

PLANNER

**Kryo 1060
(180 & 380)**

OPERATOR'S MANUAL

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Kryo1060 (180 & 380) Operator's Manual

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Planer plc reserve the right to alter products and their specifications without notice.

Notices

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.

All equipment supplied by Planer plc. is subject to a Warranty Agreement and Limited Liability. In addition, software products are not sold but are licensed for use and are subject to a Licence Agreement. Copies of these documents will have been provided with the equipment or as part of the software installation. Please ensure that you read these documents before using the equipment or software. If you cannot locate this documentation, please contact your supplier who will be able to provide you with copies.

The freezer is fitted with a manually-resettable thermal cutout to prevent over heating. This will operate if the chamber is programmed to run above +40.0°C and will require a Service Engineer to reset it.

Planer plc reserve the right to alter products and their specifications without notice.

Symbols Used in this Manual



Failure to follow these instructions could result in personal injury.



Failure to follow these instructions could result in damage to equipment or samples.



This indicates first-aid advice.

Symbols Used on the Equipment



Caution: Refer to this manual and accompanying documentation



Mains supply ON



Mains supply OFF



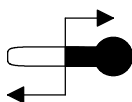
Alternating current



RUN key



STOP key



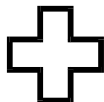
COOL manual override

HEAT manual override

SAFETY PRECAUTIONS

IT IS IMPORTANT TO READ THIS SAFETY NOTICE PRIOR TO OPERATING ANY EQUIPMENT

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.

Safety



Failure to comply with these instructions could result in personal injury

- Operating the system in a manner not specified within this manual or under conditions outside of the specifications, see Appendix A, may result in the protection offered by the equipment being impaired.
- Never leave a freezer unattended when running a program.
- 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. A typical run from 20 °C to -100 °C,

taking 75 minutes, will release approximately 85 m³ of nitrogen gas.

- 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.
- The exhaust port/ports must be connected to ducting that will route the exhaust gas away from any spaces where nitrogen build up can occur. Under no circumstances should the exhaust duct be connected so that the exhaust is released into a confined space.
- 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 -196°C 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.

- Ensure that the delivery pipe connections are secure and leak-free before supplying liquid nitrogen to the freezer.
- Liquid nitrogen pressure must not exceed 2.0 bar (30 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 9-way plug on the Controller is only for connecting to the RS232 serial port of a computer which complies with IEC950.
- The AUX socket on the Controller is to be used only for calibration by qualified service personnel. It must not be connected to any other equipment.
- The Sample PRT socket inside the chamber' 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. 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.

EMC PRECAUTIONS



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 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 stainless steel chamber enclosure.
- ◆ 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.

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CHAPTER 1

An Introduction to the Kryo1060

About this Manual

Welcome to the Kryo1060, a system that provides precision cooling and heating of biological specimens.

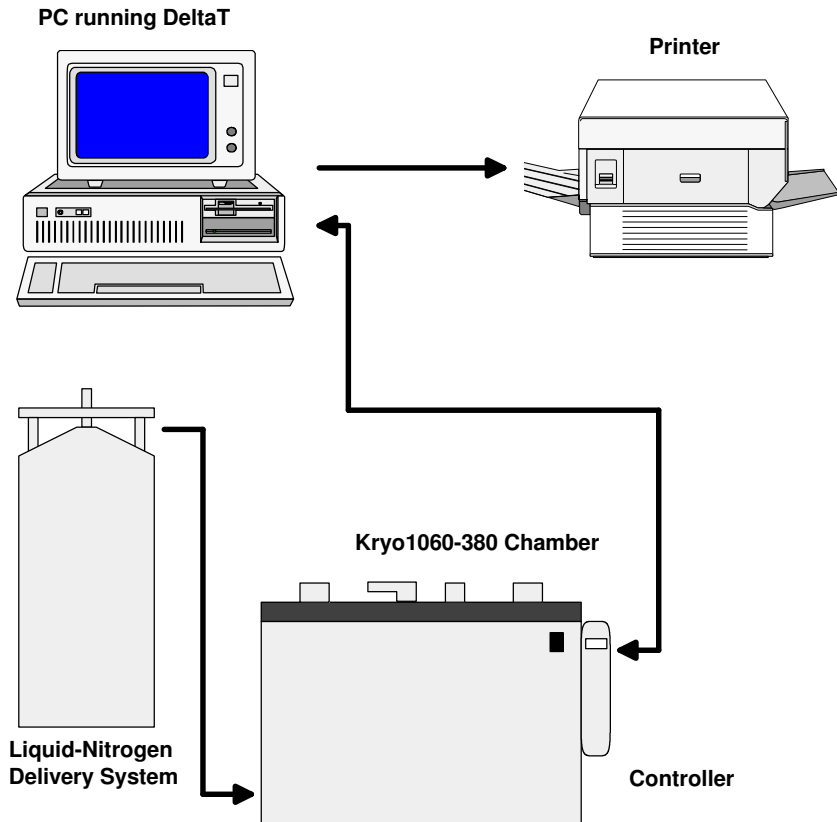
This manual is aimed at the Kryo1060-180 and Kryo1060-380 users who are responsible for operating or installing the system.

The manual consists of a number of chapters and appendices:

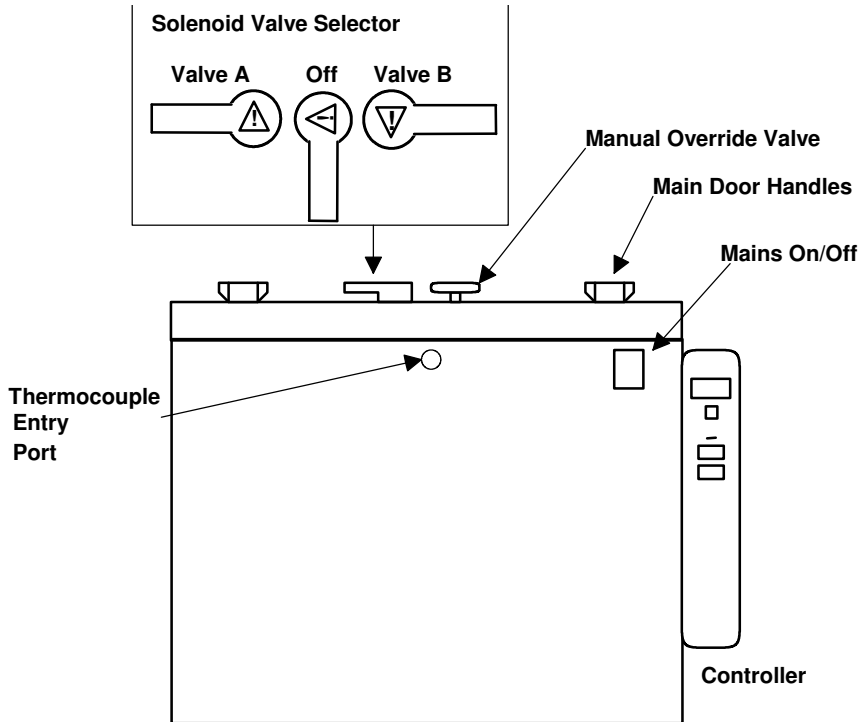
- The remainder of this chapter, Chapter 1, gives a description of each of the major components in the Kryo1060 system.
- *Chapter 2: Installing the Kryo1060 System* is useful if you are installing the system for the first time.
- *Chapter 3: Operating the Kryo1060 System* describes how to operate the equipment.
- *Chapter 4: Troubleshooting* is useful if you experience difficulties with using or setting up the equipment. If you have a problem, you should always refer to this chapter before calling your supplier.
- *Appendix A: Kryo1060 Specifications* gives a full list of the system specifications, including maximum temperature ranges, freezing rates, etc.
- *Appendix B: Spare Parts* gives a listing of Kryo1060 parts, together with part numbers. Refer to this appendix if you need to order new parts.

The Kryo1060 Components

The major components of the Kryo1060 system are shown in the following diagram. The diagram shows the Kryo 1060-380 freezer.

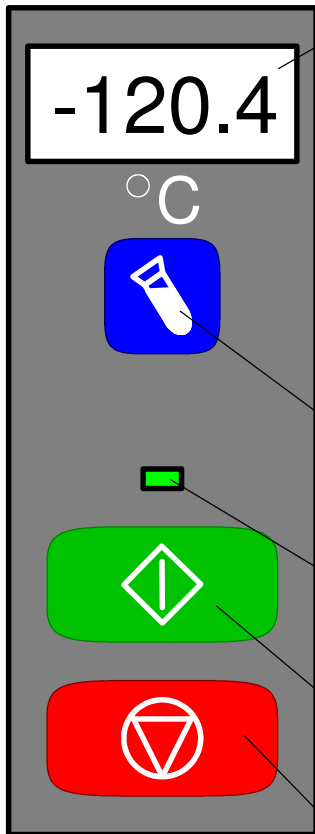


Kryo1060 Chamber Controls



The diagram shows the Kryo1060-380 freezer.

Controller - Front Controls



Chamber temperature

(or sample temperature while sample button is depressed).
EEEE indicates that the chamber or sample PRT is faulty. A profile can be run without a working sample PRT but the chamber PRT must be in full working order.

- - - - indicates a stuck button.

S indicates that samples are ready for seeding if this feature is selected.

Sample temperature button

Keep depressed to display the sample temperature.

Indicator light

Lit when running a program.
Flashes for operator attention.

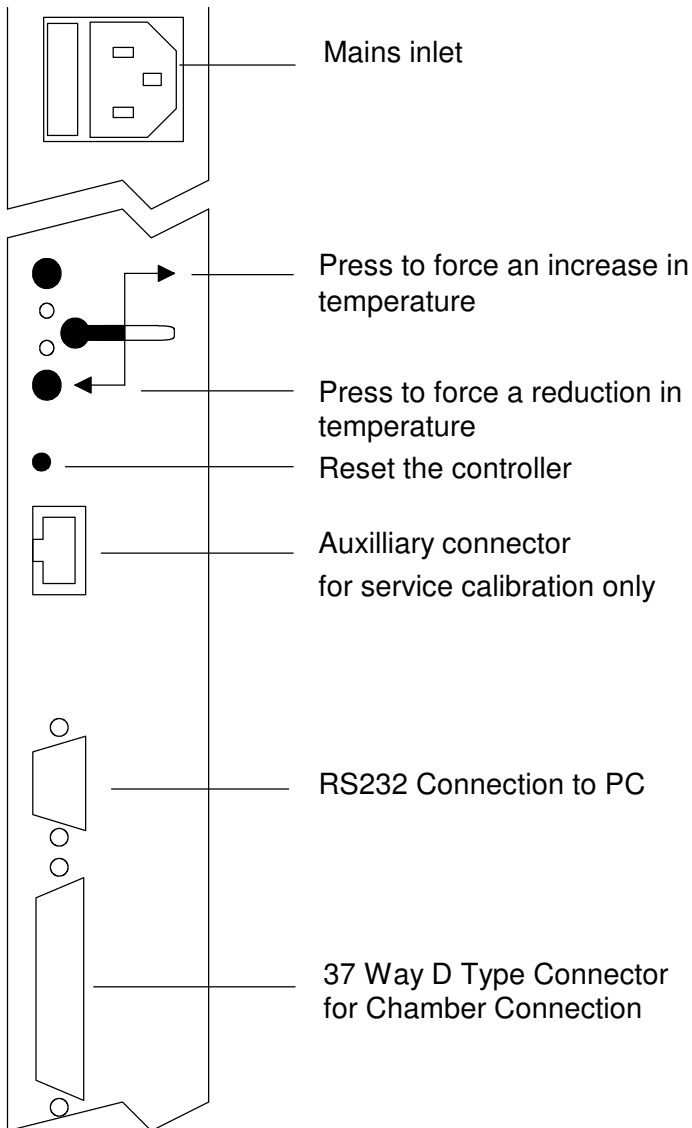
Run

Press to start a profile or after manual seeding

Stop

Press to stop a profile

Controller - Rear Controls



The Kryo1060 Freezer

The Kryo1060 freezer has many important design features:

Precision temperature control - Accurate linear cooling and heating is achieved by the controlled injection of atomised liquid nitrogen into the chamber and the pulsing of a heater. A fan system and well-designed ducting ensure uniform circulation of nitrogen gas past the specimens and a uniform temperature throughout the freezing chamber.

Precision temperature monitoring - The chamber temperature is measured by a platinum resistance thermometer (PRT). Optionally, a second PRT can be used to record the temperature of the samples. Both of these temperatures can be displayed as graphs within DeltaT.

Stainless steel construction - The chamber and other parts are made from high-quality stainless steel for durability and cleanliness.

Programmable controller - The freezer's operation is controlled by a microprocessor-based controller. The controller stores the program that specifies start temperature, freezing rates, etc. in non-volatile memory. The program can be retained in memory for several years, even if the freezer's power is disconnected.

You can load a new program by using the DeltaT software on a PC.

Stand-alone operation - The freezer can store a program from a PC and can run that program independently of the PC.

Cool/heat switches - Push-button switches on the rear panel of the Controller allow manual control of the cooling and heating functions.

Dual Solenoids - Two solenoid valves are fitted to provide backup should a failure of one or other occur. A Solenoid Valve Selection lever on top of the freezer electrically connects the selected solenoid valve and isolates the faulty valve from the liquid nitrogen supply.

Manual override valve - In the event of a total control failure, a manual override valve is provided which can be used to manually introduce liquid nitrogen into the chamber.

Safety features - The lid activates an interlock switch to switch off the heater, fan and liquid-nitrogen solenoid valves when it is opened. Safety from overheating due to sensor failure is provided by a thermal cutout. Relief valves set to 50psi (3.4bar) are fitted on the input side of the solenoid valves.

Liquid-Nitrogen Delivery System

It is normal to use a 22psi Dura-Lo or Dura-Tech cylinder to provide the supply of liquid nitrogen to the freezer. The cylinder is filled by the supplier and, being self-pressurising, does not require a pump to deliver the liquid nitrogen to the freezer.

Note The freezer must not be used with supply pressures in excess of 30psi.

Personal Computer (PC)

The optional DeltaT software on a PC enables you to create and store profiles. You can run one of these profiles from the PC and view the recorded chamber and sample temperatures graphically. All results from the run are stored on the PC for traceability purposes.

Any profile you run from the PC can be stored in the freezer's memory. This enables you to rerun the program directly from the freezer, without having the PC connected.

Printer

If you are using a PC, it is strongly recommended that you connect a printer. You can use the printer for tasks such as printing programs and graphs.

CHAPTER 2

Installing the Kryo1060 System

This chapter describes how to unpack and install the Kryo1060-380 system.

Preparation

The freezer is intended to be floor mounted on a sturdy surface able to carry the weight of the freezer easily.



It is important to ensure that there is adequate airflow around the Kryo1060 for cooling purposes. The underside of the freezer must be kept clear to ensure adequate airflow to and from the motors and there must also be a gap of at least 40mm between the Kryo1060-380 and any wall or other piece of equipment.

Ensure that access is provided to the mains inlet at the side of the freezer.

Power sockets are required for the freezer, chart recorder and PC (if using DeltaT). Ensure that sufficient power sockets are nearby.

Unpacking the Equipment

The Kryo1060 is normally packed standing on a wooden pallet. The freezer itself is provided with castors on its underside which will permit easy movement into its final location. The freezer should be positioned as close as possible to its final location whilst still secured to the pallet. A fork lift truck or similar handling equipment will be required at this stage.



Lifting equipment should only be used by suitably qualified persons trained in its use. Ensure that the equipment is suitable for supporting the weight of the Kryo1060. Refer to local Health and Safety regulations before proceeding.

1. As described above, position the freezer as close as possible to its final location whilst still mounted on its pallet.
2. Using a fork lift truck or similar equipment lift the freezer from the pallet and carefully lower onto the floor.



The legs of the fork lift truck must run through the channels provided on the underside of the freezer and protrude past the far end of the freezer before lifting. NB. These channels are not physically secured to the freezer body and care must be taken to prevent the freezer from moving off the channels.

3. From inside the Kryo1060 chamber, remove the following items:
 - Operator's Manual
 - Liquid-nitrogen delivery hose
 - Mains supply cables
 - Serial control cable
 - Sample PRT
 - Exhaust-duct adapters (1 for the 180; 2 for the 380)
 - Spare-fuse pack
4. Close the lid and latch it by pushing the two handles downwards.
5. Wheel the freezer into its final location.
6. Using an 8mm AF spanner, unscrew the feet positioned next to the two front castors until the feet just begin to take the load of the freezer and prevent the system from sliding.

Installing the Freezer

► Connect the freezer

1. Check that the mains voltage rating, shown on the right-hand side panel of the freezer, is correct for the local voltage. If incorrect, contact your supplier and do not continue to install the freezer.
2. Connect the delivery tube to the rear of the freezer. The freezer is fitted with a 3/4" UNF male nipple.
3. Connect the other end of the delivery tube to the liquid nitrogen tap by using an appropriate adapter and observing the manufacturer's instructions.



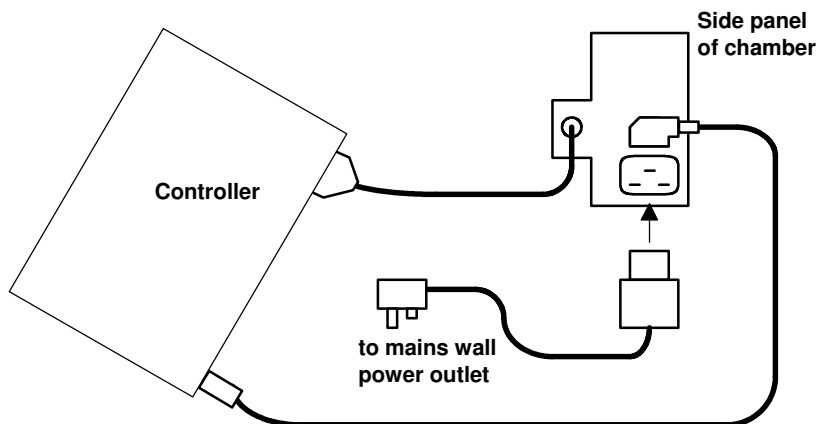
Liquid nitrogen pressure must never exceed 2.0 bar (30 psi) and the liquid nitrogen supply must be fitted with a tap or other means of shutting off.



Wear protective clothing, including cryogloves and goggles.

4. Carefully open the liquid nitrogen tap whilst checking for leaks. Rectify as necessary.

5. Connect the mains lead from the Controller Power outlet on the side of the freezer to the mains inlet on the Controller.



6. Connect the 37 way plug from the Kryo1060 side panel to the rear of the Controller.
7. If appropriate, connect the serial cable (9F-9F one-to-one connections) between the RS 232 port on the rear of the Controller to the PC's serial port, using a 9M-25F adaptor if necessary. Retain the ESD cover for future use if the cable is subsequently removed.
8. Fit the plastic elbows to all the exhaust ports at the rear of the freezer. Direct the exhaust gas to your own exhaust ducting. The Kryo 1060-180 has one exhaust port whereas the Kryo 1060-380 has two ports.



The ports must be connected to ducting that will route the exhaust gas away from any spaces where nitrogen build up can occur. Under no circumstances should the exhaust duct be connected so that the exhaust is released into a confined space. Refer to the *Safety* section at the front of this manual for details on fitting oxygen monitors

9. Ensure that the mains switch on the front of the freezer is in the off position 'O'.
10. Connect the mains power cable to the Mains Inlet on the side of the freezer and then plug into a suitable wall power outlet.

CHAPTER 3

Operating the Kryo1060 System

This chapter describes how to operate and maintain the equipment on a day-to-day basis.

Freezing Samples

The Procedure to Follow



Never leave the Kryo1060 freezer unattended while running a profile.

► Start the run

1. Switch on the freezer.
2. If you are using a Dura-Tech or Dura-Lo cylinder, make sure that the liquid-nitrogen supply tap is open.
3. If you are using DeltaT, run the profile. Otherwise, press the RUN button on the front panel of the freezer. In both cases the light near the RUN button should go on.
4. Wait for the light to flash and for the bleeper to sound (long flashes, short beeps). This indicates that the profile's start temperature has been reached.

► Load the samples

5. Load the samples into the chamber. (It is normal to load the samples at this point, rather than before the freezer has been switched on.)

6. Attach the sample PRT to the required location.
7. Replace the two inner lids, with the two stainless steel strips positioned down the centre of the freezer and then shut the main door. Press down on the two main door handles until they latch in place.
8. Wait for five minutes to allow the chamber to stabilise at the start temperature.

► **Start the freezing process**

9. Press the RUN button on the front panel of the freezer to start the freezing process. The bleeping should stop and the light should remain on to indicate that the profile is running.

► **Remove the samples**



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

10. The end of the program is signalled by long beeps and short light flashes. Press the STOP button on the front panel. The bleeping should stop and the light should go out.
11. Remove the samples and close the freezer's door.



Wear protective clothing, including boots and an apron, as well as cryogenic protective gloves and goggles.

► **Warm the chamber for the next run**

12. To warm up the chamber, press the RUN button. This causes the chamber to heat up to the start temperature of the previous program. The light should remain on.
13. When the light flashes and the bleeper sounds, load the new samples, as described above.

► **Switch off the freezer**



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

14. Switch off the freezer.

Stopping a Run

At any time, you can stop a run prematurely by pressing the STOP button on the front panel of the Controller.

If you subsequently press RUN, the chamber will heat or cool, as necessary, to reach the start temperature of the program again. The light flashes and the bleeping sounds when the freezer is at the start temperature. Pressing STOP again at this point, will terminate the profile with the chamber left at the normal start temperature.

Shutting Down the System

It is important to ensure that a program is not running, by pressing STOP if necessary, before switching off the Kryo1060. This avoids unnecessary discharging of the backup battery. (see Power Failures below)

Remove all specimens from the chamber.

Turn off the liquid nitrogen tap and then press the manual override cool button at the rear of the Controller to release the nitrogen pressure.

Switch off the freezer.

Power Failures

An integral backup battery allows the profile to continue to run for 1 minute following a loss of mains power, although the solenoid valve and heaters do not operate. If mains power is restored within this period, the system regains control of the chamber temperature. If the power is not restored, the profile terminates.

Dealing with a System Failure During a Run

Although the Kryo1060 freezer has been rigorously designed and tested to provide utmost reliability, it is recognised that a fault could cause a run to stop prematurely.

► To deal with a system failure

1. The first task is to protect the samples if at all possible. If you can hear the solenoid valve operating normally, **LEAVE THE MACHINE RUNNING**; it is virtually certain that the program will be completed correctly.
2. If the solenoid cannot be heard operating but the green light on the rear of the Controller is flashing then the solenoid valve may have failed. Move the Solenoid Selection Lever through 180 degrees to select the other valve.
3. 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 for.

Reading the temperature from the DeltaT window on the PC if available.

4. If the samples are above their freezing point, open the lid and allow the samples to warm up.
5. If the samples are below their freezing point, use the **COOL** override button on the rear panel of the Controller to go to the final temperature.
6. If the **COOL** override button cannot operate the solenoid then the Manual Override Valve may be used to introduce liquid nitrogen into the chamber for cooling. Position the Solenoid Valve Selector in its off position and then slowly open the tap to cool the freezer.



Note. Only use the Manual Override Valve if you have an independent means of monitoring the temperature within the chamber and never cool below -100 C.

Following a system lockup, you need to reset the freezer's controller. The reset button is operated by inserting the tip of a ball-point pen or similar tool through the hole in the rear panel, located between the manual over-ride button and the AUX socket. Alternatively, switch off and on again. Operate the freezer through a couple of trial runs to ensure that there is no permanent fault.

Routine Maintenance



Disconnect the mains supply before cleaning.



Before cleaning, turn off any connected liquid nitrogen cylinders.



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.

- 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



The Kryo1060 is classified as Class I equipment and must be earthed for safe operation

- The Kryo1060 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.

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.

CHAPTER 4

Troubleshooting

Kryo1060 Freezer

► **Fan not running, RUN lamp fails to light when RUN pressed**

- Faulty mains supply.
Remedy: check that the supply cable is properly connected and that the external fuse (if any) is intact. Also check the wall socket.
- F1 or F2 on side panel blown.
Remedy: check/replace as required with identically rated fuses.
- Main switch faulty.
Remedy: refer to Service Engineer.

► **Fan not running, RUN lamp lights when RUN pressed**

- Door not fully locked.
Remedy: Operate door handle to unlock and re-lock door.
- Fan motor faulty.
Remedy: refer to Service Engineer
- If motor running - fan drive belt faulty.
Remedy: refer to Service Engineer.
- If motor running - fan bearing frozen.
Remedy: refer to Service Engineer.

► **Fan running, RUN lamp fails to light when RUN pressed**

- Control board latched up.
Remedy: press reset button on rear of Controller or switch off and then on.
- Blown mains input fuses in Controller.
Remedy: check/replace as required with identically rated fuses.
- Blown mains input or fuse on pcb in Controller.
Remedy: refer to Service Engineer.

► **Fan running, RUN lamp on. No automatic cooling/heating**

- If manual cooling or heating OK, then incorrect program loaded, or controller latched up.
Remedy: press reset button on rear on Controller and/or run correct program from DeltaT.
- If no manual cooling or heating - door interlock not operated.
Remedy: close door and push door handles down until they latch.
- If no manual cooling and valve not clicking - faulty solenoid valve.
Remedy: Position Solenoid Valve Selector to the other valve for the next run and call Service Engineer.
- If no manual heating - thermal cutout has operated.
Remedy: refer to Service Engineer.
- If no manual cooling or heating - faulty door interlock switch.
Remedy: refer to Service Engineer.

► **No manual cooling after pressing STOP (RUN lamp off), but solenoid valve clicks.**

- No liquid-nitrogen supply due to Solenoid Valve Selector in off position.
Remedy: Position to either valve A or B.

- No liquid-nitrogen supply

Remedy: 1. Check supply valve is turned on. 2. Check supply hose for leaks or blockages and replace or rectify as necessary.

APPENDIX A

Kryo1060-380 Specifications

Kryo1060-380 Freezer

Note These specifications are subject to change without notice.

Dimensions

	External	Internal
Height	112cm	64cm
Width	132cm	2 x 50cm
Depth	116cm	50cm

Weight 423kg (shipping weight including packaging) approx.

Capacity 8000 x 2ml ampoules

Circulation Horizontal laminar flow.

Temperature range +40.0°C to -100°C.

Warning! The freezer is fitted with a manually-resettable thermal cutout to prevent over heating. This will operate if the chamber is programmed to run above +40.0°C and will require a Service Engineer to reset it.

Cooling medium Liquid nitrogen 22 - 30 psi.

Heater 1700W.

Sensors Control and sample: 4-wire Platinum resistance thermometer. Sensors are linearised in software to international standards that utilise a 4096-point lookup

	table based on BS EN 60751:1996. Calibration facility provided.
Accuracy	$\pm 0.5^{\circ}\text{C}$ at a hold at 0°C (dynamic accuracy depends on actual program, e.g. rate of change of temperature).
Heating rates	$0.01^{\circ}\text{C}/\text{min}$ to $1^{\circ}\text{C}/\text{min}$.
Cooling rates	$-0.01^{\circ}\text{C}/\text{min}$ to $-5^{\circ}\text{C}/\text{min}$.
Power	230 V \sim 50-60Hz , 16A (max.) The freezer may be damaged by voltage surges in excess of 15% above nominal.
Storage temperature	-10°C to $+60^{\circ}\text{C}$.
Storage humidity	Up to 95% non-condensing.
Operating temperature	5°C to $+40^{\circ}\text{C}$.
Operating humidity	Less than 90%.
Altitude	up to 2000 m
Pollution deg.	Pollution degree 2 (BS EN 61010-1)
Vibration	Designed to survive normal shipment when packed in the Planer supplied container. Not designed to endure significant vibration when being operated.

Kryo1060-180 Freezer

Note These specifications are subject to change without notice.

Dimensions

	External	Internal
Height	112 cm	64 cm
Width	86 cm	50 cm
Depth	116 cm	50 cm

Weight 211kg (shipping weight including packaging) approx.

Capacity 4000 x 2ml ampoules

Circulation Horizontal laminar flow.

Temperature range +40.0°C to -100°C.

Warning! The freezer is fitted with a manually-resetable thermal cutout to prevent over heating. This will operate if the chamber is programmed to run above +40.0°C and will require a Service Engineer to reset it.

Cooling medium Liquid nitrogen 22 - 30 psi.

Heater 1000W.

Sensors Control and sample: 4-wire Platinum resistance thermometer. Sensors are linearised in software to international standards that utilise a 4096-point lookup table based on BS EN 60751:1996. Calibration facility provided.

Accuracy $\pm 0.5^{\circ}\text{C}$ at a hold at 0°C (dynamic accuracy depends on actual program, e.g. rate of change of temperature).

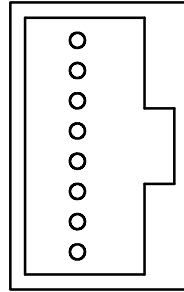
Heating rates $0.01^{\circ}\text{C}/\text{min}$ to $1^{\circ}\text{C}/\text{min}$.

Cooling rates $-0.01^{\circ}\text{C}/\text{min}$ to $-5^{\circ}\text{C}/\text{min}$.

Power	230 V ~ 50-60Hz , 16A (max.) The freezer may be damaged by voltage surges in excess of 15% above nominal.
Storage temperature	-10°C to +60°C.
Storage humidity	Up to 95% non-condensing.
Operating temperature	5°C to +40°C.
Operating humidity	Less than 90%.
Altitude	up to 2000 m
Pollution deg.	Pollution degree 2 (BS EN 61010-1)
Vibration	Designed to survive normal shipment when packed in the Planer supplied container. Not designed to endure significant vibration when being operated.

AUX Connector

8 NC
7 NC
6 Calibration switch
5 NC
4 NC
3 0V (GND)
2 0V (GND)
1 NC
Screen GND



This connector is provided for calibration by qualified service personnel only. Do not connect to any other equipment.

APPENDIX B

Spare Parts

Ordering Spares

When ordering spares, always quote the model number, the serial number, the part number and the part description. Always use qualified parts from Planer plc, except where parts are clearly marked with the original manufacturer's description and are identical to the original.

Kryo1060 Fuses

Chamber**Part No.****Description****Ident**

FL 013472

F 16A H 250V 1.25" x 0.25"
ceramic

F1, F2

FL 013471

F 7A H 250V 1.25" x 0.25"
ceramic

F3

FL 013394

T 2A H 250V 1.25" x 0.25"
ceramic

F4

Controller**Part No.****Description****Ident**

FL011977

T 1A L 250V 20 x 5mm glass

F1, F2

