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Priorclave Installation and Operating Manual

Large Rectangular Section Steam Heated Priorclave Laboratory Autoclaves

Author: Tony Collins

Version: 1

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Modification History

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Installation and Operating Manual

Large Rectangular Section Steam Heated Priorclave Laboratory Autoclaves



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Introduction

Priorclave autoclaves are a range of general-purpose laboratory autoclaves intended primarily for media preparation, the making safe of ordinary laboratory and pathological waste and other apparatus sterilisation purposes. The autoclaves are manufactured to a high standard and feature a number of patented innovative design features. The sophisticated **TACTROL** microprocessor control system provides a very simple method of setting even the most complex cycles. The machines have been designed from the outset for easy and safe operation and maintenance.

Properly looked after and serviced your autoclave should give years of valuable and trouble free service.

Priorclave Service

Model No: _____ *

Serial Number: _____

Date of Manufacture: _____

Software Version: _____

Please quote the above when asking for parts or service:

* **Model Numbers are in the formatted as PS/RSC/yZnnn**

y **E** – Electrically Heated, **S** – Direct Steam from an external steam generator or boiler

Z V for vertical, H for Horizontal, C indicating Compact model

nnn Nominal working volume in Litres

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Contents

Contents

Introduction	1
Notices and Important Information.....	5
Symbols used on the product and in this manual and their meanings	5
General Safety Instructions	6
Important Notices and Warnings	7
EC Declaration of conformity.....	10
Layout Diagrams	11
Layout Diagram.....	11
Control Panel Details	12
Operating Summary.....	13
Cycle Abort and Thermal Lock Override	13
Positioning	15
Receipt and Unpacking	15
Positioning	15
Maintenance access.....	15
Provision of Space and Access for Accessories.....	16
Installation	18
Electrical Installation.....	18
Drainage and Exhaust Gas Ventilation.....	19
Other services	23
Initial Commissioning.....	26
Full Commissioning and Performance Qualification	26
Operation.....	28
Opening the Door	28
Loading Trolley (Optional)	28
Loading Trolleys and Cassette (Optional)	29
Loading.....	30
Settings.	30
Automatic Timed Free-Steamng	32
Pulsed Free-steaming	32
Load Sensed Process Timing	33
Rapid Cooling	33
Media Warming	34
Delayed Start Time	34

Vacuum Options	34
Multi Program Memory Options	35
Closing the pressure door.....	36
Starting a cycle.....	36
Vent button.	37
During the process time.	37
Power loss during a running cycle.	38
Cooling	38
Thermal lock	38
Cycle complete	39
Media Warming	39
Aborting a Cycle.....	39
Emergency «E»Stop Button (where fitted)	39
Steam Generator Switch (if fitted)	39
Operation with Options & Accessories.....	40
Setting Lock Keyswitch Option	40
Printer	40
Serial Interface.....	42
USB Interface	42
Air Intake Filter	42
Vent Filter	42
Accelerated media cooling	42
Chart Recorder / Data Recorder / Data Logger	43
Air Ballasting	43
Internal Validation System	43
Options and Accessories associated with HTM2010 options.....	43
F ₀ Integrator function	45
Changing Date & Time	46
Warning Indicators & Fault Codes	47
Fault Finding & Rectification Guide	50
Steam Table	52
Notes.....	53
Routine Operator Maintenance	55
Daily Maintenance.....	55
Weekly Maintenance.....	55

Contents

- Monthly Maintenance56
- Bi-Annual Maintenance57
- Maintenance Log:58
- Equipment Specification Tables.....60
- Circuit Diagrams and Pipe-Work Schematics.....61
 - Output Board Designations61
 - Wiring Diagrams & Schematics.....62
 - Pipe-Work Diagrams & Schematics65
- Other Items Fitted67

Notices and Important Information

Symbols used on the product and in this manual and their meanings

WARNING: Mechanical Hazard

In this manual, warnings draw attention to the potential for Danger to personnel up to and including risk of severe injury or death. Each Mechanical Hazard Warning is emphasised by this icon.



WARNING: Electrical Hazard

In this manual, warnings draw attention to the potential for Danger to personnel up to and including risk of severe injury or death. Each Electrical Hazard Warning is emphasised by this icon.



WARNING: Bio-hazard

In this manual, warnings draw attention to the potential for Danger to personnel up to and including risk of severe injury or death. Each Bio-hazard Warning is emphasised by this icon.



Caution: -Heavy

In this manual, cautions draw attention to the potential for injury to personnel where a product or item has a weight of over 18kg and reference should be made to your in-house procedures for heavy lifting before attempting to move or lift it. Each Caution Heavy Warning is emphasised by this icon.



Caution: -Please Note

In this manual, cautions draw attention to the potential for Damage to equipment. Each caution warning is emphasized by this icon.



Hazard - Isolate before Access

When one of these stickers has been placed on a removable panel the power must be switched off before the panel is removed. There may be a number of areas behind the labelled panel that constitute a hazard. All such panels are service access panels only and should not be removed unless there is a full understanding of the equipment.



Electrical Hazard - Isolate before Access

When one of these stickers has been placed on a removable panel the power must be switched off before the panel is removed. There may be a number of areas behind the labelled panel that constitute an electrical shock hazard. All such panels are service access panels only and should not be removed unless there is a full understanding of the equipment.



Electrical Earth Point

This protective label indicates a point at which an electrical earth cable should be connected. When removing and replacing panels after maintenance electrical earth cables **must** be reconnected at these points.



Mechanical Hazard

When one of these stickers has been placed on a removable panel the power must be switched off before the panel is removed. There may be a number of areas behind the labelled panel that constitute a mechanical hazard. All such panels are service access panels only and should not be removed unless there is a full understanding of the equipment.



Caution Hot Surface.

Parts of the surface to which one of these stickers are attached may become uncomfortably hot during the operation of the equipment. Take care if touching these surfaces without heat protection.



Notices and Important Information

[Refer to Manual](#)



General Safety Instructions

- All cleaning and servicing requires the autoclave to be isolated from the power source and disconnected.
- This equipment weighs in excess of 18kg (40lbs) and requires at least 2 persons to lift.
- Should a fault occur with the autoclave, immediately isolate and disconnect the incoming power.
- When the autoclave is being transported it should be sat firmly on its feet. The machine should be strapped upright to a flat pallet during transport.
- When the machine is not in use, where possible the electrical supply and water supply should be disconnected.
- Ensure the equipment is installed, operated and maintained by trained and authorized personnel.
- Always isolate the autoclave before cleaning or maintenance
- Always ensure the machine is level when in use.
- In the event of an emergency press the red 'E'stop button situated on the front of the autoclave.
- The autoclave should be used as provided and should not be tampered with or altered as the machine contains inbuilt safety systems, which could be compromised by any interference.
- During operation some autoclave surfaces may become uncomfortably hot. Take care if touching these surfaces without thermal protection.
- Care should be taken when opening the autoclave after a sterilizing cycle as it will be hot and steam may be released. Heatproof gloves and a face shield should always be worn when unloading autoclaves.
- When operating the autoclave contains steam at elevated temperature and pressure. Always take care when operating autoclaves.
- The autoclave should only be used for its intended purpose. You must consult the manufacturer or supplier before using the autoclave for anything other than its intended purpose.

Important Notices and Warnings



Before despatch from our works all Priorclaves are subjected to rigorous electrical safety tests to the appropriate standards. Should you or your contractors carry out further insulation and flash tests as part of your internal procedures please disconnect the switch mode power supply before testing. Failure to do so will result in a test failure and may lead to corruption of the microprocessor memory which cannot be covered by our warranty.

Safety

If you are unclear about any aspects of this manual, the use and operation of the autoclave or your autoclave process please contact Priorclave or your authorised Priorclave dealer before proceeding.



Always wear gloves, a facemask and adequate protective clothing when unloading an autoclave and ensure that the workload does not exceed safe limits.

Priorclave are pleased to arrange training for operators in the use of their autoclaves at a small extra charge.

Thermal Lock

The safety Thermal Lock (80°C door retention device) has been set using a defined average dummy load.



The relatively light load defined under this procedure may not be appropriate to the load to be autoclaved in your Priorclave. Therefore, for your safety and to avoid possible injury you are strongly advised to have your autoclave with its normal working load formally validated, and the thermal lock set up accordingly by properly trained personnel.

Stainless Steel Pressure Vessels.



Vessels are manufactured from ASME / P.E.D. Coded grade 316L stabilised stainless steel, designed built and tested in accordance with PD5500 category 3 as required by BS2646 Part 1. Grade 316L stainless steel is employed to reduce the corrosive effects of substances such as hydroxides and chlorine. However we recommend that the interior of the vessel is kept free of such potentially harmful substances and is regularly cleaned out with soft water. The use of chlorine based or other aggressive cleaners is not recommended. Exposure to such chemicals could damage the surface finish and the integrity of the pressure vessel and door. Care should also be taken not to routinely introduce such chemicals where they are used to pre-wash items that form part of the load. In such cases the items should be thoroughly rinsed before autoclaving.

Product Life

Due to fatigue occurring in normal use the life of all pressure vessels is finite regardless of corrosion, erosion or other damage. Using calculations from PD5500, and assuming working at the maximum working pressure of 2.4 bar this gives the autoclave vessel a projected fatigue life of 15,000 operating cycles. The lifespan of the autoclave will obviously depend upon frequency of use, but for example (based on a 365 day working year) if the autoclave is used two or four times per day this gives a working life of 20.5 to 10.2 years respectively. Your own usage of the autoclave should be considered to determine the actual lifespan of the autoclave.

Cleaning



External cleaning should only be carried out with a damp cloth or with proprietary, non-abrasive cleaners.

This autoclave has been designed to operate most effectively with softened water.

Notices and Important Information



Where water requiring systems such as vacuum pumps and/or condensers* are fitted then connection to a hard water supply can lead to a build-up of scale and may damage parts of the system and could invalidate the warranty.

RO and Ultra-Pure water can also damage some elements of the system unless the autoclave has been specified and modified to operate with water of this quality*.

* Please refer to the specification sheet included with the Operation Manual for details.



To be serviced by Priorclave Trained Personnel only.

Priorclave Laboratory Autoclaves are complex pressure systems designed and built to special regulations and as such should only be serviced or maintained by properly trained personnel. Priorclave Ltd. cannot be held responsible for hazards or damage resulting from work carried out on the pressure system by untrained or unauthorised personnel. If in doubt please contact Priorclave Service or your nearest authorised dealership.

CE Marking

The mark applied to this autoclave is applied in relation to the EMC (Electromagnetic Compatibility) directive and the Low Voltage directive of the European Community. This indicates that this Priorclave autoclave meets the following technical standards:

- BSEN61000-6-3:2001

Electromagnetic Compatibility. Generic Emission Standard. Residential, Commercial & Light Industry.

- BSEN61000-6-1:2001

Electromagnetic Compatibility. Generic Immunity Standard. Residential, Commercial & Light Industry.

IEC/EN 61010-1

Electrical Equipment for Measurement, Control and Laboratory Use - Part 1: General Requirements.

- BSEN61010-2-040:2005

Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory use; Part 2-041, Particular Requirements for Autoclaves using Steam for the treatment of Medical Materials and for Laboratory Processes.

Pressure Vessels:

The **CE** mark applied to this autoclave is applied in relation to the PED (Pressure Equipment Directive) directive. This indicates that this Priorclave autoclave meets the following technical standards:

PD5500 2009

Unfired fusion welded pressure vessels

BS2646 1996

Autoclaves for sterilisation in laboratories

Conformity assessment modules B1 + D of the European Pressure equipment directive have been applied to ensure compliance with the essential safety requirements.

A "Declaration of Conformity" in accordance with the above standards has been made and is on file at:

Notices and Important Information

Priorclave Ltd.
129 /131 Nathan Way
West Thamesmead Business Park
London SE28 0AB

Environmental Conditions

This equipment has been designed for safe operation within the following environmental conditions:

- Indoor Use.
- Altitude up to 2,000 M (~ 6500 feet).

At this altitude the standard safety valve set at sea level will limit the upper temperature to around 136°C. Adjustments can be made to compensate for this if required. See Appendix B - Steam Table for special conditions affecting calibration for operation at elevated altitudes.

- Operating temperatures between 15°C and 27°C. - The cooling performance of air cooled autoclaves, however will be significantly affected at higher temperatures in this range.
- Maximum Relative Humidity of 85% at any temperature between 15°C and 27°C, Non Condensing.
- Mains Supply Voltage Variations not exceeding +/-10% of that shown on the Serial Plate.

Electromagnetic Interference

This equipment has been designed to comply with the requirements for immunity from electromagnetic interference under normal conditions of use. Care should be taken when positioning the equipment however, to avoid interference from potential extreme sources of interference such as MR scanners or x-ray equipment.

Quick Opening Doors



Extracts from **NON-MANDATORY APPENDIX FF (GUIDE FOR THE DESIGN AND OPERATION OF QUICK-ACTUATING (QUICK-OPENING) CLOSURES)** from ASME **SECTION VIII DIVISION 1**

FF-6 INSPECTION

It is recommended that the user inspect the completed Installation Including the pressure gauges before it is permitted to operate. Records of this inspection should be retained.

It is recommended that the user establishes, and documents a periodic in-service inspection program, and that, this program is followed and documented.

FF-7 TRAINING

Many accidents involving quick-actuating closures have occurred because the operators have been unfamiliar with the equipment or its safety features. The greater safety inherent in current designs has sometimes been produced by the use of sophisticated mechanical, electrical and electronic control devices. To ensure these features produce the maximum safety, personnel should be properly trained in their operation and maintenance.

Notices and Important Information

EC Declaration of conformity

This is a global declaration relating to the entire pressure equipment of the product range identified below

Equipment Manufacturer: Priorclave Ltd
129-131 Nathan Way
West Thamesmead Business Park
London. UK
SE28 0AB

Equipment Description

Priorclave Laboratory autoclaves – RSC series, with Tactrol microprocessor control system.

Model Numbers

PS/RSC/EH450 and PS/RSC/EH700. For direct steam heated variants substitute S for E. All models may be suffixed DBL to denote double entry versions.

Conformity Data

Directive	Relevant standards	Comments	
Low Voltage Directive 72/23/EEC	EN61010-1 2001997 BS EN 61010-2-040:2005		
EMC Directive 89/36/EEC as amended by 93/68/EEC	EN50081-1 EN50082-1 EN61326 1997 (+A1/A2)	Technical construction file ref: EMCTCFAU Competent Body: Inchcape testing Ltd Manfield Park Cranleigh Surrey Testing conducted in 2004 without certification by a competent body.	
Pressure Equipment Directive 97/23/EC Conformity assessment Modules B1+D	PD5500 2000 BS2646 1993	Notified Body No: 0037 Zurich Risk Services Park House Bristol Road South Rubery Birmingham B45 9AH	Approval references: Vessel (module B1) Certificate numbers: SS42059010-3 and SS42059010-4 Assembly certificate number SS42059010-21 Interlock certificate number SS42059010-24 Manufacturing (module D) certificate number SS42059010-26

Declaration:

Priorclave Ltd declares that the above products conform with the essential requirements of the above directives. Where appropriate this has been demonstrated by the application of the relevant standard(s). The CE mark was first affixed to these products in 1996

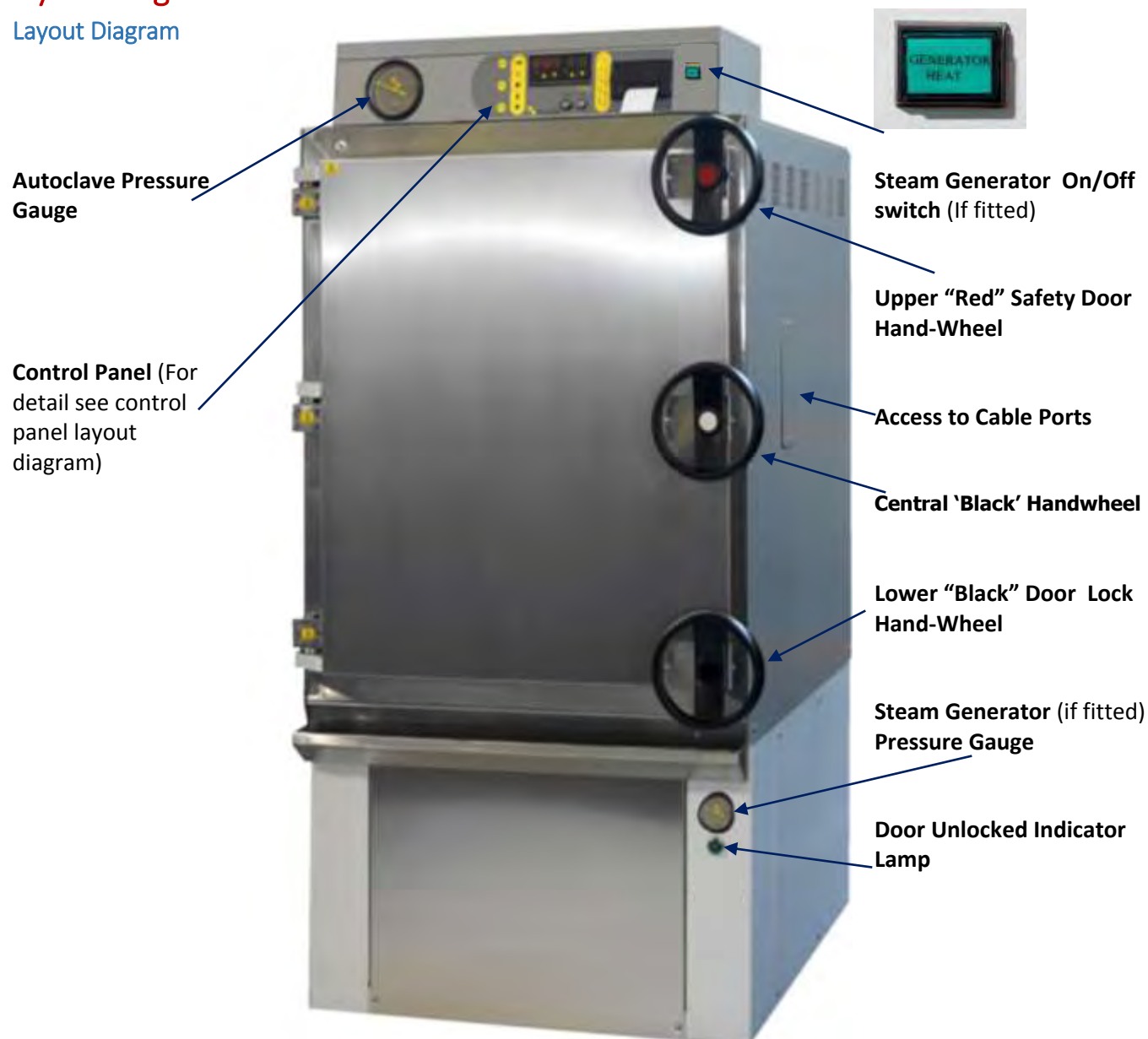
Signed for and on behalf of Priorclave Ltd

Tony Collins
Managing Director



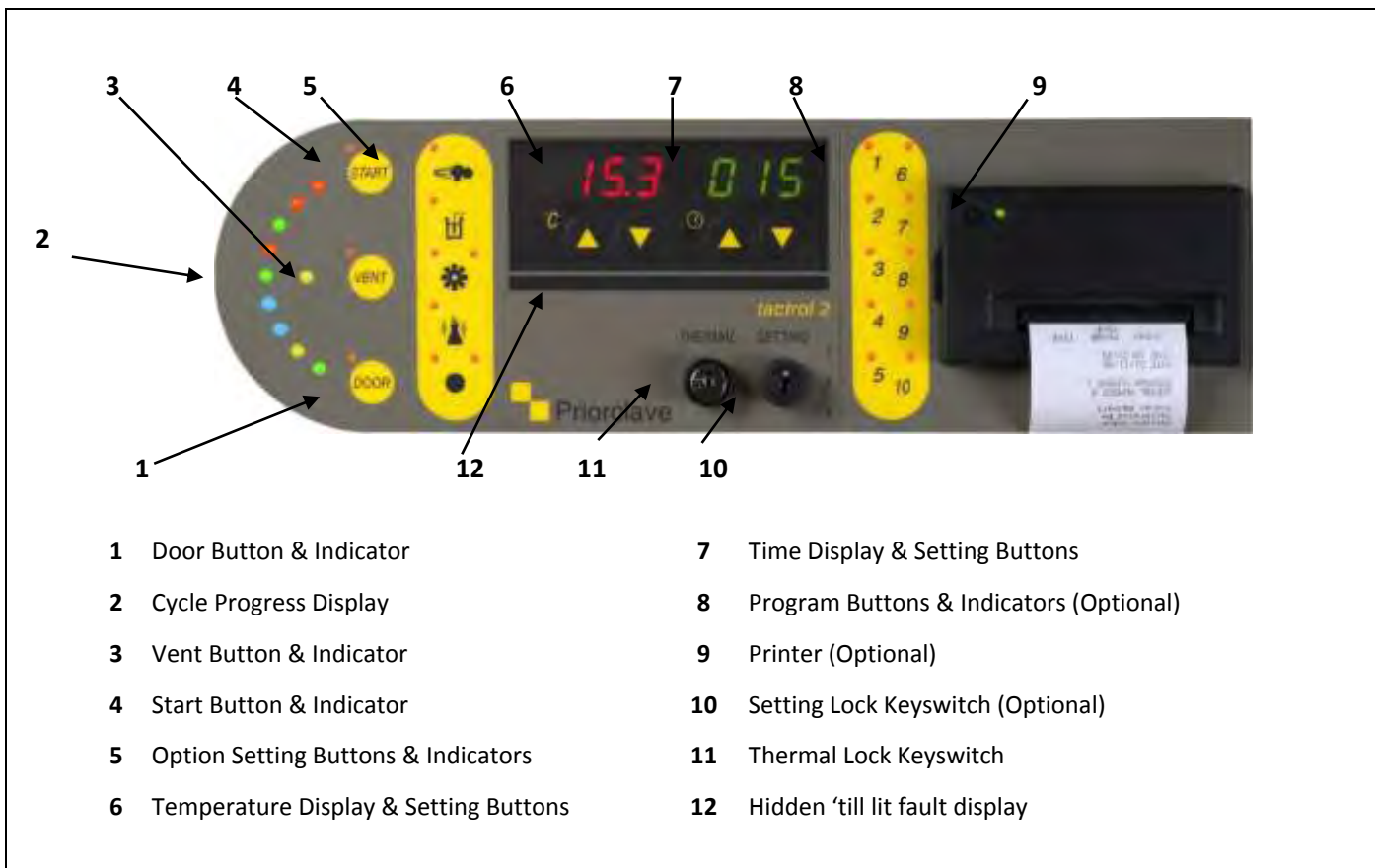
Layout Diagrams

Layout Diagram



Layout Diagrams

Control Panel Details



Operating Summary



Before proceeding please check the specification sheet at the front of this manual to establish which options and accessories, if any, are fitted to your Priorclave. This will determine whether you will need to read the instructions for these options later in this manual.



Check electricity supply is **ON**, and that the power is switched **on**.

Check the water supply (if required) is available and is turned **on**.

Check that the emergency stop button (if fitted) is not pressed in and release if necessary.

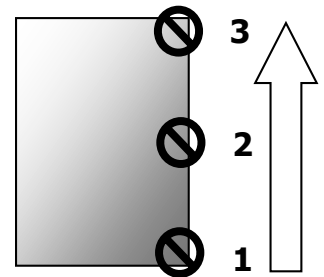
For Steam Heated models, check that the steam supply (or Internal steam generator if fitted) is ON and that there is sufficient pressure (3 to 3.5 Bar) to run a cycle.

Check that the air supply (if required) is available and is turned **on**.

Press the '**door**' button on the control panel there will be a bleep and the message '**HOLD**' will be displayed in the timer display.

Wait for a short time until the timer display returns to normal, there is another bleep and the '**door**' indicator illuminates. The '**door**' button can now be pressed again to release the lock. When the lock is released a green indicator lamp below the lower hand wheel will illuminate

Open the door by undoing the lower black hand-wheel first followed by the centre black hand-wheel and finally the red safety hand-wheel. With the door free, carefully pull open.



Load the autoclave.

Set the temperature as required using the up/down keys.

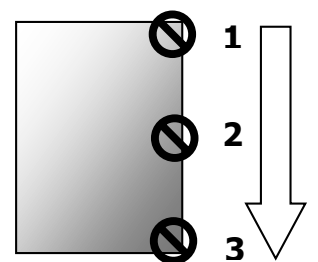
Set the process time as required using the up/down keys.

Set / select other functions i.e. free-steam, rapid cooling etc., as required and if fitted.

Carefully close the pressure door and fully wind in the **RED** safety hand-wheel followed by the centre black hand-wheel.

Press the door button there will be an immediate bleep and the door indicator illuminates along with the door unlocked lamp beneath the lower hand-wheel, showing that the locking bolt has been withdrawn.

Secure by fully tightening the lower hand-wheel. If any difficulty is encountered, open the door and check for obstruction.



Wait a few seconds for the '**start**' indicator to illuminate, and press the '**start**' button to begin the cycle.

Cycle Abort and Thermal Lock Override

Aborting a cycle

To abort the cycle at any stage press the '**Start**' Button

Thermal Lock Override

First abort the cycle as above.

After checking that there is no pressure within the autoclave turn the thermal lock key to the right hold it there.

Press the '**Door**' button once, keeping the thermal lock key held over.

Operating Summary

Wait during the '**Hold**' display until there is a bleep and the '**Door**' indicator illuminates.

Keep the key held and press the '**Door**' button once to unlock the door.

The key-switch can now be released and the door opened as above.



If the key is released at any stage the procedure must be repeated to open the door and reset the display.

Steam Generator Switch (if fitted)



The Green switch switches the Steam Generator on or off. When the autoclave is not being used it is advisable to switch the generator off to conserve electricity. The generator should be switched on around 10 minutes before the autoclave is to be used. The indicator LED will illuminate when the generator heaters are on.



Positioning

Receipt and Unpacking



Unpack the autoclave and check against the delivery note that all items ordered have been delivered.



This equipment weighs in excess of 18kg (40lbs) and requires at least 2 persons to lift. Reference should be made to your in-house procedures for heavy lifting before attempting to move unpack or lift it.

Any shortages or damage **must** be reported to Priorclave within 7 days of delivery.

Positioning



When positioning the autoclave consideration should be given to proper access for servicing and maintenance purposes. Space must also be allowed for pipe-work and electrical connections.

The autoclave has castors fitted to assist positioning and should be positioned within easy reach of a suitable isolatable electrical supply, steam supply (if required) and drain (if required). (See Installation).



Floor loading

A 700 litre autoclave weighs in the region of 1000kg when empty. Particularly in the case of refurbishment of an older building it will be necessary to consider the strength of the floor on which the autoclave is stood.

Consideration should also be given to the weight of water in the autoclave reservoir and more especially to the weight of the anticipated load, which in extreme cases could double the weight.

It is sometimes, although rarely, necessary to fill the autoclave vessel with water at some stage during its life span in order to conduct a hydrostatic pressure test. It may be prudent to take account of this additional weight when considering the bench loading.

Sufficient space should be allowed on the left hand side of the machine to allow the door to open fully.



This equipment weighs in excess of 18kg (40lbs) and requires at least 2 persons to lift. Reference should be made to your in-house procedures for heavy lifting before attempting to move or lift it.



All autoclaves during their process cycle will release steam and heat, and this should be taken into consideration when choosing a site in your laboratory in which to install your autoclave



Maintenance access

Minimum Provision of space around the autoclave

When positioning the autoclave consideration should be given to proper access for servicing and maintenance purposes. Space must also be allowed for pipe-work and electrical connections.

Some standards (mostly related to larger and more complex autoclaves) stipulate that autoclaves should have 1 metre clear space all round to allow for service access. We recognise that this can be difficult to provide. We would recommend a minimum of 500mm clear space all round. If it is not possible to provide this all round it may be acceptable to provide space to one side only provided the autoclave service connections can be made such that the autoclave (if size permits) can be moved without difficulty. In the case of all pipe connections provision should be made to ensure that rigid pipe work can be readily disconnected.

Positioning



A space to the rear of the autoclave of up to 300mm can be required to accommodate pipe-work connections. This will reduce for more simple installations such as autoclaves without vacuum systems.

For autoclaves with exhaust filters a space of at least 500mm should be allowed at the rear of the autoclave.



Heat emission

All autoclaves during their process cycle will release steam and heat, and this should be taken into consideration when choosing a site in your laboratory in which to install your autoclave

Regardless of insulation arrangements etc. employed to reduce the temperature of the autoclave outer casing all autoclaves will emit heat into the work area. For the comfort of staff it is recommended that autoclaves are installed in air conditioned areas. Heat output from the autoclave will vary at different stages of the cycle. For the purpose of calculating loading placed on the air conditioning system by the autoclave it should be adequate to allow for a figure of one third of the total heater power of the autoclave, although the actual output will vary according to the autoclave settings used.

Air cooled autoclaves cool more quickly in a cool room, and therefore high ambient temperatures increase autoclave cycle times. This can become particularly problematic if the ambient temperature exceeds 35°C



Steam emission

If correctly installed as described below, there should be no steam emitted to the work area during operation, there may however be some steam emitted when the autoclave door is opened. Under normal circumstances the thermal cooling lock will prevent the door from being opened until most of the steam in the chamber has condensed, however under certain circumstances such as the when the thermal cooling lock override is used significant amounts of steam can be released. Consideration should be given to how this steam may affect smoke and heat detectors etc.



Extractor Hoods

An extractor hood fitted above the autoclave will eliminate any remaining difficulties related to steam emission, and will also be beneficial in reducing heat build-up. Autoclaves used for processing waste materials may produce unpleasant odours, the autoclaving of waste plastic ware may also produce potentially harmful fumes, the effects of these will also be minimised by an extractor hood. An air flow rate of 0.5M³/sec is often specified for a medium sized autoclave, although this should be considered along with the hood size. It is possible to provide an output from the autoclave to boost fan speed immediately prior to door opening.

The minimum practical size of extractor hood for an autoclave is around 1 metre square. In the case of top loading autoclaves this should be positioned directly above the autoclave. In the case of front loading autoclaves the hood should extend beyond the front of the autoclave by approximately 700mm. This will be sufficient to minimise steam and fume emission into the work area, but it may also be desirable to extend the area of the hood to cover the entire autoclave to reduce the amount of heat released into the room. In the case of direct steam heated autoclaves it may also be advisable to arrange the hood or incoming steam supply in such a way as to cover the incoming steam supply pipe work and reducing valves etc. This will further assist in the elimination of heat build-up within the work area.

Provision of Space and Access for Accessories



Autoclaves with drain condensers

Drain condensers are usually fitted to the rear panel of and require sufficient space to be allowed for pipe-work to enter the condenser. On occasion Drain Condensers may be supplied as separate wall

mounted units if there is not sufficient space available in the autoclave location and in such cases consideration should be given to where the condenser is to be located as it may not be practical to site this to the rear of the autoclave. Drain condensers may operate at high temperature depending on final settings, and effectiveness of the cooling water supply. Consideration should be given to heat hazards when deciding on the location of a condenser.

When all pipe-work is complete the condenser will occupy a space of approximately 300 x 500mm.



Autoclaves with exhaust filtration

The location of exhaust filters will vary according to the individual model and specification of the autoclave.

On larger models where it is possible the filter will be fitted to the inside of the autoclave chamber. In the case of cylindrical models it is not possible to locate the filter inside the vessel due to space constraints and limitations of currently available filter mediums. It is then necessary for the filter to be located in a separate pressure vessel outside of the autoclave. External exhaust filter housings are usually located to the upper rear of the autoclave, and protrude from the left-hand side as viewed from the front of the autoclave by up to 200mm. In normal circumstances the filter housing will fit into the 300mm space already provided to the rear of the autoclave. Special arrangements for the location of exhaust filters can be made on request.



It is normal for exhaust filter housing to reach temperatures in excess of 100°C, therefore consideration should be given to heat hazards when deciding on the location of an autoclave with an exhaust filter. Provision should be made to protect personnel from heat hazards whilst maintaining adequate access for filter replacement. A minimum height of 500mm is required above the top of the filter housing for replacement of the filter.



Provision should be made to guard or insulate pipes exiting the autoclave where these may present a heat hazard.

Installation

Installation

Electrical Installation



This equipment should be installed in accordance with regional electrical codes.

To connect your Priorclave to the power supply simply connect a suitable cable from your isolator to the isolator on the back of the autoclave. In many cases the isolator will already be connected via a suitable cable and plug. In these cases connect this plug to the matching socket which should be available on your wall.

The electrical supply as per the required specification should be terminated in an industrial socket to BS 4343 (IEC/EN 60309-2) which should be located on the wall to the rear of the autoclave within 2 metres of the connection to the autoclave. The socket should be of the 3P + N & E type rated at 16 Amps.



For steam heated models without a vacuum pump or steam generator a single phase 10A rated power supply will be suitable to run the control system and valves.



If not provided as part of the industrial socket a suitable means of isolation is required to be located in a position where it can easily be accessed to terminate power to the autoclave when necessary. The socket and isolator should be installed and tested in accordance with the IEEE Wiring Regulations Sixteenth Edition.



If existing electrical services from a previous installation are used these should be examined and tested in accordance with the above regulations by a qualified electrician.



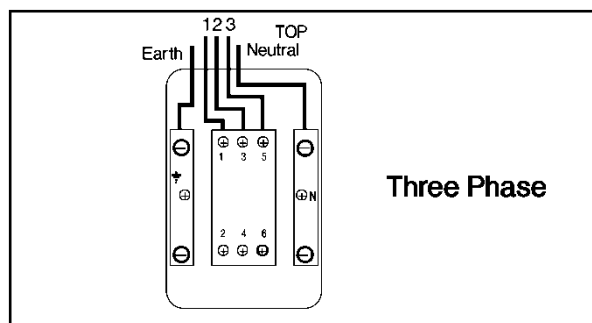
It is important to note that the earth bonding of the plug and cable arrangement is tested before dispatch from the factory, if it is necessary to remove the plug to make alternative arrangements for connection the installation will require re-testing.

If a cable and plug are not fitted then your Priorclave can be wired for single and three phase supplies as shown in the diagram below.

If a cable has been fitted to the autoclave there should be no need for any further electrical installation.



The power supply should be a 3 phase and neutral isolated supply, rated at 16 Amps per phase and connected to the isolator as in the diagram below. Sufficient length of cable should be used to allow the autoclave to be pulled out and worked on from the back if necessary. The cable used to the earth line and neutral feeds should be capable of carrying the per phase amperage of the supply.



The neutral line must be nominally at earth potential and must NOT be fused.

This equipment must be earthed.

Drainage and Exhaust Gas Ventilation

General



Autoclaves used for processing laboratory waste must be provided with a drainage connection as described below. This is a requirement of British Standard 2646. A connection will also be required if the autoclave is fitted with any freesteaming or vacuum options. The hazard groups below are as defined by the Advisory Committee on Dangerous pathogens as published in *Categorisation of Pathogens According to Hazard and Categories of Containment*.

Extract from BS2646 Part 2 1990

7.2 Drainage system

“The drainage system from the autoclave should prevent dispersion of splashes and steam into the working area. For autoclaves designed for a make-safe process, discharge should be directed to a sealed discharge system; the system should lead by direct connection to a building drain or catchment tank.

An open tun dish is not suitable for the discharge line of a laboratory autoclave, which is to be used for a make-safe process.

The sealed discharge system should be vented to a high level by a pipe not less than 30mm diameter. The vent pipe should be directed outside the building. Steam should not emit from the vent pipe.”

From Scope of BS2646



“This Part of BS2646 gives guidance on the planning for, and installation in laboratories of, autoclaves for the sterilisation of materials and equipment, including those which may be contaminated with organisms categorised as Hazard Groups 1, 2 or 3. It does not cover the installation of autoclaves used for material contaminated with organisms categorised as Hazard Group 4, for which complete containment of condensate is considered to be essential.”

A further comment in a later clause adds...

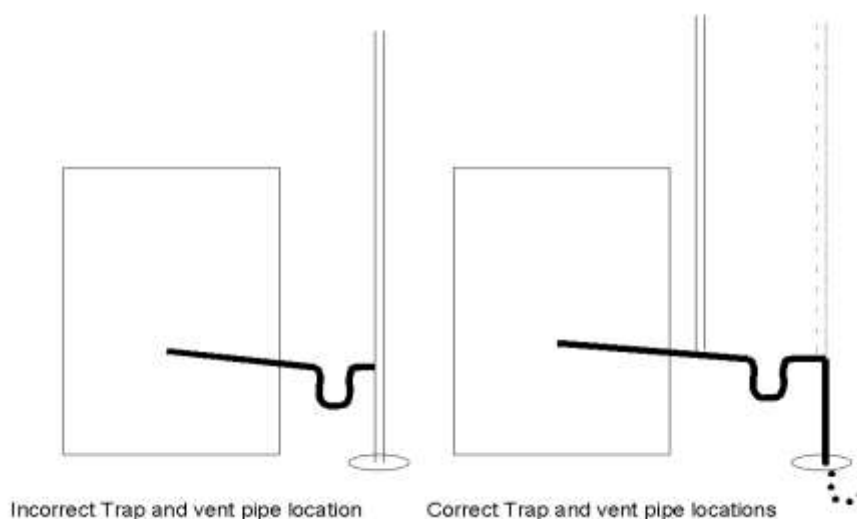


“In certain circumstances, e.g. special research activities involving high concentration and/or large volumes of agents in Hazard group 3, additional safeguards may be required. The advice of the Health and Safety Executive should be sought in each such case. Further containment than that detailed above, (Generally as described below in this case.) filtration or heat treatment of discharge is only necessary for autoclaves used to process material contaminated with organisms in Hazard Group 4.”

In case of any doubt the full text of BS2646 should be consulted.

Drainage

The autoclave requires a sealed connection to a trapped building drain. This drain should be provided with a heat resistant vent pipe of 30mm minimum diameter vented freely to atmosphere at a safe location outside the building. Care must be taken in the design of the drainage connection to ensure that an air break will be preserved at all times to prevent the autoclave from sucking water back from the drain as it cools. Excessive back pressure produced by restrictions in the vent pipe may impair the function of the autoclave. Note that at some stages of the cycle the autoclave may discharge steam under pressure, and if vent flow is inadequate steam may be forced to exit via other interconnected drains.



If possible it is always advisable to connect the autoclave to a drain to cut down on the amount of steam discharged into the laboratory. A compression fitting should be incorporated in the drainpipe in an easily accessible location to enable easy disconnection for maintenance purposes.

All drain piping should head downward towards the drain to prevent water collecting in the pipe.

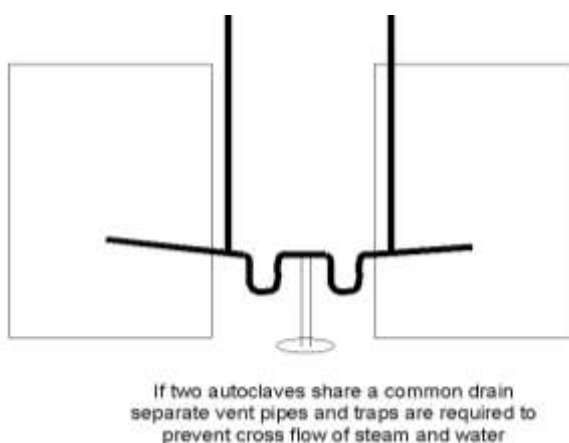


Attention should be paid to the material of the vent pipe as steam and water discharged from the autoclave can be at temperatures in excess of 100°C. In the case of autoclaves with pulsed free steaming, vacuum drying, and vacuum cooling it may be advisable to fit a drain condenser to cool the autoclave discharge, and condense the steam.

The drain and vent pipe should be in place prior to commencement of installation by Priorclave. It will then be possible to make connections from the autoclave directly into the drainage services provided.

The point where connection from the autoclave to the drainage system is made should be within 2 metres of the autoclave. The location of individual connections is shown on the installation drawings.

Multiple autoclaves in a single location



If more than one autoclave is to be installed at a single location then the services described need to be provided for each autoclave. If more than one autoclave is utilising the same drain and/or vent arrangement, then there may be problems due to cross flow of effluent between autoclaves. For example if one autoclave is being loaded by the operator whilst the other is in the free steaming stage, then it may be possible for hot air and steam being discharged by one autoclave to enter the other presenting a hazard to the operator. If common services are to be shared it is essential that these are sufficiently isolated from one another to prevent cross flow.

Safety Valve

All autoclaves are fitted with an over pressure safety valve to protect the autoclave from over pressurisation. This valve will emit large volumes of steam in the event of the autoclave exceeding its maximum working pressure. It is a requirement during safety valve function, and routine testing to be able to see and hear if the safety valve has operated.



It is Priorclave's preferred policy to direct the safety valve outlet to discharge to the floor at the rear of the autoclave. Some establishments prefer safety valve outlets to be piped to a high level outside the building. If this is required the pipe work for this should be provided, and terminated within 1 metre of the safety valve discharge point at the rear of the autoclave. All safety valve pipe work should be DN25. A drainage point should be provided at the lowest point of the safety valve pipe work. This should be a pipe of approximately 6mm ID, and should be positioned to discharge into a suitable receptacle to the rear of the autoclave. No valve should be fitted to this drainage point thereby allowing it to act as a "tell tale" indicating if the safety valve is operating. Under no circumstances must any isolating valve be fitted to the safety valve pipe work. External pipe work must be designed to be self draining, and under no circumstances should water be able to collect in a trap, which could freeze in cold weather. See also BS3970 part 1 1990, sections 7.2.4 and 7.2.5.

Exhaust filtration (optional)

If levels of containment of effluent greater than those described above are required it is possible to fit an exhaust filtration system. In such cases all deliberate discharge from the autoclave vessel is passed through a filter with a validated absolute removal capability to particles sizes of 0.01 microns in gas, and 0.2 microns in liquid. Depending on specification filter mediums are either of the sintered borosilicate glass, or PTFE membrane types. Any condensate forming in the pipe work leading to the filter is held within a sealed containment unit, and is then returned to the vessel for sterilization during the next cycle.



Regular filter replacement is essential throughout the life of the autoclave.

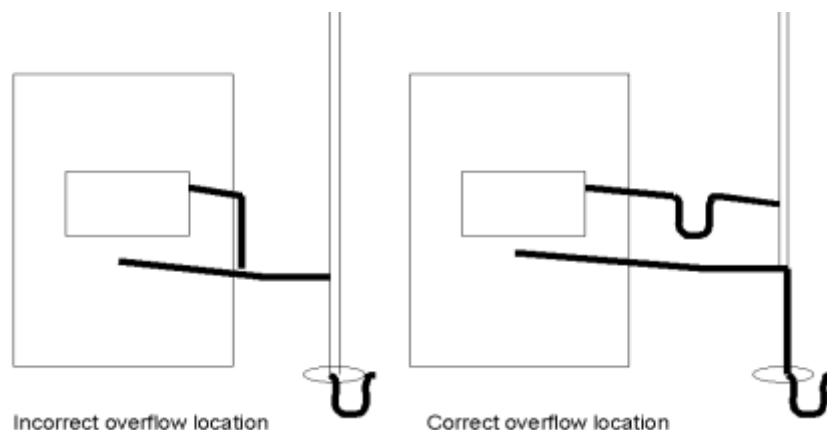
The details of the requirement, or otherwise, for exhaust filtration are beyond the scope of this document and should be discussed with Priorclave technical personnel.

It is not usual to filter discharge from the autoclave safety valve.

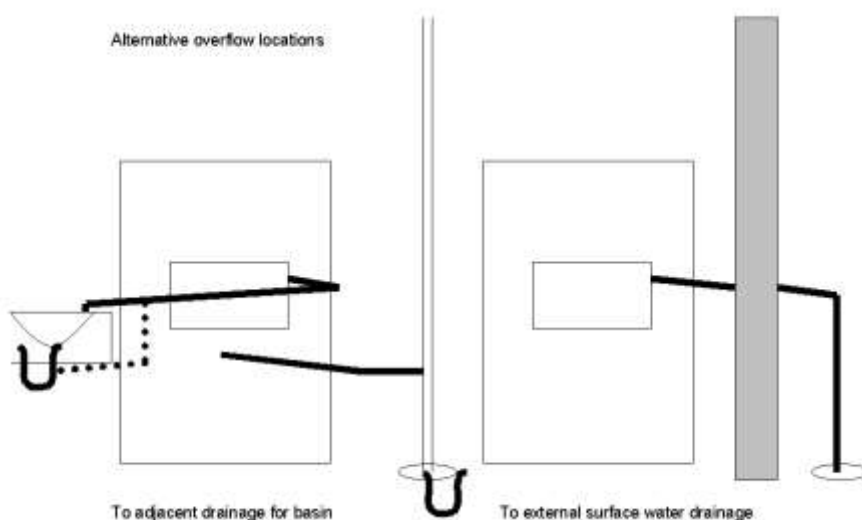
Air intake filtration (optional)

In the case of an autoclave used for the making safe of laboratory waste the above drainage provisions should be adequate. In the case of autoclaves used for processes in which the product is required to be sterile at the end of the cycle it should be noted that air will return to the chamber via the vent pipe work, and will carry with it some airborne contamination. If this is a concern the fitting of an air intake filtration system should be considered. The Priorclave part number for this is **AFL/ACS/SML**. This device ensures that all air returned to the chamber at the end of the cycle is passed through a filter with an absolute removal capability for particle sizes down to 0.02 micron.

Autoclaves with water tanks and drip trays



A separate drain is required for the connection of water tank and drip tray outlets. This may be a common connection to the same drainage system as above, but in such cases a sufficient level of isolation (such as a deep trap) is required to prevent the cross flow of steam between the drains. The drip tray and water tank overflow can be connected to an open tundish if desired. This has the advantage of making any discharge from the overflow visible, which is in accordance with water bylaws.



Water Supplies and Backflow Prevention

The Water Supply (Water Fittings) regulations 1999



Note: The fluid categories below relate only to the above regulations, and are in no way connected with the containment categories previously discussed with reference to drainage and containment of pathogens.

It is mandatory that the completed installation complies with the Water Supply (Water Fittings) regulations 1999 – SI No 1148. This will be dependent on factors outside of the autoclave such as the layout of the water supply provided. The location and usage of the autoclave will determine the fluid category for which backflow prevention measures are to be taken, however it is suggested in the guidance notes to the above regulations that all laboratories in industrial and commercial installations are considered category 5. Prevention measures suitable for fluids in this category may therefore need to be considered.

The backflow prevention measures already provided within the autoclave are as follows:

Autoclaves with Automatic Water Fill Systems and Liquid Ring Vacuum Pumps

Water is fed to the autoclave vessel and vacuum pump via a header tank with air gap and circular overflow, which is classified type AF. This alone will provide backflow prevention measures suitable for fluids up to category 4. Provided that the supply to the autoclave is delivered via a header tank with similar prevention means elsewhere in the building the installation will form an air gap with interposed cistern of type AUK, which is suitable for fluids up to category 5. Separate header tanks for each of these functions are provided allowing the automatic water fill tank to be fed from a treated water supply, and the vacuum pump to be fed from an untreated supply to economize on the use of treated water if required. Considerations for the use of treated water are discussed later.

Autoclaves with Water Cooled Condensers and Water Jackets

For installations falling into lower fluid categories it will be possible to use mechanical means to prevent back flow such as a verifiable single, or non verifiable double check valve. For higher fluid categories non mechanical means such as break tanks must be applied. Due to the pressure and flow rates required for the condensers to work effectively it is not practical to provide header tanks locally to the autoclave. The condenser and or jacket will work more effectively when more cooling water flow is achieved across the condenser, therefore the more head of water that can be provided the better.

Arrangements to meet the backflow prevention requirements will therefore need to be made at a high level. If a water feed from a suitable header tank arrangement to satisfy the regulations cannot be provided it will be necessary to take other measure such as the provision of a break tank and pump arrangement locally to the autoclave.

Other services

Steam Supply & Connection



The autoclave requires a dry saturated steam supply regulated to approximately 3 bar/43psig, supplied via a 100 mesh strainer. A suitable pressure reducing valve should be provided along with 2 x 100mm pressure gauges showing regulated and unregulated pressure, these should be located within view of the intended site of the autoclave.

A condensate trap set should be located in the supply within 1 metre of the connection to the autoclave. If required for the satisfactory operation of the reducing valve a condensate trap set should be located in the supply to the pressure reducing valve.

If a steam quality test port is required this should be incorporated into the supply pipe work.

The autoclave will be supplied with a flexible steam hose of 1 metre in length. The steam supply should be terminated with a 1/2" BSP/ DN15 female thread within 1M of the connection to the autoclave to permit connection of the flexible hose. Hoses in 2 and 3 metre lengths can be supplied at no additional charge if requested, however the shorter length is recommended for better appearance and reduced condensate accumulation. Longer hose lengths must be specified in writing to your nominated Priorclave project manager prior to delivery of the autoclave. Delivery and repeat visit charges may be incurred if this is not done.

A manual isolation valve should be fitted to the steam inlet line (a DN15 isolation valve is supplied with the autoclave).

The diagram overleaf shows a typical, but by no means definitive example of a reducing valve and trap set arrangement, which could be used to serve a single autoclave. Priorclave can provide assistance in planning a steam arrangement for a whole suite of autoclaves if required.

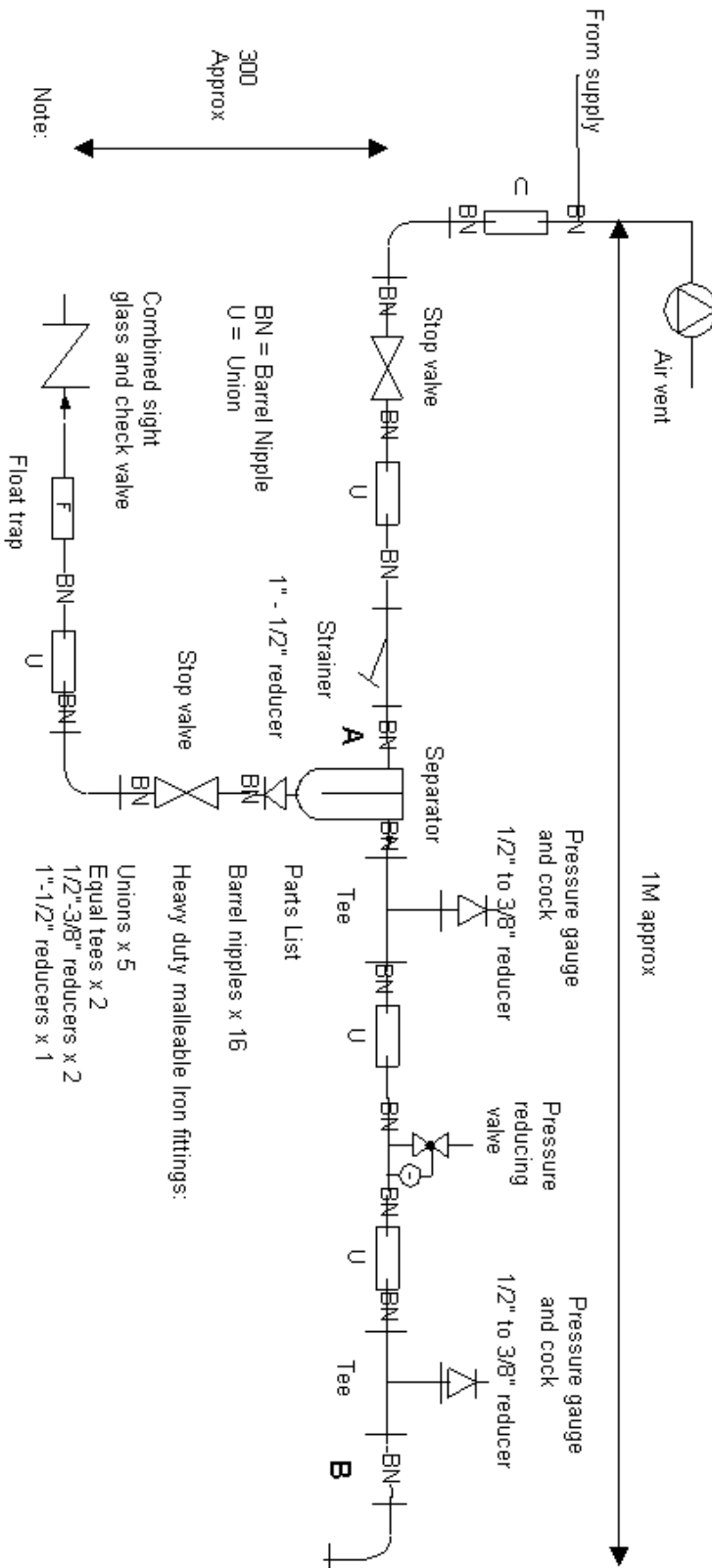
Installation



In the case of removal of an existing autoclave consideration should be given to which parts of the steam supply are integral to the old autoclave. It is possible that some parts may need to be retained, and re-mounted to suit the new autoclave.

Typical steam trap/pressure reducing valve assembly

Rev 2 17/10/02 T. Ashenden



General

All water supplies should be terminated on the wall to the rear of the autoclave, at a point within one metre of the point of connection to the autoclave.

In hard water areas it will be necessary to use softened water for the supplies to the autoclave to prevent scaling of the autoclave vessel and heating elements. Hard water can also reduce the life span of liquid ring vacuum pumps and drain condensers when fitted, however the cost of supplying treated water to these may be considered prohibitive, and if this is the case, then a second water supply will be required. If the autoclave is to be connected to a distilled or de-mineralised water supply care should be taken to guard against the corrosion of copper pipe work due to excessive purity of the water supply. The water level detection system of most autoclaves is operated on a conductivity-based system, due to this feed water requires a minimum conductivity level of 10-15 micro Seimens.

Autoclaves with an automatic water fill system require a DN15 water supply terminated in an appliance tap with a suitable connector for a standard appliance hose.

Autoclaves with liquid ring vacuum pumps require a further DN15 water supply terminated in a 1/2" BSP/DN15 compression fitting.

Autoclaves with drain condensers require a water supply for the condenser. The size of connection for this will vary depending upon the specification for the individual autoclave. In most cases a supply in DN20 will suffice, however in some cases expanding up from a DN15 supply locally in the area of the autoclave may not provide a sufficient water flow to reduce the autoclave discharge to the desired temperature.

Consideration should be given to the discharge from the Vent and Safety Valve outlets, which should be directed in such a way as to not cause a hazard. This will be determined by the location of the autoclave.

Initial Commissioning

Initial Commissioning

Priorclave Autoclaves are given a full operational test before leaving the factory and as such arrive ready for immediate use after installation. It is advisable however to run a simple cycle with the autoclave empty before processing a working load to check that no problems have arisen during transport.

If commissioning has been ordered with the autoclave this will be carried out by a Priorclave technician otherwise follow this simple procedure to check the operation of your Priorclave.



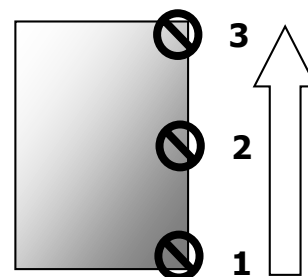
Check electricity supply is **ON**, and that the power switch is switched **on**. If the autoclave is steam heated check that a supply of steam at a suitable pressure is available. If the autoclave uses pneumatic valves or has air ballasting check that a suitable air supply is available and connected.

For details of which options and accessories are fitted to this autoclave please refer to the **Specification Sheet** included with this manual.

Press the '**Door**' button on the control panel there will be a bleep and the message '**Hold**' will be displayed in the temperature display. Wait for a short time until the temperature display returns to normal, there is another bleep and the door indicator illuminates. The door button can now be pressed again to release the lock.

Wait for a short time until the timer display returns to normal, there is another bleep and the '**door**' indicator illuminates. The '**door**' button can now be pressed again to release the lock. When the lock is released a green indicator lamp below the lower hand wheel will illuminate

Open the door by undoing the lower black handwheel first followed by the centre black handwheel and finally the red safety handwheel. With the door free, carefully pull open.



Set the temperature to 121°C using the up/down keys.

Set the process time to 15 minutes using the up/down keys.

Set / select other functions i.e. free-steam, rapid cooling etc., as required and if fitted.

Carefully close the door with the locking handle fully up.

Lower the locking handle to the bottom of its travel in one action to lock the door.

Wait a few seconds for the '**start**' indicator to illuminate, and press the '**start**' button to begin the cycle.

During the cycle, check that there are no problems during heat-up and process.

Following successful completion of the commissioning cycle your Priorclave is ready to process its first working load.

Please refer to the **Operation** section later in this manual before running your first working load as this gives further details on operation of the autoclave and on the control options which may be fitted

If you experience any problems during this procedure please contact Priorclave service or your local agent.

Full Commissioning and Performance Qualification

If you are having the unit commissioned by a Priorclave technician this will be a simple matter of checking for correct installation, checking that all functions are operating correctly, and familiarising you with the autoclave. There are, however some benefits that can be gained from having your Priorclave commissioned to suit your particular loads and requirements. Some examples of settings that can be optimised during commissioning, and the advantages these can provide are listed below.

- Establishing optimum freesteam temperatures for effective air displacement.
- Establishing optimum freesteam time for effective air displacement, whilst eliminating unnecessary time and energy consumption.
- Establishing optimum process time and temperature to ensure complete sterilisation, whilst maintaining minimum cycle time and energy consumption.
- Setting thermal lock release temperature to suit your particular load, to eliminate unnecessary cooling time whilst ensuring safety.

If you feel that any, or all of the above would be of use to you then please contact Priorclave Service.

Operation



Before using your Priorclave for the first time check that the circuit breakers and the isolator (at the back of the autoclave) are switched on and that the water supply (if required) is available and turned on.

For Steam Heated models, check that the steam supply (or Internal steam generator if fitted) is **ON** and that there is sufficient pressure (3 to 3.5 Bar) to run a cycle.

Check that the air supply (if required) is available and is turned **on**.

Press the '**Door**' button on the control panel there will be a bleep and the message '**Hold**' will be displayed in the temperature display. Wait for a short time until the temperature display returns to normal, there is another bleep and the door indicator illuminates. The door button can now be pressed again to release the lock.



Before proceeding please check the specification sheet supplied with this manual to establish which options and accessories, if any, are fitted to your Priorclave. This will determine whether you will need to read the instructions for these options later in this manual.

Opening the Door

Switch on the power at the isolator. All indicators will light momentarily and a sounder will bleep. This is to enable the indicators to be checked.

The **start** indicator should now be lit. Press and release the **door** button, which will bleep, and wait for a short time (about 20 seconds) until the **door** indicator illuminates and the sounder beeps again.

During the waiting time the temperature display will show **Hold**, confirming that the autoclave is waiting during its safety delay.

On pressing the **door** button a second time, you may hear the locking solenoid operate. You may now open the door as described below. (The **vent** button will illuminate when the **door** button is pressed and remain lit after the door is opened.)



Do not attempt to open the door before the lock has released or damage to the locking mechanism may result which will not be covered by the warranty.

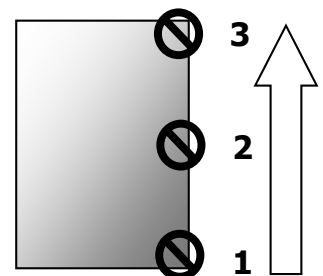


Do not attempt to open the door before the lock has released or damage to the locking mechanism may result which will not be covered by the warranty.

Open the autoclave door as described below:

Wait for a short time until the timer display returns to normal, there is another bleep and the '**door**' indicator illuminates. The '**door**' button can now be pressed again to release the lock. When the lock is released a green indicator lamp below the lower hand wheel will illuminate

Open the door by undoing the lower black hand-wheel first followed by the centre black hand-wheel and finally the red safety hand-wheel. With the door free, carefully pull open.



Loading Trolley (Optional)

When supplied and unless previously specified otherwise the loading trolley is manufactured for loading the lower shelf of the autoclave. The trolley is fitted with locking castors, which can be locked in place once the trolley has been pushed into position for loading or unloading.

These hold the trolley securely in place, preventing it from rolling backwards, especially when pulling heavy loads onto it during unloading.



Release the locking castors before pulling the trolley away from the front of the autoclave.

Great care should be taken when loading and unloading bulk loads with an autoclave trolley. Manual handling regulations should be observed at all times.

Loading Trolleys and Cassette (Optional)

Standard Loading Trolley

The Trolley has been manufactured for loading baskets or containers onto the lower shelf of the autoclave.

When loading and unloading the trolley the rear wheels should be locked, preventing movement of the trolley.

Adjustable Height Trolley

This is a hydraulic loading trolley to assist with easy loading and unloading of the autoclave to both the lower and central shelf.

The trolley includes a foot pedal to raise the loading level and a handle to lower it, so that the loading cassette can be placed at a comfortable height for loading with individual containers and can then be raised to a suitable height to load the autoclave.



When loading and unloading the trolley the rear wheels should be locked, preventing movement of the trolley.

Trolley with Loading Cassette

Where the autoclave is provided with a loading cassette the loading trolley may be of either of the two types described above.



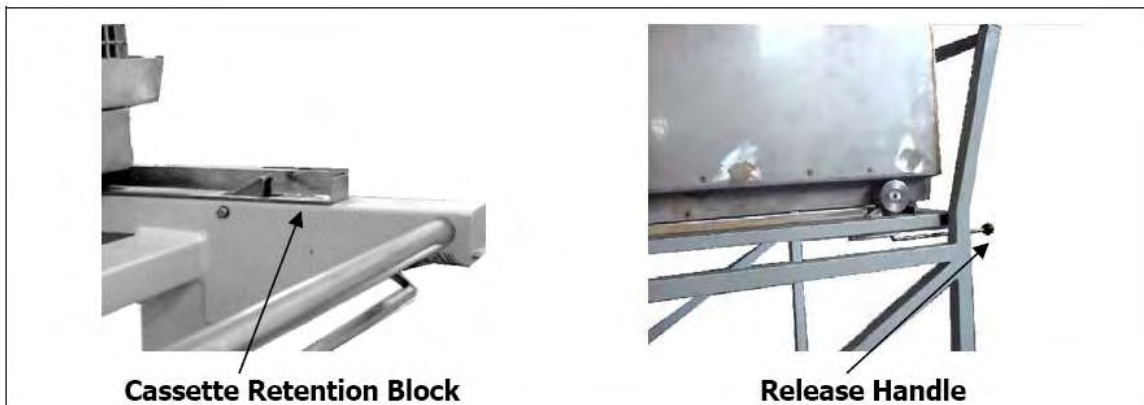
When loading and unloading the cassette from the trolley to the autoclave the rear wheels should be locked, preventing movement of the trolley.

During movement of the cassette and trolley the cassette is held in place by a retaining block in front of the rear wheel. When loading the cassette into the autoclave this block should be released by holding down the release handle until the rear wheel has run past the block.



When loading the cassette onto the trolley from the autoclave be sure to take the cassette to the back of the trolley so that the sprung block can retain it in place.

Operation



Care should be taken when opening the door as it will be hot and steam may be released. Heatproof gloves and a face shield should always be worn when unloading autoclaves.

Loading

The autoclave can now be loaded with the items to be sterilised directly onto the shelves or in baskets, or in the case of waste loads which may leak liquids when autoclaved, watertight discard containers, either manually or with the assistance of a loading trolley and / or loading cassette (optional).

Loading Trolley (Optional)

When supplied and unless previously specified otherwise the loading trolley is manufactured for loading the lower shelf of the autoclave. The trolley is fitted with locking castors, which can be locked in place once the trolley has been pushed into position for loading or unloading.

These hold the trolley securely in place, preventing it from rolling backwards, especially when pulling heavy loads onto it during unloading.



Release the locking castors before pulling the trolley away from the front of the autoclave.

Great care should be taken when loading and unloading bulk loads with an autoclave trolley.

Manual handling regulations should be observed at all times.



Care should be taken when loading the baskets or containers not to pack them too tightly with material. Ample room must be allowed for steam to penetrate the load properly or full sterilisation will not be achieved. When using autoclave bags these should be left open with the top of the bag rolled outwards, exposing the load to the steam inside the pressure vessel.



Care should also be taken that the contents of bags and containers are not able to spill over into the body of the autoclave vessel. Any such spillage could block pipes and valves and will not be covered by the warranty.

For waste loads, which may leak liquids when autoclaved, watertight discard containers are strongly recommended.



Tests have shown that the depth of un-perforated discard containers should be no greater than 180mm (7") for effective air displacement from the load. Suitable containers are available from Priorclave.

Settings.

Once the autoclave has been satisfactorily loaded the controls should be set for the process cycle that you require.

If your autoclave has a setting lock fitted this must be set to **position 3** to allow the parameters to be altered.

Sterilising Temperature & Time Settings.



Research carried out by the UK Medical Research Council has recommended the following temperatures and times as being sufficient for complete sterilisation in autoclaves:

126°C for 10 minutes.

121°C for 15 minutes.

115°C for 30 minutes.

These temperatures and times relate of course to load temperatures and the aim in setting a cycle should be to achieve one of the above criteria in the coldest part of the load. Some loads however are sensitive to elevated temperatures for prolonged periods, making full achievement of the above impractical. However the disinfection of such loads after a short cycle, without necessarily reaching full Sterilising Temperature, is usually sufficient for most purposes.

Should you require a more precise method then the optional **Load Sensed Process Timing** may be of assistance for certain load types. If your autoclave is fitted with this option please refer to the description later in this manual.

Since there is a time and temperature 'lag' between the temperature controller probe and the load, this should be compensated for either by increasing temperature or process time, or by including in the cycle a period of free steaming with the vent open at 100°C, which can assist greatly with reducing the temperature lag.

This can be achieved by pressing in the **vent** button manually and releasing it manually. Alternatively, the **Automatic Free-steaming** function will perform this function automatically if the option is selected.

If you have an interest in any of the options mentioned above, which can quite easily be retro-fitted, please contact Priorclave.

In conclusion, when setting up the autoclaving cycle a large safety margin should be allowed within the settings.

More precise settings can be assessed by carrying out a 'worst load' test. (See commissioning).

Setting the process time

The process timer can be set to a time up to 999 minutes. The time required is set by simply using the time up/down buttons. The set time is displayed until the set temperature is reached, then the process time begins counting down to zero in increments of one minute.



Setting process temperature

Pressing either the up or down button momentarily causes the current set temperature to be displayed. Subsequent use of the up/down buttons changes the set temperature. If no keys are pressed for a short time, the display returns to showing the current chamber temperature.



Selecting other functions

The function select keys may be used to switch the Timed Free-steaming, Cooling, Media Warming Option, and optional functions such as Load Sensed Process Timing and vacuum cycles, on or off at any time other than when a cycle is running. An indicator illuminates to show that a function has been selected. If an option is not fitted (or permitted in the selected program in multi-program memory

Operation

models) pressing the appropriate key will result in a visual and audible fault being signalled and the function will not be selected.

Automatic Timed Free-Steam

What is free-steaming?



Incorporating a period of free-steaming into a cycle can improve air removal in difficult loads and/or reduce temperature lag between the load and the autoclave, reducing process time at higher temperatures. Free-steaming introduces a stage during heating up to Process Temperature, when a solenoid valve at the rear of the autoclave is opened for a pre-set time. The valve opens at a factory set temperature of just above 100°C and is held open for the time set as detailed below. During this time steam is being generated in the chamber in large volumes and this creates turbulence as it passes through the load before escaping through the valve. It is this turbulence that can assist with air removal.

Setting the free-steam time.

If free-steaming is required this is selected by pressing the **free-steam** button. The indicator lights up to show that free-steaming is selected. The time display will now flash indicating that the free-steam time, not the process time, is currently being displayed. The free-steam time can now be set (in minutes) using the up/down buttons. If no further changes are made for a short time the display stops flashing, and reverts to showing process time. If you wish to check the free-steam time or make further changes then free-steaming should be deselected, then reselected.



Caution should be used before setting a free-steam time longer than 15 minutes. Excessive free-steaming times can use a large amount of water, increasing the possibility of the cycle not completing due to a Low Water condition.

Free-steam temperature setting

Timed free-steaming will commence at a temperature slightly above 100°C, which has been set at the time of manufacture. If required, this temperature may be increased by qualified personnel and the turbulence caused by the escaping steam pressure can further assist with air removal. It is desirable however to connect the autoclave to a drain and vent pipe (as described Installation), as the release of pressurised steam into the laboratory should be avoided.

Performance can be improved even further by fitting the optional pulsed free-steaming system.

Pulsed Free-steaming



(Optional Function – included for autoclaves with vacuum cycles)

With certain loads and in certain situations the efficiency of the free-steaming process can be improved by pulsing. When available according to program then free-steaming commences as described above but at a higher temperature. Instead of remaining open for the entire free-steaming period the vent valve shuts off at a lower temperature. The autoclave then heats up again to the temperature at which the vent valve opens again. The autoclave will continue this cycle for the time set when selecting free-steaming. This continual pulsing of steam out of the autoclave creates considerable turbulence within the autoclave, helping to draw trapped air out of the load.

If fitted, this function is program specific and is usually set up during commissioning or by request on particular programs in response to customer requests at the time of ordering.

When selected as part of the program the pulsing function replaces the standard free-steam function described above.

Setting of the free-steam time for a particular program is as described above.



Pulsed free-steaming is not suitable for bottled liquids and should not be selected for cycles intended for these types of load.

Load Sensed Process Timing



(Optional Function)

Load Sensed Process Timing Function

If this option is fitted, the autoclave will be provided with an additional temperature probe inside the autoclave chamber. This probe can be positioned in the load, ideally in the coolest part. When this option is selected, the autoclave will heat to the set chamber temperature as normal. However, when the set temperature is reached the process time will not begin to count down until the load temperature, as sensed by the additional temperature probe, reaches a temperature just below the set chamber temperature. The cycle will then proceed in the usual manner.

Load Sensed Process Timing Purpose

The use of load sensed process timing can greatly assist with the sterilisation of certain types of difficult dense loads, such as large baskets of bottle caps, pipette tips or animal feed, by ensuring that the load reaches set temperature. The system is also very effective for bagged plastic waste loads, however as these tend to melt down around the probe, consumption of probes can be high. For this type of use load validation may prove to be more successful and economical in the long term.

Positioning Load Sense Probe

The probe should be positioned in what is anticipated to be the slowest part of the load to heat up, for example the centre of a large densely packed load, or the largest of a group of filled bottles. This is important, as there may be large variations in temperature distribution throughout the load.

Temperature variations can be reduced by the use of timed free steaming.

Load Sense Temperature Probes

The load sensed process timing option utilises a temperature probe connected directly to the main processor board.

Replacement temperature probes are available from Priorclave.

See Maintenance - for details on temperature probe replacement.

Rapid Cooling



On most models a fan is fitted into the bodywork of the autoclave to direct cool air over the autoclave vessel, however on some models cooling is effected by cooling coils, a full or partial cold water jacket or a combination of both systems.

If selected by using the **cooling** button, the cooling system will switch on automatically during the cooling stage of the cycle. There are three possible settings for rapid cooling, and these operate as follows:

- Off -** No indicators lit.
- Immediate start -** The cooling system does not operate at all during the cycle.
Left hand indicator lit. - 1 press of the **cooling** button.

Operation

The cooling system starts as soon as the cooling stage is reached.

Delayed start -

Both indicators lit- 2 presses of the **cooling** button.

The cooling system starts after the autoclave chamber has cooled to 100°C. This setting is useful when autoclaving some fluid loads, as bringing the cooling system on at temperatures above 100°C may reduce the chamber pressure too rapidly, causing the load to boil.

In both cases the system will switch off automatically when the cycle has reached the complete stage.

Media Warming



If this highly useful feature is selected the autoclave will cool to a factory pre-set temperature of 45°C. The temperature will then cycle between approximately 45° to 55°C until the door is opened. This allows, for example, nutrient media to be held as a liquid until it is needed, especially when used along with **the delayed start function**.

Delayed Start Time

The autoclave can be set before a cycle to start at a pre-set time.

To access these settings turn & hold the thermal lock key in the override position. Press the time up or down keys. Release the thermal lock key. **1** is displayed on the temperature display, by default **0** will be displayed on the time display. The temperature display now shows the number of a list of operating parameters, the value for the parameter is shown in the time display. Scroll through the list of available parameters using the temperature up/down keys.

After no keys are pressed for eight seconds the display returns to normal.

The function of these settings is as follows:

Temp. Display	Time Display	Function	Action
1	0-24	Delayed Start Time Hour ⁺	Enter required Start time hour (24 hour clock)
2	0-59	Delayed Start time Minute ⁺	Enter required Start time minute
3	0/1	Start Delay Select On/Off ⁺	0= OFF 1= ON

⁺ The time is set in real time, therefore the clock has to be correctly set for this to work properly.

After one delayed start operation, delayed start automatically switches off, and the autoclave returns to normal operation.

For instructions on setting the clock time and for other operator settings please refer to the section **Changing Date & Time** later in this manual.

Vacuum Options

(Optional item)



It is strongly recommended that to achieve optimum performance from Priorclaves fitted with vacuum options that commissioning and/or load validation tests are carried out by a trained Priorclave engineer. If no particular programs have been specified your autoclave will be factory set with the following programs:

Program 1: Non vacuum Cycle (Pre-Cycle Vacuum can be selected)

Program 2: Pre-Cycle Vacuum and Vacuum Cooling

Program 3: Pre-Cycle Vacuum and Vacuum Cooling

Program 4: Non vacuum Cycle (Pre-Cycle Vacuum can be selected)

Program 5: Non vacuum Cycle (Pre-Cycle Vacuum can be selected)



Pre-Cycle Vacuum

The pre-cycle vacuum is selected using the function select key on the control panel. With the left-hand indicator lit the Pre-Cycle Vacuum is selected. With the Pre-Cycle Vacuum selected a vacuum pump will run at the beginning of the cycle, removing much of the air from the autoclave and load. At a pre-set level of vacuum the control system switches off the pump and the normal cycle begins. By default two vacuum stages will be performed, with a heating stage in between. Pre cycle vacuum is essential when autoclaving loads containing densely packed porous material.



Vacuum Cooling - Suitable for Non Liquid Loads Only

A vacuum cooling cycle can be selected by means of the function select key. With the option selected the right-hand lamp will illuminate. When this option is fitted it can be run along with or separately from a Pre-Cycle Vacuum. With the option selected, at the end of the process dwell time the autoclave vent is opened and the autoclave cools to a pre-set temperature with the cooling system operating. When the pre-set temperature is reached the cooling system continues to run and a partial vacuum is drawn. This has the effect of evaporating liquid on the load causing it to cool rapidly. After a pre-set time air is admitted to the vessel and this process is repeated a number of times. At the end of this stage the autoclave passes immediately to cycle complete.



Post cycle vacuum cooling **must not** be selected if the load contains bottled liquids, regardless of how these are contained. All liquids in the load will be boil over, contaminating the inside of the autoclave chamber. Sealed containers of liquid are likely to explode. Unexploded containers will be in a dangerously unstable condition when removed.



Drying Cycle - Suitable for Non Liquid Loads Only (Optional Vacuum Options Fitting)



This option must be selected for attachment to a particular program in the control software during commissioning.

A drying cycle can be selected by means of the function select key within a program pre-designated as a drying program. With the option selected the right-hand lamp will illuminate. When this option is fitted it can be run along with or separately from a Pre-Cycle Vacuum. With the option selected, at the end of the process dwell time the water charge is drained under pressure from the autoclave, and the autoclave cools to a pre-set temperature. When this temperature is reached a partial vacuum is drawn and either the steam jacket or heaters attached to the outside of the autoclave vessel are switched on. This has the effect of evaporating liquid on the load. After a pre-set time air is admitted to the vessel and this process is repeated a number of times. At the end of this stage the autoclave passes immediately to cycle complete.



Post cycle drying **must not** be selected if the load contains bottled liquids, regardless of how these are contained. All liquids in the load will be boil over, contaminating the inside of the autoclave chamber. Sealed containers of liquid are likely to explode. Unexploded containers will be in a dangerously unstable condition when removed.

Multi Program Memory Options

When this option is fitted, five program number keys are provided to the right of the control panel, each with two indicators. The indicators on the left are for programs 1 to 5 and those on the right for programs 6 to 10. If the Priorclave has been specified with a five program memory only the first five programs will be active. As each program number is selected, the indicator illuminates and the previously selected indicator is cancelled. Pressing the select button toggles between the two program numbers shown on the button.

Operation



When the program memory option is fitted a three-position setting lock keyswitch is fitted. These setting positions allow different levels of access to settings as follows.

Position 1. Only the currently selected program can be run.

Program settings cannot be changed.

Position 2. All programs can be selected and run.

Program settings cannot be changed.

Position 3. All programs can be selected and run.

Program settings can be changed freely.

NOTE: The setting lock key can only be removed in positions 1 and 2.

Programming of settings is the same as with the standard machine, but the required program number should be selected before setting. The settings entered can then be recalled for subsequent use by simply reselecting that program number.

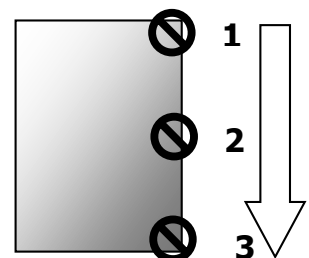
Closing the pressure door

Once you have set up the cycle parameters close the autoclave door. Then lock the door as follows:

Carefully close the pressure door and fully wind in the **RED** safety hand-wheel followed by the centre black hand-wheel.

Press the door button there will be an immediate bleep and the door indicator illuminates along with the door unlocked lamp beneath the lower hand-wheel, showing that the locking bolt has been withdrawn.

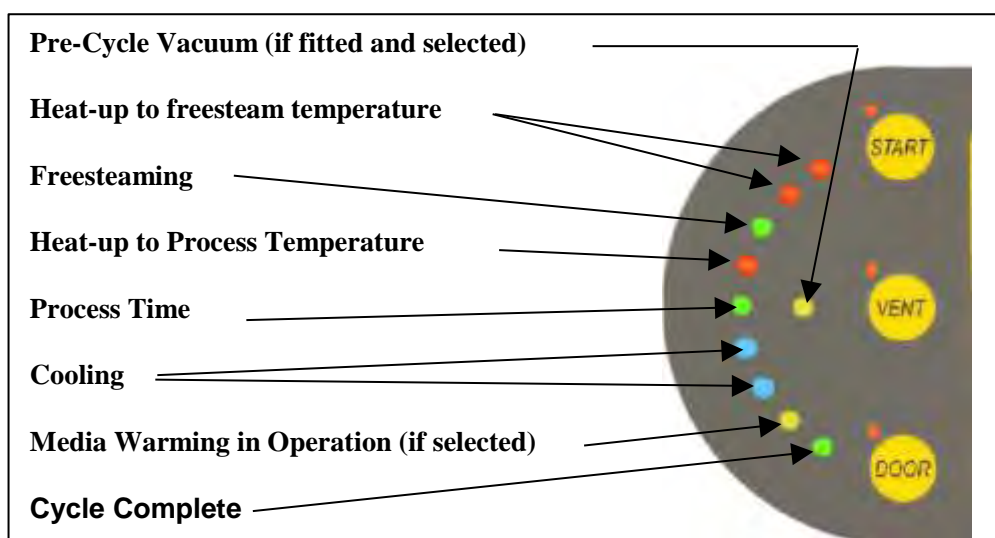
Secure by fully tightening the lower hand-wheel. If any difficulty is encountered, open the door and check for obstruction.




Starting a cycle

Ensure the door is properly secured and the **start** indicator is illuminated. To start the cycle press the **start** button.

The first segment of the cycle status indicator bar will illuminate and the autoclave will now gradually heat up to process temperature. The cycle status indicator will also advance through its stages to give 'at a glance' indication of the cycle's progress.



Once a cycle has been started the function selection settings cannot be changed; attempting to do so will cause a fault to be signalled. If changes are required the cycle should be aborted by pressing the **start** button again.

Pressing the Free-steam Button  during the freesteam part of the cycle will give an indication of free steam time remaining as a flashing display in the timer window.

On Priorclaves not fitted with the setting lock key-switch changes can be made to the process time and temperature settings once a cycle has started. At the end of the cycle the time setting will reset to its original setting.



When the autoclave has reached its operating temperature the door cover and other nearby surfaces may become uncomfortably hot. Take care if touching these surfaces without heat protection.

Vent button.

The **vent** button may be used at any stage during the cycle. When used it opens a solenoid valve at the back of the machine. It may be left open for free steaming to achieve better steam penetration of the load if **Automatic Free-steaming** has not been selected. Care should be taken with this manual method however as failing to switch the **vent** off will waste a large amount of steam and to eventual cycle failure. It may also be used with certain loads as a means of rapidly venting the autoclave. If used for manual free-steaming the **vent** button must be manually released before pressure will build up and process temperature can be achieved.



Care should be taken if using the vent button when the autoclave is pressurised. Venting of the autoclave under these circumstances with a liquid load may lead to the load boiling over and glassware may be broken.

During the process time.

Once set temperature is reached, the process time will begin to count down and the process indicator will illuminate. If the Load Sensed Process Timing Option is fitted and selected there may be a delay between the autoclave reaching set point and commencement of the process time whilst the load reaches set temperature.

During the process time a check should be made that there is correct correlation between temperature and pressure readings on the control panel. A steam table is included at the back of this manual for this purpose. The check should be made to ensure that air has been properly purged from the autoclave. Generally, a pressure reading higher than would be expected will indicate entrapped air in the autoclave.

If for any reason the temperature is forced outside a pre-set band, or power to the autoclave is removed during the process time, the cycle will abort and the fault indicator will illuminate and a fault code of either **F005** or **F006** will be shown in the temperature indicator. This is to ensure that loads that have not been subjected to the required cycle parameters are not assumed to have been processed correctly. The fault condition is cancelled by:

If no setting lock keyswitch is fitted:

pressing the reset button on the top panel on the right hand side of the autoclave,

or

If a setting lock is fitted:

turning the setting lock key to the enable position and then to the disable position. If the lock was in the enable condition when the fault occurred, then it must first be turned to the disable position.

Operation

Power loss during a running cycle.

Loss of power to the autoclave whilst the cycle is running can have one of two outcomes, depending on the stage of the cycle at which the power loss occurs:

If the power loss occurs at any point **before** completion of the sterilizing stage of the cycle (process time) then the error code **F006** will be shown in the temperature indicator and the cycle will be stopped. This is to ensure that loads that have not been subjected to the required cycle parameters are not assumed to have been processed correctly. The fault condition is cancelled as described above.

If the power loss occurs **after** completion of the sterilizing stage of the cycle (process time) then the cycle will stop but error code **F006** is **not** shown in the temperature indicator. If the autoclave was cooling or running a post-cycle vacuum process at the point of power loss then this will **NOT** resume after the power loss.

In many cases and with many loads this distinction between the stage at which power failure occurs can be helpful as it allows operators to determine whether the load is safe to use or dispose of rather than having to be run through the autoclave again.

Cooling

After completion of the process time the autoclave moves into the cooling part of its cycle, and this is shown on the cycle status indicator in blue. If **Cooling** has been selected this will be switched on automatically according to the cooling strategy selected. Otherwise cooling will be by convection.

If there is a power fail while the autoclave is in the cooling part of the process the cycle will resume in the cooling phase once power is restored.

If the power should fail before sterilisation is complete then the cycle will be stopped.

Thermal lock

Under normal circumstances the autoclave cannot be opened until the temperature of the load simulator probe, which has a cooling rate assimilated to a bottle of fluid, has fallen below 80°C at which point the yellow bar on the cycle status indicator will illuminate. The temperature shown by the temperature indicator will be significantly below 80°C as this measures the temperature in the open chamber space. Pressing the door button before the thermal lock has released causes a fault to be signalled. The temperature at which the thermal lock operates is factory set. This can be reset but must only be done following commissioning by qualified personnel. The thermal lock can be overridden using the key-switch on the control panel. The keys for this switch are provided in this manual.



Overriding the thermal lock will cause the main vent to open. Great care should be exercised when using the key-switch since liquid loads could boil over if vented at elevated pressures and glassware could be damaged.

There are circumstances, however when quicker access to the load is required. When this is necessary, first abort the cycle by pressing the start button. Then turn the key into its horizontal position and holding it in this position, press the **door** button and wait while the **Hold** message is displayed until the **door** lamp illuminates. Finally press the **door** button to release the door lock. The thermal lock key can now be released. If the key is released before this stage then the **Hold** display will not reset and the autoclave cannot be opened. To reset the display, repeat the above procedure and open the autoclave.



Great care should be exercised when using the Thermal Lock Override, especially with liquid loads. Even at temperatures below 100°C a liquid load in sealable glass containers will not be safe. For the above reasons responsible personnel should keep the Thermal Lock Override key in a safe place away from the autoclave and prevent access to it by unauthorised personnel.



Under certain cycle abort or failure conditions the thermal safety lock can latch in the locked condition. This is because the control system will always go to the safest condition if there is any uncertainty about the cycle end circumstances. To overcome this simply go through the door open or

close procedure using the thermal lock override key. Operation will return to normal as soon as the next cycle is completed satisfactorily

Cycle complete

When cooling to the 'thermal lock deactivation temperature' is complete, the **complete** indicator will illuminate, and the autoclave will emit a bleep for a short time (about 10 seconds). If the Cooling System is selected it will automatically switch off at this point. The autoclave is now ready to open and unload.

Media Warming

If this has been selected, the autoclave will remain at the pre-set temperature after the cycle is complete, until the door is opened or the cycle otherwise aborted.

Opening the autoclave to unload and re-load for the next cycle is simply a repetition of steps 1 & 2.

Aborting a Cycle

On occasions it may be necessary to abort a cycle before its completion. In order to do this, simply press the **start** button.

Emergency «E»Stop Button (where fitted)

In an emergency, pushing in the emergency stop button will cut the electricity supply to the heaters and control system.

After use this must be released using the key provided.



This key should be kept by responsible personnel in a safe place away from the autoclave and access to it by unauthorised personnel should be prevented.

Steam Generator Switch (if fitted)



The Green switch switches the Steam Generator on or off. When the autoclave is not being used it is advisable to switch the generator off to conserve electricity. The generator should be switched on around 10 minutes before the autoclave is to be used. The indicator LED will illuminate when the generator heaters are on.



Operation with Options & Accessories

Operation with Options & Accessories

The following descriptions detail how to operate and gain maximum benefit from the options and accessories that may be fitted to your Priorclave.

Setting Lock Keyswitch Option

Fitted on Priorclaves without program memory to give an optional level of security this keyswitch has two settings only, which are equivalent to positions 1 & 3 described previously. The key can only be removed in position 1.

Printer

The printer if fitted is mounted on the right hand side of the control panel. This provides a useful record of the cycle as well as an indication if any faults have occurred. The information printed is as follows:

USER NAME (if provided at time of ordering)
DEPARTMENT (if provided at time of ordering)
AUTOCLAVE SERIAL NUMBER
DATE (in the format dd/mm/yy)
CYCLE NUMBER
PROGRAM NUMBER (if multi-program memory option fitted)
TEMPERATURE AND TIME AT CYCLE START (time is set to G.M.T)
TEMPERATURE AND TIME AT END OF FREESTEAMING
TEMPERATURE AND TIME AT START OF PROCESS TIME

The temperature and time are then recorded at pre-set time intervals, until the end of the process time.

TEMPERATURE AND TIME AT END OF PROCESS TIME
TEMPERATURE AND TIME AT CYCLE COMPLETE.
CYCLE PASS/FAIL/ABORT

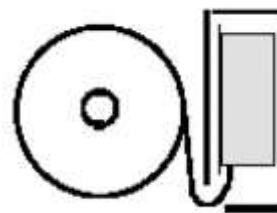
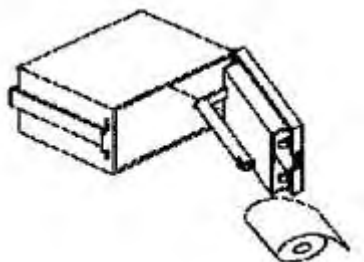
(Fail means that a fault signal has occurred during the cycle or that the cycle was aborted. See - Warning Indicators)

The above information will be printed in the order listed, allowing the information to be read as it is printed.

Power On Self Test

The self test procedure is initiated by applying power to the printer while the paper feed button is depressed. When the paper feed button is released a test print will be produced.

Replacing Paper Roll



Correct Paper Path

Access to the printer for changing the paper roll is provided by a hinged front panel. The spring-loaded catch on the left-hand side of the printer front panel should be depressed to release the front panel.

Operation with Options & Accessories



The paper roll carrier is mounted on the rear of the printer front panel and will swing out from the main body for ease of roll changing.

Always use the correct paper. Suitable paper is available from Priorclave Service or your local distributor.

Changing Printer Ribbon



Ribbon fitting detail

With the door of the printer open gently push the printer door at the point shown in the diagram. The outer door cover should come away exposing the print ribbon mounting plate as shown above.

The old print ribbon can be lifted out and a new one put in its place. If necessary take up any slack on the ribbon with the tensioning wheel.

The paper should pass between the ribbon and the bottom of the ribbon cassette.

The two parts of the door can now be pushed together and will click into position.

Changing Printer Settings

The time period between printouts during the sterilising time can be changed by accessing the “hidden” menu, which contains printer and other settings.

To access these settings turn & hold the thermal lock key in the override position. Press the time up or down keys. Release the thermal lock key. **1** is displayed on the temperature display, by default **0** will displayed on the time display. The temperature display now shows the number of a list of operating parameters, the value for the parameter is shown in the time display. Scroll through the list of available parameters using the temperature up/down keys.

After no keys are pressed for eight seconds the display returns to normal.

Temp. Display	Time Display	Function	Action
4	0-999	Print Interval	Enter time (minutes) between printing during process time (0= printer disabled)

Once you have accessed this menu scroll to setting 4 and select the print interval that you require.



Printer Fault (F011)

As the production of a printout is a vital and required part of a successful autoclaving cycle for many users the autoclave will detect whether it is in communication with the printer and will stop operating, giving the fault code **F011**.

If this happens and you are able to operate, at least temporarily, without a printout, set the print interval to 0 to de-activate the printer in software.

Operation with Options & Accessories



The print interval setting is set for each individual program on the autoclave and so if you have a multi-program autoclave and want to make a change across all of the programs then you will need to select each program in turn and change the setting.

For instructions on setting the clock time and other operator settings please refer to the section **Changing Date & Time** later in this manual.

For information on fault codes please refer to the section **Fault Codes** later in this manual.

Serial Interface

The autoclave is supplied with an externally mounted serial connector and a suitable connecting cable for serial or USB connection to a computer. Also supplied is a website address from which to download the latest software and a full operation manual for the system.

USB Interface

The autoclave is supplied with an externally mounted USB port. Also supplied is a website address from which to download the latest software and a full operation manual for the system.

Air Intake Filter

(Optional or fitted as part of a vacuum drying system)



When fitted to the autoclave this system ensures that air drawn into the autoclave during the cooling stage of the cycle is first passed through a bacteriological air filter. This filter is fitted at the back of the autoclave.

The filter should be regularly changed to maintain its effectiveness

Vent Filter

When fitted to the autoclave this system passes all autoclave discharge through a filter fitted inside a pressurisable stainless steel housing. At the end of the cycle any unfiltered condensate from the filter housing is returned to the autoclave.



On some larger models the filter is fitted in front of the main exhaust outlet inside the chamber. The filter uses a bayonet type fitting allowing simple removal and fitting for maintenance and replacement.

The correct operation and effectiveness of the filter system must be regularly checked. Please refer to the manufacturer's instructions enclosed with this manual.

Accelerated media cooling

Unless specified otherwise before delivery of the autoclave or set up during the commissioning process the Media cooling function is set to operate by default with **program 1**.

It can easily be re-set to operate on different programs by a Priorclave Engineer or your local approved Priorclave representative.

When selected the autoclave will carry out a standard media cycle and will begin cooling as normal with the cooling fan coming on at the end of the process time.

As the autoclave cools below 100°C the pressure on the gauge will gradually drop below 0 and into a vacuum. This assists greatly in the cooling of liquid loads giving savings of around 50% of the total cooling time to cycle completion at a safe thermal lock temperature.



Once the cycle has completed any vacuum in the autoclave is automatically released and the door can be opened in the normal way.

For best results over sized bottles should be used, i.e. 500ml volumes in a 1000ml bottle.

Delayed start cooling (both lights lit on the cooling button) may be required if excessive media volume losses during cooling are observed.

Chart Recorder / Data Recorder / Data Logger

If fitted, the recorder power input is connected directly to the autoclave in such a way that the recorder will only operate during the autoclave cycle, i.e. from the pressing of the start button to cycle complete. At this time power to the recorder is cut. Unless otherwise specified, single channel units record the temperature of a fixed temperature probe, and in the case of two channel units the second channel records the temperature of the load probe.

For more details on individual recorder function and operation please refer to the recorder or logger manufacturer's manual supplied with the autoclave.

Air Ballasting

In order to reduce and control media losses during the rapid cooling with the water jacket cooling system this autoclave is fitted with an air ballasting system.

Air ballast in this application works by maintaining the pressure in the autoclave at a pressure above the vapour pressure of the media in the containers.

In this instance the autoclave is run at a maximum temperature for media of 123°C. At this temperature the pressure below which the media will boil is just over 1 bar. Therefore the air pressure is increased to above this level (about 1.5 to 2 bar) by injecting air at the end of the sterilising. This air pressure is maintained until the completion temperature is reached.

According to specification either an external air supply is used (via a filter) or alternatively a silent running air compressor supplying dry, oil-free biologically filtered air to the autoclave may be fitted.

Water jacket cooling is set to come on at temperature between 5 and 10 degrees below the sterilising temperature. This period of natural cooling is to allow time for the pressure to build up in the autoclave. This is particularly necessary in the case of water jacketed machines where the cooling is more powerful. To achieve this the air ballasting is activated by the cooling output of the Tactrol mainboard whilst the water jacket cooling is called up by a temperature controlled digital output set as required to give the necessary time delay.

Internal Validation System

If fitted this system continuously monitors the performance of the temperature reading and control system with reference to an internal reference standard. If any problem is detected with the system the autoclave is stopped and a fault is signalled. (See Warning Indicators and Fault Codes for details.)

Options and Accessories associated with HTM2010 options

This is fitted to enable the autoclave to comply with the general requirements of C14/HTM2010. Depending on the autoclave specification the following options will be fitted:

- Test port on the pressure gauge,
- Electro-Mechanical non-resettable cycle counter
- Thermal Lock Back-up timer
- Air Detection*
- Automatic Leak Test program*
- Bowie and Dick test program*
- Tactrol Internal Validation System
- For direct steam heated models a steam test port is also fitted.

* Models with Vacuum Drying only

Operation with Options & Accessories



Fitting of this option does not give compliance to HTM2010 but provides the additional equipment required to meet the requirements. Compliance to HTM2010 requires that a C14 Specification Document be issued by an Authorised Person as part of the procurement process.

Thermal Lock Back-up timer

This serves as a backup to the thermal cooling interlock. The timer counts down from the end of the sterilization dwell time. In the event of the thermal lock failing to prevent door release until a safe temperature is reached the cycle will not complete until the timer has expired. If not specifically required this can be set to a short time in order to prevent it from interfering with the machine operation.

Air Detection

It is possible for air to be released from the load or to be introduced via a pipe-work or valve leak in circumstances that might not be detected by regular Leak testing. As leakage of air into the chamber will cause evacuated air to be replaced with air instead of steam, which could adversely affect sterilisation, in some applications or operating regimes, it is desirable to be able to detect situations when there is excess air in the autoclave chamber.

In most cases air is detected by comparing chamber temperature against pressure within the microprocessor control system and comparing this relationship to pre-defined steam tables.

If the relationship falls outside of that expected from the steam table then an excess air fault is triggered during the sterilizing stage. On triggering of an air detector error the sterilization stage is aborted, and the cycle advances to the drying stage. The cycle completes as normal, with the exception that cycle fail, and the excess air detected message is printed, and the fault code F010 is displayed.

In some cases an external air detection system may be fitted, which is used to trigger the fault to the same effect.

Automatic Leak Test program

If ordered the leak test program will be set up by a Priorclave trained technician and set up as one of the programs in the program memory.

When this program is selected and run a leak test will be performed instead of a normal cycle.

As leakage of air into the chamber will cause evacuated air to be replaced with air instead of steam, which could adversely affect sterilisation, in some applications or operating regimes, it is essential to regularly test the chamber and interconnecting pipework for leaks.

This is an automatic system for performing a leak test. This follows the following procedure during which pressures and elapsed times are recorded on the autoclave printer if fitted, and logged to the autoclave log file. If a printer is not fitted, or if a higher level of pressure measurement accuracy than that provided by the built in pressure transducer is required then a reference vacuum gauge may be connected to the pressure instrument port, and the readings noted at the appropriate times.

The Leak test sequence is as follows:

- Evacuate chamber to the pre-set leak test pressure set-point. The time and pressure are logged.
- After a five minutes the pressure and time are logged again.
- After a further 10 minutes the time and pressure are logged again.

The pressure increase over this final ten-minute period is used to assess the leak rate. If the pressure rise is greater than that pre-set as the pass/fail level a failed leak test is recorded, otherwise a passed leak test is recorded. The first five-minute period allows for evaporation of gasses within the chamber.

Bowie Dick test

This is set up during commissioning by a Priorclave trained technician. It will normally be set in connection with a drying cycle.

All programs set to be Bowie Dick test programs will be identical to normal cycles with the exception that at cycle complete "Bowie Dick test Complete" will be printed instead of cycle complete.

The feature serves to label tests using Bowie Dick papers so that the autoclave cycle record can more easily be matched to the test papers.

Tactrol Internal Validation System

See earlier description above

F₀ Integrator function

What is F₀?

F₀ is an algorithm, used to calculate what is sometimes referred to as lethality. F₀ has been used as a means of evaluating sterilization processes in the pharmaceutical industry for some time, as it is particularly useful when dealing with sterilization of temperature sensitive vaccines for example. It is a calculated equivalent sterilization time at any given temperature referred to a base sterilization temperature. In simple terms it is a calculation of the total heat input into the autoclave load after a predetermined temperature has been reached.

This is set up during commissioning by a Priorclave trained technician. Certain parameters relating to the particular cycle are required to be set, usually according to customer requirements as follows:

- **Temp minimum.** The F₀ value will begin to accumulate once the load probe temperature exceeds this temperature.
- **Base temperature.** The F₀ value will be calculated in terms of equivalence to a sterilization period at this temperature.
- **Z value.** Factor for a theoretical property of a micro-organism. This controls the amount by which the F₀ value accumulated at each registered interval will be reduced according to how far the current temperature is away from the base temperature.

The F₀ Integrator function works in conjunction with the Load Sensed Process Timing Function and this must be selected and functioning for the Integrator to work.

During the cycle the F₀ value will be printed and logged at each set interval. If the Load Sensed Process Timing Function is set to on, the integrator takes over control of the sterilization stage timing. The dwell time is terminated once the set F₀ value is achieved. The F₀ value is set in the dwell time field.

Changing Date & Time

Changing Date & Time

A number of additional control system settings can be accessed via a "Hidden Menu".

To access these settings turn & hold the thermal lock key in the override position. Press the time up or down keys. Release the thermal lock key. **1** is displayed on the temperature display, by default **0** will be displayed on the time display. The temperature display now shows the number of a list of operating parameters, the value for the parameter is shown in the time display. Scroll through the list of available parameters using the temperature up/down keys.

After no keys are pressed for eight seconds the display returns to normal.

The function of these settings is as follows:

	Temp. Display	Time Display	Function	Action
			The autoclave can be set for the cycle to start after a pre-programmed delay, for example to allow a media preparation cycle to complete shortly prior to the start of the working day. Setting the value of parameter 1 to 1 in the time display switches delayed start on.	
	1	0-24	Delayed Start Time Hour ⁺	Enter required Start time hour (24 hour clock)
	2	0-59	Delayed Start time Minute ⁺	Enter required Start time minute
	3	0/1	Start Delay Select On/Off ⁺	1= ON 0= OFF
*	4	0-999	Print Interval	Enter time (minutes) between printing during process time (0= printer disabled)
	5		Year Setting	Enter Year
	6		Month Setting	Enter Month
	7		Date Setting	Enter Day of month
	8		Hour Setting	Enter Hour (24 Hr Clock)
	9		Minute Setting	Enter Minute
	10		Second Setting	Enter Second.
			Scroll back up to parameter 1 to confirm the new or current time settings.	
#	11	1-999	Cycle Repeats	Enter Number of Cycles Required
⁺ The time is set in real time, therefore the clock has to be correctly set for this to work properly. After one delayed start operation, delayed start automatically switches off, and the autoclave returns to normal operation.				
#	Models fitted with optional Cycle Repeat Facility only			
*	Models fitted with 5 or 10 Program Memory Setting marked * are program number related, and therefore should you wish to use different values for these in different programs this can be done by changing the value when the correct program is selected.			

Warning Indicators & Fault Codes

On the control panel there are a series of 'hidden until active' warning indicators. Some of these indicators will appear in conjunction with a fault code in the temperature display. The meaning of these warnings, why they appear, and what to do when they appear, is as follows.

SERVICE

This means that 500 cycles, or six months have passed since the autoclave was last serviced. The engineer will cancel the message when the autoclave is serviced.

WATER + FAULT CODE F004

The water level has fallen below the minimum level and must be topped up before the autoclave can be run. The warning will automatically cancel when the door is opened and the water level is topped up. The low water condition may have caused a running cycle to abort, and the load may need to be autoclaved again.

O/HEAT + FAULT CODE F003

If fitted, the heater over-temperature protection temperature sensor may have sensed that the heating element became too hot. This is probably due to a low water condition, which was not sensed by the low water probe. The water level and the condition of the probe (see Maintenance) should be checked before attempting to use the autoclave again.

If heater over protection is not fitted then the over-heat cut out will only operate under extreme conditions, such as a failure of the temperature control system. The next attempt to run the autoclave should be closely observed and if problems persist contact Priorclave Service.

FAULT + FAULT CODES F000, F002, F005, F006, F007, F008, F009, F010 & F011

The fault indicator illuminates under conditions that may invalidate the autoclaving process, and may result in the load requiring to be autoclaved again. The fault condition will be triggered by any of the following:

- | | |
|-------------|---|
| F006 | Power to the autoclave being interrupted when a cycle is in the heating or process dwell stage of the cycle. |
| F005 | The chamber temperature falling below the set temperature by more than 3°C during the process dwell time. |
| F002 | Failure of the temperature control, display, or load simulator temperature sensor. |
| F000 | If your autoclave is fitted with the optional self-validation system, an error in the temperature measurement system is signalled by fault code F000 . Usually this would mean that a critical error has developed in the temperature measurement system, however, as the detection system is extremely sensitive it is possible that it may be triggered by fluctuations in the electrical power supply. If fault code F000 appears it may be cleared by the method described below. If the fault code will not clear, or continues to re-appear then the user cannot correct the fault. In such a case please contact Priorclave service or your local Priorclave approved service agent. |
| F007 | Vacuum stage timeout (loop break). The autoclave has not achieved the pre-set level of vacuum during the Pre-cycle vacuum stage during the pre-set time. |
| F008 | Heating stage timeout. The autoclave has not reached process temperature within the Pre-set time. |
| F009 | Vacuum cooling set-point not achieved. The autoclave has not achieved a low enough level of vacuum during the post cycle vacuum stage (Vacuum Cooling or Drying Cycle) |

Warning Indicators & Fault Codes

- F010** Air detector input activated. If fitted the air detector system has detected an over pressure condition symptomatic of excess air remaining in the load.
- F011** Printer Timeout / Malfunction. The control system has not received confirmation from the printer within its pre-set timeout.
- F012** Door micro-switch fault. If a door micro-switch opens during a cycle this fault code is displayed
- F013** Jacket Timeout -If a jacket is fitted it has not reached the required temperature within the Pre-set time. This would indicate a problem with steam supply or inlet or drain valve operation
- F014** Jacket Over temperature - If a jacket is fitted the temperature has exceeded the pre-set alarm temperature
- F015** Jacket under temperature - If a jacket is fitted the temperature has fallen below the pre-set operating temperature band.
- F016** Water Fill Timeout - The upper level water probe level has not been reached within the allowed time for filling and the filling operation has been stopped. This function prevents continuous unsupervised operation of the water fill, which could lead to flooding.
- F017** Free-Steam - During Pulsed Free-steaming operation the lower of the two set temperatures has not been achieved. The temperature has not fallen sufficiently following the opening of the vent valve.
- F018** Heater Overheat. If this fault occurs then the most likely cause is a Low Water condition. Check the water supply is turned on and the condition of the heater before resetting this fault.

LOCK

This warning will light when the thermal lock keyswitch is in the override position.

LOAD + FAULT CODE F001

This warning is activated in the event of the failure of the load sensing temperature sensor. The temperature sensor should be replaced as soon as possible. Great care should be taken to ensure that loads which would ordinarily be autoclaved with load sensed process timing are adequately sterilised.

CANCELLING FAULT MESSAGES

The fault messages are cancelled by first correcting the source of the original fault, then turning the setting lock key switch to position 3. If a key-switch is not fitted they are cancelled by pressing the reset button.

If 2 or more faults occur at the same time, the one with the highest priority is displayed. (F000 is the highest priority and F012 is the lowest.) If a higher priority fault is cleared it will be replaced by the next active fault, unless this too is cleared by the same action.

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Fault Finding & Rectification Guide

Fault Finding & Rectification Guide

Symptom	Possible Cause	Possible Solution
No Power	Power switched off at isolator	Check
	Circuit Breaker Tripped	Call Engineer
	Electrical Failure	Call Engineer
	Emergency Stop Button in (if fitted)	Release Emergency Stop
Cycle does not commence when start button is pressed (Fault indicator flashes)	Door is not closed properly	Open & Re-close
	Micro-switch Failure	Check Micro-switches
Heating slow or not apparent	Controller incorrectly set	Check setting & reset if necessary
	Circuit Breaker Tripped out	Check Circuit Breaker position. Check cause of trip & reset if necessary
	Insufficient steam pressure	Check steam supply
	Steam Inlet Solenoid Failed	Check & replace as necessary
	Fault in control circuit	Check all connections, output board function & thermal cut-out(s)
Autoclave does not pressurise	Vent button in open position	Check Vent Indicator and switch off
	Freesteam time not completed (if option is selected)	Check Cycle Progress Indicator Display
	Air purge valve failure (if fitted)	Check and replace internal parts or valve
	Steam Trap Failure	Check and replace internal parts or valve
	Vent Valve stuck open	Check & Replace if necessary
	Safety Valve stuck open	Check for obstructions on lifting handle
	Door incorrectly closed	Check door position and door micro-switch settings
Incorrect Temperature/Pressure Correlation	Air not fully purged from autoclave. Due to :	
	Incorrect Load Packing	Re-Load and re-start cycle with (more) freesteaming
	Faulty Air Purge Valve (if fitted)	Check & Replace if necessary
	Faulty Steam Trap	Check & Replace if necessary
	Faulty Controller or Gauge	Check function and calibration

Fault Finding & Rectification Guide

Symptom	Possible Cause	Possible Solution
Safety Valve opening	Temperature set too high	Check Temperature Setting
	Safety Valve Faulty	Check the seal on the valve is intact and has not been tampered with and that the lifting handle is not obstructed. Check the pressure shown on the gauge is above 2.4 Bar. If not replace the valve
	Output board Failure	Check & Replace if necessary
Door will not open once Autoclave has cooled to 80°C	Thermal Lock Temperature not yet reached in Load Simulator	WAIT. Thermal Lock is set to Load and not Chamber temperature.
Door does not open when door button is pressed	Safety delay not completed	Wait while ' Hold ' is displayed in the temperature display
	Thermal Lock Temperature not yet reached in load simulator	Check Cycle Complete indicator is lit on cycle progress display
	Faulty Door Solenoid	Check Solenoid and Output Board Function. Replace if necessary
	Thermal Lock previously overridden	Use thermal lock key to open door. Normal function will return after a complete cycle has been run
Fault Indication will not go out	Fault not Re-set. (Refer to manual for list of Fault Codes)	Rectify cause of fault and reset with Key-switch or re-set button



Autoclaves are pressure equipment and as such are potentially extremely hazardous if not correctly serviced.

If you have any doubts or If you do not feel competent to carry out any of the above procedures then do not hesitate to call Priorclave Service on 020 8316 6620 or your nearest Priorclave approved service agent.

This device may be fitted with a non-resettable thermal cut out to protect the heater. In the event of failure of this device contact Priorclave Service or your local authorised service agent.

Steam Table

Steam Table

Autoclaves

Temperature (°C)	Pressure (Bar)
100	0.00
105	0.20
110	0.43
115	0.69
120	0.99
121	1.06
122	1.13
124	1.25
126	1.35
128	1.55
130	1.70
132	1.86
134	2.04
136	2.21
138	2.40
140	2.60

Steam Generators
(where fitted)

Temperature (°C)	Pressure (Bar)
140	2.6
142	2.8
144	3.0
146	3.2
147.5	3.4
150	3.6
152	3.8
153.5	4.0
155	4.4

Correct Correlation between Temperature and Pressure shows correct operation of the autoclave and that air purging is satisfactory.



This table is accurate at sea level and at moderate altitudes will be sufficiently accurate for its intended purpose. However, at higher altitudes the pressures indicated will be slightly higher than those shown above.

Notes

Notes

Notes - Continued

Routine Operator Maintenance



Before carrying out any maintenance work check the autoclave for any visual signs of materials which may be contaminated or damaged. Should any such matter be apparent contact the relevant person of authority before proceeding.



Do not attempt to carry out any work unless you are competent to do so.



Disconnect or **Isolate** the machine from mains power supply before removing any panels or commencing any maintenance work.

Ensure that any electrically locked doors are open before disconnecting power.



In the event of any difficulty or doubt about any maintenance or service procedure contact Priorclave Limited or your nearest Priorclave approved agent or supplier immediately.



For full maintenance and servicing details please refer to the Maintenance Manual



To keep your autoclave operating safely and efficiently it is recommended that you keep your autoclave regularly serviced by a Priorclave Qualified Engineer in addition to the routine items described below.

Daily Maintenance

Autoclave Cleanliness

Check exterior of machine and the inside walls of the pressure vessel for general cleanliness, particularly around operating parts and external switches and pins. Use anti-bacterial wipes to clean exterior panelling.



Under no circumstances should an abrasive or chemically aggressive cleaner be used on the pressure vessel. The use of chlorine or hydroxide based cleaners is **not** recommended (see notices at the beginning of this manual).

If destruct type loads are regularly being processed consideration should be given to the use of suitable containers for such loads to minimise spillage. A range of such containers suitable for individual Priorclave models is available from Priorclave.

Weekly Maintenance

(To be carried out in addition to daily maintenance program.)

Door Gasket (s)

To prolong the life of the sealing gaskets it is advisable to lubricate the sealing faces. This is carried out with the pressure door in the open position by applying high melting point grease to the exposed surfaces of the gasket, after cleaning the gasket and inspecting for damage. Silicone grease such as high vacuum grease is ideal for this purpose. Ensure that the grease is lightly spread evenly around the surface of the gasket.

Routine Operator Maintenance

Door Closure Bolts

To ensure a free action of the closure bolts they should be kept lubricated and free from dirt. The threads of the bolts and the threaded holes in the header ring should be thoroughly cleaned and then lubricated with high melting point grease.



Drainage

If the autoclave has been plumbed directly into a drain using flexible tubing, this should be checked for any signs of blockage, obstruction or damage. Also ensure that both ends of the tube are connected as originally intended. Check for any obstruction to the safety valve outlet, which must remain exposed and unconnected to any form of drainage at all times.

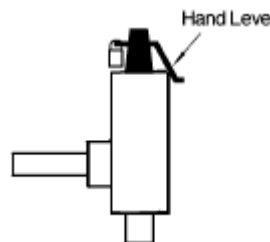
Indicator Lamp Check

To ensure that the Control Panel is displaying correct information, perform a check on the function of the Control Panel by re-setting the Autoclave power supply. The process of re-starting will illuminate ALL Control Panel lamps for a period of approximately 3 seconds. If any lamps are seen to be OFF during this time, report the error for further investigation.

Safety Valves (Caution needed)



The safety valve should be periodically checked for freedom of movement. This can be done without the need for removing panels from the machine, as the hand lever of the valve may be accessed from above the back panel of the autoclave or via a removable patch panel, depending on model type. When the autoclave is at working pressure, keeping well clear of the safety valve outlet and wearing heat-proof gloves, lift the hand lever for 2 seconds and check for a free flow of steam from the outlet pipe. If steam does not flow the valve should be replaced or serviced by a qualified person immediately. After releasing the lever ensure that the steam flow stops fully.



Other Safety Valves (where fitted) (Caution needed)

If a steam generator is fitted this will also have its own safety valve fitted. Please refer to the separate steam generator manual for more detail.

Monthly Maintenance

(To be carried out in addition to weekly maintenance program.)

General Cleaning

Check exterior of machine and inside pressure vessel for general cleanliness, particularly around operating parts and external switches and pins. Wipe over all surfaces using anti-bacterial wipes.

Empty all water reservoirs using a vacuum water remover if available. In order to prolong the lifespan of the heating elements, water level probe, etc., it is advisable to wipe away any spilled media, chalk, lime scale, etc. on these parts or in the reservoir area. This build up should be minimised by the use of softened water and a discard load container.



Under no circumstances should an abrasive cleaner be used on the pressure vessel. The use of chlorine or hydroxide based cleaners is not recommended (see notices at the beginning of this manual).

General Operation

The general operation and performance of the autoclave should be observed frequently to ascertain consistency of cycles. Any fault or defect reported or rectified immediately, and entered into a

Maintenance Log. (This will assist a service engineer in locating any persistent fault and reporting it to the manufacturer.)

Bi-Annual Maintenance

(To be carried out in addition to weekly and monthly maintenance programme.)

Hinges

With the pressure lid in the open position the hinge should be cleaned and lubricated with high melting point grease.

Checking Temperature Control and Pressure Gauge

During the **DWELL** stage of a running autoclave cycle when the **Process Time** has run for at least five minutes, check the reading shown by the temperature display against that of the Steam Table in this manual.

A consistent disparity of readings would indicate either trapped air or a calibration issue. A note should be made of any observations in the Maintenance Log.



The pressure gauge and control system fitted to Priorclave are extremely reliable instruments and as such are unlikely to produce false readings. Therefore it is more likely that any deviation from the values given in the steam table is caused by incorrect air purging etc.

Routine Operator Maintenance

Maintenance Log:

[illegible]

Routine Operator Maintenance

[illegible]


Equipment Specification Tables

Equipment Specification Tables

Priorclave Large Capacity Rectangular Section Laboratory Autoclaves

Where the vacuum model is not listed separately the weight of the vacuum models is shown.

For steam models substitute E with S

Intended use. 	Principle uses: Preparation of Laboratory growth media and sterilization of laboratory waste prior to disposal. Additional uses: * sterilization of bottled liquids and glassware, sterilization of unwrapped instruments and porous loads. * Dependent upon options fitted		
	This equipment has not been designed for or intended for use as a medical steriliser.		
Model:		PS/RSC/EH450	PS/RSC/E700
Capacity (L)		450	700
Dimensions (mm)	External (mm) (wxdxh)	855x1325x1785	855x1780x1785
	Min. Installation Area Required (wxd)	1055x1535	1055x1990
	Door Swing	760	
Weight kg (Approx.)	Unloaded	800	1000
	With water charge	850	1060
	Door	135	
	Pressure Vessel	500	650
Electrical*	Voltage (V)	400	
	Frequency (Hz)	50	
	Phases	3	
	Max. Current Rating (A)	45	63
	with Drying (A)	45	63
	Max. Heater power kW [#]	31.5	42
Steam*	Steam Supply Required	Dry steam regulated to 3 Bar(G)	
Water	With Auto-waterfill:	15mm BSP (Softened Water Supply Required)	
Drainage	Main Drain Connection	28mm BSP	
	Secondary Drain Connections	15mm BSP and 22mm BSP (where applicable)	
Max. Sound Level (working environment)	Without Vacuum Pump	Approx. 60db @ 2M (Intermittent)	
	With Vacuum Pump	Approx. 70db @ 2M (Intermittent)	
Max. Heat Emission	Full Cycle - to thermal lock temperature	$((31.5\mathbf{h} \times 15.75\mathbf{p}) \times 0.75) / \mathbf{t}$	$((42\mathbf{h} \times 21\mathbf{p}) \times 0.75) / \mathbf{t}$
		In kW/Hour: Where: h = heat-up time (hrs), p = process time (hrs) and t = Total cycle* (hrs) (* to thermal lock opening temperature)	

* Steam Heated models – Steam supply for steam heated or dual steam / electric models without an internal steam generator.

*On non-vacuum steam heated models a 230V 6A 50Hz power supply is required

Electrically Heated Models Only

Circuit Diagrams and Pipe-Work Schematics

Output Board Designations

Output Board 1

IN		OUT	FUNCTION
	1		
	2		
	3		
	4		

Output Board 2

IN		OUT	FUNCTION
	1		
	2		
	3		
	4		

Output Board 3

IN		OUT	FUNCTION
	1		
	2		
	3		
	4		

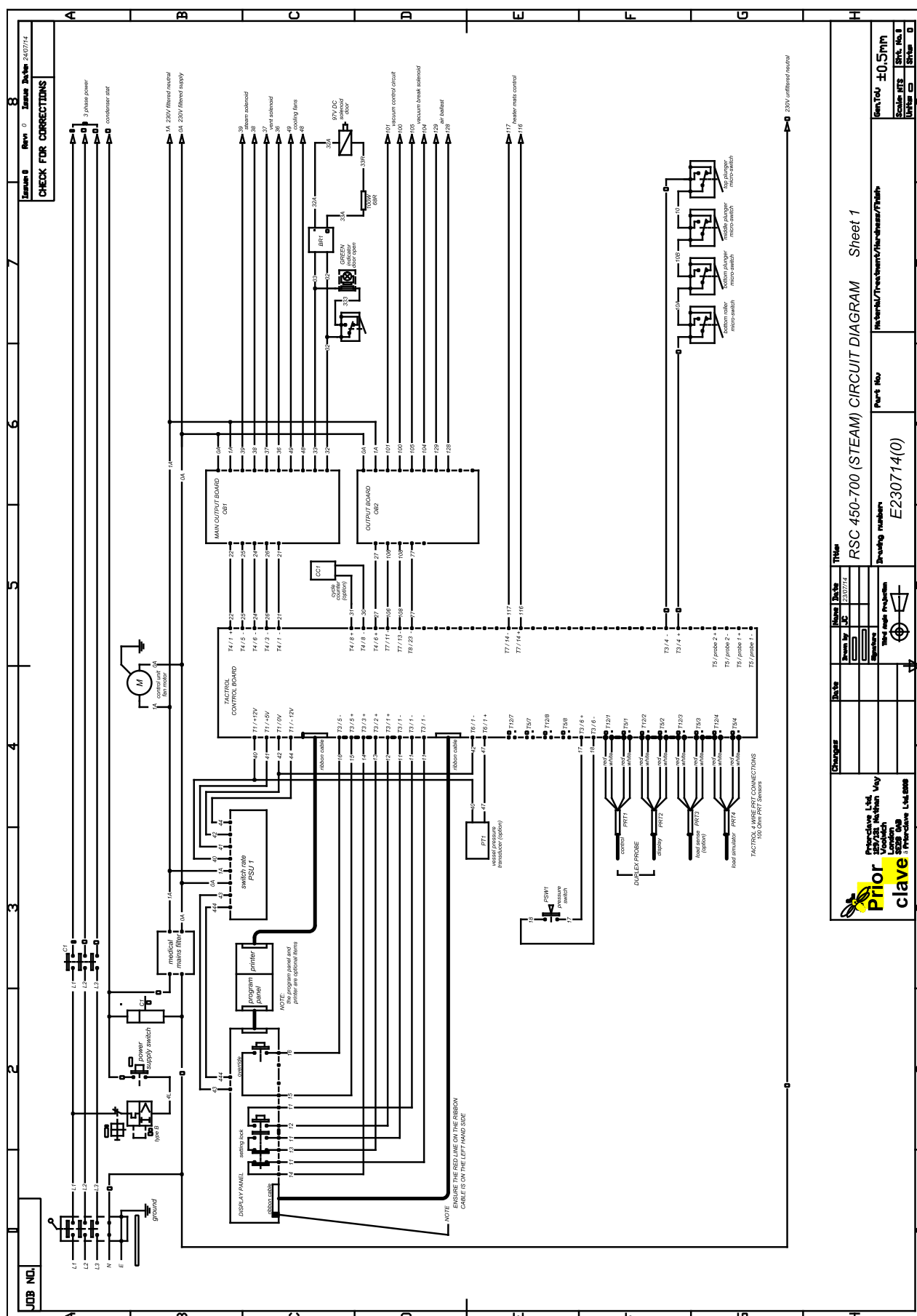
Other Items Fitted

Wiring Diagrams & Schematics

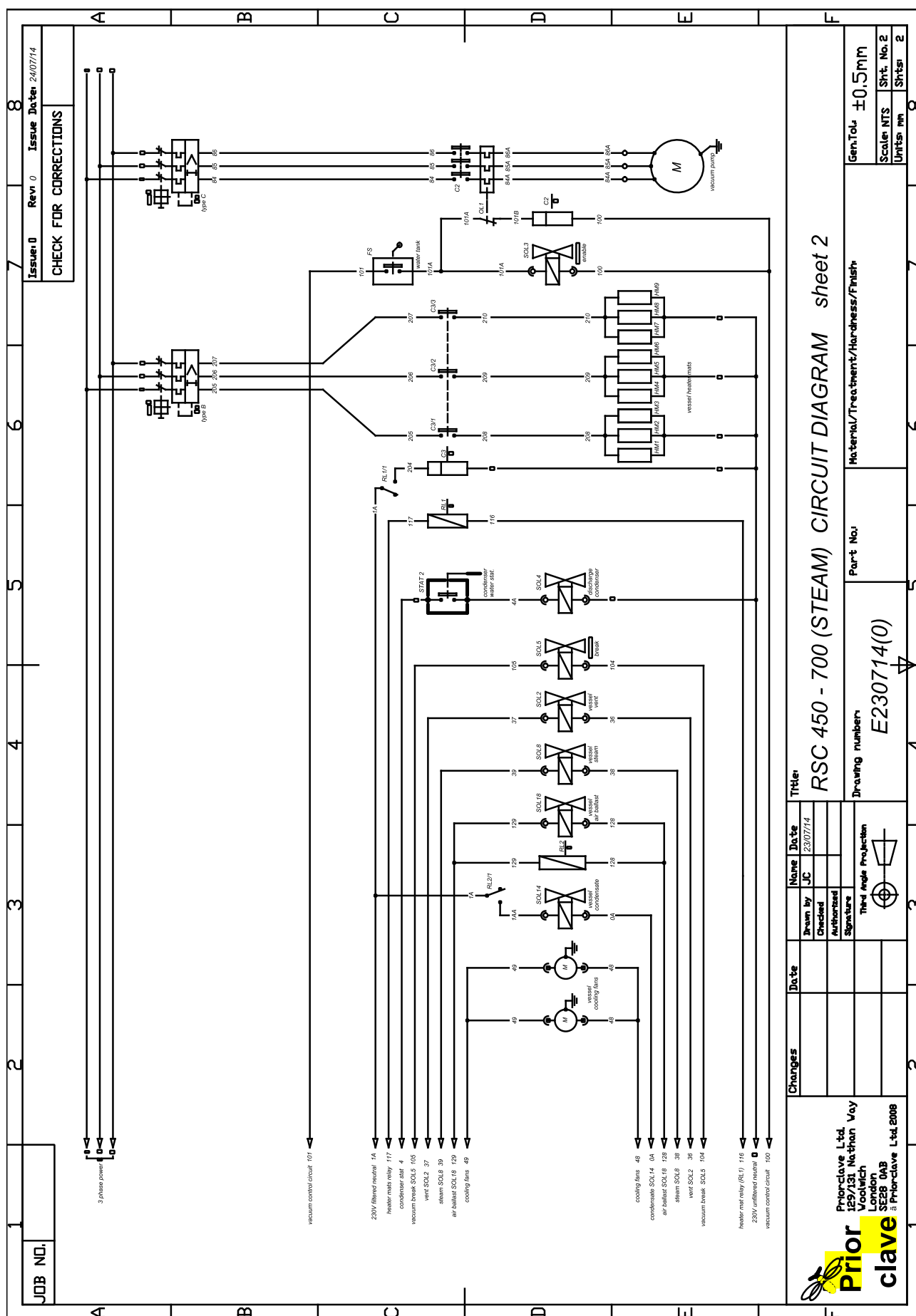


The following Circuit Diagrams show the wiring configuration for the standard models and in addition for the more popular options and accessories.

For Options and Accessories not covered by these standard drawings supplementary drawing sheets will be issued and these should be included within the manual and/or are available from Priorclave. (info@priorclave.co.uk)



Other Items Fitted



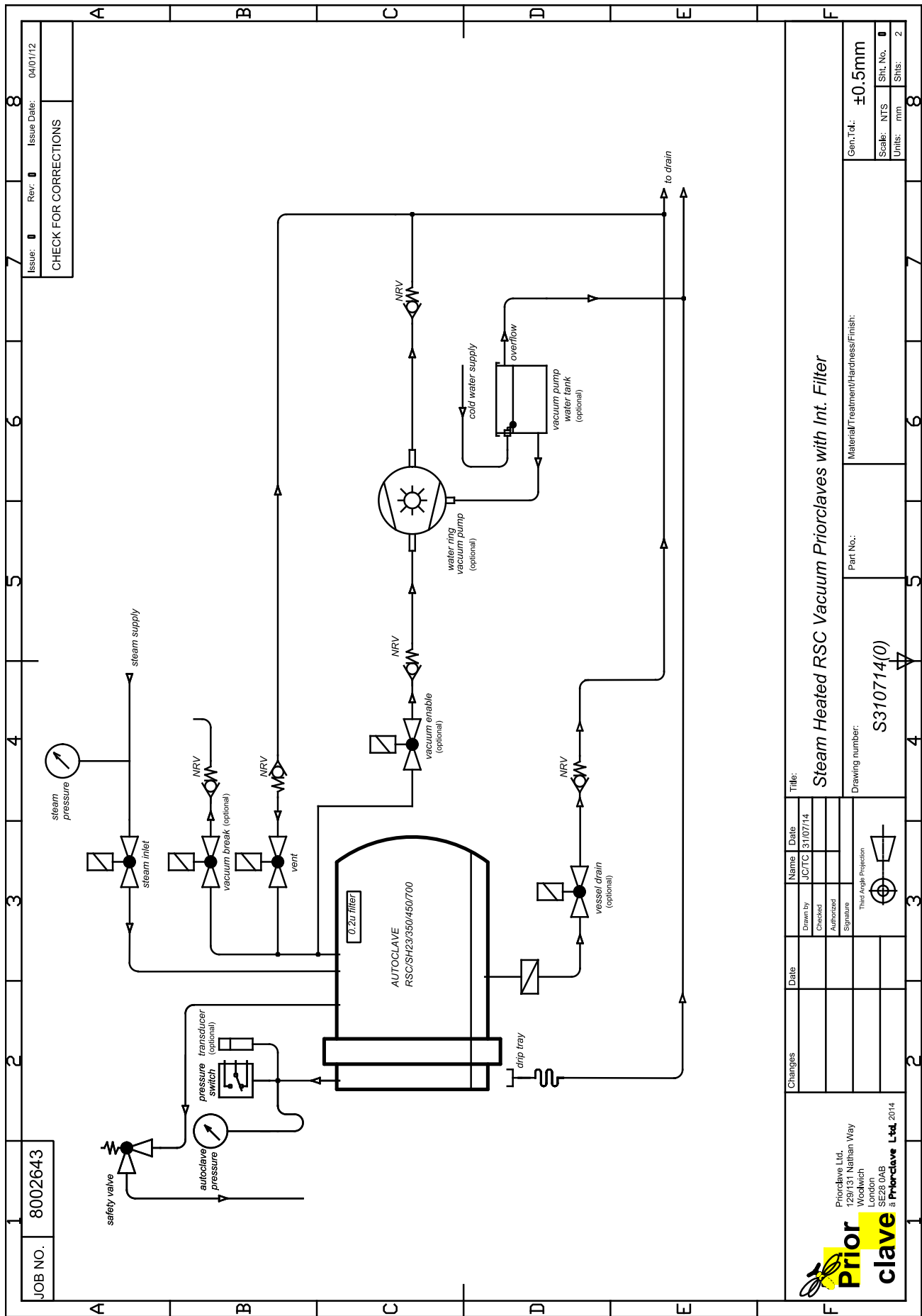
Pipe-Work Diagrams & Schematics



The following Circuit Diagrams show the wiring configuration for the standard models and in addition for the more popular options and accessories.

For Options and Accessories not covered by these standard drawings supplementary drawing sheets will be issued and these should be included within the manual and/or are available from Priorclave. (info@priorclave.co.uk)

Other Items Fitted



Other Items Fitted

Other Items Fitted

Specification Sheet



Attention:

Please read the manual before attempting to operate your Priorclave.
Connection to the wrong power supply could lead to an expensive and unnecessary call out.

Priorclave Service

129-131 Nathan Way
West Thamesmead Business Park
London SE28 0AB

Tel: 020 8316 6620

Fax: 020 8855 0616

E-Mail: service@priorclave.co.uk

Web: www.priorclave.co.uk

Model Number: _____

Working Capacity: _____ Litres

Serial Number: _____

Heater Power: _____ kW

Power Supply Required:

_____ Volts

_____ Hz

_____ Phase

_____ Amps/Phase

Steam Supply: _____

Electrically Heated ☐

Direct Steam Heated ☐

Options:

Automatic Waterfill ☐

Steam Generator ☐

Timed Freesteaming ☐

Pulsed Freesteaming ☐

Load Sensed Process Timing ☐

Cooling Fans ☐

Programmer 5 ☐ 10 ☐

Printer ☐

Pressure Print ☐

Load Sensed Indication ☐

Pre-Cycle Vacuum ☐

Vacuum Drying ☐

USB Port ☐

Hospital Specification ☐

Accessories:

Baskets ☐

Discard Containers ☐

Drip Cover: ☐

False Floor ☐

Condensate Bottle ☐

Heat Exchanger ☐



Continued overleaf if applicable

Specification Sheet



Additional Options & Accessories Supplied & Fitted:

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Customer Warranty Registration



Please complete the details below and return by fax or email within 14 days of delivery of your Priorclave Laboratory Autoclave.

You will then be registered as a Priorclave user and your 12month* Parts and labour warranty will commence from the date entered below.

IMPORTANT

If this form is not returned we can only commence your warranty period from the date of completion at our works.

** UK customers only. Outside the UK a full 12month warranty applies for parts only. Refer to your supplier for further details.*

Priorclave Service

129-131 Nathan Way
West Thamesmead Business Park
London SE28 0AB

Tel: 020 8316 6620

Fax: 020 8855 0616

E-Mail: service@priorclave.co.uk

Web: www.priorclave.co.uk

Autoclave Details:

Priorclave Model :

Serial Number:

Delivery Date:

Customer Details:

Company Name:

Address:

Post Code:

Contact Name:

Telephone:

E-mail:

Fax:

Purchased From:

Date:



