Thank you for purchasing this Esco Polymerase Chain Reaction Cabinet. Please read this manual thoroughly to familiarize yourself with the many unique features and exciting innovations we have built into your new equipment. Esco provides many other resources at our website, www.escoglobal.com, to complement this manual and help you enjoy many years of productive and safe use of your Esco products.



### For Technical Service, contact North America

Esco Technologies, Inc. 903 Sheehy Drive, Suite F, Horsham, PA 19044, USA Tel 215-441-9661 • Fax 484-698-7757 escolifesciences.us • eti.admin@escoglobal.com

### Rest of World

Esco Micro Pte. Ltd. 21 Changi South Street 1 • Singapore 486 777 Tel +65 6542 0833 • Fax +65 6542 6920 www.escoglobal.com • mail@escoglobal.com

# **Service Manual**

Polymerase Chain Reaction Cabinets

Esco Polymerase Chain Reaction Cabinets (SCR-2A, PCR-3A, PCR-4A) Service Manual Version E - Released January 2021

### **Copyright Information**

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"Material in this manual is provided for informational purposes only. The contents and the product described in this manual (including any appendix, addendum, attachment or inclusion), are subject to change without notice. Esco makes no representations or warranties as to the accuracy of the information contained in this manual. In no event shall Esco be held liable for any damages, direct or consequential, arising out of or related to the use of this manual."

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# MANUAL REVISION HISTORY

REV. NO.	DATE RELEASED	DESCRIPTION OF CHANGE	REFERENCE	SERIAL # OF 1 <sup>ST</sup> UNIT FOR IMPLEMENTATION
В	13-Aug-2019	Updated certification testing; Added manual revision history	-	-
С	20-Sep-2019	Updated Total airflow for HEPA filter leak test	-	-
D	09-Jun-2020	Removed airflow and sash alarm	-	-
E	22-Jan-2021	Updated Declaration of Conformity	-	-
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# Warranty Terms and Conditions

Esco products come with a limited warranty. The warranty period will vary depending on the product purchased, beginning on the date of shipment from any Esco international warehousing location. To determine which warranty applies to your product, refer to the appendix below.

Esco's limited warranty covers defects in materials and workmanship. Esco's liability under this limited warranty shall be, at our option, to repair or replace any defective parts of the equipment, provided if proven to the satisfaction of Esco that these parts were defective at the time of being sold, and that all defective parts shall be returned, properly identified with a Return Authorization.

This limited warranty covers parts only, and not transportation/insurance charges.

This limited warranty does not cover:

- Freight or installation (inside delivery handling) damage. If your product was damaged in transit, you ٠ must file a claim directly with the freight carrier.
- Products with missing or defaced serial numbers.
- Products for which Esco has not received payment.
- Problems that result from:
  - External causes such as accident, abuse, misuse, problems with electrical power, improper 0 operating environmental conditions.
  - Servicing not authorized by Esco. 0
  - Usage that is not in accordance with product instructions. 0
  - 0 Failure to follow the product instructions.
  - Failure to perform preventive maintenance. 0
  - 0 Problems caused by using accessories, parts, or components not supplied by Esco.
  - Damage by fire, floods, or acts of God. 0
  - Customer modifications to the product 0
- Consumables
- Esco is not liable for any damage incurred on the objects used on or stored in Esco equipment. If the objects are highly valuable, user is advised to have in place independent external preventive measures such as connection to a centralized alarm system.

Factory installed, customer specified equipment or accessories are warranted only to the extent guaranteed by the original manufacturer. The customer agrees that in relation to these products purchased through Esco, our limited warranty shall not apply and the original manufacturer's warranty shall be the sole warranty in respect of these products. The customer shall utilize that warranty for the support of such products and in any event not look to Esco for such warranty support.

Esco encourages all users to register their equipment online at www.escoglobal.com/warranty or complete the warranty registration form included with each product.

ALL EXPRESS AND IMPLIED WARRANTIES FOR THE PRODUCT, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES AND CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE LIMITED IN TIME TO THE TERM OF THIS LIMITED WARRANTY. NO WARRANTIES, WHETHER EXPRESS OR IMPLIED, WILL APPLY AFTER THE LIMITED WARRANTY PERIOD HAS EXPIRED. ESCO DOES NOT ACCEPT LIABILITY BEYOND THE REMEDIES PROVIDED FOR IN THIS LIMITED WARRANTY OR FOR SPECIAL, INDIRECT, CONSEQUENTIAL OR INCIDENTAL DAMAGES, INCLUDING, WITHOUT LIMITATION, ANY LIABILITY FOR THIRD- PARTY CLAIMS AGAINST YOU FOR DAMAGES, FOR PRODUCTS NOT BEING AVAILABLE FOR USE, OR FOR LOST WORK. ESCO'S LIABILITY WILL BE NO MORE THAN THE AMOUNT YOU PAID FOR THE PRODUCT THAT IS THE SUBJECT OF A CLAIM. THIS IS THE MAXIMUM AMOUNT FOR WHICH ESCO IS RESPONSIBLE.



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These Terms and Conditions shall be governed by and construed in accordance with the laws of Singapore and shall be subject to the exclusive jurisdiction of the courts of Singapore.

### **Technical Support, Warranty Service Contacts**

USA: +1 215-441-9661 Singapore: +65 65420833 Global Email Helpdesk: <u>support@escoglobal.com</u> Visit <u>http://www.escoglobal.com/</u> to talk to a Live Support Representative Distributors are encouraged to visit the Distributor Intranet for self-help materials.

### **Product Appendix, Warranty Listings**

Biological Safety Cabinets, Laminar Flow Cabinets,	
Laboratory Animal Research Workstations, HEPA-	3 years limited
Filtered Cabinets (except Streamline brand)	
Laboratory Fume Hoods	2 years limited
Ductless Fume Hoods	2 years limited
Cleanroom Equipment	1 year limited
Laboratory Ovens and Incubators	1 year limited
Laboratory Shaker	1 year limited
CO <sub>2</sub> Incubators	2 years limited
Containment/Pharma Products	2 years limited
Liltra Jow Tomporatura Eroozor	5 years limited
	5 years on compressor
Laboratory Centrifuge	2 years limited
Freeze Dryer	2 years limited
Laboratory Refrigerator	2 years limited
Thermal Cyclers	2 years limited for MiniPro, Aeris
	1 year limited for Provocell

Note: The warranty periods may vary by country. Contact your local distributor for specific warranty details.

For international distributors, warranty period starts two months from the date the equipment is shipped from Esco facility. This allows shipping time so the warranty will go into effect at approximately the same time the equipment is delivered to the user. The warranty protection extends to any subsequent owner during the warranty period. Distributors who stock Esco equipment are allowed an additional four months for delivery and installation, providing the product is registered with Esco. User can register their products online at www.escoglobal.com/warranty or complete the warranty registration form include with each product.

Policy updated on 1<sup>st</sup> January 2015 (This limited warranty policy applies to products purchased on and after 1<sup>st</sup> January 2015)

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# Introduction

### 1. Products Covered

Esco Streamline <sup>®</sup> and Airstream <sup>®</sup> PCR Cabinets			
Electrical Rating	0.6 m (2 ft.)	0.9 m (3 ft.)	1.2 m (4 ft.)
220-240 V AC, 50 Hz, 1Ø	SCR-2A1	PCR-3A1	PCR-4A1
110-130 V AC, 60Hz, 1Ø	SCR-2A2	PCR-3A2	PCR-4A2
220-240 V AC, 60 Hz, 1Ø	SCR-2A3	PCR-3A3	PCR-4A3

### 2. Safety Warning

- Anyone working with, on or around this equipment should read this manual. Failure to read, understand and comply with the instructions given in this manual may result in damage to the unit, injury to operating personnel, and/or poor equipment performance.
- Any internal adjustment, modification or maintenance to this equipment must be undertaken by qualified service personnel.
- The use of any hazardous materials in this equipment is prohibited. Laminar flow cabinets are intended for product protection ONLY.
- Explosive or inflammable substances should never be used in the cabinet unless adequate risk assessment has been carried out.
- Before you process, you should thoroughly understand the installation procedures and take note of the environmental/electrical requirements.
- In this manual, important safety-related points will be marked with the symbol.



• If the equipment is used in a manner not specified by this manual, the protection provided by this equipment may be impaired.

### 3. Document Management

We recommend that you keep this manual, along with the factory test report close to the cabinet for easy reference by the cabinet operator and qualified maintenance personnel.

If you require replacements for any of the provided documentation (including factory test reports) you can request copies from Esco Customer Services\*. Please provide the following information when making requests for replacement documents:

- Company (Organization) Name
- Product Brand and Model
- Product Serial Number
- Documents requested

\* There may be a nominal charge for this service.



### 4. Limitation of Liability

The disposal and/or emission of substances used in connection with this equipment may be governed by various local regulations. Familiarization and compliance with any such regulations are the sole responsibility of the users. Esco's liability is limited with respect to user compliance with such regulations.

### 5. European Union Directive on WEEE and RoHS

The European Union has issued two directives:

• Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE)

This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC. It is marked with the following symbol: Esco sells products through distributors throughout Europe. Contact your local Esco distributor for recycling/disposal.

Recommended method of disposal is according to The Federal, State, and Local Government regulations

• Directive 2002/95/EC on Restriction on the use of Hazardous Substances (RoHS)

With respect to the directive on RoHS, please note that this cabinet falls under category 8 (medical devices) and category 9 (monitoring and control instruments) and is therefore exempted from requirement to comply with the provisions of this directive.

### 6. Symbols

Information in this manual may be prefaced with the following symbols. They are provided to help you identify important operational, safety, maintenance or conformance issues.



Safety First: Important safety reminders



Note: Important reminders and helpful tips



Electrical Hazard: Danger of electric shock



Turn Off and Disconnect From Main Supply Before Proceeding: Do not perform this operation while the unit is operational



Approved Service Engineer Only: Operation to be performed only by approved engineers



# **Declaration of Conformity**

In accordance to EN ISO/IEC 17050-1:2010

We, Esco Micro Pte. Ltd. Of 21 Changi South Street 1 Singapore, 486777 Tel: +65 6542 0833 Fax: +65 6542 6920



declare on our sole responsibility that the product

Category	: Polymerase Chain Reaction Cabinets
Brand	: Airstream <sup>®</sup>
Model	: PCR-3A, PCR-4A

in accordance with the following directives:

2014/35/EU	: The Low Voltage Directive and its amending directives
2014/30/EU	: The Electromagnetic Compatibility Directive and its amending directives
2011/65/EU	: The RoHS in Electrical and Electronic Equipment Directive and its amending directives

has been designed to comply with the requirement of the following Harmonized Standard:

Low Voltage	: EN 61010-1:2010
EMC	: EN 61326-1:2013 Class B

More information may be obtained from Esco's authorized distributors located within the European Union. A list of these parties and their contact information is available on request from Esco.

Lim Lay Yew

Lim Lay Yew Director, Esco



has been designed to comply with the requirement of the following Harmonized Standard:

Low Voltage	: EN 61010-1:2010
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More information may be obtained from Esco's authorized distributors located within the European Union. A list of these parties and their contact information is available on request from Esco.

Lim Lay New

Lim Lay Yew Director, Esco

# Chapter 1 – Re-Certification by Service Personnel

Esco products generally provide years of trouble-free operation. However, like any other equipment, they require maintenance and service. Maintenance and service should be carried out by trained personnel. Esco offers training courses to equip service providers with the latest skills, information and tools to successfully maintain and service Esco products. For more information on the nearest training course, please contact Esco.

Service providers should familiarize themselves with the basic operating principles of products before working on them. Suitable references include information in the User Section of this Manual or brochures which may be downloaded from the Esco web site.

### Polymerase Chain Reaction Cabinets generally require:

- Re-certification, when:
  - $\circ \quad \text{The cabinet is relocated} \\$
  - Decline of cabinet performance is suspected
  - o After filter or blower replacement
  - o At least once a year

During recertification:

- Cabinet airflow velocities and flow patterns are verified against the manufacturer's specifications and relevant international standards
- Filters are scan-tested to ensure they do not leak
- o Operator comfort tests may be performed
- If airflow velocities are found to be off the setpoint, adjustments are made as part of the certification process before final values are recorded.
- Filter replacement, when:
  - o The filters are clogged and the fan(s) is/are already adjusted to maximum setting
  - $\circ$  ~ Filter leaks which cannot be repaired are found during scan-testing
- Fan replacement (typically rare) if failure occurs.

### Routine maintenance also includes:

- Fluorescent lamp(s) replacement typically once every 2 years.
- $\circ \quad {\sf UV} \ {\sf lamp \ replacement typically \ once \ every \ 1 \ year.}$

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**1.1 Certification Flowchart** 

2

### **1.2 Airflow Adjustment**

The speed controller is located in the electrical panel at the top of the cabinet.

Plug the multimeter probes to the Motor Voltage Sampling Port. Use the multimeter to take the motor voltage with corresponding air velocityreading. Adjust the airflow by adjusting the speed controller. Use the knob provided to adjust the speed controller.



Adjust the speed controller by turning on the knob.

### **1.3 Unit Re-Certification**

### 1.3.1 SCR-A

### 1.3.1.1 Airflow Velocity and Uniformity Test

Set up a calibrated airflow meter within the interior of the cabinet to measure filter airflow at a distance of 15 cm from the filter face. Set the measurement point at the center of the filter face area.



Testing was performed in accordance with the following IEST (Institute of Environmental Sciences and Technology) contamination control document: IEST-RP-CC002.3 "Recommended Practice for Unidirectional Flow Clean Air Devices" Section 6.1

Polymerase Chain Reaction Cabinets \_ ESCO



### 1.3.1.2 HEPA/ULPA Filter Leak Test

The filter was challenged with PAO aerosol of fixed concentration. The aerosol was evenly distributed throughout the supply (positive) cabinet plenum. An aerosol photometer was used to monitor aerosol penetration downstream of the filter, and to scan for the presence of leaks.

Use calculated method, along with ATI TDA-4Blite aerosol generator, the upstream aerosol concentration can be calculated using the following equation:

Aerosol concentration =  $\frac{13,500 \times N}{Total Airflow cfm}$ , where N = Number of Laskin nozzle(s) opened

See Chart for Total Airflow below:

PCR cabinet model	2 feet
Total Airflow	177

Actual PAO concentration: \_\_\_\_\_µg/liter

Airflow Filter	6
Leaks detected in media	Yes / No
Leaks detected in gasket	Yes / No
Particle penetration	%

Acceptance: Maximum particle penetration of 0.01% for filters; no filters leaks present.

Result:

Acceptance criteria / testing procedures have been adopted in accordance with the requirements of the:

a. EN 1822 "High Efficiency Air Filters (HEPA and ULPA)"

Pass / Fail

b. IEST-RP-CC034.3 "Recommended Practice for HEPA and ULPA Filter Leak Tests" AS 1807.6 "Filter Installation Integrity"

### 1.3.1.3 Particle Count Test

Use a particle counter with sampling rate of 0.028 m<sup>3</sup> (1 ft.<sup>3</sup>) of air per minute. Put the particle counter sampling cone inside the work zone, following the grid below:



	Cabinet Model	3 feet	4 feet
Width = <b>w</b> (mm) (in)		914 (36)	1219 (48)
Depth = <b>h</b> (mm) (in)		457 (18)	457 (18)
Left to	Distance from walls = <b>a</b> (mm) (in)	300 (12)	300 (12)
Right	Distance apart = <b>x</b> (mm) (in)	314 (12.4)	619 (24.4)
Front to	Distance from walls = <b>b</b> (mm) (in)	150 (6)	150 (6)
Back	Distance apart = <b>y</b> (mm) (in)	157 (6.2)	157 (6.2)

### Average Count:

6

\_\_\_\_\_for particle size of 0.5 micron and larger sampled in 0.028



<u>Note</u>: The particle count done in the factory is "as-built" condition. If 0.5 micron counter is used on the field, there shall be no more than 35 particles of 0.5  $\mu$ m sampled in 1 m<sup>3</sup> (35.3 ft<sup>3</sup>) of air to reach ISO Class 3.

**Cleanliness rating:** 

ISO Class 3 as per ISO 14644.1 ( $\leq$  35 count for particles equal to and larger than 0.5 µm per 1 m<sup>3</sup> or 35.3 ft<sup>3</sup> of air).

**Results**:

Pass / Fail

m<sup>3</sup> of air

### 1.3.1.4 Light Intensity Test

A light intensity meter was used to measure light intensity at work surface level of the cabinet:

### 3 & 4 feet (w)



Cabinet Model		3 feet	4 feet
Width = <b>w</b>	(mm) (in)	930 (36.6)	1235 (48.6)
Depth = <b>h</b> (	(mm) (in)	530 (20.9)	530 (20.9)
Left to	Distance from walls = <b>a</b> (mm) (in)	300 (11.8)	300 (11.8)
Right	Distance apart = <b>x</b> (mm) (in)	330 (12.9)	635 (25)
Front to Back	Distance from walls = <b>b</b> (mm) (in)	265 (10.4)	265 (10.4)

Average light reading:

\_lux (ft.-candles)

Acceptance:

Average light reading should be at least 800 lux (75 ft-candles)

**Results:** 

Pass / Fail

Acceptance criteria / testing procedures have been adopted in accordance with the requirements of the: IEST-RP-CC002.3 Section 6.10 and AS 1807.15 "Illuminance (Lightning Intensity)"

### 1.3.1.5 Noise Level Test

The cabinet was isolated in a noise-controlled environment and a noise level meter was set up at a distance of 30 cm in front of the cabinet and 38 cm above the work surface. With the cabinet running under normal parameters, the instrument was used to obtain a noise level of the cabinet during normal operation.

Result:	dBA
Acceptance:	Less than 67 dBA (Based on IEST-RP-CC002.3 Section 6.11)

Result:

Pass/ Fail

Disclaimer:

- 1. This noise test was done in the factory that is susceptible to reflective, reverberant, and background noise effect. This noise figure may be different than the brochure value that is obtained from anechoic chamber.
- 2. If the difference between cabinet and ambient noise was less than 10 dBA, correction chart was used, which combined with transient ambient noise, may vary the corrected noise level by ± 1.5 dBA.

Testing was performed in accordance with the following IEST (Institute of Environmental Sciences and Technology) contamination control document: IEST-RP-CC002.3 "Recommended Practice for Unidirectional Flow Clean Air Devices" Section 6.11.

### 1.3.1.6 UV Radiation Intensity Test

UV radiation intensity meter was used to obtain light intensity at work surface level within the cabinet. Readings were taken along the front to back centerline within the interior work area: All units are  $\mu$ W/cm<sup>2</sup>

Average reading:	μW/cm <sup>2</sup>
werage reading.	µvv/cm

Acceptance:

UV Radiation intensity inside the cabinet should not be less than 40  $\mu W/cm^2$ 

UV Radiation intensity outside the cabinet with all windows closed must be zero

Results: Pass / Fail



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# 1.3.2 PCR-A1.3.2.1 Airflow Velocity Test

Put the anemometer on a plane that is 150 mm (6 in.) from the filter face, and measure the airflow using the grid below:



Cabinet Model		3 feet	4 feet
Width = <b>w</b> (mm) (in)		914 (36.6)	1219 (47.9)
Depth = <b>h</b> (mm) (in)		457 (17.9)	457 (17.9)
Left to Right	Distance from walls = a (mm) (in)	150 (5.9)	150 (5.9)
	Distance apart = <b>x</b> (mm) (in)	307 (12.1)	306 (12.1)
Front to Back	Distance from walls = <b>b</b> (mm) (in)	150 (5.9)	150 (5.9)
	Distance apart = <b>y</b> (mm) (in)	157 (6.2)	157 (6.2)

Average Velocity:	m/s (fpm)	
Maximum Deviation:	m/s (fpm) =	%

Acceptance:	0.275 – 0.325 m/s (55 – 65 fpm)
Deviation Acceptance:	20%
Result:	Pass / Fail

Actual motor voltage for nominal airflow:

True RMS:	VAC	Averaging:	VAC	
Note: From factory, both True RMS and Averaging motor voltage are given. If your vo				

<u>Note</u>: From factory, both True RMS and Averaging motor voltage are given. If your voltmeter has "True RMS" written on it, use the True RMS voltage given here, for new cabinet installation. If "True RMS" is not written there, it's an averaging meter, so use the **Averaging** Voltage



### 1.3.2.2 Particle Count Test

Use a particle counter with sampling rate of 0.028 m<sup>3</sup> (1 ft.<sup>3</sup>) of air per minute. Put the particle counter sampling cone inside the work zone, following the grid below:



Cabinet Model		3 feet	4 feet
Width = <b>w</b> (mm) (in)		914 (36)	1219 (48)
Depth = <b>h</b> (mm) (in)		457 (18)	457 (18)
Left to	Distance from walls = <b>a</b> (mm) (in)	300 (12)	300 (12)
Right	Distance apart = <b>x</b> (mm) (in)	314 (12.4)	619 (24.4)
Front to	Distance from walls = <b>b</b> (mm) (in)	150 (6)	150 (6)
Back	Distance apart = <b>y</b> (mm) (in)	157 (6.2)	157 (6.2)

### Average Count: for particle size of 0.5 micron and larger sampled in 0.028 m<sup>3</sup> of air

**<u>Note</u>**: The particle count done in the factory is "as-built" condition. If 0.5 micron counter is used on the field, there shall be no more than 35 particles of 0.5  $\mu m$ sampled in 1  $m^3$  (35.3  $ft^3$ ) of air to reach ISO Class 3.

### **Cleanliness rating:** ISO Class 3 as per ISO 14644.1 (≤ 35 count for particles equal to and larger than 0.5 $\mu$ m per 1 m<sup>3</sup> or 35.3 ft<sup>3</sup> of air).

**Results**:

Pass / Fail



### 1.3.2.3 HEPA/ULPA Filter PAO Leak Test

- 1. The airflow filter was challenged with PAO aerosol of fixed concentration. The aerosol was evenly distributed throughout the cabinet plenum. An aerosol photometer was used to monitor aerosol penetration downstream of filter, and to scan for the presence of leaks.
- 2. Use calculated method, along with ATI TDA-4Blite aerosol generator, the upstream aerosol concentration can be calculated using the following equation:

Aerosol concentration =  $\frac{13,500 \times N}{TotalAirfol wCfm}$ , where N = Number of Laskin nozzle(s) opened

See Chart for Total Airflow below:

Cabinet Model PCR	3 feet	4 feet
Total Airflow (cfm)	266	354

Record the concentration below:

Calculated PAO concentration:\_\_\_\_\_µg/Liter

- 3. Connect the aerosol generator to compressed air or compressed nitrogen supply. Open the aerosol generator valve(s). Set the supply pressure valve to 23 psi for PAO or 20 psi for DOP.
- 4. Turn on the aerosol photometer.
- 5. Check background aerosol concentration in room. Make sure it's not too high. Also check the upstream aerosol concentration again after the test is completed to ensure same value.
- 6. With traverse speed of 5 cm/s (2 in./s), scan the airflow filter media for leakage and record the results below:

Downflow Filter		
Leaks detected in media	Yes / No	
Leaks detected in gasket	Yes / No	
Particle penetration	%	

Acceptance:	
Results:	

Maximum particle penetration of 0.01% for both filters; no filters leaks present **Pass / Fail** 



### 1.3.2.4 Light Intensity Test

A light intensity meter was used to measure light intensity at work surface level of the cabinet:



Cabinet Model		3 feet	4 feet
Width = <b>w</b> (mm) (in)		930 (36.6)	1235 (48.6)
Depth = <b>h</b> (mm) (in)		530 (20.9)	530 (20.9)
Left to	Distance from walls = <b>a</b> (mm) (in)	300 (11.8)	300 (11.8)
Right	Distance apart = <b>x</b> (mm) (in)	330 (12.9)	635 (25)
Front to Back	Distance from walls = <b>b</b> (mm) (in)	265 (10.4)	265 (10.4)

Average light reading: lux (ft.-candles)

Acceptance:

Average light reading should be at least 975 lux (91 ft-candles) for PCR 3A Average light reading should be at least 1230 lux (114 ft-candles) for PCR 4A

**Results:** 

Pass / Fail

Acceptance criteria / testing procedures have been adopted in accordance with the requirements of the: IEST-RP-CC002.3 Section 6.10 and AS 1807.15 "Illuminance (Lightning Intensity)"



### 1.3.2.5 Noise Level Test

The cabinet was isolated in a noise-controlled environment and a noise level meter was set up at a distance of 30 cm in front of the cabinet and 38 cm above the work surface. With the cabinet running under normal parameters, the instrument was used to obtain a noise level of the cabinet during normal operation.

Result:	dBA

Acceptance:

Less than 67 dBA (Based on IEST-RP-CC002.3 Section 6.11)

**Result:** 

Pass/ Fail

Disclaimer:

- 3. This noise test was done in the factory that is susceptible to reflective, reverberant, and background noise effect. This noise figure may be different than the brochure value that is obtained from anechoic chamber.
- 4. If the difference between cabinet and ambient noise was less than 10 dBA, correction chart was used, which combined with transient ambient noise, may vary the corrected noise level by ± 1.5 dBA.

Testing was performed in accordance with the following IEST (Institute of Environmental Sciences and Technology) contamination control document: IEST-RP-CC002.3 "Recommended Practice for Unidirectional Flow Clean Air Devices" Section 6.11.

### 1.3.2.6 UV Radiation Intensity Test

UV radiation intensity meter was used to obtain light intensity at work surface level within the cabinet. Readings were taken along the front to back centerline within the interior work area: All units are  $\mu$ W/cm<sup>2</sup>



	Cabinet Model PCR	3 feet	4 feet
Width = <b>w</b>	(mm) (in)	930 (36.6)	1235 (48.6)
Depth = <b>h</b> (	mm) (in)	530 (20.9)	530 (20.9)
Left to	Distance from walls = <b>a</b> (mm) (in)	150 (5.9)	150 (5.9)
Right	Distance apart = x (mm) (in)	315 (12.1)	312 (12)

Average reading:

\_\_\_\_μW/cm<sup>2</sup>

Acceptance:

UV Radiation intensity inside the cabinet should not be less than 40  $\mu$ W/cm<sup>2</sup> UV Radiation intensity outside the cabinet with all windows closed must be zero

Results:

Pass / Fail

Note: The UV radiation intensity test is tested with the shelf unassembled. The shelf is designed for users who want to obtain higher intensity, i.e. item to be disinfected is to be placed on the shelf.

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### **1.4 Replacement of Filter**

### 1.4.1 SCR-A

- 1. Unscrew and remove front cover
- 2. Unscrew and remove the perforated shelf
- 3. Unscrew and remove the UV lamp and unsnap the holder
- 4. Unbolt and remove the filter clamp. Makesure to hold the filter when doing this.
- 5. Carefully remove the filter and replace
- 6. Reverse above steps
- 7. Re-certify the cabinet



5AC

### 1.4.2 PCR-A

- 1. Unscrew and remove front cover
- 2. Unscrew and remove the perforated shelf
- 3. Unscrew and remove the UV lamp and unsnap The holder
- 4. Unbolt and remove the filter clamp. Ensure to hold the filter when doing this
- 5. Carefully remove the filter and replace
- 6. Reverse above steps
- 7. Re-certify the cabinet



A

### **1.5 Replacement of Blower**

### 1.5.1 SCR-A

- 1. Remove the black foam at top exhaust.
- 2. Unscrew the top metal mesh and remove.
- 3. Remove the blower wiring connection.
- 4. Unscrew the blower mounting house and take out.
- 5. Replace the blower and reverse above steps.



### 1.5.2 PCR-A

- 1. Remove the black foam at top exhaust
- 2. Unscrew the top metal mesh and remove
- 3. Disconnect the blower wiring
- 4. Unscrew the blower mounting house and take out
- 5. Replace the blower and reverse above steps
- 6. Re-certify the cabinet



P

### 1.6 Fluorescent Lamp and UV Lamp replacement

### 1.6.1 Replacing the fluorescent lamp



1. Before changing the fluorescent bulbs, ensure that the cabinet is powered down and disconnected from the electrical supply

- 2. Locate the bulbs.
- 3. Remove the power clips at the ends of the bulbs by gently pulling whilst holding the bulb steady.
- 4. Remove the bulbs from the mounting clips and replace with new ones.
- 5. Replace the power clips on the ends of the new bulbs and ensure they are firmly seated.
- 6. Reconnect the cabinet to the electrical supply and test the bulbs for proper operation.

### 1.6.2 Replacing the UV lamp



- 1. Disconnect the electrical connections
- 2. Take out the old UV lamp by rotating 90° counter-clockwise and pull downward.
- 3. Install the new UV lamp by pushing it upward and rotate 90° clockwise.

# Chapter 2 – Troubleshooting

This section helps you troubleshoot some of the common problems you might face while operating this clean bench. Should you have any queries left unanswered here, please feel free to contact Esco.

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
	Power Failure	<ul> <li>Check if there is power at the wall/building socket.</li> <li>You can use voltmeter or test pen to check power on the wall/building socket.</li> </ul>
	Fig 1.1 Wall socket	
Cabinet does not start (LCD, button, fan, light, and UV are all inoperative)	<ul> <li>Check whether power cord has been connected properly or faulty</li> <li>Power cord is not connected properly or faulty</li> <li>Check whether the power cord is giving por the AC voltage between the live and the nector by using voltmeter (see If the voltage is NOT within ±2% of the wall see voltage, replace the cord.</li> <li>If the voltage is within ±2% of the wall sock please proceed to next step.</li> </ul>	
	POWER INL	ET

# Problem 1 — Cabinet does not start

	Circuit breaker has tripped (for PCR only)	<ul> <li>If there is power on wall socket and cord, check whether circuit breaker has tripped.</li> <li>The circuit breaker can be found right beside the cabinet power inlet.</li> <li>Note: If circuit breaker has tripped, do not reset the breaker before checking all electrical components and wiring connections. (See Fig. 1.4).</li> <li>Does the cabinet operate correctly after resetting the circuit breaker? If not proceed to next step.</li> </ul>
		Push to reset
	Fig 1.4	Circuit breaker       Circuit breaker         normal condition) (tripped condition)
		<ul> <li>Locate electrical panel at the top right portion of the cabinet (with red metal cover).</li> <li>Open electrical panel and ensure cabinet is plugged in to</li> </ul>
Cabinet does not start (LCD, button, fan, light, and UV are all inoperative)	Improper connection	<ul> <li>Open electrical panel and ensure cabinet is plugged in to main power supply.</li> <li>Carefully measure AC voltage between any LIVE and NEUTRAL pin on the terminal block inside electrical panel (see Fig. 1.5).</li> <li>The voltage should be 230 VAC or 115 VAC ± 10%.</li> <li>See Layout A at the end of this section to locate connector A and find pin numbering system of the connector (see Fig. 1.6).</li> <li>If the voltage is out of the range, check cable connection at connector A pin 1, 2 and 3.</li> </ul>
	Fig 1.5	
	Fig 1.6 Connector A	└ 230 /115 VAC ┘

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		For PCR:
		• Switch on the Fan by pressing Fan button on control panel (see Fig. 2.1).
		• Enter the Fan PIN number if required (default is 0001)
		The LED for FAN should illuminate and the FAN should start.
		If the FAN does not come on, proceed to next step.
	Fan is Off	<ul> <li>If the LED does not illuminate, check connection from control panel to main board or replace the membrane.</li> </ul>
		For SCR:
		• Switch on the Fan by switching the rocker switch to "I" or on position at control panel (see Fig. 2.2).
		• If the FAN does not come on, check for loose or improper wiring connections at the back of the switch.
		If the problem persists, proceed to next step.
Blower does not function	Green LED Fan   Button	AIR SAFE 16:20 Read all safety-related instructions before use Operate unit continuously for best performance Test / certify this cabinet at least annually Despect ta Medi 65 010% Bigs 600 (Duity Certified Mandatareng Revenuent
		Fan Switch
	FSC00. Extraordina: PCRC Cabinet Protocol provident with the first and with Restance Contracting face with stress and strengt face about mer and merity program of a stress stress and protocol and strengt of stress stress and and protocol and stress stress and and bother stress Postal start crystant stress stress and and bother Postal stress crystant and protocol and bother stress Postal start crystant stress stress and and advances for counter counters stress and and the stress stress and and advances and postal start crystant stress stress and advances and postal start crystant stress stress and advances and postal start crystant stress stress and postal start crystant stress stress stress stress and postal start crystant stress stress stress stress stress stress postal start crystant stress stress stress stress stress stress postal start crystant stress stress stress stress stress stress stress postal start crystant stress stress stress stress stress stress stress postal stress s	<ul> <li>Review of the wave of the second of the secon</li></ul>
		John Consta Tana and Ana Andre Sola a Solay Guady System Song a Anna Sola a Solay 
		Lipplug the solitest from regin surply
		Onpug the cabinet from main supply.     Onen the ten access namel and leasts electrical namel
		behind it.
	Fuse F1 is blown	• See Layout A at the end of this section to locate the relay board inside electrical panel.

# Problem 2 — Blower does not function

POSSIBLE CAUSE

PROBLEM



**CORRECTIVE ACTION** 



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Cabinet	Voltage	Cabinet Model	Capacitance			
	115//00 + 10%	2, 3 ft.	8-12 μF			
	115VAC ± 10%	4 ft.	17-23 μF			
PCR/SCK	2201/46 + 10%	2, 3 ft.	2.2-2.7 μF			
4 ft. 3.5-4.5 μF						
Table 2						



	Auto-thermal cut-off	<ul> <li>Check the Fan for overheating – The motor has an inbuilt thermal cut off.</li> <li>Wait 60 minutes with the FAN turned off and then tryto restart.</li> <li>If the FAN restarts determine why there is excessive heat in the cabinet.</li> </ul>
		If the FAN does not restart proceed to the next step.
Blower does not	Motor failure	<ul> <li>Unplug the cabinet from the main supply.</li> <li>Check motor condition. If physical damage is present, like fan blades bent, cracked or chipped off, replace blower (see Fig. 2.9).</li> </ul>
function		• To replace the blower, please follow instruction which is available in this manual under Service Section.
	Blower	Fig 2.9

## Problem 3 — Airflow is not at nominal velocity

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION	
Airflow is not at nominal velocity	External air interference	<ul> <li>Ensure that there are no external sources of airflow disturbance like air conditioner vent, window or incidences of door opening or people walking fast near the cabinet.</li> <li>Ensure that there is no air disturbance or obstruction on top of the pre-filter of the cabinet.</li> <li>If there is no external air blockage/interference, switch "ON" the blower fan.</li> <li>Open the top access cover and locate electrical panel inside.</li> <li>Refer to Fig. 3.1 (PCR) or Fig. 3.2 (SCR) below to locate motor voltage sampling port.</li> <li>Using voltmeter, measure AC voltage at the motor voltage sampling port as described in the re-certification section of this manual. This is to measure the motor voltage.</li> <li>If the motor voltage is lower than the Nominal Voltage value recorded in factory test report, adjust the speed control to get output voltage to blower as specified in the Test Report – Test Conditions Documentation Sheet.</li> <li>If still the airflow is not at nominal velocity, proceed to next step</li> </ul>	

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	Switch "ON" the blowerfan.
	• Lift-up the top pre-filter and open cover to access the electrical panel. Locate Motor Voltage Sampling Port.
	• Plug in the voltmeter to the Motor Voltage Sampling Port.
	<ul> <li>Measure the actual airflow velocity using anemometer or flow hood. If actual airflow is not okay, please adjust motor speed controller accordingly until actual airflow is okay.</li> </ul>
Filter loaded or wrong	Adjust the blower voltage until airflow is at nominal point.
speed controller setting	• If the blower is already operating at maximum voltage and the airflow is still lower than nominal point, it may be due to filter being loaded. Please change the filter.
	Note: The cabinet must be certified at least annually.
	• If the blower is already operating at maximum voltage and the airflow is still low due to filter loaded, it's time to change the filter. Instruction on how to replace the filter is available in this manual under ServiceSection.
	If filter is not loaded, proceed to next step.
	Measure and check voltage stability of the wall/building supply.
Fluctuating voltage	<ul> <li>If the building supply voltage fluctuates more than the stated tolerance (± 2%), connect the cabinet to a voltage stabilizer.</li> </ul>
	<ul> <li>If the building supply voltage fluctuation is below±2%, proceed to next step.</li> </ul>
Motor failure	Check the motor. If motor is not running, refer to <i>Blower doesn't function</i> problem.

### **Problem 4** — **Contaminated samples**

PI	ROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
Contan	ninated	Low airflow	<ul> <li>Adjust the speed control (located inside the electrical panel, on top of the cabinet) to get the optimum airflow as stated in the test report.</li> </ul>
sample	S		Perform the filter integrity test. Refer to test report.
		Leaking downflow filter	<ul> <li>Change the downflow filter if filter is found out to be leaking.</li> <li>Re-certify the cabinet after the new filter has been installed.</li> </ul>

![](_page_44_Picture_5.jpeg)

# Problem 5 — Excessive fan noise

Faulty Capacitor <ul> <li>Refer to Problem 2: Blower doesn't function – possible cause 4 – Faulty capacitor.</li> <li>Plug the cabinet power cord to the wall outlet and lift-up the top pre-filter. Open cover to access the electrical panel.</li> <li>See Layout A at the end of this section to locate the speed controller inside electrical box.</li> <li>Increase the motor speed by 5 – 10 VAC. Check whether the noise is already gone. If the noise is gone, measure the accula iarflow velocity. If the velocity is still in the acceptable range, keep it. If velocity is suit of acceptable range and noise still persists, proceed to the next step.</li> </ul> <li>Refer to above Blower doesn't function <math>\rightarrow</math> Faulty Capacitor section, to check the capacitor, and replace if necessary.</li> <li>Open the blower access panel (see Fig. 5.1) and check if the blower mounting bolts have been fully tightened.</li> <li>Also check whether the motor can rotate properly and not loosened. See Fig. 5.2 below.</li> <li>If blower is physically damaged, replace it. Instructions on how to replace the blower is available in this manual under Chapter 1.</li>	PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
Excessive fan noise <ul> <li>Plug the cabinet power cord to the wall outlet and lift-up the top pre-filter. Open cover to access the electrical panel.</li> <li>See Layout A at the end of this section to locate the speed controller inside electrical box.</li> <li>Increase the motor speed by 5 – 10 VAC. Check whether the noise is already gone. If the noise is gone, measure the actual airflow velocity. If the velocity is still in the acceptable range, keep it. If velocity is out of acceptable range and noise still persists, proceed to the next step.</li> </ul> <li>Refer to above Blower doesn't function → Faulty Capacitor section, to check the capacitor, and replace if necessary.</li> <li>Open the blower access panel (see Fig. 5.1) and check if the blower mounting bolts have been fully tightened.</li> <li>Also check whether the motor can rotate properly and not loosened. See Fig. 5.2 below.</li> <li>If blower is physically damaged, replace it. Instructions on how to replace the blower is available in this manual under Chapter 1.</li> <li><i>Pre-filter</i></li> <li><i>Biower</i></li> <li><i>Access</i></li> <li><i>Fig</i> 5.1</li> <li><i>Fig</i> 5.2</li>		Faulty Capacitor	<ul> <li>Refer to Problem 2: Blower doesn't function – possible cause 4 – Faulty capacitor.</li> </ul>
<ul> <li>Increase the motor speed by 5 - 10 VAC. Check Whether the noise is already gone. If the noise is gone, measure the actual airflow velocity. If the velocity is still in the acceptable range, keep it. If velocity is still in the acceptable range and noise still persists, proceed to the next step.</li> <li>Refer to above Blower doesn't function → Faulty Capacitor section, to check the capacitor, and replace if necessary.</li> <li>Open the blower access panel (see Fig. 5.1) and check if the blower mounting bolts have been fully tightened.</li> <li>Also check whether the motor can rotate properly and not loosened. See Fig. 5.2 below.</li> <li>If blower is physically damaged, replace it. Instructions on how to replace the blower is available in this manual under Chapter 1.</li> </ul>		Resonance	<ul> <li>Plug the cabinet power cord to the wall outlet and lift-up the top pre- filter. Open cover to access the electrical panel.</li> <li>See Layout A at the end of this section to locate the speed controller inside electrical box.</li> </ul>
<ul> <li>Excessive fan noise</li> <li>Loosed motor or impeller wheel mounting</li> <li>Copen the blower access panel (see Fig. 5.1) and check if the blower mounting bolts have been fully tightened.</li> <li>Also check whether the motor can rotate properly and not loosened. See Fig. 5.2 below.</li> <li>If blower is physically damaged, replace it. Instructions on how to replace the blower 1.</li> </ul>		Resonance	<ul> <li>Increase the motor speed by 5 – 10 VAC. Check whether the noise is already gone. If the noise is gone, measure the actual airflow velocity. If the velocity is still in the acceptable range, keep it. If velocity is out of acceptable range and noise still persists, proceed to the next step.</li> </ul>
Pre-filter Blower Access panel Fig 5.1 Fig 5.2 Blower Blower Blower Fig 5.2	Excessive fan noise	Loosed motor or impeller wheel mounting	<ul> <li>Refer to above Blower doesn't function → Faulty Capacitor section, to check the capacitor, and replace if necessary.</li> <li>Open the blower access panel (see Fig. 5.1) and check if the blower mounting bolts have been fully tightened.</li> <li>Also check whether the motor can rotate properly and not loosened. See Fig. 5.2 below.</li> <li>If blower is physically damaged, replace it. Instructions on how to replace the blower is available in this manual under Chapter 1.</li> </ul>
Fig 5.1 Fig 5.2		Pre-filter Blower Access panel	Blowe
		Fig 5	5.1 Fig 5.2

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
	Connection problem	<ul> <li>Unplug the cabinet from the main supply.</li> <li>Open the top access cover and locate electrical panel behind it.</li> <li>Open electrical panel and see Layout A at the end of this section to locate the main board inside electrical panel.</li> <li>Check whether LCD FRC (Flat Ribbon Cable) has been inserted properly into its socket on the main board (see Fig. 6.1).</li> </ul>
Blank LCD	LCD FRC cable	Fig 6.1

![](_page_46_Picture_2.jpeg)

![](_page_46_Picture_3.jpeg)

# Problem 7 — Inoperative buttons

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
	Connection problem	<ul> <li>Unplug the cabinet from the main supply.</li> <li>Open the top access cover and locate electrical panelinside.</li> <li>See Layout A at the end of this section to locate the main board inside electrical panel.</li> <li>See Fig. 7.1 below and ensure FRC cable going to interface board is connected properly. The triangle sign on the female connector indicates PIN number 1.</li> <li>Interface board and membrane/keypad are located behind the blue panel, underneath the light metaldeflector.</li> <li>With the cabinet still turned-off, uninstall the fluorescent light and metal deflector to access the interface board (see Fig. 7.3).</li> <li>See Fig. 7.2 below for the proper connection between main board, interface board, and membrane/keypad.</li> <li>Check if the green plastic cable from the membrane has been inserted properly into the interface board. Follow Fig. 7.4 for the correct orientation of connector.</li> </ul>
Inoperative buttons		FRC to Main Board — Green plastic cable INTERFACE BOARD MEMBRANE
	Cable to	Fig 7.2
	Fig 7.	The screws and thumbs screws inside that holds the glas in place In place

![](_page_48_Picture_0.jpeg)

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# Problem 8 — Lights always OFF

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
	Faulty fluorescent tube	<ul> <li>Replace the faulty fluorescent tube.</li> <li>Fluorescent tube is located inside the blue panel (Refer to Fig. 7.3 for lamp location and replacement).</li> </ul>
		<ul> <li>For PCR:</li> <li>See Layout A at the end of this section to locate the fluorescentballast, connector B, and relay board inside electricalpanel.</li> <li>Turn on the cabinet by connecting to the main supply, then turn on the light by pressing LIGHT button on membrane/keypad.</li> <li>Check AC voltage at ballast input (between pin NO on J13 terminal on relay board to neutral), see Fig. 8.1below.</li> <li>It should be 230 VAC + 10% for 230 V cabinets or 115 VAC</li> </ul>
Lights always OFF	Faulty Fluorescent ballast	<ul> <li>± 10% for 115 V cabinets.</li> <li>If not, check the LS7 relay and F7 fuse (refer to possible cause <i>Faulty relay or fuse</i> below).</li> <li>For SCR:</li> <li>See Layout B at the end of this section to locate the fluorescent ballast and connector B inside electrical panel.</li> <li>Turn on the cabinet by connecting to the main supply, then switch on the light with the LIGHT rocker switch on control panel.</li> <li>Check AC voltage at ballast input (between pin connector</li> </ul>
		A-5 to neutral). It should be 230 VAC ± 10% for 230 V cabinets or 115 VAC ± 10% for 115 V cabinets. Black cable is ballast input (230VAC or 115VAC) C NO NC Terminal J13
		Fig 8.1

		1		
		For PCR:		
		Unplug the cabinet from the main supply.		
		• See Layout A at the end of this section to locate the relay board, fluorescent ballast, and connector B inside electrical panel.		
		Check forany loosedor bad connectionbetween relay board, fluorescent lamp ballast, and female connector B.		
		• See Figure 8-1 to locate terminal J13 on relay board, check tightness of 2 cables connected to J13.		
	Connection Problem	• For connector B, disconnect the male side from electrical panel, then check male and female side for any bad connection.		
		Check also connection of the lamp holder(see		
		Figure 7-3). For SCR:		
		Unplug the cabinet from the main supply.		
		• See Layout B at the end of this section to locate the fluorescent ballast and connector B inside electrical panel.		
		Checkforanyloosedorbadconnectionbetweenlight     switch, fluorescent lamp ballast, and female connector B.		
		• For connector B, disconnect the male side from electrical panel, then check male and female side connectors for any loose or wrong connection.		
		Check also connection of the lamp holder (see Figure 7-3).		
Lights always OFF		Unplug the cabinet from the main supply.		
		Open the top access cover and locate electrical panelinside.		
	Faulty relay or fuse (For PCR only)	• See Layout A at the end of this section to locate the relay board inside electrical panel.		
		Check relay LS7 and fuse F7 on the relay board. See Figure 8- 2 below.		
		• If fuse F7 is blown, as temporary solution, use F5 to replace F1. The fuse F5 is not used and is a spare fuse.		
		<ul> <li>On terminal J13, check the Normally Open (NO) to Common and Normally Closed (NC) to Common (C) circuits by checking continuity. Normally Open to Common doesn't have continuity while the Normally Closed to Common has continuity.</li> </ul>		
		<ul> <li>If the NO to Common and NC to Common contacts are not correct, replace the RelayBoard</li> </ul>		
	Relay LS7			

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# Problem 9 — Cannot turn on UV lamp

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION			
	Sash not in UV state	<ul> <li>WARNING: Before turning the UV lamp on, make sure that the hinged window is closed. Also ensure that you are protected.</li> <li>For PCR:</li> <li>Close the hinged window for UV mode position (fully closed, see Fig. 9.1 below).</li> <li>If UV MODE is not displayed on the LCD, please refer to the Magnetic Switch troubleshooting section.</li> <li>Switch on the UV lamp by pressing the UV button (see Fig. 9.2 below).</li> <li>If UV MODE is displayed on LCD but UV is not on after pressing UV button, please refer to possible cause 2-UV magneticswitchis misaligned or faulty.</li> <li>For SCR:</li> <li>Close the hinged window for UV mode position (fully closed, see Figure 9-1 below).</li> <li>Set the mechanical timer for the UV at the desired value.</li> <li>If UV timer is on but UV lamp is not, please refer to possible</li> </ul>			
Cannot turn ON UV Lamp	Sash at	fully closed position Fig 9.1			
	MENU SET/X	AIR SAFE 16:20 AIR SAFE 16:20 Read: all safety-related instructions before use Operate unit contranuously for best performance Test / contributions the least annually Oregonale to Main Bio Contrant Contract to Main Bio Contract to Contract			

![](_page_52_Picture_3.jpeg)

<ul> <li>Open the top access cover and locate electrical p</li> <li>See Layout A at the end of this section to locate ballast, relay board, and connector B inside elect</li> <li>Turn on the cabinet by connecting to the main s switch on the UV by pressing UV button on membrane/keypad. Make sure that the front co attached and the LCD displays UV mode.</li> <li>Check AC voltage at UV ballast input (between p J15 terminal on relay board to neutral), see Figur</li> <li>It should be 230 VAC ± 10% for 230 V cabinets or 10% for 115 V cabinets.</li> <li>If not, check the LS8 relay and F8 fuse (refer to p cause 6 below)</li> <li>For SCR:</li> </ul>	e the UV rical panel. upply, then over is in NO on re 9-4. 115 VAC ±			
<ul> <li>See Layout A at the end of this section to locate ballast, relay board, and connector B inside elect</li> <li>Turn on the cabinet by connecting to the main s switch on the UV by pressing UV button on membrane/keypad. Make sure that the front co attached and the LCD displays UV mode.</li> <li>Check AC voltage at UV ballast input (between p J15 terminal on relay board to neutral), see Figur</li> <li>It should be 230 VAC ± 10% for 230 V cabinets or 10% for 115 V cabinets.</li> <li>If not, check the LS8 relay and F8 fuse (refer to p cause 6 below)</li> <li>For SCR:</li> </ul>	e the UV trical panel. upply, then over is in NO on re 9-4. 115 VAC ± possible			
<ul> <li>Turn on the cabinet by connecting to the main s switch on the UV by pressing UV button on membrane/keypad. Make sure that the front co attached and the LCD displays UV mode.</li> <li>Check AC voltage at UV ballast input (between p J15 terminal on relay board to neutral), see Figur</li> <li>It should be 230 VAC ± 10% for 230 V cabinets or 10% for 115 V cabinets.</li> <li>If not, check the LS8 relay and F8 fuse (refer to p cause 6 below)</li> <li>For SCR:</li> </ul>	upply, then over is in NO on 'e 9-4. 115 VAC ± oossible			
<ul> <li>Check AC voltage at UV ballast input (between p J15 terminal on relay board to neutral), see Figur</li> <li>It should be 230 VAC ± 10% for 230 V cabinets or 10% for 115 V cabinets.</li> <li>If not, check the LS8 relay and F8 fuse (refer to p cause 6 below)</li> <li>For SCR:</li> </ul>	in NO on <sup>.</sup> e 9-4. 115 VAC± oossible			
<ul> <li>It should be 230 VAC ± 10% for 230 V cabinets or 10% for 115 V cabinets.</li> <li>If not, check the LS8 relay and F8 fuse (refer to p cause 6 below)</li> <li>For SCR:</li> </ul>	115 VAC±			
If not, check the LS8 relay and F8 fuse (refer to p cause 6 below) For SCR:	ossible			
For SCR:				
Owner the ten process or loss and loss to be trial a				
Open the top access cover and locate electrical p	anelinside.			
See Layout B at the end of this section to locate ballast and connector B inside electrical panel.	the UV			
Faulty UV ballast       • Turnon the cabinetby connecting to the main sup switch on the UV by turning UV timeron. Make s the front cover is attached so that the unit is in U operation.	oply, then ure that V mode			
Cannot turn ON UV     Check AC voltage at UV ballast input (between p connector A-6 to neutral terminal block).	Check AC voltage at UV ballast input (between pin connector A-6 to neutral terminal block).			
It should be 230 VAC ± 10% for 230V cabinets or 10% for 115V cabinets.	115 VAC ±			
<ul> <li>If not, check the UV timer, relays K1, K2, and K3 connections. Verify that the building voltage is al and not fluctuating.</li> </ul>	3 wiring Iso correct			
For PCR/SCR:				
Disconnect male connector B on electrical panel.				
Turn on the unit by connecting to the main supp	ly.			
<ul> <li>Turnon the UV, then check AC voltageat ballast (between female connector B pin 3 and 9[for PC and 8[for SCR]). It should be around 10-25 VAC for cabinets or around 450-600 VAC for 115 V cabin Table 6 below.</li> </ul>	: output R], pin 7 for 230V iets. See			
Cabinet Voltage Connector Pin UV ballast	output			
230VAC +/- 10% B 3 to 9 (PCR) 10-25V	AC			
115VAC +/- 10% B 3 to 9 (PCR) 450-600 7 to 8 (SCR)	IVAC			
Table 9				

![](_page_53_Picture_3.jpeg)

![](_page_54_Picture_0.jpeg)

		For PCR.
		Unplug the cabinet from the main supply
		Onen the ton access cover and locate electrical nanel inside
		<ul> <li>See Layout A at the end of this section to locate the relay board inside electrical panel</li> </ul>
		<ul> <li>Check I S8 relay and fuse E8 on the relay board (see Fig. 9.6)</li> </ul>
		If fuse E8 is blown as temporary solution use E5 to replace
		F8. The fuse F5 is not used and is a spare fuse.
		<ul> <li>On terminal J15, check the Normally Open (NO) to Common and Normally Closed (NC) to Common (C) circuits by checking continuity. Normally Open to Common doesn't have continuity while the Normally Closed to Common has continuity.</li> </ul>
	Faulty relay or fuse	If the NO to Common and NC to Common contacts are not correct, replace the Relay Board.
		For SCR:
		Unplug the cabinet from the main supply.
		Open the top access cover and locate electrical panel inside.
		• See Layout B at the end of this section to locate the relay board inside electrical panel.
		Check the K1, K2, and K3 relays. See Fig. 9.7 below.
Cannot turn ON UV Lamp		Check the Normally Open (NO) to Common and Normally Closed (NC) to Common (C) circuits by checking continuity. Normally Open to Common doesn't have continuity while the Normally Closed to Common bas continuity.
		If the NO to Common and NC to Common contacts are not
		correct, replace the relays.
	NC NO C Fuse F8	<i>Relay LS8</i> <b>Fig. 9.6</b>
	Check Relay Continuity Status	Fig. 9.7

![](_page_55_Picture_2.jpeg)

![](_page_56_Figure_0.jpeg)

LAYOUT A

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Polymerase Chain Reaction Cabinets

ESCO

![](_page_57_Figure_0.jpeg)

LAYOUT B

ESCO

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# Chapter 3 – Product Specifications

### **Technical Specification Summary Table** 3.1

Polymerase Chain Reaction Cabinets										
Model		SCR-2A_			PCR-3A_			PCR-4A_		
Nominal Size		(	).6 meter (2	')	0	.9 meter (3	')	1	.2 meter (4	5)
External Dimer (L x W x H)	isions	730 x 617 x 950 mm (28.7" x 24.3" x 37.4")		1035 (40.7'	x 617 x 950 ' x 24.3" x 3	) mm 37.4")	1340 (52.8	x 617 x 950 " x 24.3" 3	0 mm 7.4")	
Internal Dimensions (L x W x H)		630 x 538 x 550 mm (24.8" x 21.2" x 21.7")			935 x 538 x 550 mm (36.8" x 21.2" x 21.7")			1240 x 538 x 550 mm (48.8" x 21.2" x 21.7")		
Laminar Airflow	v Velocity	0.30 m/s (60 fpm)								
Pre-Filter		Washable polyurethane fibers with 85% arrestance								
Sound Emission	า*		<63 dBA			<56 dBA			<58 dBA	
Fluorescent Laı Intensity	np	>800 Lu	x (>75 foot	candles)	>975 Lu>	< (>91 foot	candles)	>123	0 Lux (>114 candles)	l foot
UV Lamp			253.7 r	nanometer 1	.5-watt UV	lamp		253.7 n	anometer 3 UV lamp	30-watt
Controller		Ro	ocker Switch	nes	E	sco Sentine	el™ Silver N	licroproces	sor Contro	I
Construction	Main Body	Elec	Electrogalvanized steel with white oven-baked epoxy-polyester powder-coated finish. Coated with Esco ISOCIDE™ antimicrobial coating							
construction	Work Zone	1.2 mm (0.05") 18 gauge stainless steel grade 304								
	Model	SCR-2A1 220-230 VAC, 50 Hz	SCR-2A2 110-120 VAC, 50/60 Hz	SCR-2A3 220-230 VAC, 60 Hz	PCR-3A1 220-230 VAC, 50 Hz	PCR-3A2 110-120 VAC, 50/60 Hz	PCR-3A3 220-230 VAC, 60 Hz	PCR-4A1 220-230 VAC,	PCR-4A2 110-120 VAC, 50/60 Hz	PCR-4A3 220-230 VAC, 60 Hz
Electrical**	Cabinet Full Load Amps (FLA)	1 A	1.5 A	1 A	0.75 A	1.1 A	0.75 A	1.8 A	3.8 A	1.8 A
	Cabinet Nominal Power	136 W	165 W	117 W	135 W	146 W	144 W	184 W	260 W	180 W
	Cabinet BTU	464	563	400	461	498	491	628	887	614
Net Weight		76	.5 Kg (169 II	os.)	99	99 Kg (218 lbs.)		115.4 Kg (254 lbs.)		
Shipping Weigh	nt***	100.5 Kg (222 lbs.)		123.3 Kg (272 lbs.)		139.8 Kg (308 lbs.)				
Shipping Dimensions, Maximum (L x W x H)***		850 x 730 x 1150 mm (33.5" x 28.7" x 45.3")		1130 x 730 x 1150 mm (44.5" x 28.7" x 45.3")			1420 x 730 x 1150 mm (55.9" x 28.7" x 45.3")			
Shipping Volume, Maximum***		0.71 m <sup>3</sup> (25 ft <sup>3</sup> )			0.95 m³ (34 ft³)			1.19 m <sup>3</sup> (42 ft <sup>3</sup> )		

\* Noise reading in open field condition / anechoic chamber

\*\* Additional voltages may be available; contact Esco for ordering information.

\*\*\* Cabinet only; excludes optional stand.

![](_page_58_Picture_8.jpeg)

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# APPENDIX A: LOG RECORD

Cabinet :			
Serial Number:			
Person in Charge:			

- 1. This log record should be used by the operator to record any new agent/virus/bacteria/germs that has been introduced to the cabinet during its operation, problems encountered, etc.
- 2. Any decontamination procedure performed by either the user or the technician should be recorded down as well.

Please also record any major maintenance procedure performed by the service technician, for example: parts replacement, recertification, etc.

DATE	EVENT	USER SIGNATURE	SUPERVISOR SIGNATURE
			0
			7
		S	
	>		

In case of emergencies, p	please call:
Name:	
Cell Phone Number:	
E-mail:	

# APPENDIX B: FURTHER INFORMATION AND REFERENCE MATERIALS

The following documents are available for download at <u>www.escoglobal.com</u>, in the Resources area. These documents have been selected as pertinent to this product and we would recommend that anyone operating the cabinet familiarize themselves with this information.

- 1. Introduction to Laminar Flow Cabinets
- 2. Ultraviolet Lamps in Laminar Flow and Biological Safety Cabinets

### FILTRATION TECHNOLOGY

 Introduction to Contamination Control and Cleanroom Technology. 2000. Matt Ramstorp. Wiley-VCH. Weinheim.
 Cleanroom Technology. Fundamentals of Design, Testing, and Operation. 2001. Whyte.W. Wiley, West Sussex, England.

• IEST-RP-CC001: HEPA and ULPA Filters.2002. Institute of Environmental Sciences and Technology, Illinois, USA.

• IEST-RP-CC007: Testing ULPA Filters.2002. Institute of Environmental Sciences and Technology, Illinois, USA.

• IEST-RP-CC021: Testing HEPA and ULPA Filter Media.2002. Institute of Environmental Sciences and Technology, Illinois, USA.

• IEST-RP-CC034: HEPA and ULPA Filter Leak Tests.2002. Institute of Environmental Sciences and Technology, Illinois, USA.

• BS EN 13091: Biotechnology. Performance Criteria for Filter Elements and Filtration Assemblies. 2000. British Standards, UK.

### **CLEAN AIR TECHNOLOGY**

• *ISO 14644: Cleanrooms and Controlled Environments*.2000. International Organization for Standardization, Switzerland.

• *IEST-G-CC1001: Counting Airborne Particles for Classification and Monitoring of Cleanrooms and Clean Zones*. 1999. Institute of Environmental Sciences and Technology, Illinois, USA.

• *IEST-G-CC1002: Determination of the Concentration of Airborne Ultrafine Particles*. 1999. Institute of Environmental Sciences and Technology, Illinois, USA.

• *IEST-G-CC1003: Measurement of Airborne Macro Particles*. 1999. Institute of Environmental Sciences and Technology, Illinois, USA.

• *IEST-G-CC1004: Sequential Sampling Plan for Use in Classification of the Particulate Cleanliness of Air in Cleanrooms and Clean Zones*. 1999. Institute of Environmental Sciences and Technology, Illinois, USA.

### WEBSITES

Esco Micro Pte. Ltd. www.escoglobal.com International Organization for Standardization (ISO) www.iso.org Institute of Environmental Sciences and Technology (IEST) www.iest.org NSF International www.nsf.org Occupational Safety and Health Administration, USA www.osha.gov American Biological Safety Association www.absa.org