PLANER

Series 300 & 500 Operator's Manual

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This equipment contains batteries and other components which have a limited life. To ensure the long life of the equipment and help ensure trouble-free operation, we recommend that you join one of our Maintenance and Support Schemes. Please contact your supplier for details.

Good practice demands that in critical applications, reliance should not be placed on a single source of data. Hard copies and backup copies should be routinely kept.

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Table of Contents

Section I

1 Introduction

The Series 300 and 500 models are intended to be used for cooling biological samples, following a defined temperature-time profile, as part of a cryopreservation process.

This guide has been designed to help you get the best from your new freezer. The guide includes important information concerning the safe use of the equipment and it is important that you familiarise yourself with this document before attempting to use the product.

1.1 Symbols

1.1.1 Symbols

This shows information or instructions that are related to safety. Failure to follow these instructions may result in personal or third-party injury.

This symbol is used to introduce important information or instructions related to the use of the product. Failure to follow these instructions may result in damage to equipment, samples or data.

This symbol indicates first aid advice.

1.1.2 Symbols used on the equipment

	Caution: Refer to this manual and accompanying documentation.
	Mains supply ON
	Mains supply OFF.
	Alternating current
	Calibration
	Manual control
	Temperature: Up/down
	Menu selection
	Enter key

1.2 Safety precautions

1.2.1 First aid

IF IN DOUBT, SEEK IMMEDIATE MEDICAL ATTENTION. If any quantity of liquid nitrogen comes into contact with the skin or eyes, immediately flood that area of the body with large quantities of unheated water, apply cold compresses and seek medical attention. If the skin is blistered or there is any possibility that eyes have been affected, the patient should be taken immediately to a doctor or hospital for treatment.

1.2.2 Safety

Warning

- Operating the system in a manner not specified within in this manual or under conditions outside of the specifications may result in the protection offered by the equipment being impaired.
- Avoid nitrogen build up: anywhere liquid nitrogen is used must be well ventilated to reduce the risk of nitrogen build up. Small volumes of liquid nitrogen convert to very large volumes of gas. This can result in drowsiness, or in extreme cases, asphyxiation.
- When liquid nitrogen is used in confined spaces, oxygen-deficiency alarms must be installed. Guidance on ventilation requirements are given in BCGA Code of Practice CP30, The safe use of liquid nitrogen dewars up to 50 litres.
- When there is a risk of reduced or insufficient ventilation when a room is unoccupied, then alarms to indicate oxygen deficiency must be installed and positioned outside of the room so that operators are aware of the hazard before entering. The operational status of such an alarm should also be visible from outside the room.
- If liquid nitrogen is used in an area that requires forced ventilation, an alarm to indicate its failure should be fitted.
- When dispensing or potentially being exposed to liquid nitrogen, protect the face with a shield and wear gloves, boots and a protective apron. Prevent spillage into shoes and onto unprotected parts of the body.
- Handle vessels containing liquid nitrogen carefully. Liquid nitrogen boils at -196ºC and both liquid and gas can cause rapid and severe frostbite. Delicate tissue, e.g. the eyes, can be damaged by an exposure to the cold gas, which may be too brief to affect the skin of the hands or face.
- Stand clear of boiling and splashing liquid nitrogen and its gas when filling a dewar at normal room temperature or when inserting objects (such as a pump) into the liquid.
- Use tongs or wear cryogloves when handling cold or hot objects. Cryogloves are available as an accessory from Planer plc. When running a program, the chamber and contents may get cold enough to cause frostbite.
- The dewar must be depressurised before the pump can be removed. This is achieved by opening the pressure-relief valve mounted on the side of the pump, which seals an orifice in the pressure system by toggle action. Avoid contact with cold nitrogen gas when depressurising the dewar.

- The dewars used with this equipment must never be used to store any liquid other than liquid nitrogen.
- Only use vessels designed for working with liquid nitrogen.
- Secure the liquid nitrogen container to prevent toppling.
- Ensure that the delivery pipe connections are secure and leak-free before supplying liquid nitrogen to the freezer.
- Liquid nitrogen pressure must not exceed 1.7 bar (25 psi).
- To maintain protection against electric shock, the mains lead must be properly fitted to a 3-way mains connector plugged into an earthed mains outlet.
- Because of the potentially wet laboratory environment, the operator should be provided with additional protection against electric shock by supplying mains power to the freezer through a residual current circuit breaker (RCCB) operating at a differential of 30 mA. Note that care must be taken to ensure that the freezer is not compromised by faulty equipment sharing the same supply and causing nuisance trips.
- The mains outlets on the chamber's rear panel are only for use with the Planer LNP4 unit and the Kryo250 Controller.
- The 9-way plug on the Controller is only for connecting to the RS232 serial port of a computer that complies with IEC950.
- The 15-way plug on the Controller is only to be used for connecting to the chamber's cable.
- The "Autoseeder / alarm" socket on the MRV Controller is to be used only with a Planer MRV Autoseeder unit as described in the Autoseeder's Operating Manual or to an external alarm as described within this manual..
- The Sample PRT socket on the chamber's rear panel is only to be used with a Planer Sample PRT.
- When heating under manual control, check the chamber temperature at intervals of 30 seconds or less to avoid overheating.
- User servicing is limited to cleaning and decontamination. All other servicing must only be undertaken by suitably qualified engineers.
- To avoid risk of fire, fuses must always be replaced with the same type and rating.
- The Series 500 chambers weigh 23 Kg and require at least two people for safe handling. Do not attempt to lift using the edges of the case but use the bottom chassis plate.
- When switched on but not running a profile, the Series 500 chambers and contents may eventually become hot enough to cause burns.
- Do not move the chamber whilst still wet after a freezing run.

1.2.3 EMC Precautions

> ***Note***
>
> The following precautions must be taken to ensure that the equipment is not damaged by electrostatic discharge (ESD), and that its immunity to radio frequency interference is not compromised.

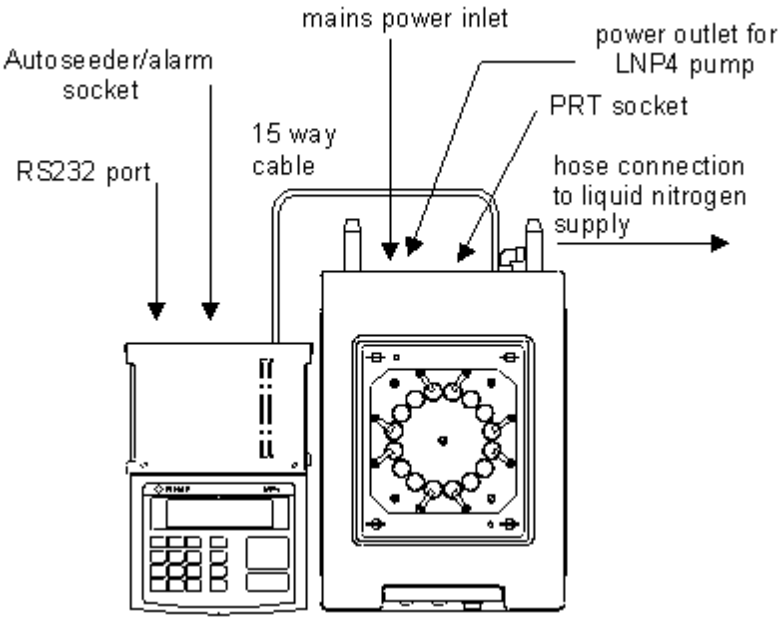
- Ensure that the MRV Controller is not running a program and that the mains power is disconnected before connecting or disconnecting any cable.
- Fit the plastic covers and plugs provided to all unused connectors.
- Immediately before touching the sample PRT, touch an earthed part, such as the metal surface at the rear of the MRV Controller.
- Do not touch any uncovered connectors with your hands or tools, even when the equipment is switched off.
- When connecting the system to a PC via the 9 way plug, always use a fully screened cable no longer than 2m.
- Take care to avoid placing freezers in environments influenced by sources of electromagnetic interference, such as cyclotrons, large transformers etc.

Section II

2 Installing the system

> **Warning**
>
> The Series 500 chambers weigh 23 kg and require at least two people for safe handling. Do not attempt to lift using the edges of the case but use the bottom chassis plate.

- Carefully unpack the equipment.
- Place the MRV Controller and the Chamber on secure, flat surface.



- Connect the 15 way D Type socket from the Chamber to the plug on the rear of the MRV Controller.
- Connect the sample platinum resistance thermometer (PRT) into the PRT socket on the rear of the Chamber.
- If an MRV Autoseeder is to be used, connect this to the Autoseeder/alarm socket on the rear of the MRV Controller. Refer to the Autoseeder manual for details.

> **Warning**
>
> The 9-way plug on the MRV Controller is only for connecting to the serial port of a computer which complies with IEC950

> **Note**
>
> When connecting the system to a PC via the 9 way plug, always use a fully screened cable no longer than 2m.

- If connecting to a PC, connect the 9 way D type plug on the rear of the MRV Controller to an RS232 port on the PC using the Null Modem cable supplied.
- If using a Planer pump and Dewar refer to the instructions under Installing a Planer Pump and Dewar or if using a CryoCyl low pressure cylinder, refer to the instructions under Installing a CryoCyl Low Pressure Cylinder 9.
- After connecting the liquid nitrogen supply, connect the mains inlet at the rear of the Chamber, to a suitable wall socket.
- Switch on the MRV system and wait for the main menu to appear.
- Follow the instructions under Loading Printer Paper 12 to complete the installation.

2.1 Installing a CryoCyl low pressure cylinder

> ***Warning***
>
> Wear protective clothing, including cryogloves, goggles, boots and a protective apron.

> ***Note***
>
> The liquid-nitrogen supply pressure must not exceed 1.7 bar (25 psi).

- If the hose is not already fitted to the Chamber, wrap the male hose thread with PTFE tap and fix to the N2 input on the back of the chamber. Tighten securely with a spanner.
- Connect an appropriate adapter to the cylinder, observing the manufacturer's instructions, then connect the delivery tube to the adapter ensuring that the fibre washer is fitted to this joint. Tighten securely with a spanner.

> ***Warning***
>
> After connecting both ends of the delivery tube, open the liquid-nitrogen tap slowly and check for leaks.

2.2 Installing a Planer pump and dewar

2.2.1 Connecting the delivery hose

> ***Warning***
>
> Never insert the pump into a dewar until it has been connected to the chamber.

Note

To avoid damage to the heating element, support the pump carefully while it is out of the dewar.

- If the hose is not already fitted to the Chamber, wrap the male hose thread with PTFE tap and fix to the N2 input on the back of the chamber. Tighten securely with a spanner.
- Fit the female ferrule at the other end of the hose, to the outlet on the side of the pump. Ensure that the fibre washer is fitted to this joint. Tighten securely with a spanner.

2.2.2 Filling the dewar

Warning

- When refilling a dewar that already contains liquid nitrogen, you must first depressurise it and remove the pump as described in Removing the pump 11.
- Wear protective clothing, including cryogloves, goggles, boots and a protective apron.
- Only fill the dewar with liquid nitrogen and do not exceed 85% of its capacity.

- Fully insert the hose from the main liquid nitrogen storage container into the dewar to avoid spillage.
- Add the liquid nitrogen slowly into the dewar. Cold gas will issue from the dewar. Use a dipstick to ensure that the dewar is filled to between 50% and 85% of its capacity.

2.2.3 Fitting the pump

Warning

- Wear protective clothing, including cryogloves, goggles, boots and a protective apron.
- Ensure that the red pressure relief valve on the pump is open.
- Ensure that power is disconnected from the chamber and the pump.
- Ensure the delivery hose from the pump to the chamber is securely tightened.

- Make sure that the delivery hose is as straight as possible, with no major high or low spots.

Warning

Do not insert the pump rapidly as the liquid nitrogen may bubble violently.

- In one smooth and continuous action, insert the pump evenly into the neck of the dewar until the microswitch plunger operates on the neck ring. It is normal for nitrogen gas to issue from the pressure-relief valve.

- Press firmly on the top of the pump to hold it level and clip all the springs onto the dewar, alternating between handles.
- Close the pressure-relief valve.

> **Warning**
>
> The mains power outlet on the rear of the Chamber must only be used for connection to a Planer pump.

- Connect the mains inlet of the pump power supply unit to the auxiliary power output on the rear of the Chamber.

> **Warning**
>
> Always test the dewar after refitting the pump.

2.2.4 Testing the dewar

> **Warning**
>
> Wear protective clothing, including cryogloves, goggles, boots and a protective apron.

- Connect the mains lead from the Chamber to a appropriate wall socket.
- Switch on the MRV system.
- Press the switch on the pump power supply unit. The adjacent light will illuminate. After about 5 minutes, the pressure will rise to 5 psi and the light will switch off. The dewar should remain pressurised until almost empty.

> **Warning**
>
> Before rectifying any leaks, or to shutdown the system, switch off the MRV system, disconnect the mains supply at the wall socket, open the red pressure-relief valve and wait for the flow of gas to stop.

- Check for liquid and gas leaks.

2.2.5 Removing the pump

You will need to remove the pump whenever the dewar needs to be refilled.

> **Warning**
>
> - Never remove a pump from a dewar until the pressure gauge reading has fallen to 0 psi.
> - Wear protective clothing, including cryogloves, goggles, boots and a protective apron.

- Switch off the freezer.
- Disconnect the mains supply at the wall socket.
- Open the red pressure-relief valve. Cold gas will issue from the valve.
- Wait until the pressure on the gauge has fallen to zero and the flow of gas has stopped.
- Disconnect the pump from its power supply unit.
- Press firmly on the upper surface of the pump, then remove the spring clips from the handles on the dewar. To prevent jamming only remove one spring at a time from each side.
- Lift the pump carefully, but firmly, out of the neck of the dewar using a slight twisting and rocking action.

> ***Warning***
>
> The end of the pump may be cold enough to cause frostbite

- Place the pump in a safe position on its side or suspended vertically.
- Remove frost using a hot-air gun.

> ***Note***
>
> Do not overheat as the plastic parts or thermal cut-out may be damaged.

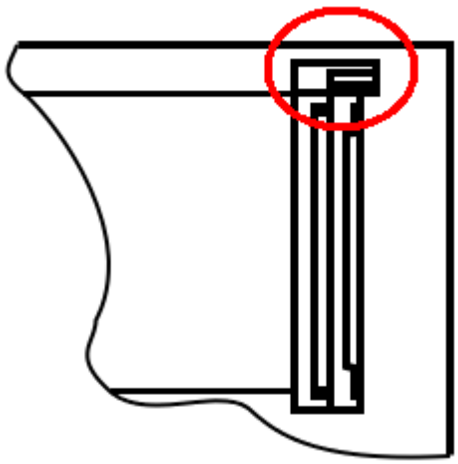
- When the pump has attained ambient temperature, dry any condensation with absorbent tissue to prevent ice from blocking the filter when the pump is refitted.

> ***Note***
>
> Fit a bung to the dewar to prevent water condensing inside.

2.3 Loading printer paper

> ***Note***
>
> - If you are removing a existing paper roll, always tear off any extra paper before lifting the inner stainless lid.
> - Only use thermal paper recommended by Planer plc or an authorised distributor.

Current versions of the MRV are fitted with an LTPV445 thermal printer; older versions of the system may be supplied with an STP411 mechanism. The LTPV445 version can be recognised by the paper release mechanism at the rear of the MRV.

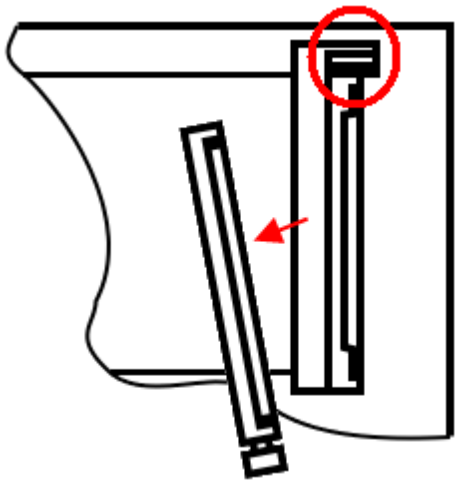


Release mechanism on the LTP445

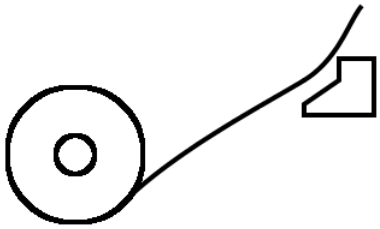
Refer to the appropriate section for your printer; Changing paper on the LTPV445 printer 13 or Changing paper on the STP411 printer 15.

2.3.1 Changing paper on the LTPV445 printer

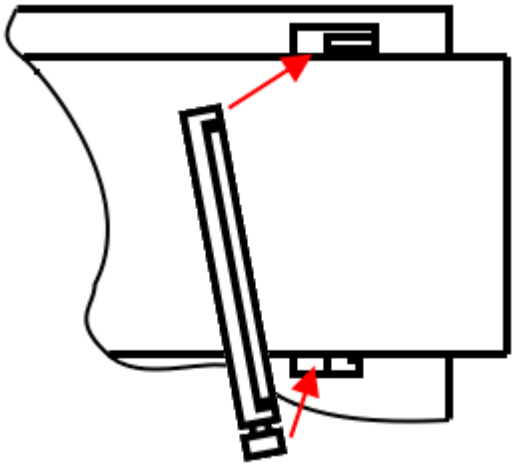
- Lift the smoked acrylic lid and the inner stainless steel paper shield, removing the old paper roll if any, and load the thermal paper onto the MRV paper spindle.
- Press the paper release lever at the rear of the printer mechanism so that the paper roller is ejected.



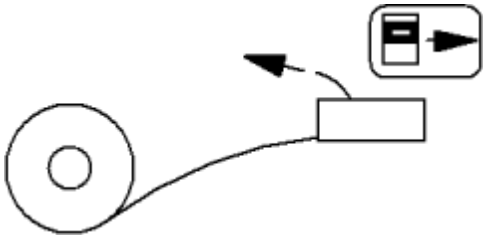
- Lay the paper roll in the printer mechanism as shown below.



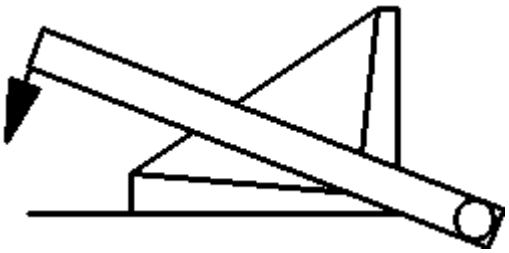
- Refit the paper roller on top of the paper. Apply pressure evenly to both ends of the roller and press down firmly to clip in place. Make sure that the gear at the front of the mechanism is correctly engaged.



- Feed the paper through the printer mechanism as shown below, using the menu/right arrow key to advance the paper



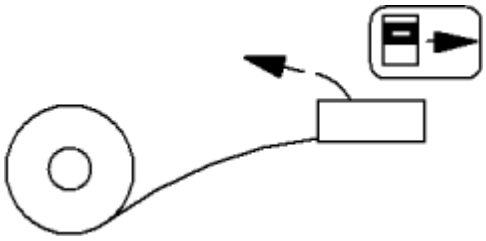
- Feed the paper so that approximately 10 cm is showing through the printer.
- Fold the corner, nearest the display, down towards the printer and lower the inner stainless steel paper shield as shown below.



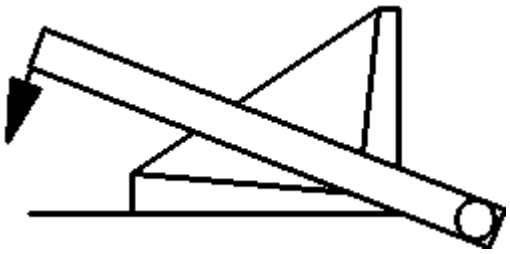
- Unfold the corner and then lower the smoked acrylic lid down over the paper.
- Use the menu/right arrow key to advance the paper through to the left hand side of the controller.

2.3.2 Changing paper on the STP411 printer

- Lift the smoked acrylic lid and the inner stainless steel paper shield, removing the old paper roll if any, and load the thermal paper onto the MRV paper spindle. Feed the paper through the printer mechanism as shown below, using the menu/right arrow key to advance the paper



- Feed the paper so that approximately 10 cm is showing through the printer.
- Fold the corner, nearest the display, down towards the printer and lower the inner stainless steel paper shield as shown below.



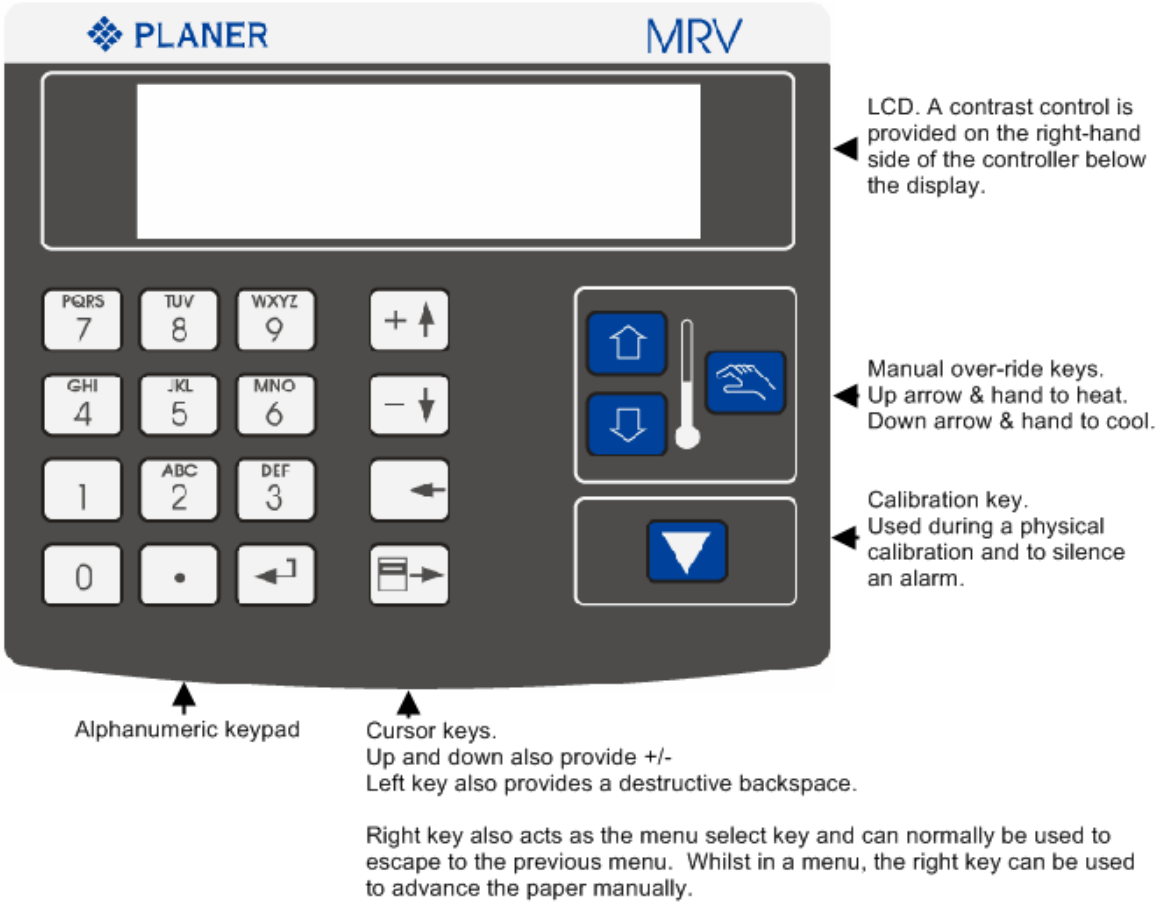
- Unfold the corner and then lower the smoked acrylic lid down over the paper.
- Use the menu/right arrow key to advance the paper through to the left hand side of the controller.

Section III

3 Setting up the MRV system

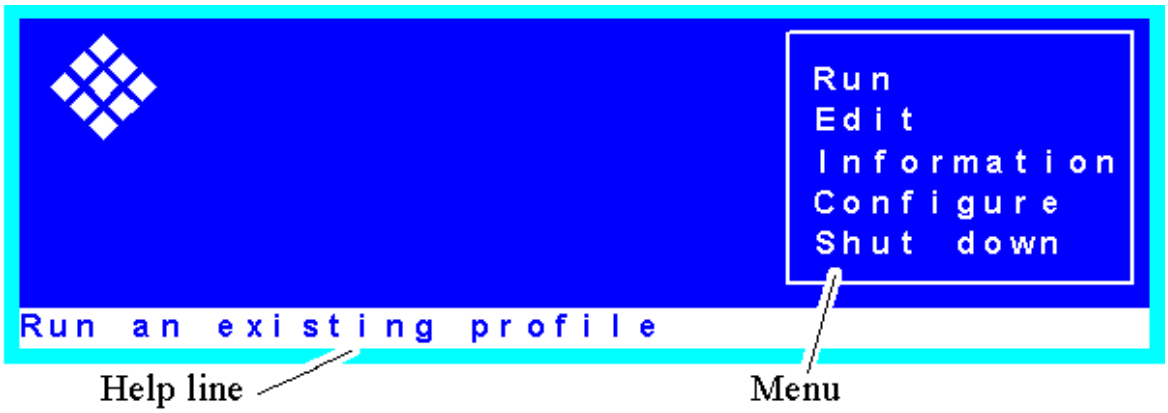
3.1 Guide to the MRV Controller keys

A guide to the keys used on the MRV Controller is given below.



Where alphabetic characters are required, press the key to cycle through the options. e.g. multiple presses on key 2 will give ABCabc2. Pressing another alphanumeric key, or the right arrow key, will select the current character and advance to the next position. Note that the cursor automatically advances when the last option, the digit, is reached. To enter a space, use the right arrow key and to delete a character use the left arrow key.

3.2 Screen layout



The menu offers a set of options which may be selected by using the up/+ and down/- keys until the required option is highlighted. The enter key should then be pressed to select the option. In most cases when the menu is not visible, pressing the menu select key will return to the last menu.

3.3 Configuring the system

After installing the MRV System, the controller must be configured.

Note that the passwords default to 1111 when first installed.

- Select **Configure** from the main menu.
- Select **Set Time** and **Date** and enter the correct time and day using a 24 hour clock and entering the date in dd/mm/yyyy format.
- Select **Chamber/Service** and then **Select Standard Chamber**. Choose the chamber matching your system. Then select **Exit** to return to the Configuration menu.
- Select **Set Passwords**, and then select **Passwords** 1 to 3 to create new security codes for these levels.
  - o Level 1 users can run programs from the MRV controller or a PC.
  - o Level 2 users can also create and edit profiles, print historic run data and system reports.
  - o Level 3 users can also reconfigure the system.
- Use **Exit** to return to the main menu.

3.4 Calibrating the system

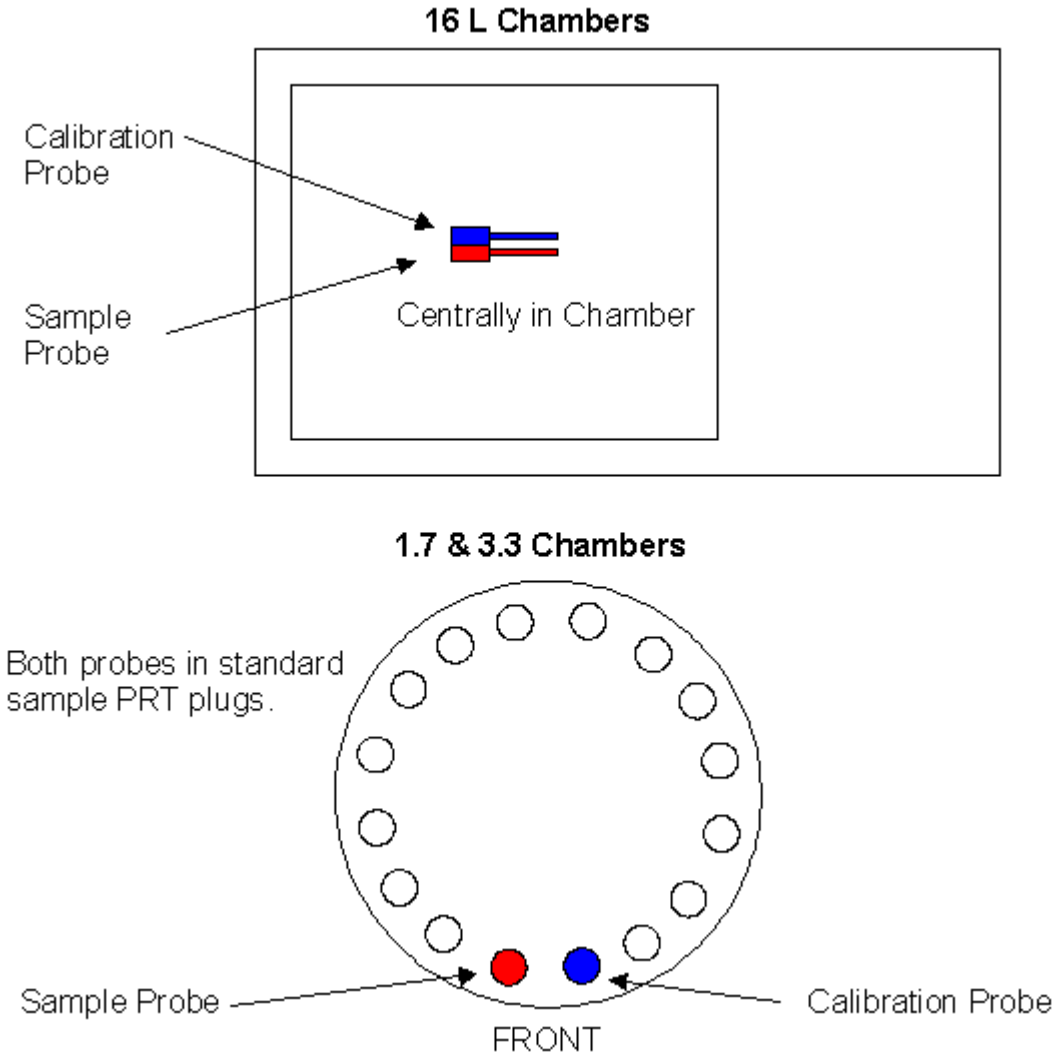
The system will have been factory calibrated when first supplied. However, the system should be regularly calibrated to ensure its continued accuracy.

Two methods of calibration are available: Manual Calibration 20 or Physical Calibration 21.

Both systems require the use of an additional temperature measurement device with an accuracy better than ±0.05 °C; this is referred to as the calibration probe.

Note

Before calibration, the Sample probe and the Calibration probe must be positioned as shown below.



3.4.1 Manual calibration

- Select the **Configure | Calibrate | Manual Calibration** menu option and set the Actual, Chamber and Sample temperatures to 0 °C.
- Return to the main menu and create a profile comprising a single hold at 0 °C for 10 minutes. See Section 2 - Entering a Profile.
- Run the profile. See Starting the run 26.
- After approximately 8 minutes into the run, record the temperature displayed by the Calibration probe and the Sample temperature as displayed by the MRV.

- Return to the main menu and select the **Configure | Calibrate | Manual Calibration** menu option again.
- Set the Actual temperature to that displayed by the Calibration probe, set the Chamber temperature to 0 °C and set the Sample temperature to that recorded during the hold.
- The system will then calculate the correct adjustments up to a maximum of 2.0°C

3.4.2 Physical calibration

> ***Note***
>
> This method of calibration is not recommended for field use.

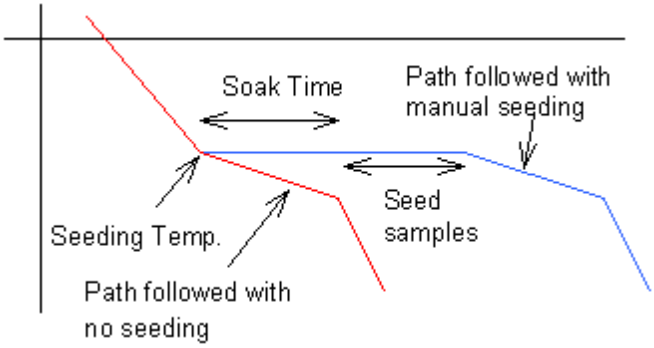
- Select the **Configure | Calibrate | Physical Calibration** menu option.
- Following the screen prompts, enter the actual temperature at which calibration is to be performed.
- Follow the on screen instructions to calibrate the system.
- When the calibration cycle is complete, the system will then calculate the correct adjustments up to a maximum of 2.0°C

3.5 Entering a profile

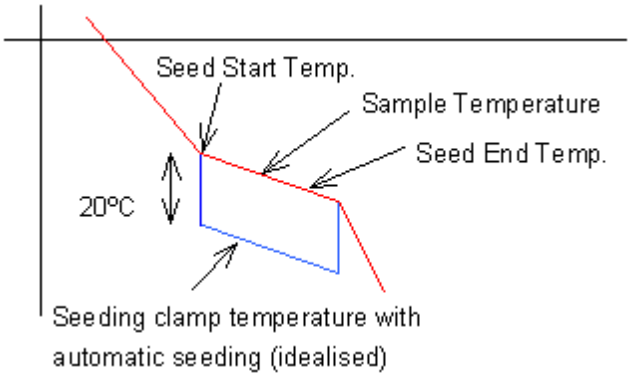
The profile defines the temperature-time profile which the system will follow when freezing your samples. In addition, different types of seeding can be entered which are defined below.

- From the main menu select **Edit**.
- Select the **Create Profile** menu option. If there are no free slots available (10 profiles can be stored) you will first need to free a slot by selecting **Remove Profile** and then selecting an unused profile for deletion.
- If you want to create a new profile from scratch, select **Manual Entry**. If you want to create a copy of the last profile you ran, select **From Last Run**. In this case a new copy will be created with the name CFG007951, and you will need to select **Edit Profile** to make the required changes.
- The MRV will now take you through each step in turn. If you make any errors, either continue to the end and then select **Edit Profile** at the end, or when asked whether you want to add a profile step, select **No** and then select **Edit Profile**.
- Enter the name of the profile.
- Select whether you want to enter the start temperature of the profile now or when the profile is actually run. If you select the start temperature at runtime, the person initiating the run will be asked to enter the start temperature. Alternatively the start temperature can be entered now.
- Select whether you want Seeding enabled and the type. Two types of seeding are available.
  - **Manual seeding**: this requires you to define a temperature and soak time. When the chamber reaches the seeding temperature, it suspends the profile and holds the chamber at the seeding temperature for the period defined as the soak time. After this period, the controller will prompt

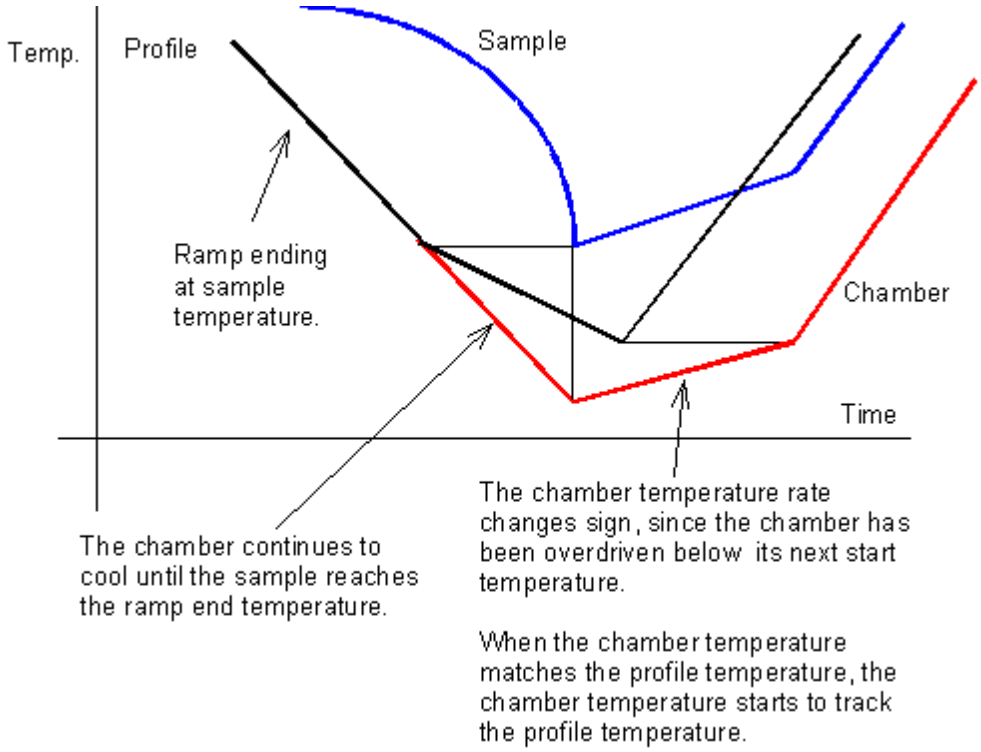
the operator that the samples are ready for seeding. After seeding, the operator presses a key on the MRV Controller and the profile continues as normal.



- **Automatic seeding**: This requires an MRV Autoseeder and a start and end temperature must be defined. During the profile run, when the chamber temperature falls below the seeding start temperature, the MRV Autoseeder is switched on. Once the temperature falls below the seeding end temperature, the MRV Autoseeder will switch off.



- Enter each profile step in turn. There are two types of step available.
  - **Ramps**: these require a rate of change and an end temperature. When running the chamber will change temperature at the defined rate until either the Sample or Chamber temperature, depending on which was selected, reaches the defined end temperature. The next step in the profile is then implemented. NB. rates which are cooling should be entered as negative values. However, if you enter the sign incorrectly, the MRV will automatically correct the sign at the end of the profile entry to ensure that the end temperature of each step can be reached. If the Sample is chosen as the end temperature, the Chamber will continue to cool (or heat) until the target is reached as shown in the diagram below



> ***Note***
>
> Never program a hold directly after ramp which ends on the Sample temperature. This is because the hold operates at the chamber temperature which is not defined in this circumstance

  - o **Holds**: these hold the Chamber at the defined temperature for the desired period of time before moving onto the next step.

- Continue adding steps until the profile is fully defined.
- Once a profile has been created, the **Edit | Edit Profile** menu option can be used to make changes.
- To view a profile, either on the display or printer, select **View Profile** and then select the required destination.

Section IV

4 Freezing samples

4.1 Starting the run

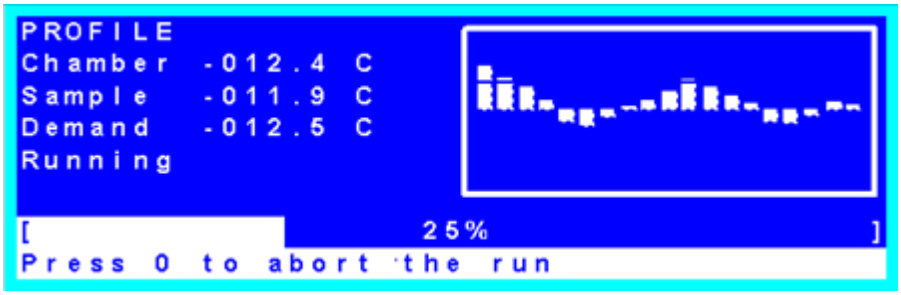
> ***Note***
>
> Never leave the MRV System unattended while running a profile.

- Make sure that there is sufficient liquid nitrogen to complete the freezing profile.
- It is normal to load the samples after the chamber has reached the start temperature.
- Select **Run** from the main menu.
- If you intend to run from a PC, select **Control from PC** and then initiate the profile from the PC using the Planer plc application - DeltaT. Refer to the DeltaT documentation for details. If running directly from the MRV Controller select **Run profile**.
- Enter a name to identify the run.
- If this profile has been designed with a runtime start temperature, enter the required temperature.
- The chamber will start to be heated or cooled until the start temperature is reached.
- When the start temperature has been reached and has stabilised for 3 minutes, the MRV Controller will beep and prompt you.

4.2 Loading the samples

> ***Warning***
>
> Always use tongs or wear cryogloves when handling cold objects.

- Load the samples. This will depend on the freezer furniture fitted to your Chamber. Note that during this time the beeping can be cancelled, without starting the run , by pressing any key other than the Enter key.
- After loading all of the samples, it is advisable to wait 5 minutes to allow the chamber to re-stabilise before pressing enter on the MRV Controller to start the run.
- The profile will now run, displaying the percentage progress of the entire run at the bottom of the display and the real time temperatures on the left. The right-hand side of the display will show a graphical representation of the control accuracy. Except at rate changes, this should show a narrow band through the centre of the graph.



- If Manual Seeding has been selected the MRV Controller will prompt you during the run when the samples are ready for seeding. after the defined soak period.
- When you are ready to resume the profile, press enter.
- At the end of the run , the MRV Controller will prompt you when the samples are ready for removal. The MRV Controller holds the chamber at the end temperature until you confirm that all samples have been removed.

4.3 Removing the samples

> ***Warning***
>
> Always use tongs or wear cryogloves when handling cold objects.

- Remove the samples (and furniture if appropriate).
- Press enter on the MRV Controller when complete.

> ***Note***
>
> Switching off the chamber at sub-zero temperatures may cause serious damage to the equipment.

- When prompted to return the Chamber to room temperature select **Yes**. You should only reject this option if you intend to run another profile starting at a very low temperature.
- When the chamber has warmed, the MRV Controller will return to the Run menu.

4.4 Switching off the system

> ***Note***
>
> - Switching off the chamber at sub-zero temperatures may cause serious damage to the equipment.
> - In normal use, if connected to a liquid nitrogen cylinder, allow the hose to thaw and warm up to room temperature before shutting off the valve on the cylinder.

- Return to the main menu.

- Select the **Shut down** menu option.
- Switch off the system using the mains switch on the Chamber's control panel when the MRV Controller indicates that the system has shut down and may be switched off.

4.5 Unexpected reset

If power is removed from the MRV system, the LCD display will go blank but the internal controller will continue to operate. The alarm will sound to indicate that the internal controller is operating under internal battery power. The alarm can be silenced by pressing the CAL key.

During this time, the solenoid and heater will not operate, but the controller will continue to monitor the chamber temperatures to ensure that it can resume the profile upon return of mains power.

If power resumes within 1 minute, the MRV will detect the presence of the run and, after informing you of the unexpected reset, continue to monitor the run.

If power is removed for more than 1 minute, the run will be automatically terminated.

Section V

5 Reviewing information

The MRV Controller allows a number of reports to be printed or viewed on screen. To produce any of these reports select **Information** from the main menu.

5.1 To print an old run

- Select **Print Run Data**.
- Select the file you wish to review. The 5 last runs can be selected.

5.2 To print the last run

❖ Either select **Print Run Data** as described in To print an old run 30, or if a power failure occurred, select **Retrieve Last Run**. This produces a printout from the system's backup memory.

5.3 To print a system report

- Select **Print System Report**. This gives a full system configuration report.

5.4 To review system details on screen

- Select **System Details**.
- From the menu select the information you wish to view; i.e. the controller's firmware version, calibration details or the current temperatures

Routine maintenance and troubleshooting

Section VI

6 Routine maintenance and troubleshooting

6.1 Routine maintenance

> **Warning**
>
> - Disconnect the mains supply before cleaning.
> - Before cleaning, turn off any connected liquid nitrogen cylinders or depressurise a Planer Pump and Dewar by opening the red pressure-relief valve.
> - Ensure that the system has been cleaned as necessary to ensure that it is safe to handle and service and is free from any biohazard or toxic materials.

> **Note**
>
> The 1.7 chamber is fitted with a long platinum resistance thermometer (PRT). In order to prevent damage to the sensor it is important that the lid is always removed in a vertical, straight line until the stainless steel centre tube is clear of the chamber. Do not rotate or twist the lid while removing, or the chamber PRT may be damaged.

- Clean the system periodically with a cloth containing water and detergent or IPA (alcohol).
- Check all nitrogen fittings periodically for any signs of leaks or damage.
- Check all mains cables and interconnecting cables for signs of damage

> **Warning**
>
> - The MRV System is classified as Class I equipment and must be earthed for safe operation
> - Repetition of potentially damaging high-voltage flash tests should be avoided.

- The MRV System and the mains connecting cord should be regularly checked by suitably trained personnel, using a Portable Appliance Tester or similar equipment, to ensure adequate earth bonding.
- The earth continuity of the mains installation must also be regularly inspected by the person responsible for the safety of the installation.

6.2 Troubleshooting

6.2.1 The run has stopped prematurely

A run could stop prematurely if, for example, the liquid-nitrogen supply is used up, there is a power failure, or the controller cannot respond to the program. The first task is to protect the samples if at all possible.

To protect your samples

- If you can hear the solenoid valve operating normally, LEAVE THE MACHINE RUNNING; the

program will probably finish correctly.

- If the solenoid valve has stopped for more than five minutes, estimate the temperature of the samples by:
  estimating the amount of time that the program has been running, or
- reading the temperature off the display or chart recorder or from DeltaT, or
- removing the sample PRT or its plug and inserting a thermometer (suitable for use to -200ºC) into the chamber.
- If the samples are above their freezing point, allow them to warm up.
- If the controller is not responding, but mains power and liquid nitrogen are available and the samples are below their freezing point, press the Manual Override Key and the Manual Cool key together on the front of the MRV Controller to go to the final temperature.
- When you have removed the samples, press the Reset button on the back of the MRV Controller.

6.2.2 The chamber will not cool

> ***Warning***
>
> Refer to the safety instructions 3 at the front of this manual.

- Check the nitrogen supply.
- Check the fuses.
- Check that the pump filter is not blocked by ice (if using a Planer pump).

6.2.3 The chamber will not heat

> ***Warning***
>
> Refer to the safety instructions 3 at the front of this manual.

- Check the fuses.
- Check that the Chamber did not overheat (wait until the thermal cut-out resets).

6.2.4 No response from the system

> ***Warning***
>
> Refer to the safety instructions 3 at the front of this manual.

- Check the mains supply.

- Check that the lid of the chamber is seated properly.
- Check the fuses.
- Press the Reset button on the back of the MRV Controller.

6.2.5 The display is blank

- If the display is illuminated but is entirely white or blue adjust the contrast wheel which is located on the right-hand side of the MRV Controller.

6.2.6 Returning for service

Should the system or any part of the system need to be sent back to Planer plc for repair, or if the system is to be inspected, maintained or repaired on-site by Planer plc personnel, the Safety Declaration form described in Safety Declaration 41 must be completed.

6.3 Disposal

- Do not dispose of with general waste.
- Ensure that the system has been cleaned as necessary to ensure that it is safe to handle and service and is free from any biohazard or toxic materials.

Section VII

7 Additional information

7.1 Specifications

7.1.1 System specifications

Accuracy	±(0.3 + 0.005 x TM) °C (where TM is the magnitude of the temperature).
Storage temperature	-10 °C to +50 °C
Storage humidity	5% to 95% relative humidity non-condensing
Operating environment	For indoor use only
Operating temperature	+5 °C to +40 °C
Operating humidity	5% to 90% relative humidity non-condensing
Altitude	up to 2000 m
Pollution degree	Pollution degree 2 (BS EN61010-1)

7.1.2 Controller specifications

Feature	MRV	MRV light
Heating rates	0.01 to 10 °C/min	upgrade required
Cooling rates	-0.01 to -50 °C/min *	-0.01 to -30 °C/min
Temperature range	+40 to -180 °C/min	ambient to -100 °C
Printer	320/640 dot thermal printer STP411 or 832 dot thermal printer LTPV445	upgrade required
PC interface to DeltaT	RS232	upgrade required
Dimensions	80 mm high x 220 mm wide x 350 mm deep	
Weight	2.6 kg approx.	
Display	240 x 64 LCD with CCFL backlight	
Keypad	20 key membrane keypad	
Number of profiles	10	
Steps per profile	32	
Number of stored runs	5	
Maximum profile length	9 hours	

* programmable to -99.9 °C/min.

7.1.3 Chamber specifications

Kryo chamber	320-1.7	360-1.7	360-3.3	520-16 560-16
Weight kg	14.4	14.4	14.7	23
Capacity litres	1.7	1.7	3.3	16
Dimensions mm	200 x Ø150	200 x Ø150	400 x Ø150	320h x 226w x 230d Chamber access 217 x 217
0.25 mL straws	60	60	60	608 horizontal 250 vertical
0.5 mL straws	45	45	45	608
2 mL ampoules	30	30	60	726
50 cc blood bags	-	-	-	22
250 cc blood bags	-	-	-	11
500 cc blood bags	-	-	-	11
Power requirements (see note) Includes MRV Controller	115 V~ ±10% 50/60Hz 10 A	115 V~ ±10% 50/60Hz 10 A	115 V~ ±10% 50/60Hz 10 A	115 V~ ±10% 50/60Hz 15 A
	230 V~ ±10% 50/60Hz 5 A	230 V~ ±10% 50/60Hz 5 A	230 V~ ±10% 50/60Hz 5 A	230 V~ ±10% 50/60Hz 10 A

Note. The Series 300 & 500 systems are designed to be connected to an Installation Category (over-voltage category) II mains supply as defined in IEC 60364-4-443

7.1.4 Fuses

Warning

- There are no user replaceable fuses.
- Internal fuses should only be replaced by suitably trained service personnel.
- For continued protection against electric shock, fuses must only be replaced with fuses of the same type and rating.

Kryo 320-16, 360-1.7 and 360-3.3

	F1 and F2	F3
115V ~ model	T 10A H 250V (Planer # FL013299)	T 5A L 250V (Planer #FL013801)
230 V~ model	T 5A L 250V (Planer #FL013801)	T 2.5A L 250V (Planer #FL012026)

Kryo 520-16 and 560-16

	F1 and F2	F3	F4
115V ~ model	F 15A H 250V (Planer #FL011916)	F 12A L 250V (Planer #FL011915)	T 6.25A L 250V (Planer #FL011911)
230 V~ model	F 10A L 250V (Planer #FL011913)	F 6A L 250V (Planer #FL011912)	T 3A L 250V (Planer #FL011909)

7.2 Menu structure

- **RUN password level 1**
  - o Run Profile
    - Run a profile directly from the MRV Controller
  - o Control from PC
    - Allow the controller to be run from DeltaT on a PC

- **EDIT password level 2**
  - o Create Profile
    - Allows entry of a new profile or a copy of the last run profile
  - o View Profile
    - View or print a profile
  - o Edit Profile
    - Modify existing profiles
  - o Remove Profile
    - Delete unused profiles

- **INFORMATION password level 2**
  - o Print Run Data
    - Select and print an old run
  - o Retrieve Last Run

    - Print last run from backup memory
  - Print System Report
    - Print a System Report
  - System Details
    - Display controller firmware version, calibration details and current temperatures

- **CONFIGURE password level 3**
  - Set Time and Date
    - Adjust the real-time clock
  - Set Passwords
    - Modify security codes
  - Calibrate
    - Calibrate the system
  - Chamber/Service
    - Select chamber and select service functions

7.3 Fitting an alarm

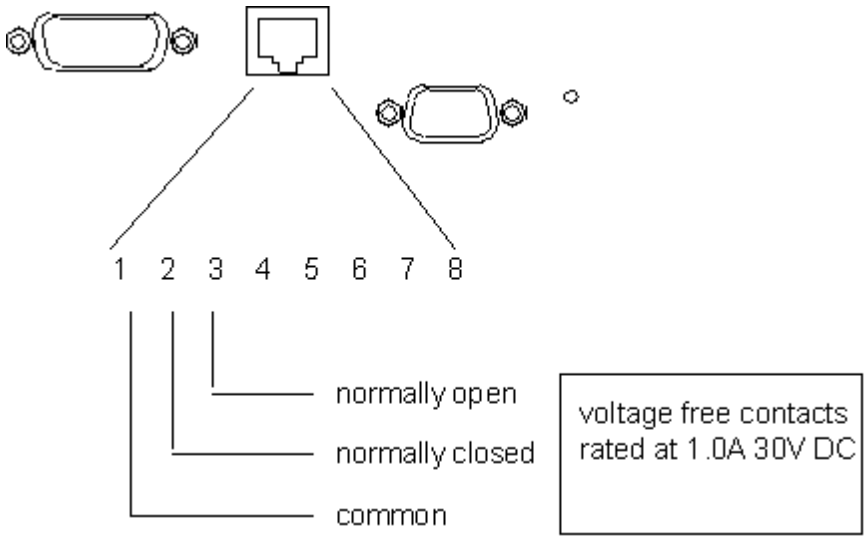
Warning

- Any device connected to the MRV Controller Autoseeder/Alarm connection must comply with IEC950
- Do not use the alarm for any safety critical application.
- Do not exceed the maximum rating of the connector of 1.0A at 30VDC

Note

- Never connect any device to pins 4, 5, 6, 7 or 8 of the Autoseeder/Alarm connector.
- All cabling should be fully screened and should not exceed 2m in length. Lengths > 2m may require special provisions to prevent RFI affecting the performance of the MRV System or compromising the EMC compliance of the system.

The rear of the MRV Controller is fitted with an RJ45 connector (Alarm/Autoseeder) which is normally used for fitting the MRV Autoseeder. If the MRV Autoseeder is not used, this connector can be used for connecting to an external alarm. The voltage-free relay contacts on pins 1, 2 and 3 may be used. The diagram below shows the connection details of this connector.



MRV alarm connection details

7.4 Safety Declaration

For the inspection, maintenance or repair of laboratory equipment to be performed by Planer plc personnel. The Health and Safety at Work Act (1974) and the Control of Substances Hazardous to Health (COSHH) regulations (1998) include specific requirements that workers are not put at risk by handling items that may be contaminated, for example, as a result of their use in health care or a laboratory. The requirements apply in the widest possible sense and place responsibility on the owner and the manager of the laboratory as well as the employer of the individual concerned.

In the case of maintenance or repair of laboratory equipment current DHSS recommendations support the issue of a certificate/statement of decontamination prior to submitting the equipment for servicing. The Declaration of Contamination Status 42 sheet must be completed, signed by a competent authority and returned to Planer plc before the service engineer arrives at the laboratory, (or before equipment is received at the factory when returning for repair).

A second copy of the declaration, duly completed and signed, should be affixed to the equipment to be serviced. For emergency repairs on site the engineer will request that the declaration is completed on his arrival at the laboratory. It is our policy that unless the above actions are taken the service engineer must refuse to perform maintenance or repair work. In this event a charge will be made to cover the costs of the visit. Such charges are not included in an existing preventative maintenance contract.

7.4.1 Declaration of Contamination Status

Prior to the Inspection, Servicing, Repair or Return of Medical and Laboratory Equipment

To: Planer plc. 110 Windmill Rd., Sunbury, Middlesex, TW16 7HD	Make and Description of Equipment:
	Serial No:
Authority's Reference or Order Number:	Planer's Service Order or Returns Authorisation Reference.

Tick box A if applicable. Otherwise complete all parts of B, providing further information as requested or appropriate.

A ☐	This equipment/item has not been used in any invasive procedure or been in contact with blood, other body fluids, respired gases, pathological samples or substances hazardous to health. It has been cleaned in preparation for inspection, servicing, repair or transportation.
B	1. Has this equipment/item been exposed internally or externally to hazardous materials as indicated below? Provide further details here: YES/NO Blood, body fluids, respired gases, pathological samples. YES/NO Other biohazards. YES/NO Chemicals or substances hazardous to health. YES/NO Other hazards.
	2. Has this equipment/item been cleaned and decontaminated? YES/NO Indicate the methods and materials used. If the equipment/item could not be decontaminated, please indicate why. Such equipment must not be returned/presented without the prior agreement of the recipient whose reference or contact name must be given above.
	3. Has the equipment/item been suitably prepared to ensure safe handling/transportation. YES/NO

I declare that I have taken all reasonable steps to ensure the accuracy of the above information in accordance with HSG(93)26.

Authorised signature:	Unit:
Name (printed):	Department:
Position:	Tel. No.
Date:	Fax No.

Index

- A -

- C -

- D -

- E -

- F -

- I -

- K -

- L -

- M -

- P -

- R -

- S -

- T -

- U -

- V -

MA007944 Issue 15

Series 300 & 500 Operator's Manual

Planer plc. 110 Windmill Rd., Sunbury, Middlesex, TW16 7HD, UK