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Principal Display Panel

Aero HygenX

RAY

AUTONOMOUS UVC ROBOT  
REGISTRATION NO. 34541 PCPA



**KEEP OUT OF REACH OF CHILDREN**

**This device is intended for commercial or industrial use only  
READ LABEL AND THIS OPERATING MANUAL BEFORE USING.**

WARNING - UV radiation emitted at 254 nm from this device



Reduces micro-organisms on surfaces

Aero HygenX Inc.  
217-150 Katimavik Road  
Ottawa, Ontario  
K2L 2N2  
CANADA  
1-800-260-0787

NOTICE TO USER: This pest control product is to be used only in accordance with the directions on the label. It is an offence under the *Pest Control Products Act* to use this product in a way that is inconsistent with the directions on the label.

# RAY Operating Manual

**READ AND SAVE THESE INSTRUCTIONS!**

THIS DEVICE IS INTENDED FOR COMMERCIAL OR INDUSTRIAL USE ON AIRCRAFT ONLY. BEFORE USING THIS DEVICE READ ALL INSTRUCTIONS, WARNINGS AND CAUTIONS IN THIS MANUAL AND ON THE PRODUCT LABEL.

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# 1. PRECAUTIONS

## WARNING

UV radiation emitted at 254nm from this device. Unintended use of the device, or damage to the housing, may result in exposure to ultraviolet radiation. Ultraviolet radiation may cause eye and skin irritation. Avoid exposing eyes and skin to ultraviolet radiation by always using the robot in the autonomous mode.

## DANGER

Direct exposure to UVC can be dangerous and result in a sunburn-like reaction to the skin and serious damage to the cornea. Never operate the Aero HygenyX Ray - Autonomous UVC Robot with anyone in the cabin. Direct exposure to UVC is dangerous. UVC products are not meant to be used in applications or activities which may cause and/or lead to death, personal injury and/or damage to the environment.



## FIRST AID

Take label, manual or product name and Pest Control Product Registration Number with you when seeking medical attention.

- a. Personal UVC dosimeter indicators are recommended for staff involved with the operation of RAY. ([www.uvcdosimeters.com/personal-uvc-indicator/](http://www.uvcdosimeters.com/personal-uvc-indicator/))  
  
(According to the American Conference of Government Industrial Hygienists (ACGIH), the Threshold Limit Value (TLV) for UVC is 6 mJ/cm<sup>2</sup> per workday, as indicated in the *Documentation of the Threshold Limit Values and Biological Exposure Indices, 8th Edition, Copyright 2020.*)
- b. This device contains a Lithium Iron Phosphate (LiFePo<sub>4</sub>) Battery. To reduce the risk of fire, electric shock, or injury, refer to the “MAINTENANCE & CLEANING” section for instructions on battery replacement. To eliminate any possible exposure to UVC light, ensure the Master Power Switch is off and the battery disconnected before servicing the device. The battery must also be disconnected before shipping.
- c. The battery in this device must only be charged using the charger supplied by Aero HygenX. Charging with unapproved chargers may result in battery damage, explosion or fire.
- d. The UVC lamps in this device contain amalgam which contains traces of mercury (Hg) stabilized as an alloy. Dispose of or recycle UVC lamps according to applicable laws. (Visit: [www.lamprecycle.org](http://www.lamprecycle.org)). Should lamps require replacement, they must be replaced with lamps approved and certified by Aero HygenX. Failure to do so could result in damage to the machine or the production of ozone.
- e. Use Aero HygenX RAY – Autonomous UVC Robot only as described in this Operating Manual. Do not carry out any maintenance other than that shown in this manual, or

as advised by a company supervisor. This device is not intended for use by persons with reduced physical, sensory or reasoning capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the device by a person responsible for their safety.

- f. Disconnect battery when not in use for extended periods and before maintenance or servicing. If the device is not working as it should, has received a sharp blow, has been dropped, damaged, left outdoors, or dropped into water, do not use and contact a company supervisor. When service or repair is required, a company supervisor should contact the Aero HygenX Helpline (1-800-260-0787).

## IMPORTANT SAFETY FEATURES

Aero HygenX RAY – Autonomous UVC Robot is equipped with LIDAR, SONAR and onboard cameras which are used for guidance and to detect objects, motion of persons or other obstructions which will impede its movement.

The following list outlines the important safety features of Aero HygenX RAY – Autonomous UVC Robot and the corresponding response of the unit when operating in the autonomous mode.

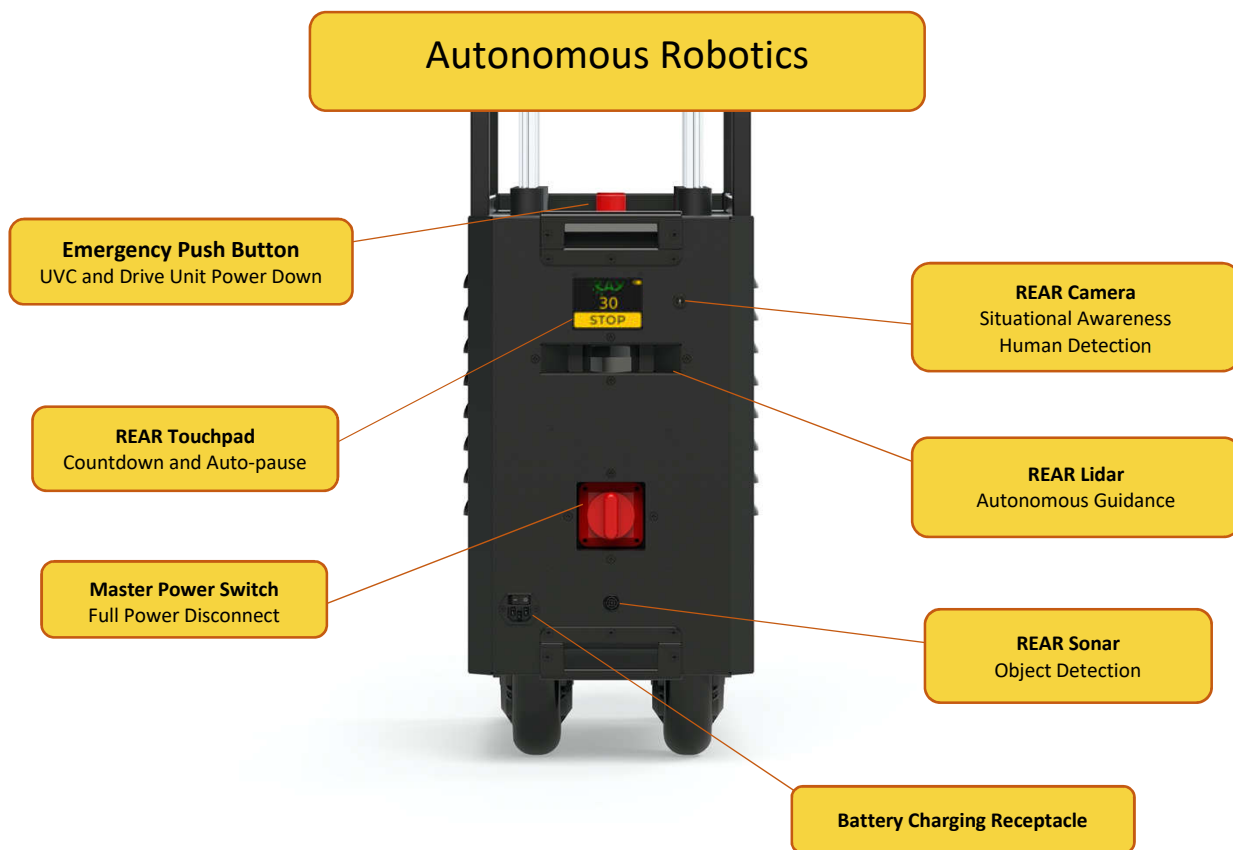
- Auto-Delay during Start-Up: To prevent exposure to UVC light during operation, Aero HygenX RAY – Autonomous UVC Robot is equipped with a configurable time delay between directional input on the device, until lamp illumination. This auto-delay allows time for the operator to exit the aircraft and close the aircraft door before the lamps commence warm-up. The default value for the auto-delay is 30 seconds. The auto-delay can be set to any desired time interval (in seconds) between directional input and lamp illumination.
- Object and Motion detection within 0.5 metres (1.64 feet): If an object or any motion is detected within 0.5 metres of the device, Aero HygenX RAY – Autonomous UVC Robot will stop and the UVC lamps will extinguish. Operator input is required before RAY will re-start.
- Human Face detection up to 3 metres (9.84 feet): If a human face is detected within 3.0 metres of the device, Aero HygenX RAY – Autonomous UVC Robot will stop and the UVC lamps will extinguish. Operator input is required before Aero HygenX RAY – Autonomous UVC Robot will re-start.
- Speed limitation 0.2 metres/second (0.66 feet/second): This is the maximum speed of the device. For most sanitizing procedures, Aero HygenX RAY – Autonomous UVC Robot will operate at speeds between 0.1m - 0.15m/second (0.33-0.49 feet/second).
- Auto-shutoff if no motion detected: If Aero HygenX RAY – Autonomous UVC Robot determines it is not safe to proceed (i.e., becomes impeded by an aircraft seat or object on the floor), it will shut off following no motion detected for more than 20 seconds.

- STOP button on Touchpad: The STOP button can be pushed at any time to cancel all inputs. Pushing the STOP button will stop the disinfection sequence.
- Emergency Pushbuttons: If either of the red Emergency Pushbuttons on the top of the device are pressed, Aero HygenX RAY – Autonomous UVC Robot will:
  - a) remove power from lamps; and
  - b) remove power from drive unit.
- Protective Cage: Aero HygenX RAY – Autonomous UVC Robot is equipped with a protective cage to prevent damage to the lamps during transport of unit. Although the cage is removable, Aero HygenX recommends leaving the cage on during operation of unit.
- Environmental Cover: In addition to the cage, Aero HygenX RAY – Autonomous UVC Robot also comes with an environmental cover, which fits over top of the cage, providing protection from water/moisture/dust ingress. The environmental cover should be in place when the device is being transported outdoors.
- Amber Warning Lights: During the start-up sequence, amber flashing lights on either end of the top cover illuminate indicating that the UVC lamps are now armed and the system is powered for use. (The start-up sequence is initiated by ensuring the Emergency Pushbuttons are UP, followed by the Master Power Switch being turned ON)
- Master Power Switch: The large red rotary knob on the back end of Aero HygenX RAY – Autonomous UVC Robot is the Master Power Switch. Turning the Master Power Switch OFF disconnects the Main Battery from all electronics and lamps and allows for safe transport or maintenance of the unit.

Use this unit only in the manner intended by the manufacturer. If you have questions, contact the manufacturer at the address or telephone number on the label. For more information regarding automatic safety features, contact the Aero HygenX Helpline @ (1-800-260-0787).

## 2. FEATURES AND CONTROLS

REAR VIEW



FRONT VIEW



### 3. OPERATION

#### TREATMENT OF THE AIRCRAFT

Supported efficacy claims for hard and soft surfaces within an aircraft cabin\*

Treatment Cycle	Supported Claims
Single pass at 0.125 m/s	Kills 99.999% of SARS-CoV-2
Two passes at 0.125 m/s	Kills 99.999% of SARS-CoV-2 Reduces viruses by 99%
Two passes at 0.125 m/s with a 40 s stationary phase at each row of seats	Kills 99.999% of SARS-CoV-2 Kills 99.99% of viruses
Two passes at 0.125 m/s with a 4.5 minute stationary phase at each row of seats	Kills 99.999% of SARS-CoV-2 Kills 99.99% of viruses Kills 99.9% of bacteria

\*Applicable only when surfaces are less than 1.5m away from the path of travel

- a. The use of this device is a supplement to, and not a substitute for, standard disinfection control practices; users must continue to follow all current infection control practices, including those related to the cleaning and disinfection of environmental surfaces.
- b. The following procedure outlines the steps necessary to treat the aircraft, using UVC light, following routine operations or following carriage of individuals who have been exposed to an infectious disease.
- c. Ensure all personnel involved in the task familiarize themselves with the required safety precautions and operating instructions associated with the device. (Refer to “PRECAUTIONS” section above.)
- d. Treatment of an aircraft using UVC light is based on the assumption of a clean aircraft. Visible soil and liquid spills, including bodily fluids, must be removed from aircraft surfaces prior to the commencement of treatment. If necessary, seek guidance from the local health authority or medical professional if notified of the presence of bodily fluids, prior to the commencement of treatment.
- e. Ensure the following Tools and Equipment are available prior to commencing treatment:
  1. Protective clothing.
  2. Safety goggles for eye protection.
  3. Personal UVC Exposure Indicatorp
  4. Warning placards.
- f. Put up external warning placards when UVC treatment of the aircraft is in progress. All unnecessary personnel should be kept at a distance until the task is completed.
- g. Prepare the aircraft cabin for treatment. Ensure all flight crew and passengers are not in the treatment area and their belongings and garbage have been removed from the aircraft.





## AREA OF COVERAGE

- a. Aero HygenX RAY – Autonomous UVC Robot incorporates a unique design which has been engineered for both single and dual-aisle aircraft. The lamp array allows for maximum UVC light exposure on to the high-touch surfaces of an aircraft. To sanitize or disinfect, the UV light must have direct line-of-sight with target surfaces.
- b. By eliminating the need for an operator to be present during the treatment process, the autonomous operation of Aero HygenX RAY – Autonomous UVC Robot allows for safe UVC treatment at the push of a button.
- c. The powerful 24V LiFePo 50Ah battery allows for a minimum of 6 dual-pass treatment before recharging is required.

## START SEQUENCE

Aero HygenX RAY – Autonomous UVC Robot has 3 modes of Operation:

(1) FORWARD:



Aero HygenX RAY – Autonomous UVC Robot will move down the aisle (away from the operator) until detecting a wall or obstruction and will then come to a STOP.

(2) LOOP:



Aero HygenX RAY – Autonomous UVC Robot will move in the direction of the chevron labelled “1” until detecting a wall or obstruction, stop momentarily, then reverse direction and move back down the aisle, in the direction of the chevron labelled “2”, until detecting another wall or obstruction, and will then come to a stop.

(3) REVERSE:



Aero HygenX RAY – Autonomous UVC Robot will move down the aisle (towards the operator) until detecting a wall or obstruction and will then come to a STOP.

Once Aero HygenX RAY – Autonomous UVC Robot is in position in the aircraft aisle, and the environmental cover has been removed, the Master Power Switch is turned to the ON position. (Power-up is verified by amber flashing lights on the top of the unit). The device will now go through a short System Health Check.



When the System Health Check is complete, the “RAY” logo turns green and the device is ready for use.

The operator then selects a directional command; either FORWARD, REVERSE, or LOOP.



The touchpad now reverts to the Countdown mode (shown here), commencing the auto-delay of 30 seconds before lamp warm-up. *This countdown allows time for the operator to exit the aircraft.*



When the countdown is complete, the lamp warm-up will commence. *The operator must be well away from the unit prior to lamp warm-up.* If the operator wishes to delay commencement of treatment, the STOP icon on the touchpad should be pressed.

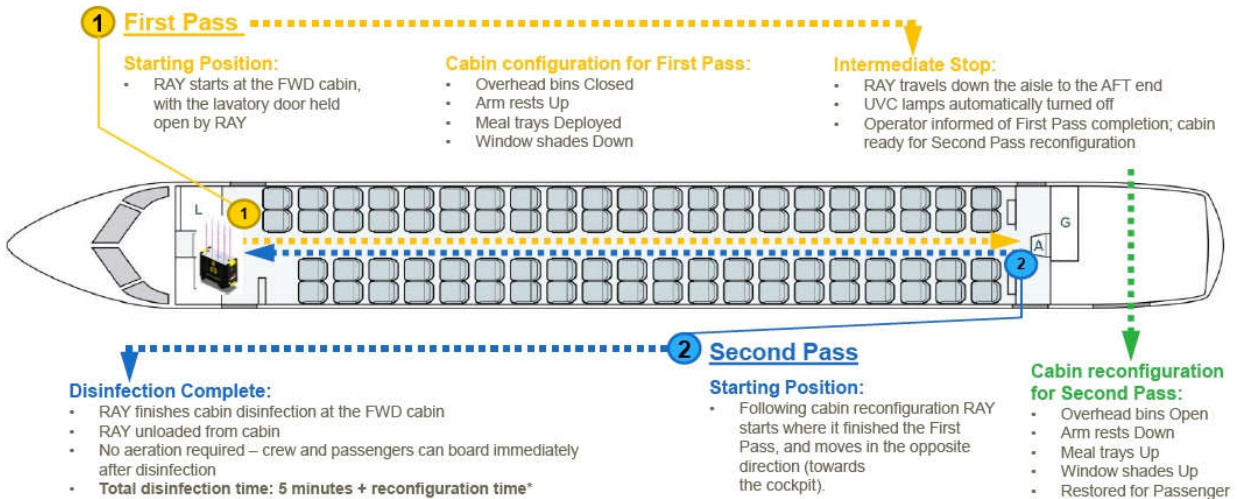


When the lamp warm-up is complete (default warm-up time is 2 minutes), the treatment will commence. The lamps will be fully illuminated and Aero HygenX RAY – Autonomous UVC Robot will start moving down the aisle. (If Aero HygenX RAY – Autonomous UVC Robot has been used in the previous 5 minutes, lamp warm-up reverts to just 30 seconds.)



## EXAMPLE TREATMENT SEQUENCE

Note: The following is a description of a SARS-CoV-2 treatment sequence for a DHC Dash-8-400 aircraft. Operating procedures may require modification for other viruses, bacteria, aircraft types or variants.



- The starting position is at the front of the aircraft, adjacent to the lavatory, with the lavatory door open. The front of Aero HygenX RAY – Autonomous UVC Robot should be facing the first intended direction of travel.
- Place Aero HygenX RAY – Autonomous UVC Robot in the starting position and remove the environmental cover.
- Ensure there are no obstructions on the aircraft cabin floor.
- Ensure the aircraft cabin has been configured with all tray tables down and all overhead bins closed.
- Plan treatment for either a single or dual pass (loop mode; refer to modes of operation above)
- Turn the Master Power Switch ON. (Power-up is verified by amber flashing lights on the top of the unit. If the amber lights are not on, ensure both red Emergency Push Buttons are in the UP position.)
- Initiate START sequence by selecting one of the operation modes. (i.e., FORWARD, REVERSE, or LOOP.)
- Exit the aircraft and close the aircraft door within 30 seconds of initiating the START sequence.
- To monitor the progress of Aero HygenX RAY – Autonomous UVC Robot, the operator will be able to see the bright aura of light from outside the aircraft.
- For single pass operation, when the first pass is complete, and lamps are extinguished, enter the aircraft and reconfigure for the second pass by opening the window shades and placing the meal trays in the UP position.
- Initiate the START sequence for the 2<sup>nd</sup> pass.
- When the cabin treatment is complete, enter the aircraft, turn the Master Power Switch off and replace the environmental cover on to the Aero HygenX RAY – Autonomous UVC Robot unit before moving to the next work assignment.

## 4. TRANSPORTING THE DEVICE

- a. When transporting Aero HygenX RAY – Autonomous UVC Robot to the aircraft, the device should remain upright. The Master Power Switch must be selected off to prevent damage to the drive unit.
- b. If Aero HygenX RAY – Autonomous UVC Robot is to be transported outdoors, the protective environmental cover should be installed, especially during periods of inclement weather. Ingress of water or moisture into the device will cause damage to electronic components.

### LOADING RAY ON TO THE AIRCRAFT

- c. If the aircraft is parked adjacent to a jetway, Aero HygenX RAY – Autonomous UVC Robot can be manually positioned (on wheels) into the cabin.

NOTE: For manual repositioning, ensure Master Power Switch is selected “OFF”. (refer to “REAR VIEW” image in section above entitled “FEATURES & CONTROLS” for location of Master Power Switch)



- d. If the aircraft is parked on an open ramp, ground staff may load Aero HygenX RAY – Autonomous UVC Robot through the aircraft door as shown:

NOTE: Carry handle at the front is mid-way up the unit. Carry handle at the aft is on the lower portion of the unit.

## 5. BATTERY CHARGING

- a. Charge the battery as often as possible, to maximize battery life. (Numerous short charges are better than one long charge.)
- b. A complete charge will take approximately three hours, using the 12A charger provided.
- c. RAY should remain powered off during charging.
- d. The Emergency Push Buttons should be pressed down to ensure wheels and lamps remain unpowered.
- e. Connect the charger to the XLR charge receptacle at the front of Aero HygenX RAY – Autonomous UVC Robot. (refer to FRONT view under “FEATURES & CONTROLS” section.)



## 6. MAINTENANCE & CLEANING

### BATTERY EXCHANGE

- a. Power off Aero HygenX RAY – Autonomous UVC Robot by ensuring the Master Power Switch is OFF.

- b. Open side panel of Aero HygenX RAY – Autonomous UVC Robot (With panel open, top of battery will be visible).



- c. Locate the large red Handle.



- d. Pull on the red handle while holding on to the battery-side portion of the connector to separate the two parts – as shown in the photo.



- e. Remove the Velcro strap around the battery and slide the battery out.
- f. Slide the replacement battery in.
- g. Attach the Velcro strap around the battery.
- h. Connect the new battery by pushing the red connectors together (reverse of removal).
- i. Ensure correct polarity (per image).
- j. Close side panel.
- k. Ensure Aero HygenX RAY – Autonomous UVC Robot can be powered on.
- l. Ensure battery disposal is in compliance with local laws.



## LAMP EXCHANGE

- a. Ensure safety gloves are worn to avoid skin contact with glass and to avoid the possibility of injury if the lamp were to shatter.

- b. Open the side panel.



- c. Pull up gently on the bulb requiring replacement, holding on to the lamp as close to the base as possible.



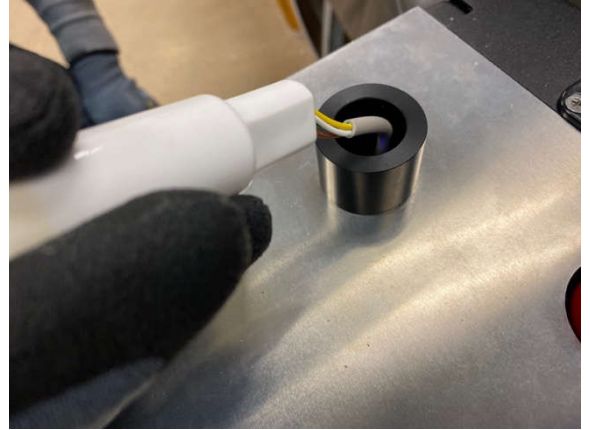
- d. When raised, gently pull the white ceramic connector apart from the 4 pins at the base of the lamp.

- e. Slide the new lamp into the ceramic connector, ensuring all pins are securely connected. (Take note of the key pattern of the connector; it will fit only one way).





- f. Slide the connector and lamp back down into the black UVC holder.



## CLEANING

- a. Clean Aero HygenX RAY – Autonomous UVC Robot with a soft, dry cloth.
- b. For more stubborn stains, use a soft cloth slightly dampened with a solution of mild soap and warm water. Do not use alcohol or acetone-based cleaners.
- c. Do not allow water or other liquids to pool or enter the unit from the top panel.
- d. Ensure the inside electronic components are not exposed to water or moisture.

## 7. TROUBLESHOOTING

<b>Problem</b>	<b>Possible cause</b>	<b>Solution</b>
No power to device following selection of Master Power switch to "ON"	<ul style="list-style-type: none"> <li>• Dead battery</li> <li>• Main battery connection</li> </ul>	<ul style="list-style-type: none"> <li>• Charge Battery</li> <li>• Check main battery connection</li> <li>• Swap battery</li> </ul>
Aero HygenX RAY – Autonomous UVC Robot becomes hung up during travel down the aisle.	Obstruction on the floor or in the aisle	<ul style="list-style-type: none"> <li>• Wait 20 seconds for Auto-Shutoff to extinguish lamps</li> <li>• Enter aircraft and clear the obstruction</li> <li>• RE- Input directional command on touchpad to continue with treatment</li> </ul>
Aero HygenX RAY – Autonomous UVC Robot does not respond to inputs	Internal issue	Reset unit by turning Master Power Switch Off for 10 seconds, then on.
All Lamps fail to illuminate	Possible lamp connection issue.	<ul style="list-style-type: none"> <li>• Check that both Emergency Push Buttons are "UP".</li> <li>• Check that the Main Battery Switch is "ON"</li> </ul>
Half of the lamps fail to illuminate	Possible ballast failure	Reset unit by turning Master Power Switch Off for 10 seconds then on.
Single lamp fails to illuminate	Single lamp failure (lamp replacement required after 16,000 hours of use)	Refer to Maintenance & Cleaning Section for instructions on lamp replacement.
No movement of device following directional input	Internal issue	Reset unit by turning Master Power Switch Off for 10 seconds then on.
No response to commands from tablet	Wireless network not available.	<ul style="list-style-type: none"> <li>• Check wireless connection.</li> </ul>

		<ul style="list-style-type: none"> <li>• Use a different wireless connection.</li> <li>• Use touch screen on device.</li> </ul>
“System Health Check” message remains shown on Touchpad screen.	Internal system issue unresolved.	Reset unit by turning Master Power Switch Off for 10 seconds then ON.
Aero HygenX RAY – Autonomous UVC Robot countdown does not initiate following directional command	Internal systems not ready.	<ol style="list-style-type: none"> <li>1) Wait 30 seconds and re-attempt directional command.</li> <li>2) Reset unit by turning Master Power Switch Off for 10 seconds then on.</li> </ol>
Aero HygenX RAY – Autonomous UVC Robot does not maintain directional control in aircraft aisle or displays erratic movement.	Internal system issue.	<ul style="list-style-type: none"> <li>• Check Lidar ports to ensure there are no obstructions. Remove obstruction.</li> <li>• Ensure caster brakes are off.</li> <li>• Check for obstructions on aircraft floor.</li> <li>• Reset unit by turning Master Power Switch Off for 10 seconds, then on.</li> </ul>

## 8. WARRANTY

The sole and exclusive obligation of Aero HygenX (AHX) to the Customer for any Product (including, without limitation, integral parts thereof not manufactured by AHX but excluding bulbs, fuses, or parts made from glass construction) and services made by AHX and sold hereunder are to be repaired, returned, or provided with a replacement Product, at the sole option of AHX.

For any Product which has been returned to AHX under the Return Material Authorization (RMA) procedure (as defined below) and is determined to be defective in workmanship, material or not in compliance with the AHX specification applicable to the Product and has in fact failed under normal use on or before one (1) year from the date of original shipment, then the product will be repaired or replaced by AHX.

During the warranty period, any labour or travel costs associated with warranty services performed at the Customer's facility shall be at the Customer's sole expense.

Replacement accessories or parts are warranted hereunder to be free from any material defect in workmanship and materials for a period of thirty (30) days from the original date of delivery.

All third parties' products (including software) sold by AHX carry only the original manufacturer's warranty applicable to the Customer. Any Product repaired or replaced under warranty is only warranted for the period of time remaining in the original warranty for the Product. The warranty provided herein shall extend to any Product which has proven to be defective and has failed through normal use but excludes and does not cover any Products or parts thereof which have been accidentally damaged, disassembled, modified, misused, used in applications which exceed the Product specifications or ratings, neglected, improperly installed by the Customer or otherwise abused or used in hazardous activities.

The Customer must claim under the warranty, in writing, not later than thirty (30) days after the claimed defect is discovered. AHX warrants that services will be performed in a good and workmanlike manner in accordance with standards reasonably applicable to the services and will perform any services which AHX determines are not in compliance with this warranty which the Customer advises AHX of in writing, on or before thirty (30) days immediately following completion of the applicable service.

The Customer must make all claims under these warranties and no claim will be accepted from any third party. Warranties hereunder are not transferable or assignable.

## RETURN MATERIAL AUTHORIZATION (RMA)

AHX will only accept Products returned under the AHX Return Material Authorization (“RMA”) process. The customer shall obtain an RMA number from AHX prior to returning any Product. Upon the issuance of an RMA, the customer shall diligently return the Product with prepaid shipping arrangements and sufficient insurance against the loss or further damage to the Product, to AHX’s facility.

Any Product which has been returned to AHX but which is found to meet the applicable specification for the Product and not defective in workmanship and material, may be subject to AHX’s standard examination charge in effect at the time and may be charged to the Customer, at the sole discretion of AHX.

## 9. SPECIFICATIONS

### Product Dimensions

Length	66 cm
Width	30 cm
Height	132 cm
Weight	44 kg
Compatibility	Aircraft

### Robotics

Max Speed	0.15 m/s
Direction	Multi- (Forward/Reverse)
Turning Radius	0.7m (Clockwise/Counter-Clockwise)
Maneuverability	360 degree
WiFi	Yes
Bluetooth	Yes
Cameras	(2) 1080p, 30fps
Sonar	Yes
Lidar	Yes
Autonomous Control	Yes
Manual Control	Touchpad
Cloud Service	HygenX Stream

### Electric

Charge Power	400W (100-240VAC)
Charge Time (Full Charge)	3.33 hours
Battery Life	2000 hours

### Safety

Human Detection Auto Shut Off	Yes
UVC Indication Light	Yes
Emergency Kill Switch	Yes
Battery Disconnect Switch	Yes



## Sticker



AEROHYGENX "RAY" - AUTONOMOUS UVC ROBOT

[www.aerohygenx.com](http://www.aerohygenx.com)



### COMMERCIAL

Inactivates up to 99.99% of micro-organisms on interior surfaces of aircraft. Read all instructions, warnings and cautions in the Operating Manual before using this device. The Operating Manual can be accessed via this QR code:

**CAUTION:** This device emits UVC radiation. Exposure to UVC radiation may cause eye and skin irritation.

**READ LABEL AND OPERATING MANUAL BEFORE USING. KEEP OUT OF REACH OF CHILDREN.**



**NOTICE TO USER:** This pest control product is to be used only in accordance with the directions on the label. It is an offence under the *Pest Control Products Act* to use this product in a way that is inconsistent with the directions on the label.

Designed and Manufactured by AEROHYGENX 217-150 Katimavik Road, Ottawa, Ontario, Canada K2L 2N2 (1-800-260-0787)  
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