ASTON MAINTENANCE AND REPAIR GUIDE

April 2022
Software Version: 1.0
Document Version: 1.0

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Revision History

Revision	ECO	Change Log	Author
A	ECO-001XX	No content change in this guide	Vinay Kulkarni

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1. SAFETY AND HANDLING

Warnings in this user guide, or on the Aston Impact system, must be observed during all phases of service, repair, installation, and operation of the Aston Impact system. Failure to comply with these precautions violates the safety standards of the design and intended use of the Aston Impact system. Atonarp assumes no liability for the user's failure to comply with these requirements. Atonarp does not have any control on the type of the gas passing through Aston Impact. If these gasses are toxic, corrosive, explosive or flammable, appropriate safety symbols shown below shall be used at the inlet or exhaust lines connected to Aston Impact.

1.1 Safety symbols

The following symbols are used in the user guide, or on the Aston Impact system.

SAFETY SYMBOLS	DESCRIPTION
	WARNING: Electricity. Indicates a warning of electrical shock hazard. Read the warning and follow all precautions before performing any operation described in the guide. Failure to do so can result in serious injury.
	WARNING: Hot surface
	WARNING: Toxic material
	WARNING: Corrosive substances
	WARNING: Explosive material

	WARNING: Pressurized cylinder
	General warning sign. Indicating that there is a potential health or safety hazard; the user must refer to this user guide for instructions
	WARNING: Flammable material
	Connect an earth terminal to the ground
	Alternating current. Indicate on the rating plate that the equipment is suitable for alternating current only; to identify relevant terminals

1.2 General safety information

To prevent personal injury or damage to the Aston Impact system; read the user manual and understand and obey all recommended safety precautions before using the Aston Impact. Warnings in this document and labels on the Aston Impact system are described with international symbols. Failure to heed these warnings can result in serious injury. This safety information is intended to supplement federal, state, provincial, and local environmental health, and safety (EHS) regulations.

The information provided covers safety relating to the operation of the Aston Impact system. It does not cover every safety procedure that must be practiced. Ultimately, the operator and the operator's organization are responsible for compliance with federal, state, provincial, and local EHS regulations and for maintaining a safe working environment.

Whenever the safety protection of the Aston Impact system is compromised, disconnect it from all power sources and secure the Aston Impact system against unintended operation. The Aston Impact system must be installed in such a manner that the user can easily access and isolate the power source.

1.3 Circuit protection devices

WARNING! Improper circuit protection, or an improper main supply, can damage the Aston Impact system or the wiring system and cause a fire. Before powering on the

Aston Impact system, verify that the branch circuit protection satisfies the requirements for the Aston Impact system and that the Aston Impact voltage requirements match the mains supply to which it is connected.

1.4 Over pressure

WARNING! Injury to operators can be caused by released parts and escaping analytes if process connections to the Aston Impact system unit are opened while the system is under vacuum. Do not open any inlet ports while the system is under vacuum.
The external analyte delivery system from the process to the Aston Impact must be designed to provide input to a system that operates under vacuum. The exhaust from the Aston Impact must be safely vented out of the process. Ensure that the safety valves are operational and are not blocked.

1.5 Vacuum components

Dirt and damage impair the functioning of the vacuum components in the Aston Impact system. When handling vacuum components, take appropriate measures to ensure cleanliness and to prevent damage.

WARNING! The Aston Impact system has a turbo molecular pump, capable of generating tremendous mechanical torques if its rotor gets blocked. This can cause the pump to become detached from its housing if it is not properly affixed. This can cause the entire pump, or pieces from the pump, to be ejected into the surrounding work environment, causing severe, possibly fatal, injuries and severe property damage.

We highly recommend the user not to clean the sensor or decontaminate the vacuum chamber and sample inlet. If sensor contamination has been established, the user should contact Atonarp Service Department.

1.6 High internal temperature

WARNING! The Aston Impact is fitted with a heater that can operate as high as 250 deg C. Opening the Aston Impact (not advised) while heaters are running or shortly after powering off the system can expose the user to hot surfaces

- Do not open the instrument cover when the power is on.
- Use work gloves for repairing the instrument.
- Do not operate Aston Impact while the cover is removed.

1.7 Aston Impact use and modification

- Carefully follow the installation instructions recommended by Atonarp.
- Use approved original parts from Atonarp (Accessories) for the installation.
- The Aston Impact system is heavy and can cause injury to the operator or damage to other equipment if it falls during transport. Two-person handling, along with a mechanism to hold it from the top, is recommended during transfer and handling of the equipment.
- The Aston Impact system must be installed in a location that complies with the

environmental conditions recommended by Atonarp. If the Aston Impact system is used in an environment or in a manner not prescribed by Atonarp, the protection provided by the Aston Impact system can be impaired.

- Unauthorized modification or operation of Aston Impact can cause personal injury, damage to the equipment, and can void the warranty.
- Not using the particulate filter provided with the Aston Impact at the inlet connection to the process can void the sensor warranty.
- Erroneous data can be generated if Aston Impact is operating outside the recommended environmental conditions or with unauthorized modifications.
- The fans in the Aston Impact system must be fully functional to maintain proper operation.
- Do not block the vents in the enclosure or the unit cannot operate properly.
- Contact Atonarp representative for more information about servicing the Aston Impact system.

1.8 Electrical hazards

High voltages exist in certain areas of the Aston Impact system. However, it is designed to protect the operator from electrical hazards, but if used in a manner not prescribed by Atonarp the protection provided by the Aston Impact system can be impaired. Under no circumstances, the cover should be removed before Aston Impact is unplugged from the power sources. Also, work gloves shall be used by service and repair personnel. Only Atonarp supplied power cords, or power cords with same ratings, as specified in Section 2.1, shall be used with the Aston Impact.

1.9 Electrical safety practices

WARNING! Electrical Shock Hazard: High voltage can be present even when the mains switch is off. Assembled electronics and circuitry inside the Aston Impact system can still be charged even if
the Aston Impact system has been disconnected from all mains supply sources.

- Do not install components or perform internal maintenance on the Aston Impact system. Only an Atonarp representative or a similarly authorized and trained person can perform these tasks.
- Connect the Aston Impact system correctly to a main power supply that is installed and checked by a qualified electrician, that adheres to all local codes and regulations, and that has appropriate branch circuit protection.
- Do not open the instrument cover when the power is on.
- Use work gloves for repairing the instrument.
- Do not operate Aston Impact while the cover is removed.
- If the Aston Impact is not electrically safe for use, remove the power cord and secure the Aston Impact against unauthorized or unintentional operation. For example, the electrical safety of the Aston Impact system is likely to be impaired if, the Aston Impact
    - Is subjected to prolonged storage under unfavorable conditions
    - Shows visible damage
    - Is subjected to severe stress during transportation
    - Is operated outside of specified environmental and electrical conditions

1.10 Protective earth conductor

Aston Impact has a protective earth conductor inside the system that provides proper ground connection for the internal components and prevents shock hazard to the users. Only Atonarp supplied power cords, or power cords with same ratings, shall be used with the Aston Impact. The power cords shall be plugged into 3-prong grounded plug or European style, 2-prong plug with ground contact.

MANDATORY: The main supply must have a correctly installed protective earth (ground) conductor and must be installed or checked by a qualified electrician before the Aston Impact system is connected. Ensure that the protective earth ground integrity is maintained.

WARNING! Interruption of the protective earth ground conductor inside or outside the Aston Impact system, or disconnection of the protective earth conductor terminal is likely to cause shocks or other damages.

1.11 Pressure Threshold

The operation of SEM, ion source, and turbo pump are subject to certain pressure thresholds. So, if the pressure goes above this threshold, the corresponding equipment is switched off immediately as a failsafe measure.

Ion Source Safety

Pressure TH-1	Drive Board	CB
	Switch off SEM	
	Inform CB for Ion Source to be off	Off Filament
		Off RF Coil
Pressure TH-2	Switch off Power Supply CB Switch off.	

1.12 Managing exhaust gas

Aston Impact can be used to analyze and monitor mixtures of gasses with potentially some hazardous contaminants. To protect the personnel, it is necessary to connect the exhaust of the system to a proper exhaust line in the facility that carries the gas for proper disposal or storage. If these gasses are toxic, corrosive, explosive or flammable, appropriate safety symbols shall be used at the inlet or exhaust lines connected to Aston Impact.

2. MAINTENANCE

This chapter provides guidance for proper usage and periodic maintenance activities for reducing Aston Impact failures.

2.1 General maintenance guidelines

- Run diagnostics once every two months to ensure that there has been no hardware failure or degradation.
- Keep the surroundings clean; clear any dust and dirt that might block the vents on the Aston Impact system.
- Periodically ensure that the electrical cables are not frayed or have detached from the socket due to vibration.
- Periodically test integrity of mechanical joints and mates that connect the Aston Impact to the sample delivery system and the process.
- Periodically verify that the exhaust from the Aston Impact is correctly vented to an external vent line and there are no blocks.
- Periodically replace or clean clogged filters.

2.2 Sensor

- The Aston Impact sensor is rated for a specific lifetime. The AtonLab user interface, or the command line interface, has alert mechanisms to indicate a sensor failure. Contact Atonarp to obtain a replacement sensor.
- Put the system into standby state when not in use for long durations.

2.3 Contamination

After prolonged usage with contaminants, the sensor is likely to have residual deposits of the contaminant. This can affect accuracy of the measurements.

If the analytes tested are changed, and the previous or unexpected analytes are still seen in the acquired data, the vacuum chamber must be purged of the residual molecules.

Contact Atonarp for information about purging the vacuum chamber.

2.4 Filament block replacement procedure

- Remove the knob by turning it counterclockwise
- Remove the front mesh
- Remove the Front Panel Spacer by unscrewing three M3x8mm socket head cap screws
- Remove Front Plate 2 by unscrewing three partially threaded M3x10mm socket head cap screws
- Loosen the three M2x5mm screws that holds the filament block to the sensor
- Attach the filament tool provided with the system to the filament block by screwing the M2.5 thread at the end of the tool to the filament block (the filament tool is in the front panel tray and is accessible when the front panel mesh is removed).
- Hold the filament block with the filament tool while removing all three M2x5mm screws.
- Pull out the filament block carefully from the HyperQuad

- Unscrew the filament tool from the filament block
- Pick up a new filament block and screw the filament tool to it
- Gently slide the filament block into the HyperQuad
- Fix the filament block in place with three M2x5mm screws.
- Mount the front plate 2 with three partially threaded M3x10mm socket head cap screws
- Leave the filament tool inside the front panel tray
- Install the Front Panel Spacer by three M3x8mm socket head cap screws
- Install front mesh
- Install the knob by turning is clockwise until it is tight

2.5 Pumps

- Turbo molecular pump: The oil reservoir and the bearings of the pump must be replaced at least once every three years. Contact Atonarp for information on replacing the bearings in the turbo molecular pump.
- Diaphragm pump: the diaphragm pumps shall be serviced once a year and the diaphragms and valve shall be replaced.
- Always operate Aston Impact with analyte delivery at less than maximum rated pressure
- Do not subject Aston Impact to rapid pressure changes or fluctuations.
- If pressure in the Aston Impact chamber does not reach down to 1e-3 Pa with no pressure load, contact Atonarp.

NOTE

If the system is shut down for longer periods (more than a year), pump maintenance procedures must be performed by an Atonarp representative. For more information about the turbo pump maintenance, contact Atonarp.

2.6 Risks and mitigation

Risks from component failure and sample contamination that can adversely affect the performance of the Aston Impact system are identified. Possible preventive measures to mitigate these risks are suggested.

Table 34. Risk and mitigation

RISK	CONSEQUENCE	MITIGATION
Analyte leak from the Aston Impact system or in the plumbing connected to the Aston Impact system	• Incorrect composition estimation due to sample contamination. • Pressure increases that can possibly put the Aston Impact outside of a safe operating range and prevent the sensor from functioning properly. • Environmental contamination.	Periodic leak detection using Helium. Aston Impact has a mechanism to perform helium leak detection. Notify Atonarp if leaks in Aston Impact are detected.

Sensor failure	• Failure to achieve desired emission current. • Software does not initialize and enable scanning.	Change filament/sensor when advised. Operate at a lower Aston Impact chamber pressure to increase filament life. Use special filament resistant to corrosive substances. Notify Atonarp.
Pump failure	• Pressure increases that can possibly put the instrument outside of a safe operating range and prevent it from functioning. • Unusual noise during operation.	Service the pumps at recommended intervals and when the Aston Impact displays pump- related errors and warnings. Notify Atonarp.
Fan failure and overheating	• Internal electronics overheat beyond desired operating range. • Inaccurate measurement results. • Aston Impact system shutdown. • Unusual noise during operation.	Periodically service the fan and remove grime and dirt accumulation from the instrument. Do not operate beyond the ambient temperature rating of the Aston Impact system. Notify Atonarp.
Vibration related failures	• Loosening of plumbing fittings causing leaks and pressure changes. • Inaccurate measurement results Sample contamination.	Mount the Aston Impact on a rigid surface with dampeners to minimize vibration. Periodically check instrument mountings and tighten assembly screws.
Valve failure	• Pressure increase that can possibly put the Aston Impact outside of a safe operating range and prevent proper functioning. • Contamination from corrosive sub- stances.	Do not operate any valves beyond its specified life- time.

3. CUSTOMER SUPPORT

When issues are encountered with the operation of the Aston Impact, or if there are any queries regarding the product, it is advised to raise a support request at the Atonarp customer portal available at https://support.atonarp.com/. This ensures a formal record of the request for further follow up and allows Atonarp to provide the fastest response.

Contact Atonarp for login details needed to access the Atonarp support website. A user ID can be suggested for the account. Once access is granted, a notification email is sent to the email ID with the log on details.

3.1 Types of support request

- Report a bug: for functional or performance issues observed with the Aston Impact
- Suggest a new feature: to facilitate Aston Impact usage in the application domain
- Suggest improvement: request enhancement to an existing feature to improve usability
- Technical Support: for assistance with installation, configuration, or troubleshooting

3.2 Creating and Issue

Perform the following actions to create a request:

1. Select the type of request on the Dashboard.
2. Type the summary of the request in summary.
3. Type the detailed description of the request in description. Include snapshots of the issue and plots if required.
4. Attach files (for example, logs) to substantiate the request.
5. Click Create to create a request. Request is created with a unique ID. Once a request is created a confirmation notification is sent to your mail ID.

Existing requests can be viewed by clicking the Request button.

- My requests: Request created by you
- Atonarp: Requests shared with Atonarp
- All requests: All requests made from a single customer account

It displays the

- Type - See Types of Requests.
- Reference - The unique ID of the request
- Summary - Summary entered while creating the request
- Service desk - The assignee of the request
- Status - The status of the issue (Open: Issue unresolved Closed: Request is resolved)
- Requester - The person who created the request.

3.3 Response from Atonarp

After a request is made at the Atonarp support website, it can take up to 24 hours for a response. If no response is received, please check your mailbox spam folder. If no email has been received, please comment on the already raised request for attention and/or send an email to engsupport@atonarp.com

4. ABBREVIATIONS

A	Amperes (current)
Amu	Atomic Mass Unit
BSD	Berkeley Software Distribution
CLI	Command Line Interface
COMM	Communication Port
CTS	Clear to Send
Da	Dalton
dB	Decibel
DB	Database
DC	Direct current
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
EI	Electron Ionization
EHS	Environmental Health and Safety
eV	Electron volt
GND	Ground
GPL	General Public License
HTTPS	Hypertext Transfer Protocol Secure
Hz	Hertz (frequency)
IP	Internet Protocol
IPv4	Internet Protocol version 4
I2C	Inter Integrated Circuit Communications
JPEG	Joint Photographic Experts Group
JSON	JavaScript Object Notation
LED	Light emitting diode
m/z	Mass to charge
Nmtui	NetworkManager Text User Interface
PC	Personal Computer
PDF	Portable Document Format
pF	Picofarads

PNG	Portable Network Graphics
RF	Radio Frequency
RPM	Revolutions per Minute
RS-232	Recommended Standard no. 232
RTS	Request to Send
RX	Receive
SoC	System on a Chip
SSH	Secure Shell
SSL	Secure Sockets Layer
SVG	Scalable Vector Graphics
Th	Thomson
TLS	Transport layer security
TTL	Transistor-Transistor Logic
TX	Transmit
U	Unified Atomic Mass Unit
USB	Universal Serial Bus
UI	User Interface
URL	Uniform Resource Locator
V	Volts (voltage)
W	Watts (power)

5. QUICK ACCESS TO ASTON IMPACT FILES

Quick Links to Aston Impact Source Files

1	Atonarp knowledge base
2	Aston Impact Windows client application
3	Aston Impact Ubuntu client application

6. GLOSSARY

Ambient Temperature

Ambient temperature is the temperature of the air surrounding a component.

Analyte

Analyte is a substance whose chemical constituents are being identified and measured.

Annotate

Annotate is technique to describe or add additional comments, notes, explanations, or other types of remarks to a plot.

Aston Impact

Aston Impact uses mass spectrometry to quantify the composition of constituents in a gas blend by measuring the mass to charge ratio of the ions generated from the blend.

Aston Impact configuration

Aston Impact configuration sets the mass spectrometer properties.

Aston Impact manager

A middleware layer of the Aston Impact software stack.

Background scan

A background scan measures the contribution of ion leakages and environment to the generated spectrum.

Baud

Baud is a component that determines the speed of communication over a data channel.

Blend

Blend is a mixture of different analyte molecules. Known blends are used for calibrating the Aston Impact.

Calorific value

The amount of energy produced by the complete combustion of a specified quantity of material or fuel.

Compliance

Following certain accepted standards

Dashboard

Dashboard is the primary page for the user to interact with and monitor the Aston Impact.

Detector

Detector is a component in the mass spectrometer which generates an electronic signal proportional to the number of ions striking it.

DHCP server

DHCP server is a network server that automatically assigns an IP addresses and other network configuration parameters to a device on a network so it can communicate with other IP networks. It relies on the standard protocol known as Dynamic Host Configuration Protocol (DHCP).

Ethernet

A system for connecting computer systems to form a local area network, to transmit the data bits containing any sort of information.

Faraday cup

Faraday cup is a component in the mass spectrometer, also known as Detector.

Filter

Filter is a process which removes or separates unwanted components. The Aston Impact requires one filter at the inlet to keep out undesired contamination.

Initialize

Bring the system into a state ready for data acquisition.

Ion Current

An ion current is the rate of flow of electrical charge associated with the flow of ions into the ion detector (electrometer/collector).

Ion source

Ion source is a component in the mass spectrometer where ionization of the analyte takes place by electron bombardment.

Ionization

Ionization is a technique used in mass spectrometer to ionize the analyte.

Mass Filter

Mass filter separates ions according to their mass-to-charge ratio (m/z).

Mass spectrometer

Mass spectrometer is an analytical technique that ionizes a sample based on their mass-to-charge ratio of the ions generated from the sample.

Molecules

A molecule is an electrically neutral group of two or more atoms held together by chemical bonds. Molecules are distinguished from ions by their lack of electrical charge.

Quadrupole

Quadrupole is a type of mass filter used in mass spectrometry. It consists of four cylindrical rods mounted in a ceramic collar. Every pair of opposing rods is electrically shorted, and a radio frequency (RF) voltage with a DC offset voltage is applied between one pair of rods and the other. The magnitude of the RF voltage determines the mass-to-charge ratio of the ions that pass through the mass filter and reach the detector. The ratio of DC-to-RF voltage determines the resolution (widths of the mass peaks).

RF to DC ratio

Ratio of the RF (AC) voltage to the DC voltage applied to the quadrupoles of a mass filter. The RF-DC ratio determines the resolution (inverse to sensitivity) of the peaks in a mass spectrum.

Scan

Each sequence of processing the ions in the mass filter followed by analysis of the ions in the detector is called a scan.

Scan configuration

Scan configuration provides options to configure the masses scanned, the number of scans run, trade- off between speed and accuracy.

Scan report

Record of all scans performed on the system. This includes system settings, mole fractions, and ion currents for all masses that are scanned.

Spectrum

Distribution of ion currents corresponding to ion fragment masses of interest.

Standby

Put the system in a state not ready for scan so that it can then be shutdown. Also required before certain features in the Aston Impact software can be used.

Workflow

Workflows allow the user to sequence scan events with unique scan properties and controls valves alongside running scans in the sequence.

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