REVISED 2021

PCR Series

LAMINAR FLOW CLEAN WORKSTATION

OPERATION AND MAINTENANCE MANUAL

CONTENTS

1. INTRODUCTION

Thank you for your decision to purchase a Clyde Apac PCR Series laminar flow cabinet.

The PCR Series of cabinets are designed and manufactured by AES Environmental to comply with Australian Standard AS2252.6 ,which specifies requirements for laminar flow cabinets (clean work stations).

AES Environmental laminar flow and HEPA filter products are designed and manufactured in Australia. All stages of manufacture are subjected to rigorous checks to ensure that specified quality standards are maintained.

HEPA filters are individually tested and certified for efficiency, integrity and pressure drop before installation in cabinets. Each cabinet undergoes stringent testing of filter installations, airflows and other performance aspects. All tests are conducted by a NATA accredited factory laboratory using calibrated apparatus and test procedures.

Backed by a comprehensive warranty covering the quality and performance of materials and workmanship, PCR Series cabinets are designed to provide many years of reliable operation.

Your investment in this cabinet and its contribution to your work programme should be protected by regular specialised inspection, testing and certification.

AES Environmental are able to provide comprehensive on site commissioning, testing and certification services for safety cabinets, laminar flow systems, clean rooms and all HEPA filter installations.

2. APPLICATIONS AND LIMITATIONS

2.1 APPLICATIONS:

PCR Series cabinets are designed to provide a high degree of product protection in laboratory and production facilities. Many critical applications in the pharmaceutical, medical, scientific and electronics fields demand an ultra clean work environment which is free from biological and particulate contamination.

PCR Series cabinets are intended for work involving the handling of non hazardous (non toxic and non infectious) materials in such applications.

2.2 LIMITATIONS:

2.2.1 HAZARDOUS MATERIALS:

PCR Series cabinets are not safety cabinets. They are not suitable for use with infectious or toxic materials.

Laminar flow cabinets do not provide personnel or environmental protection, as aerosols from the work zone are directed towards the operator. For applications involving the handling of hazardous materials, Contact AES Environmental for further information regarding our range of Class I BSC, Class II BSC or Cytotoxic Drug Safety Cabinets.

2.2.2 FLAMMABLE MATERIALS:

PCR Series cabinets are not suitable for use with flammable or explosive materials, as the fan motor and other electrical components are in the air stream.

3. CABINET DESCRIPTION AND OPTIONS

3.1 DESCRIPTION

PCR Series cabinets are self contained, bench top laminar flow clean work stations which operate independently of other air handling systems. Vertical laminar air flow in the work zone creates a biologically clean, particle free work environment.

A direct drive fan draws in ambient air through a pre-filter on the top of the cabinet and supplies it to the work zone through a HEPA filter. The average vertical air velocity in the work zone is maintained between 0.45 and 0.5 m/s, with all velocity readings within 20% of their average. Air leaving the work zone is divided into two main portions. The major part of the airflow leaves through the work opening, and a portion is recirculated to the fan/ HEPA system via perforations in panels which form the lower section of the work zone.

Recirculation of part of the clean air supplied to the work zone reduces the dust loading of the HEPA filter, extending filter life. Air cleanliness within the work zone is better than ISO 5 in accordance with ISO 14644.1 To enhance work zone air cleanliness, it is recommended that cabinets are installed in clean rooms which provide a secondary barrier. Such clean rooms are HEPA filtered and constructed to provide ISO 7 or better conditions in accordance with ISO 14644.1.

3.2 OPTIONS

Factory options available for PCR Series cabinets are:

- Germicidal UV lamp*
- UV shield/ work zone cover
- Power outlet*
- Service taps for air, gas and vacuum*
- Floor stand
- Electrically Height-adjustable floor stand

* Fitted in the work zone

Although these options attract modest additional cost when supplied with a new cabinet, fitting of some items to installed cabinets can be very costly.

4. INSTALLATION, TESTING AND CERTIFICATION

4.1 INSTALLATION

4.1.1 LOCATION

Cabinets should be located in a clean, draught free area, not subject to air turbulence from air conditioning inlets, room exhausts, personnel traffic and other sources. All windows should be fixed. Work zone cleanliness can be compromised by air turbulence in front of laminar flow cabinets. Special Care should be taken to avoid locating the cabinet in positions where room air ventilation

4.1.2 SERVICES

Electrical power and other reticulated services which are required for cabinet operation (such as gas and vacuum) should be provided at the cabinet installation site.
Compliance with local regulations for reticulated services such as gas should be confirmed.

4.2 TESTING AND CERTIFICATION:

4.2.1 GENERAL:

We recommend that the performance of this cabinet is maintained by regular specialised inspection, testing and certification. All testing procedures should be conducted using calibrated apparatus, in accordance with AS2252.6 and AS1807 .

AES Environmental provides comprehensive on site maintenance, testing and certification services for clean rooms, laminar flow work stations, safety cabinets, HEPA filter installations and fume cabinets.

4.2.2 FREQUENCY:

Cabinets are tested in the factory and further testing is recommended as follows:

(a) On site prior to use.
(b) After any electrical or mechanical maintenance.
(c) After filter replacement.
(d) After re location.
(e) At least annually.
(f) If faulty cabinet operation is suspected.

5. CONTROLS

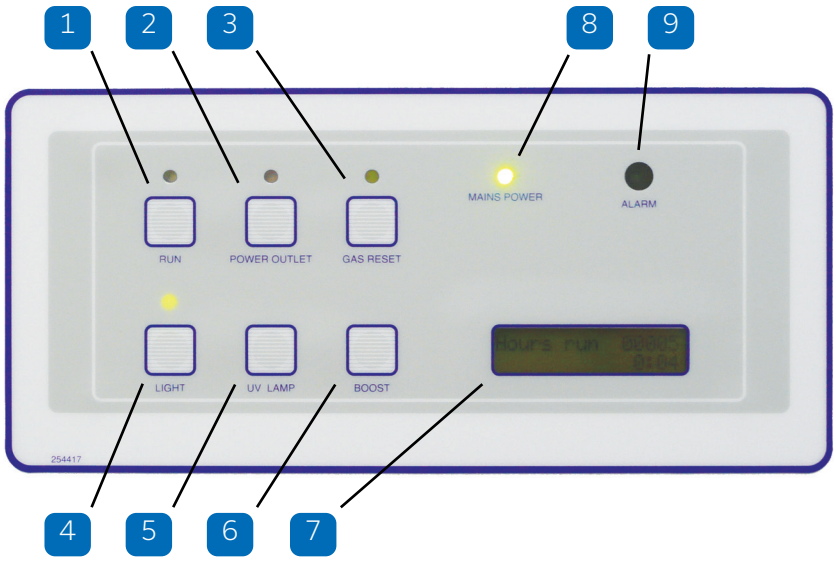
5.1 GENERAL

High-efficiency filters and fans deliver quiet operation and safety. Negative pressure zones surround all positive pressure areas, eliminating the possibility of contaminated air bypassing the filter or escaping from the cabinet. Outer shells are gas-tight for safe decontamination.
In operation, vertical laminar airflow through a HEPA filter bathes the work tray, dividing and passing around the perimeter to create a biologically clean work area.

A microprocessor is used to control the speed of the blower motors. This microprocessor also allows fingertip control of functions and status including:

- Cabinet performance and status clearly displayed in plain English.
- Built-in stopwatch.

5.2 SWITCHES AND INDICATORS



Control Panel

1. Fan/post-use over-run switch
2. Power outlet switch
3. Gas reset switch
4. LED light switch
5. UV lamp switch
6. Boost mode switch*
7. Display panel
8. Mains power indicator
9. Alarm indicator

*Not Applicable for this cabinet

5.2.1 DESCRIPTION:

Switches are of the momentary touch-pad type with toggle operation. A short 'pip' sound accompanies any toggle operation. A short 'pip-pip-pip' sound accompanies any operation that has been ignored. LEDs indicate the status of switched functions.
UV lamps and gas taps are optional fittings. On cabinets not fitted with these services, the relevant switch functions are not operative.

5.2.2 SWITCH FUNCTIONS AND INDICATORS

(i)'RUN' switch for fans and operating modes:

This switch controls the laminar flow and exhaust fan systems A single actuation of the touch pad turns the fans on and off.

POST-USE OVER-RUN TIMER:

Press and hold the 'RUN' Button on the touch pad for 3 seconds or longer selects the post-use over-run feature. When this has been Activated, the fans and fluorescent lamps will switch off after the pre-set period of 10 minutes. In this mode, the VDP counts down the minutes during the Post-Purge period. The Post-Use Timer is a post-purge function designed to purge the work zone of contaminants prior to shut-down of the cabinet

(ii)'LIGHT' switch for fluorescent lamps:

This switch controls the fluorescent lamps, which provide work zone illumination. Operating this switch when the optional UV lamp is on, toggles the UV to off.

(iii) 'POWER OUTLET' switch for work zone power outlet(s):

This switch provides remote control of the standard splash-proof, general purpose power outlet (GPO) and optional additional GPOs in the work zone.

(iv) 'UV LAMP' switch for UV lamp:

This switch controls the optional germicidal UV lamp which is fitted to enhance work zone sterility. The UV lamp can only be switched on when the cabinet is not running. Operating this switch when the fluorescent lamps are on will toggle the fluorescent lamp to off.

(v)'GAS RESET' switch for optional gas tap:

This switch re-establishes supply of gas to the optional gas tap if the solenoid safety valve has interrupted supply of gas to the tap. The optional gas tap is connected via a solenoid valve, which cuts off gas supply to the tap if the cabinet has been turned off or if mains power supply has been interrupted.

(vii) 'RUN TIME' display panel (VDP):

The VDP operates in the default mode as an hour-meter (elapsed hours meter) when the cabinet is connected to mains supply and when no error condition exists, or nonstandard mode is selected. See 5.2.3 below.

5.2.2 SWITCH FUNCTIONS AND INDICATORS (CONT.)

(viii) 'ALARM' LED and audible alarm:

The VDP will visually and audibly alarm in the event of failure, unsafe operating conditions or loss of power

(ix) Hour Meter:

The hour-meter cannot be reset by the user. It displays the total hours that the BSC has been in operation for.

5.2.3 VPD DISPLAY MESSAGES

5.2.3.1 Description

In the default mode, the VDP functions as a hour-meter, which displays total elapsed running hours. If there is an identified malfunction in the conditions monitored by the controller, the VDP displays an error message, and the alarms are activated. The VDP also displays a message to indicate the selection or activation of a special mode. A latched error condition can be cleared by the actuation of any touch pad. Clearing of any error resets the controller to the default condition.

5.2.3.2 Error messages:

- A reduction in exhaust airflow will generate the error message 'ERROR!EXHAUST LOW'. Full exhaust fan speed is selected, the laminar flow fan speed is maintained, the optional gas supply is shut off and the alarm is activated.
- A reduction in laminar airflow will generate the error message 'ERROR!MAIN LOW'. Full exhaust fan speed is selected, the laminar flow fan speed is maintained, the optional gas supply is shut off and the alarm is activated.
- An increase in laminar airflow will generate the error message 'ERROR!MAIN HIGH'. Full exhaust fan speed is selected, the laminar flow fan speed is maintained, the optional gas supply is shut off and the alarm is activated.
- Failure of the controller will generate the error message 'ERROR! CONTROL FAILURE' to signify a ROM or RAM error. The optional gas supply is shut off and the alarm is activated.
- Mains power interruption with the cabinet running will generate the error message 'ERROR! POWER FAILURE'. The optional gas supply is shut off and the alarm is activated. To reset press 'boost' button twice.

5.2.4 MAINS SUPPLY AND DEFAULT MODE OPERATION:

On connection of mains power to the cabinet, the 'MAINS POWER' LED is illuminated and the following default conditions are set:

a. Power outlet control to off.

b. Optional UV control to off.

c. Fluorescent lamps to off.

e. Fan control to off.

f. Gas supply is off.

g. The VDP display operates in the default mode and displays the total elapsed running hours of the cabinet and the message 'POWER ON'.

h. The controller is not in an error mode.

5.2.5 ALARM

The alarm system provides audible and visual indication of operating system malfunctions.

The audible alarm and the 'ALARM' LED are activated by pressure sensors in the exhaust and laminar flow filter plenums. Any significant variation in airflow will produce a change in plenum pressure. This will activate the alarm.

The alarm will also be activated if an error condition was pending on initial start-up, if mains power supply is interrupted while the cabinet is running, or in the event of failure of the controller. **The cabinet should not be used until any identified fault is rectified.**

5.2.6 FUSES

The cabinet electrical system is protected by individual fuses on all switched circuits. The fuses are located on the power board inside the control panel. The cabinet must be disconnected from mains supply before the control panel is opened.

5.2.7 SERVICE MODE

Authorised service technicians can access a service mode which provides a diagnostics facility and enables various cabinet settings to be changed. These include the following:

- Fan speeds.
- Pressure switch settings.
- Diagnostics and events
- Isolation of fans for test procedures.
- DAO time settings

5.3 RUN MODE STABILISATION

When the 'RUN' switch is operated the fans are switched on and the pressure sensing switches activated. The fans require approximately 20 seconds for it to develop normal operating pressure and airflow.

6. TECHNIQUES FOR EFFECTIVE CABINET USE

6.1 GENERAL

The function and limitations of cabinets should be clearly understood and be covered in staff training programmes, as should techniques for effective use and cleaning.

Cabinets are open fronted enclosures and rely on stable, unimpeded airflows and good user technique in order to provide design levels of product protection. Australian Standard 2252.6 is a recommended guide to the use of laminar flow cabinets.

6.2 PROTECTIVE GARMENTS

Cabinet users should wear suitable clothing. In critical applications, a continuous, fronted garment with adjustable or elasticised wrist closures or special clean room clothing is recommended. Thin, protective gloves are required for some work.

6.3 USE OF THE CABINET

6.3.1 PRE-USE CHECKS

The cabinet test certificate should be checked to verify its validity (less than 12 months old).

In general:

(a) Check that the unit is connected to a suitable power supply.

(b) Check that the exhaust air outlet is free from any obstruction, which may affect airflow.

(c) Switch on the cabinet and check the operation of the following:

- (a) The control panel indicators.
- (b) The fan
- (c) The LED lamps
- (d) Any fitted services, such as gas, power or vacuum.

6.3.2 CABINET SERVICES

AS 2252.6 states that the use of Bunsen burners is not recommended in laminar flow cabinets as they disrupt the laminar air flow. However, many users wish to use some form of gas burner. If routine use of a gas burner is required, the burner should be of the type which has a pilot light, and only produces full flame on actuation of a touch control.

Hose to connect gas supply inside the cabinet should be of the two ply, reinforced type.

Hoses and power leads should not be introduced into cabinets through the work opening.

6.3.3 PRE-OPERATIONAL PROCEDURES

1. Remove unnecessary items from the cabinet.
2. Check that the work zone surfaces are clean. If necessary, wipe down with a suitable cleaning agent/ disinfectant. See 7.2 below. Allow the cabinet to run while being cleaned.
3. Plan work so as to place all materials in, or close to the cabinet and within reach of the operator.
4. Place the working materials in the work surface.
5. Wipe down the external surface of all materials with a suitable cleaning agent/disinfectant before placing them in the cabinet.
6. Allow the cabinet to run for at least 5 minutes before use to stabilise airflows and to clear away any residual aerosols.

6.3.4 OPERATION

1. Effective contamination control practice should be used to minimise the transmission of contamination into the work zone by the operator's hands and arms, and by uncleaned work materials or equipment.
2. Unnecessary hand and arm movements in, and near the work zone can disrupt airflows and cause cross contamination.
3. Contamination generating items such as papers, paper products and pencils should not be used in the cabinet.
4. Care should be taken in placing materials in the work zone so as to minimise potential cross contamination.
5. At the end of the work, leave the cabinet running and conduct the following procedures:
    i. Clean/disinfect and remove all unnecessary materials to reduce the potential for
    ii. Cross contamination and interruption of airflows; cabinets are not designed for protracted storage of materials.
    iii. Wipe the work zone surfaces with a cleaning/disinfectant solution.
    iv. Allow the cabinet to run for at least 5 minutes.
    v. Fit the work opening cover/UV shield (if provided).
    vi. Turn on the UV lamp (if fitted) for 20 minutes. See 9. below.

6.3.5 TROUBLE SHOOTING

6.3.5.1 IF NO AIRFLOW:

1. Check mains power supply.
2. Check 'RUN' switch.
3. Check fuses.
4. Call authorised service technician.

6.3.5.2 IF LOW AIRFLOW VELOCITY:

1. Check mains power supply for low voltage.
2. Check filter for obstruction.
3. Call authorised service technician

7. MAINTENANCE, CLEANING AND DISINFECTION

7.1 MAINTENANCE

7.1.1 GENERAL

Under normal conditions of use, regular user maintenance is confined to routine work zone cleaning and occasional prefilter maintenance. Any maintenance requirements outside the scope of those detailed in this section should be entrusted to an authorised service organisation.

7.2 CLEANING AND DISINFECTION

Appendix B of AS2243.3 details the properties of common disinfectants and antiseptics. Some disinfectants and cleaning agents, although widely used in cabinets, can present problems unless their limitations are understood and their use is controlled, e.g.:

i. Hypochlorite solutions can corrode stainless steel and wet residue should not be left on cabinet surfaces.

ii. Alcoholic solutions pose a fire hazard and should only be used sparingly and with the cabinet running.

iii. Abrasive compounds may degrade stainless steel and painted surfaces.

iv. The grade and quality of stainless steel used in cabinet construction has a high degree of resistance to staining and corrosion, but may be degraded by the use of unsuitable cleaning agents.

8. HEPA FILTERS

HEPA filters, which arrest sub-micron particles, are the physical containment barrier in safety cabinets. They incorporate a very fragile filter medium which is easily damaged by physical contact and which may suffer degradation if splashed with liquid.

HEPA filters can not be cleaned and are normally replaced when their increased resistance to airflow impairs cabinet performance, when excessive leak repair is necessary, or when heavy surface contamination occurs.

Replacement filters should be suitable for use in critical applications and should be individually tested and certified in a NATA-accredited laboratory. Arrestance efficiency should be not less than 99.997% in accordance with AS4260. Additionally, filters should be certified for integrity (free from pin-hole leaks) in accordance with AS1807:2021 Clause 4.4.

Determination of the in-situ integrity of HEPA filters and their installation is a critical testing procedure for cabinets. Cabinets with suspected filter damage should not be used until testing of filter integrity has been carried out.

9. UV LAMPS

Many laminar flow cabinets are ordered with an optional germicidal UV lamp fitted in the work zone. The intended use, and occupational health and safety aspects of UV should be understood by laboratory managers and cabinet users, for example:

1. UV can be a useful adjunct to surface cleaning procedures, but should not be seen as a panacea that can replace good cleaning technique.

2. UV lamps should be used for 20 to 30 minutes at the beginning and end of work programmes. They should not be left on for extended periods.

3. Personnel should avoid exposure to UV radiation. Exposure may cause eye damage and erythema. Work opening covers should be in place whenever UV lamps are in use.

4. Radiation intensity reduces over time due to degradation and external staining of lamps. Where the use of UV is a significant element of surface decontamination procedure, regular testing of lamp intensity and lamp replacement should be specified.

5. UV radiation degrades nitrile, plastics and rubber products and organic coatings, such as those used in typical cabinet construction.

10. WARRANTY AND REPLACEMENT PARTS

10.1 WARRANTY

This cabinet is protected by a One (1) year warranty covering all materials, components and workmanship.

We will honour this warranty on advice to a AES Environmental office or authorised distributor with full details of the cabinet, including date of purchase, serial number, and the nature of the fault.

Items which have a limited service life, such as fan motors, fluorescent and ultraviolet lamps and HEPA filters, are not covered in respect of normal degradation over time. Servicing of the cabinet by persons other than AES Environmental technicians or authorised service agents may wholly or partially invalidate the warranty.

10.2 REPLACEMENT PARTS

Only genuine AES Environmental replacement parts should be used in this cabinet. A continuing 100% ex-factory availability of all replacement items is maintained.

The use of non-genuine parts may significantly compromise the protection afforded by the cabinet and may invalidate the warranty. To obtain replacement parts, contact your nearest AES Environmental branch or distributor with the following information:

a. Full description of part(s).
b. Cabinet model number and serial number.

11. PRODUCT RANGE

In addition to PCR cabinets, AES Environmental manufacture the full range of AES Environmental standard and custom designed equipment, including:

- Ultrasafe Class II Biological Safety Cabinet.
- MK5 Series Cytotoxic drug safety cabinets.
- Cytotoxic drug safety cabinets.
- HEPA filter clean room modules.
- Sterile animal holding units.
- Modular laminar flow clean room systems - horizontal and vertical flow.
- Custom designs for any application.