Tisch Environmental
737 Series Hi Volume ZAG
Advanced Ultra-Pure Air Generator

737 Series Hi Volume Generator Operations Manual

Table of Contents

1.0 Introduction

Tisch Environmental was established in 1971 as the pioneer of ultra-pure air generation and gas generation instrumentation. Based in Cleves, Ohio TISCH has remained on the forefront of manufacturing and design of laboratory instrumentation. With over 40 years of innovation, TISCH products are unsurpassed in quality and air purity specifications. At AACO we place customer service as our highest priority. We would like to welcome you to our company and thank you for choosing TISCH products.

1.1 Contact Us

If you require assistance please contact us:

Direct: (513) 467-9000
Fax: (513) 467-9009
Email: Sales@Tisch-Env.com
Website: www.Tisch-Env.com
Address: **Tisch Environmental**
145 South Miami Ave.
Cleves, OH 45002

1.2 Patents, Copyrights, Trademarks

Tisch Environmental instrumentation is protected by patent in the United States of America. The distribution or duplication of TISCH products, designs, or trade secrets is strictly prohibited without the express written consent of Tisch Environmental.

1.3 Warranty

Instruments manufactured by Tisch Environmental are guaranteed by warranty to be free of defects in materials and workmanship for one year after shipment from Tisch Environmental factories. The liability of Tisch Environmental is limited to servicing or replacing any defective part of any instrument returned to the factory by the original purchaser. All service traceable to defects in original material or workmanship is considered warranty service and is performed free of charge. The expense of warranty shipping charges to and from our factory will be borne by Tisch Environmental. Service performed to rectify an instrument malfunction caused by abuse, acts of god or neglect, and service performed after the one-year warranty period will be charged to the customer at the current prices for labor, parts, and transportation. The right is reserved to make changes in construction, design specifications, and prices without prior notice.

1.4 Equipment Description

The 737 Series Hi Volume Generator is a compact, highly efficient ultra-zero air generator that converts ambient air to pollutant-free ultra-pure zero air. The unit employs a heated catalyst for hydrocarbon and CO removal and a pressure swing absorption system for contaminant and optional CO_2 removal. The unit is provided in a 5U case for standard rack mounting or for benchtop mounting. The 737 Series Hi Volume Generator can be used in a variety of applications for the reliable generation of ultra-zero air.

Industries and Applications

- Automotive emission monitoring
- Gas Chromatography
- Oil and Natural gas
- Aerospace
- Laboratory instrumentation
- Calibration and Certification
- Environmental gaseous instrumentation
- Ultra-zero air generation
- Reliable generation of ultra-high purity zero air
- Economical replacement of zero air bottles

1.5 737 Series Hi Vol Series Ordering Information

2.0 Safety Precautions

Before using Tisch Environmental products, always be sure to review the corresponding operations manual and take all necessary safety precautions. Tisch Environmental products are to be used only for the purposes specified by the operations manual. Tisch Environmental cannot guarantee the safe usage of its instruments in procedures that do not adhere to Tisch Environmental guidelines and standards. If you have concerns about the safety of your product or questions about safe practices, contact Tisch Environmental by phone or e-mail to speak with a representative.

2.1 Symbols used in this document

The following symbols are used in this document:

Shock hazard – this symbol is used to alert the operator that there is a potential for an electrical shock hazard.

General Attention – this symbol is used to alert the operator of an important directive.

High temperature – this symbol is used to alert the operator that there is a potential for surfaces to have a temperature high enough to burn the skin.

2.2 Safety Warnings

General

Service and repair of this instrument should only be attempted by a trained technician whom is familiar with electrical safety.

During operation, the housing of the methane reactor inside the instrument will become hot to the touch and could cause serious burns. Do not attempt to service or remove the instrument's cover until the unit has cooled completely.

Electrical

Do not remove the inner enclosure covers without disconnecting mains power and powering down the unit completely.

Use grounded electrical connections at all times to prevent inadvertent electrical shock hazards.

Use only an approved cord. The cord must be rated for the environment used and the current and voltage rating of the instrument.

3.0 Specifications

Environmental

For indoor use only
Enclosure rating IPX0
No wet locations
Altitude up to 2000 m
Temperature rating 5°C to 40°C
Maximum relative humidity 80% @ 31°C max to 50% at 40°C
Pollution degree 2

Weight

737-13: 107 lbs (48.5kg)
737-14: 180 (80.2kl)
737-15: 200lbs (90.9kg)

Dimensions

21” (534mm) H x 18.75” (476mm) W x 28” (712mm) D

Electrical

120VAC Operation
Nominal Voltage: 120V / 60Hz Mains
Maximum Current: 16 Amps
Fuse: 20 Amp Time-lag fuse

220VAC Operation
Nominal Voltage: 220V / 50hz Mains
Maximum Voltage: 220V
Maximum Current: 8 Amps
Fuse: 10 Amp Time-lag fuse

Mains supply fluctuations up to ±10% of nominal voltage

Overvoltage Category II

Duty	Designed for continuous use
Gas Purity	SO_2 < 0.5 ppb H_2S < 0.5 ppb NO < 0.5 ppb NO_2 < 0.5 ppb NH_3 < 0.5 ppb O_3 < 1 ppb CO < 1 ppb Hydrocarbons < 0.5 ppb (Methane and non-methane)
Pressure	Input pressure of 90-120 PSI will yield an output of 80 PSI Maximum operating pressure is 140 PSI. Pressure drop of 10 PSI is expected between input and output.

4.0 Installation Requirements

4.1 Placement

Place the unit in an area that will permit a free flow of air, avoiding confined spaces. This is especially important if the unit houses a methane reactor system. The heat generated during operation of the methane reactor must be dissipated away from the instrument's cooling coils. If the unit does not contain a methane reactor, location is not critical. However, it should be kept flat on the floor and several inches away from the wall. Situating these instruments on specially constructed shelves above head level is not unusual, or in out of the way places outside the area of use; e.g., in hallways, electrical rooms, and closets. When placing this unit on any surface other than a floor make sure the surface is rated to support the unit securely.

4.2 Air Supply Specifications

The Tisch 737 series generator requires a source of OIL FREE, dry air. Proper filtration and the quality of the air delivered to the 737 generator is the responsibility of the customer. Failure to supply these requirements to your 737 series generator could result in the demise of your generator and/or contaminate your equipment being supplied zero air downstream.

During the installation, it should be considered that the performance of the 737 Series Hi Volume Generator hinges upon the availability of a large volume of pressurized air close to the instrument (within 25 feet). THIS IS MANDATORY. If the air source is unable to satisfy the sudden demands for pressurized air, the pure air generator will not perform to specifications.

4.3 Air Source Capacity (by unit size)

737-14 (100LPM)

6.0 CFM (Duty cycle requires compressor producing 9.0 CFM @ 130- 150 psig)

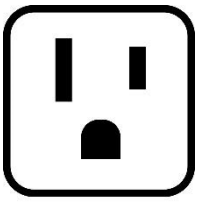
737-15 (250LPM)

14.3 CFM (Duty cycle requires compressor producing 21.5 CFM @ 130- 150 psig)

4.2 Electrical Connection Requirements

The 737 series generators are available in both **120V** and **220V** versions. Please verify which voltage your unit requires before supplying power to the unit. Failure to do so may result in the permanent failure of your device.

The 737 Series Hi Volume Generator comes standard with an American "Type B" cord set.



Type B

Use grounded electrical connections at all times to prevent inadvertent electrical shock hazards.

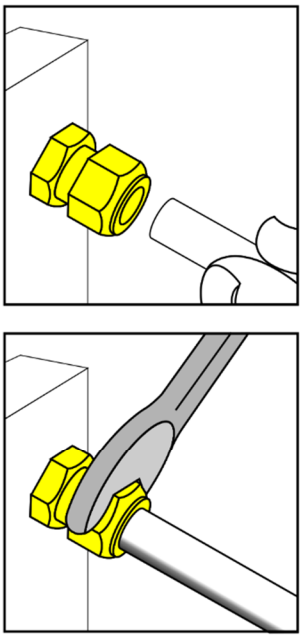
4.3 Air Input Connection

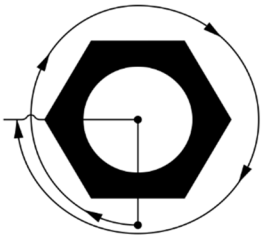
Your generator has two ports on the rear:

1/2 inch tube fitting marked "AIR INPUT"

3/8 inch tube fitting marked as "ZERO AIR OUTPUT"

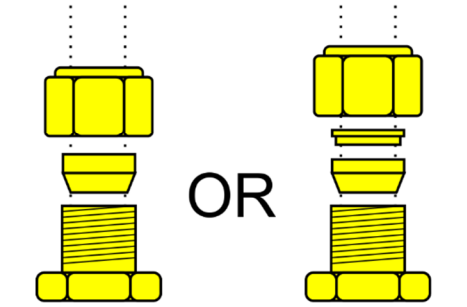
If you have the Tisch 737-1000 house air adapter you will first connect the **½ Inch** tube protruding from the filter housing output into the "AIR INPUT" connection on the rear of the generator and then follow the instructions below.





1-1/4 Turns from Finger Tight

The tube fitting nut and ferrule are included in your shipment. Make sure that the tube and fittings are assembled in order as pictured below. After inserting your air compressor tubing into the fitting, make sure that it is pushed all the way in till it is seated firmly into the fitting. Finger tighten the brass nut. Now use the appropriate sized wrench and tighten the fitting for 1-1/4 turns. There is no need to use a second wrench to hold the fitting body since the generator has a fitting retainer plate installed to prevent the fitting from spinning.



4.4 Burn-In Time

The "Burn-In" process is necessary to remove any ambient air moisture that has accumulated within the methane reactors.

AT THIS TIME THERE SHOULD BE NO USING EQUIPMENT CONNECTED TO THE "ZERO AIR OUTPUT" FITTING ON THE GENERATOR.

1) The process begins with making sure that your "AIR INPUT" port is connected to your source of oil-free/dry air.

2) Flip the red "POWER" switch on the front of the generator. The switch will indicate power by "illuminating red".

3) Adjust the "PRESSURE ADJUST" knob and observe the flow rate on the front LCD screen. Turn knob counter-clockwise to decrease flow and clockwise to increase flow.

4) Allow the generator to run free-flowing for at least 1 hour.

During this "Burn-In" period copious amounts of water will be driven from the catalyst and be expelled from the "ZERO AIR OUTPUT" port. ALLOW AT LEAST 1 HOUR OF BURN IN TIME WITH AIR FLOWING THROUGH THE INSTRUMENT TO EXPEL THE MOISTURE COMPLETELY.

4.5 Zero Air Output Connection

Once the "AIR INPUT" port is connected to the compressed air supply and you performed the
"Burn-In" process successfully you can connect your tubing using the above instructions (Section
4.3) to complete the connection of your generator to your equipment.

5.0 Quick Start

5.1 Power

Powering On

The 737 is powered on by pressing the red rocker switch marked "POWER" on the front face of the device. Once the device is powered on the red power switch will illuminate, the front ventilation holes will illuminate blue and the LCD panel will begin its boot-up sequence. You will also hear the internal fans power on.

Powering Off

To power OFF the instrument press the "POWER" rocker switch on the front of the instrument. The red indication light will turn off and the machine will release any internal pressure from within the purification reactor towers.

5.2 Basic Operation

During operation, tubing, fittings, and the enclosure of the methane reactor(s) inside the instrument will become extremely hot to the touch and could cause serious burns. Do not attempt to service or remove the instrument's cover until the unit has cooled completely

Verify before operation that your air supply is oil free and relatively dry. The presence of moisture and oil within the incoming air source can damage the PSA and catalyst modules negatively affecting the purity of the air output.

After powering the unit on, the front ventilation holes will illuminate blue, and the unit will begin to heat the methane reactor(s). The PSA (Pressure Swing Absorption) modules will continue to switch on and off at timed intervals.

It is recommended to wait up to 60 minutes to allow the unit to get to the correct reactor temperature of 290°C and stabilize for the generation of ultra-pure air.

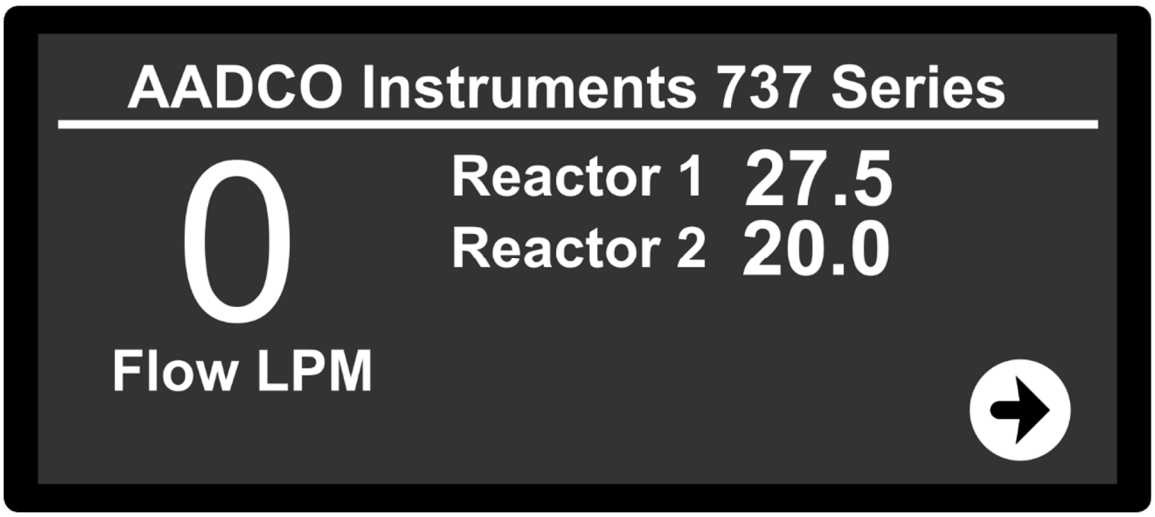
The "PRESSURE ADJUST" knob on the front panel of the unit can be turned in the counter-clockwise direction to increase the output pressure and turned in the clockwise direction to decrease the output pressure.

6.0 Touchscreen Operation

The touchscreen on the front panel allows you to monitor and interact with your 737 series generator.

6.1 Home Screen

The default screen that will appear after the TISCH logo screen is the Flow and Temperature monitoring screen. This display will allow you to monitor the flowrate and status and temperature of the methane reactors.



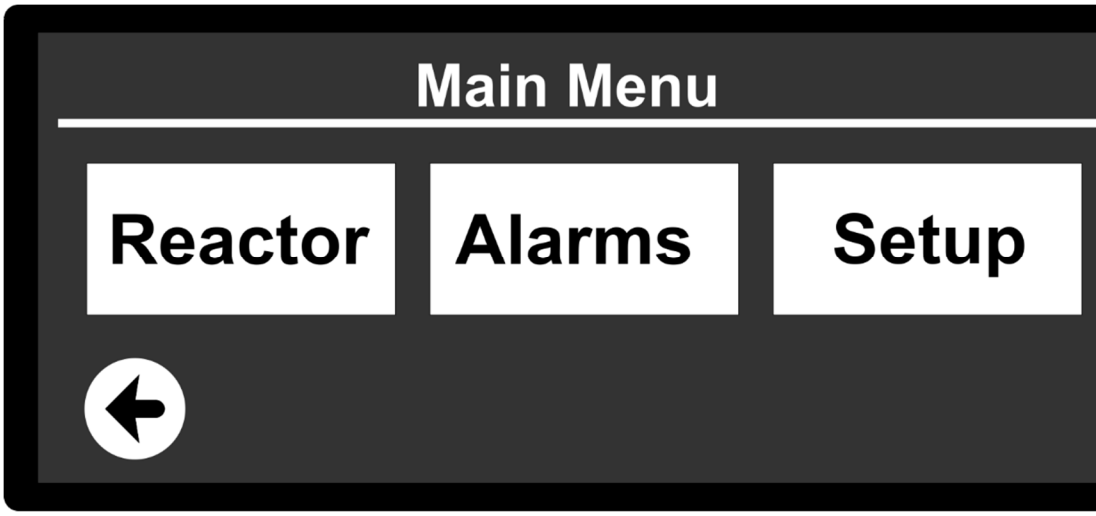
Flow LPM: Flow rate is adjusted by turning the regulator knob (OUTPUT PRESSURE ADJUST). Turning counter-clockwise will increase flow and pressure, turning clockwise will decease flow and pressure. You will see the Flow LPM value change as flow is adjusted.

Reactor Temp: Reactor temperatures are displayed in Celcius. The model generator you have will affect the number of generators that you see on display.

737-14: Reactor 1 / Reactor 2
737-15: Reactor 1 / Reactor 2 / Reactor 3

Next Arrow: This will take you to the **MAIN MENU**

6.2 Main Menu



MAIN MENU has three options.

Reactor: View the status of reactors and take them offline if needed.
Alarms: View any active alarms regarding generator performance
Setup: Adjust screen brightness and turn internal LED's on or off.

6.3 Reactor Control Menu

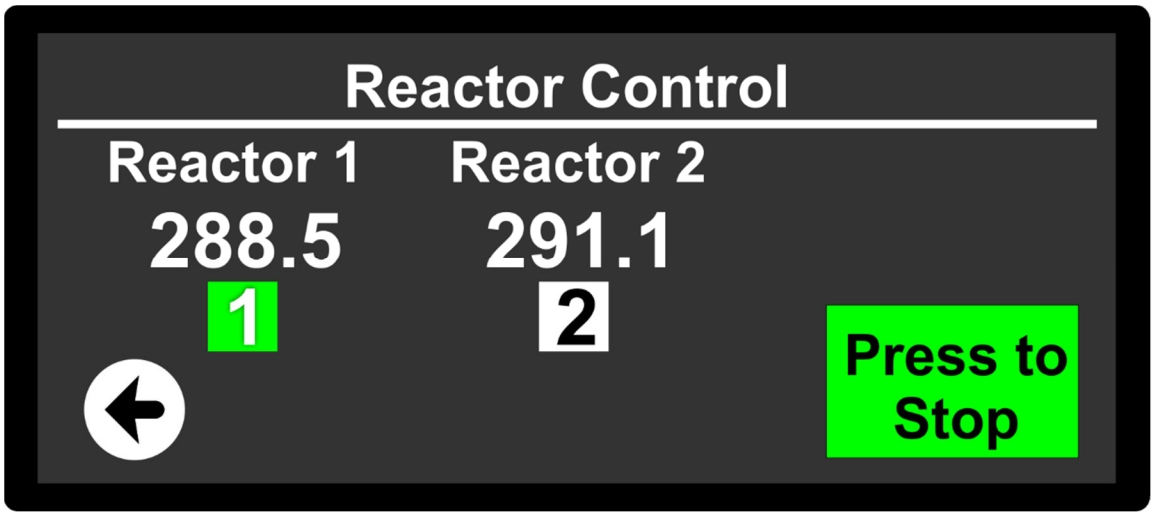


Image indicates reactors are in proper temperature range and Reactor 1 is heating.

This menu will allow you to see the current temperatures and will indicate the powered reactor
with a green box around the reactor number. Only one reactor is energized at a time. "**Press to Stop"** will take the methane reactors offline. After which **"Press to Start"** will appear and can be
pressed to resume power to the methane reactors.

7.0 Maintenance and Troubleshooting

7.1 Troubleshooting the Purification Reactor

If a one or two-minute check of the flow rate reading on the LCD, and the OUTPUT PRESSURE gauge, both show sudden drops during a two minute observation:

If the sudden change is only momentary with recovery within a second or two:

(a) This suggests that the output pressure has been set too close to the input pressure or that the input pressure had deteriorated.

NOTE: For the OUTPUT PRESSURE REGULATOR to operate effectively, a pressure differential of at least 10-psig must be maintained between these two pressure settings, with the input pressure being the higher of the two. If either of the above pressure settings does not conform to this restriction, make the necessary pressure adjustments, beginning with the input pressure setting. See Section 9.3.

(b) A further confirmation of this condition can be made by observing the purge flow. This purge air flow can be monitored at the DUMP fitting. It should be noted that, during some portion of each two-minute cycle, for an interval of about four seconds, there is no purge flow. This period occurs when either S-1 or S-2 is activated and during the same interval the alternate valve is energized. Should it be that S-1 is activated then column one would be pressurized. The moment S-2 is energized there is a sudden demand for pressurized air from the ballast tank to fill column two. The ballast tank at the time may only be at 60-psig. If during this interval the OUTPUT PRESSURE REGULATOR were set between 52 and 60-psig the symptoms of pressure drops will prevail. By observing the four-second no purge flow interval and simultaneously glancing at the OUTPUT PRESSURE gauge one would observe a sudden, sharp decrease in output pressure. This would further confirm the problem. To remedy this situation, input pressure must be raised if it is mandatory that the output pressure remain at its value, or lower the output pressure if the input pressure cannot be increased.

If for only forty to fifty-seconds of each two-minute interval there is full output pressure as observed on the OUTPUT PRESSURE gauge, and full pure air flow as observed on the output flow indicator on screen.

(a) These symptoms suggest that only one of the solenoid valves on the inlet to the purification reactor is being energized during the full two-minute cycle or that flow through one of the solenoids is being obstructed.

(b) For further confirmation, it is necessary to access the electrical system; i.e., timers, etc. Remove the cover from the generator unit. With the POWER switch on observe whether the timer lights are alternating on and off or not.

(1) If the timer is alternating properly (with a 4 second overlay), simply listen for the “click” of the solenoid valves, during one full cycle of the timer. Each should be energized for alternate halves of each cycle.

(2) If the timer lights are illuminating on and off but the solenoid valves do not “click”, disconnect the electrical disconnects leading from the solenoid valves to the timer. Measure the voltage at each male disconnect during alternate halves of the timer cycle. They should both read the voltage of 24VDC.

PLEASE NOTE: Previous systems may use 120VAC and 220VAC solenoids and timers. Systems with these voltages can be indicated by the presence of a cam wheel timer with connections to the solenoid valves. Newer systems using a solid state 24VDC timer will be indicated by the presence of a small black box with connections to the solenoid valves.

If there is purge flow although the POWER switch is off (no power to solenoid valves on purification reactor):

(a) The problem lies with one of the purification reactor’s solenoid valves experiencing “blow by”. It is due to the weakening of the spring within the coil housing. This spring holds the spindle against its seat when the coil is not energized, effectively closing the inlet side of the valve at any pressure up to 150-psig. If the spring were defective air is admitted through the valve and, because there is less restriction through the purge valve and opposite column system than through the check valve, pressure regulator, etc., this air appears as purge air through the opposite solenoid valve.

(b) Further confirmation of this condition can be made by removing the connecting tubing from the tops of the solenoid valves; i.e., the common dump connection, and determining which solenoid valve is leaking when its coil is not energized by feeling the flow from the top of the valve with the POWER switch off and pressurized air being applied to the solenoid valve inlet. The defective solenoid valve is that valve which does not evidence purge flow since its opposite number is leaking when non- energized.

If the purge flow is extremely unequal from one side of the purification reactor to the other during normal operation with the POWER switch on:

(a) It is probably caused by a defective check valve, Figures 6, 7 and 9 (10), on the output side of the purification reactor. To determine which check valve is defective, disconnect one of the electrical quick-disconnects leading to one solenoid valve on the input to the purification reactor with the POWER switch on and pressurized air at the valve inlet. If the purge air is normal, the defective check valve is on the same half of the purification reactor as the solenoid valve receiving power. If the purge air is abnormally high, the defective check valve is on the opposite half of the purification reactor. See figure 15. Replace the defective check valve.

(b) Further confirmation can be made that one check valve is defective by: (1) turning the POWER switch off, (2) remove the 3/8-inch tubing, which connects the output of the purification reactor to the input of the output pressure regulator, (3) connect pressurized air to the output tee fitting of the purification reactor, then (4) there will be a high flow of air from the top of that solenoid valve, which is in the same half of the purification reactor containing the defective check valve.

NOTE: It may be necessary to remove the three eights inch purge tubing joining the purge connections of the two solenoid valves to isolate the valve that is producing the improper purge flow.

Should the cooling fan fail, the generator cabinet will feel unduly warm and the pure air

that exits from the PURE AIR fitting on the rear of the unit will feel hot since the cooling fan passes air over the cooling coil. To confirm that the cooling fan has failed, place a hand behind the screened opening on the rear of the generator unit. If no air flow is evident when the METHANE HEAT switch is on, replace the fan. It is held in place by four 6-32 screws with kep-nuts. The electrical connection is via electrical quick connect. Be certain that the replacement fan is oriented properly to blow air outside the cabinet.

Instruments manufactured by Tisch Environmental are guaranteed by warranty to be free of defects in materials and workmanship for one year after shipment from Tisch Environmental factories. If your instrument needs servicing or if you need assistance please contact our technicians during normal business hours.

Direct: (513) 467-1477
Fax: (513) 467-9009
Email: sales@Tisch-Env.com
Website: www.Tisch-Env.com
Address: **Tisch Environmental**
145 South Miami Ave.
Cleves, OH 45002

7.2 Replacement Parts and Accessories

Replacement Part	Model Number
Catalytic Reactor for **50L (737-13) 120v** **50L (737-13) 220-240v** **100L (737-13) 120v** **100L (737-13) 220-240v** **250L (737-15) 120v** **250L (737-15) 220-240v**	737-42-120 737-42-240 737-42-2-120 737-42-2-240 737-42-3-120 737-42-3-240
Pressure Swing Adsorption Module (Used for 120 and 220-240v systems) **50L (737-13)** **100L (737-13)** **250L (737-15)**	737-25-A-120/24 737-26-A-120/24 737-37-A-120/24
120v/24v Solenoid for Purification Reactor	SV-3W-NC-250-120/24

7.3 Fuse Replacement

There are (2) fuse locations on the 737 Series Hi Volume Generator

The main fuse for the 737 Series Hi Volume Generator is located near the power inlet

CAUTION: REMOVE POWER FROM UNIT BEFORE SERVICING

To replace the fuse, use a small flat-head screwdriver to open the tray of the power inlet where the fuse(s) are located.

Remove the blown fuse(s) and replace with new fuse(s)

Fuse information:
220V Systems: P/N: 737 Series Hi Volume Generator-106-2 – 5 Amp, time-lag 5x20mm fuse
120V Systems: P/N: 737 Series Hi Volume Generator-106 - 10 Amp, time-lag 5x20mm fuse

There is an internal fuse for the 24VDC power supply that provides power to the internal controller and other internal equipment.

To replace the DC fuse, remove the top cover and located the fuse holder. The fuse holder can be opened by pulling up on the lever.

Fuse information:
P/N: 737 Series Hi Volume Generator-104 – 1.25 Amp, quick-blow 5x20mm fuse

7.4 Air flow Troubleshooting

To troubleshoot air-flow problems, please see Appendix A for the system diagram. By removing the connection to each major component, the air flow clog can be identified and remedied. If the system is connected to a dirty or wet incoming air supply,

clogs can develop in the system and the PSA module can get fouled causing the media to congeal. It is imperative a clean, dry air source is used.

Appendix A: System Diagrams

Appendix B: Revision History

Revision	Date	Description
1.0	5/26/2021	Revised 737 Hi Vol Manual created