front panel) then there is connection problems from the PC. Make sure the valve is installed properly and that instrument cables are correctly connected.
024	Set valve position timeout. A timeout occurred when trying to change the 8-channel valve (**VALVEMATE**) valve position.	There might be a problem with the instrument hardware. Try to restart the software and instruments. If the problem persists, contact GE Service.
100	File export error. An error occurred while exporting the method.	Ensure that the file is not write protected and that there is sufficient space on the drive where the file was to be saved.
101	Method read error. An error occurred while reading the method from file.	The file may be damaged or contain bad method parameters.
102	File error. The file ***SystemSetup.ini*** is damaged.	Reinstall Ettan Digester Control Software to get a new ***SystemSetup.ini***. Run ***System Setup*** after the installation is complete (see *Ettan Digester Instrument Handbook*).

Error number	Details/Possible cause	Corrective action
103	File error. The file ***SystemSetup.ini*** cannot be updated.	Make sure that it is not write protected. If the problem persists, reinstall Ettan Digester Control Software. Run ***System Setup*** after the installation is complete (see *Ettan Digester Instrument Handbook*).
104	File error. Failed to export file.	Make sure you have access to the specified location and that it is not write protected.
105	File error. Failed to import file.	Make sure you have access to the specified location.
200	Method run error. Error during method run.	Try to run the method again. If the problem persists, contact GE Service.

Troubleshooting

Problem	Possible cause	Corrective action
Start-up. When the ***OK*** button is pressed to start instrument ***Homing***, nothing happens and an error message is displayed.	Check the cause of the error message in *Diagnostics, on page 87*.	Take the described corrective action.

Problem	Possible cause	Corrective action
The software exits unexpectedly without displaying an error message.	Incompatible operating system and/or third-party software.	Use the specified operating system ONLY, and do not re-install the operating system without reinstalling Ettan Digester Control Software. If problem appears after installing another thirdparty software, un-install that software first and then install the Ettan Digester Control Software. ***Note:*** *The computer connected to the Ettan Digester system is primarily intended for running Ettan Digester Control Software. Please do not install any additional software on this computer.*
The software displays an error message that begins with ***Runtime error X***.	Unhandled software error in the Ettan Digester Control Software.	If the problem persists, contact GE service.
Other problems.		Call your GE service representative.

7 Reference information

Specifications

Parameter	Value
Ingression protection	IP20
Supply voltage	• 100-120 V~ ±10% 50/60 Hz, single phase • 220-240 V~ ±10% 50/60 Hz, single phase
Power consumption: • 8-channel valve • Liquid handler	 • 120 VA • 240 VA
Dimensions (H × W × D)	690 × 910 × 610 mm
Weight, Liquid handler incl. 8-channel valve Weight, Protective hood	53 kg 25 kg
Ambient temperature	+15°C to +32°C
Relative humidity tolerance	≤ 80% (non-condensing)
Altitude	≤ 2000 m
Acoustic noise level	< 70 dB A
Overvoltage catergory	II
Pollution degree	2

Ordering information

For ordering information, visit www.gelifesciences.com.

7.1 Health and Safety Declaration Form

On site service

GE Services

DOC1149542

On Site Service Health & Safety Declaration Form

Service Ticket #: .....

To ensure the mutual protection and safety of GE Healthcare service personnel and our customers, all equipment and work areas must be clean and free of any hazardous contaminants before a Service Engineer starts a repair. To avoid delays in the servicing of your equipment, please complete this checklist and present it to the Service Engineer upon arrival. Equipment and/or work areas not sufficiently cleaned, accessible and safe for an engineer may lead to delays in servicing the equipment and could be subject to additional charges.

Yes	No	Please review the actions below and answer "Yes" or "No". Provide explanation for any "No" answers in box below.
		Instrument has been cleaned of hazardous substances. Please rinse tubing or piping, wipe down scanner surfaces, or otherwise ensure removal of any dangerous residue. Ensure the area around the instrument is clean. If radioactivity has been used, please perform a wipe test or other suitable survey.
○	○	**Adequate space and clearance is provided to allow safe access for instrument service, repair or installation.** In some cases this may require customer to move equipment from normal operating location prior to GE arrival.
		Consumables, such as columns or gels, have been removed or isolated from the instrument and from any area that may impede access to the instrument.
○	○	**All buffer / waste vessels are labeled. Excess containers have been removed from the area to provide access.**
Provide explanation for any "No" answers here:		

Equipment type / Product No: ..... **Serial No:** .....

I hereby confirm that the equipment specified above has been cleaned to remove any hazardous substances and that the area has been made safe and accessible.

Name in Capital letters: .....

Company or institution: .....

Position or job title: ..... **Date (Year/month/date):** .....20...../...../.....

Signed: .....

28-9800-26 AB 05/2012

Product return or servicing

GE Services

DOC1149544

Health & Safety Declaration Form for Product Return or Servicing

Return authorization number: ..... **and/or Service Ticket/Request:** .....

To ensure the mutual protection and safety of GE Healthcare personnel, our customers, transportation personnel and our environment, all equipment must be clean and free of any hazardous contaminants before shipping to GE Healthcare. To avoid delays in the processing of your equipment, please complete this checklist and include it with your return.

1. **Please note that items will NOT be accepted for servicing or return without this form**
2. Equipment which is not sufficiently cleaned prior to return to GE Healthcare may lead to delays in servicing the equipment and could be subject to additional charges
3. Visible contamination will be assumed hazardous and additional cleaning and decontamination charges will be applied

Please specify if the equipment has been in contact with any of the following:

Yes **No** Radioactivity (please specify): .....

Yes **No** Infectious or hazardous biological substances (please specify) .....

Yes **No** Other Hazardous Chemicals (please specify) .....

Equipment must be decontaminated prior to service / return. Please provide a telephone number where GE Healthcare can contact you for additional information concerning the system / equipment.

Telephone No: .....

Liquid and/or gas in equipment is: **Water** **Ethanol** **None, empty** **Argon, Helium, Nitrogen**

Liquid Nitrogen **Other, please specify:** .....

Equipment type / Product No: ..... **Serial No:** .....

I hereby confirm that the equipment specified above has been cleaned to remove any hazardous substances and that the area has been made safe and accessible.

Name in Capital letters: .....

Company or institution: .....

Position or job title: ..... **Date (Year/month/date):** .....20...../...../.....

Signed: .....

To receive a return authorization number or service number, please call local technical support or customer service.

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www.gelifesciences.com/contact

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