

Parker Balston® FID 1000 and FID 2500 Gas Stations

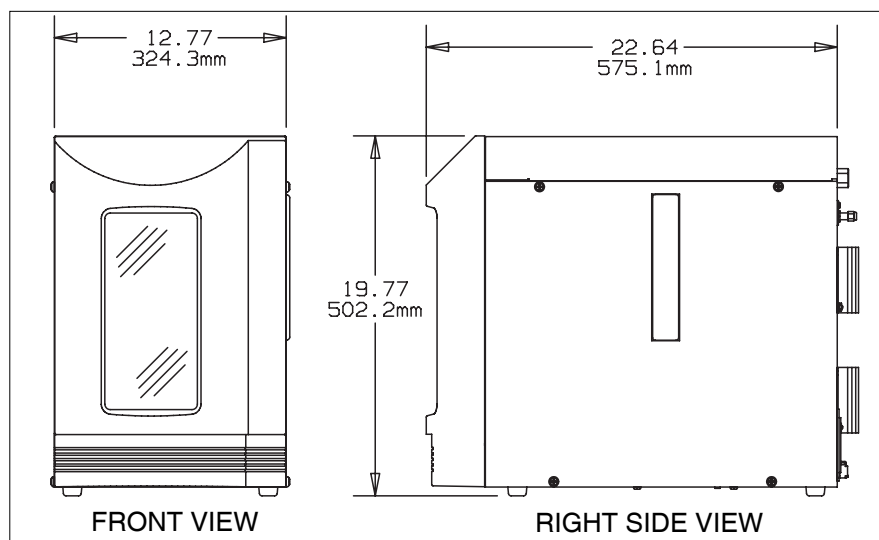


Figure 1 - FID Gas Stations

These instructions must be thoroughly read and understood before installing and operating this product. Any modification of the product will void the warranty. Failure to operate this product in accordance with the instructions set forth in this manual and other safety governing bodies could jeopardize the safety of the operator and void the safety certification of this product.

If you have any questions or concerns, please call the Technical Services Department at 800-343-4048, 8AM to 5PM Eastern Time (North America only). For other locations, please contact your local representative.



Do not use a Hydrogen gas storage vessel in conjunction with the Hydrogen generator. Stored quantities of hydrogen pose an explosion hazard.



Normal precautions for any hydrogen supply should be taken when using the hydrogen generator. DO NOT USE IN A SEALED OR UNVENTED ROOM.



CAUTION: DO NOT USE AN OPEN FLAME OR OTHER IGNITION SOURCE WITHIN 10 INCHES (25cm) OF THE OXYGEN VENT!

General Description

FID Gas Stations (see Figure 1) are completely engineered systems designed to produce ultra pure, dry hydrogen gas from deionized water using a Proton Exchange Membrane cell. The hydrogen generator utilizes the principle of electrolytic dissociation of water and hydrogen proton conduction through the membrane. The hydrogen stream is dried using a coalescing filter, a drying tube and dessicant. The outlet pressure of the hydrogen unit is 60 psi (4.08 Barg) with a maximum hydrogen delivery flow rate of 90 cc/min for Model 1000, and 250 cc/min for Model 2500. The FID gas stations are ideal for use as fuel gas in Flame Ionization Detectors (FID's), Trace Hydrocarbon Analyzers, and other general laboratory equipment requiring a source of pure hydrogen.

Parker Balston Gas Stations also incorporate a Zero Air Generator (ZAG) which will replace inconvenient high pressure gas cylinders as a source of hydrocarbon-free air. This will purify on site compressed air to a total hydrocarbon concentration of less than 0.1 ppm (measured as methane). The ZAG may be used to generate fuel for Flame Ionization Detectors (FID's) or for a zero reference for any instruments which measure hydrocarbon concentration. Model 1000 is capable of producing 1000 cc/min of zero grade air and will serve up to three FID's, and Model 2500 will serve up to six FID's.

Installation and Operation

Regulatory Compliance

The FID Gas Stations are certified to the electrical safety requirements as specified by the IEC, CSA, and UL standards. These units bear both the CSA and UL markings on the product label. Products supplied to Europe carry the CE mark (220, 230, 240 VAC units only). The generator meets EMC compliance.

Zero Air System

The Parker Balston FID Gas Station includes all of the components necessary to purify compressed air into zero-grade hydrocarbon-free air. The generator comprises three primary functional groups: prefiltration, hydrocarbon removal and final filtration (see Figure 2).

Prefiltration

A high efficiency coalescing filter has been incorporated into the design of the Parker Balston FID 1000 and FID 2500 as a prefilter to remove oil, water, and particulate contamination from the incoming compressed air supply. The prefilter assembly is equipped with an solenoid autodrain to eliminate any liquids which have accumulated within the filter housing. The solenoid drain opens to dump condensate once per hour for 1 second. If the condensate capacity exceeds the volume of the filter housing, condensate can be carried into the catalyst module. Refer to the compressed air utility section to eliminate this occurrence.

Hydrocarbon Removal

The catalyst module is a stainless steel housing filled with proprietary catalyst and assembled with a heater. The catalyst module oxidizes hydrocarbons from the compressed air supply into carbon dioxide and water. The module is sized to deliver 1000 cc/min or 2500 cc/min of zero-grade hydrocarbon-free air to the instrumentation downstream.

Final Filtration

The final filter on the Parker Balston FID Gas Station is a high efficiency sintered metal filter which removes particulate contamination to 0.5 micron. This final filter ensures that the outlet air from the Parker Balston Gas Station is particle-free.

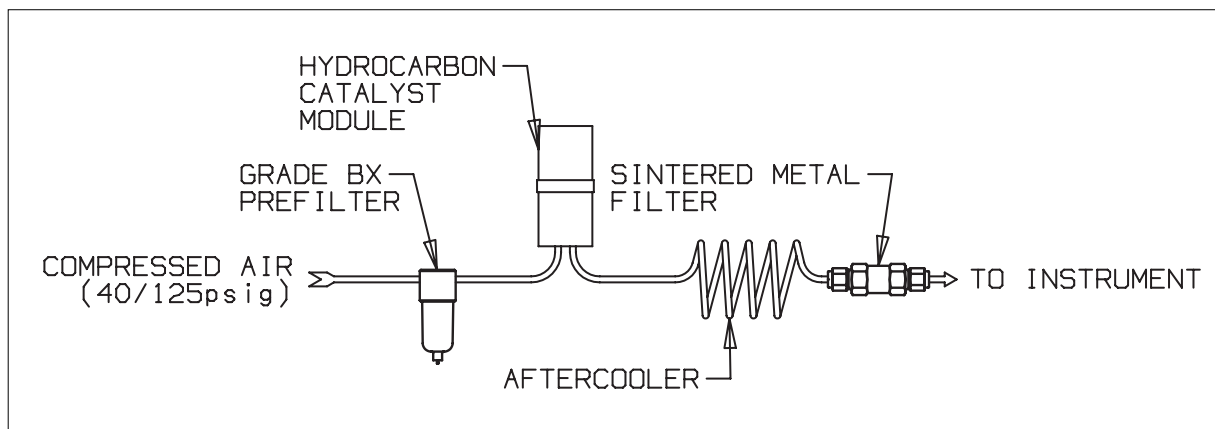


Figure 2 - Flow Schematic Zero Air

Hydrogen System

The Parker Balston FID Gas Station also includes a system to generate and purify hydrogen gas. This portion of the generator includes: water feed system, proton exchange membrane cell, and desiccant dryer (See figure 3).

Water Feed

The water reservoir for the hydrogen system includes an integral deionizer resin cartridge. The resin cartridge sits inside the water bottle and all deionized water fed to the system passes through this resin. The purpose of the cartridge is to ensure good quality (greater than 5 Megohm) water is circulated through the electrolyzer cell. Note: The deionizer cartridge is not intended to purify tap water.

PEM Cell

Electrolysis occurs inside the electrochemical cell assembly (Figure 3). Positively charged hydrogen ions are transported across the solid polymer electrolyte along with excess water molecules. The hydrogen ions then recombine to create molecular hydrogen. Negatively charged oxygen ions recombine to form molecular oxygen. The water saturated oxygen is fed into a water/oxygen separator, where the water is returned to the water tank, and the oxygen escapes to the atmosphere. Small deionizer bags in the separator ensure the quality of the water returned to the water tank.

Desiccant Dryer

The final stage of the hydrogen process is purification through the desiccant drying bed. Any liquid water or moisture carried over in the electrolysis process is removed to purity 99.9995%. When the desiccant becomes saturated, the blue indicating color will turn beige or gray. At this point, the expended cartridge can be exchanged or regenerated as per the procedure in the Maintenance section.

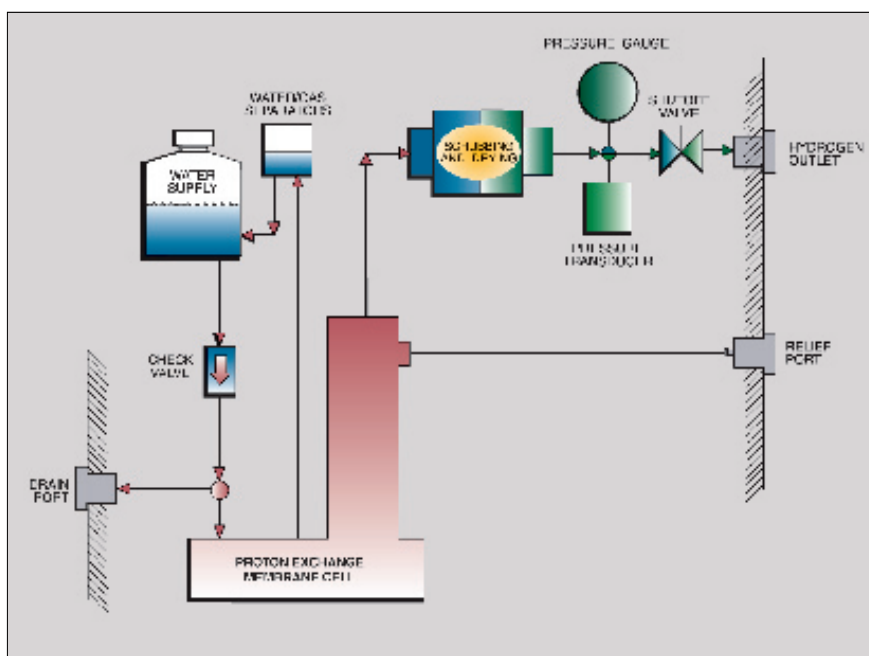


Figure 3 - Flow Schematic Hydrogen

Installation and Operation

Installation and Operation

Note: All installation, operation and maintenance activities for the FID Gas Stations should be performed by suitable personnel using reasonable care.

General

The FID 1000 and FID 2500 generators are a free-standing bench-top unit. **Do not suspend the generator from the wall or ceiling.** The weight and size could pose a falling hazard. The generator should be located indoors, protected from severe weather conditions and free from excessive ambient, dust or dirt. **Do not install the generator outdoors.**

The ambient temperature of the air surrounding the generator must be between 60°F-100°F (16°C-40°C). **Do not place the generator where there is a chance of freezing.** Place the generator in an upright position, on a level surface, in close proximity to the electrical power supply and the equipment requiring both hydrogen and hydrocarbon-free air.

The Zero Air Generator compressed air inlet port is brass 1/4" female NPT. The inlet port is located at the top center of the generator. The Zero Air outlet port is brass 1/8" compression union, located below the Inlet port. Male 1/4" NPT compressed air inlet pipe fittings rated for 125 psig (8.5 Barg) line pressure should be used to connect to the generator. **The Hydrogen vent is also a brass 1/4" female NPT, located at the right hand side of the generator and the Hydrogen outlet is a SS 1/8" Compression Union, located directly below the hydrogen vent.**

A shut-off valve and a pressure regulator should be installed directly upstream from the Parker Balston Zero Air generator. The shut-off valve isolates the unit from the air line for maintenance and troubleshooting tasks. The pressure regulator controls the inlet air pressure and should be set to maintain a constant pressure between 40 psig and 125 psig (2.7 barg and 8.5 barg). Maintaining a constant inlet air pressure will minimize system pressure fluctuations which may affect the purity of the zero grade air. Parker offers a pressure regulator, complete with a pressure gauge, as an accessory (P/N 72-130-V883).

Location

The FID 1000 and FID 2500 Gas Stations should be located in close proximity to the electrical power supply, and the downstream equipment to which it supplies both Hydrogen and Zero grade air. There is no limit to the distance between the generator and the point of use as long as tubing size, cleanliness, and pressure drop are taken into consideration. The generator should be located indoors, protected from severe weather conditions. The installation location should be free from excessive ambient dust or dirt. **Do not install the generator outdoors.** The ambient temperature of the air surrounding the generator must be between 60°F-100°F (16°C-40°C) to ensure optimal operation of the unit.

Symbols

See page 18 for a list of the symbols displayed on the generator and referred to in this Manual.

Transporting



The FID 1000 and FID 2500 generator weigh 53 lbs (24 kg). Use proper equipment and lifting techniques for transporting this equipment to its installation location. The FID/Hydrogen is intended to remain stationary when filled with water. If necessary, the generator may be transported over short distances when filled. **Do not grasp the front panel Bezel when moving the generator; lift only from the bottom. Keep the generator in an upright position.**

Preparation

Remove all red tape from the top cover, the back panel, and any other surfaces. Open the top cover of the FID Gas Station. Unscrew the dessicant cartridge cap (see Figure 6) and remove the red tape covering the outlet port located on the inside of the dessicant cartridge housing. Remove the red caps/tape sealing the back panel outlet fittings.

Dessicant - Wipe any drops of moisture with a lint free cloth or paper towel from the dessicant cap and housing. Remove the dessicant cartridge from the sealed bag. Use a drop of deionized water to wet the o-rings. Insert the cartridge into the housing, nipple end first (see Figures 7,8, and 9). Firmly push down on the cartridge to create a hydrogen-tight seal at the bottom of the housing, making sure the cartridge is seated.

Before replacing the dessicant cartridge cap, make sure the large Viton o-ring is centered inside the cap (see Figure 9). Screw the cap on and tighten securely by hand. Make sure that the o-ring is centered and that the o-ring has created a dark ringed seal.

Note: Most leaks occur due to improper sealing of the cap to the housing on the dessicant cartridge.

Installation and Operation

Utilities

Power - The Parker Balston Zero Air Generator may be operated by a 120 VAC, 220 VAC, 230 VAC, or 240 VAC, 50/60 Hz power supply. **Main supply voltage fluctuations must be within $\pm 10\%$ of the nominal main supply voltage.** The generator is shipped with a tag at the power receptacle which specifies the factory setting of the voltage selector. For optimal performance of the generator, the operator should set the voltage selector to match the local power supply. To change the setting on the voltage selector, simply remove the selector/fuse drawer from the receptacle using a small screwdriver, turn the selector so the desired voltage shows in the window, and reassemble. To connect the generator to the power supply, simply plug the female end of the electrical cord into the receptacle on the right side of the generator, and the opposite end into a three-pronged earthed power receptacle.



Before plugging power cord into power receptacle, check the voltage selector setting. The voltage setting must match the local power supply voltage. (Note: "NA" versions of the generator are designed for 120 VAC operation only.)

Deionized Water - The FID 1000 and FID 2500 / hydrogen must be supplied with deionized water with a resistivity of at least 5 Meg-Ohm/cm. Parker Balston provides a point of use accessory, the HydroGen Mate (P/N 72-230 or 72-231) that provides high purity water (>5 Meg-Ohm/cm) from tap water for manual filling or autofilling the generator.

Resin Bed - FID gas stations are supplied with a resin bed to be installed in the water fill reservoir. This is to ensure proper water quality is being supplied to the Hydrogen system. A message on the front display reading "check resin bed or 75% usage" is a reminder to occasionally check resin. It needs to be replaced only if color has changed to orange on more than 75% of the cartridge.

To install resin bed, remove water bottle cap. Remove resin cartridge from sealed bag and set resin in bottle. Screw cap securely on water bottle (see Figures 4 and 5).

Caution: Cell contamination is a cumulative and irreversible process which will eventually cause an over-voltage fault, automatically shutting down the generator. The deioniser resin bed is for a final decontamination stage and should not be used to purify low grade water.



Figure 4 - Set resin bed in bottle



Figure 5 - Screw cap securely on water bottle

Compressed air - The Parker Balston FID 1000 and FID 2500 Zero Air Generators require a source of clean compressed air for optimal operation. The compressed air should be as close to instrument quality as possible, and supplied at a pressure and flow rate above that required at the point of use. The temperature and/or dewpoint of the supply air should be at room temperature (or lower), and it should be relatively free from compressor oil, hydrocarbons, and particulate matter. Contamination of the catalyst bed may occur if it is exposed to certain compounds (see warning below). If the compressed air supply has excess water, oil, or particulate contamination, install extra prefiltration upstream from the unit (see Recommended Accessories, page 18).



Chlorinated hydrocarbon compounds and chlorofluorocarbons (or freons) will permanently contaminate the hydrocarbon catalyst module in the FID ZAG generator. Extreme care should be taken when specifying an air supply for the generator to ensure that these compounds are not present in the air supply nor likely to get into the compressor providing air to the generator.



The hydrocarbon catalyst module can also be contaminated by high concentrations of lead, sulfur, or phosphorous compounds, heavy metals, and long chain polymers. Care should be taken to avoid introducing these compounds into the Parker Balston FID Gas Station. None of these compounds are to be stored near the inlet to the compressor supplying the system with compressed air. The intake for the compressor should be vented to the outdoors.

Connect the compressed air supply to the 1/4" NPT (female) inlet port in the top center of the generator, back of instrument (see Figure 10).

Piping Components, FID 1000 and FID 2500 / ZAG - The inlet port for the Parker Balston FID 1000 and FID 2500 Zero Air Generator is a 1/4" NPT (female) and is located at the top center of the rear panel. Inlet tubing and fittings should be clean and rated for 125 psig (8.5 Barg), minimally. The tubing and fittings used downstream from the FID 1000 and FID 2500 should be clean stainless steel or pre-cleaned refrigeration-grade copper (1/4" od x .030" wall) and rated for 125 psig (8.5 Barg).

Do not use plastic tubing downstream from the generator. Outgassing from the plastic may contaminate the zero-grade gas. Use PTFE tape on all inlet and outlet NPT fittings. (Thread sealing compounds may contaminate the process stream).

Note: The use of plastic piping components or unclean copper or stainless steel piping components will result in the FID Gas Station failing to meet zero air purity specifications.

Connect downstream delivery lines (Zero Air Outlet) to the 1/8" compression union port on the middle of the generator.

Piping Components, FID 1000 and FID 2500 / Hydrogen - The outlet connection for the FID 1000 and FID 2500 / Hydrogen is a 1/8" compression fitting. All tubing and fittings downstream from the hydrogen generator should be clean stainless steel to minimize contamination of the hydrogen stream. If copper tubing has been used with hydrogen in the past and has yielded acceptable results, there is no need to alter an existing piping configuration to install the hydrogen generator.

Flow Controller - A flow control device should be installed downstream from the zero air outlet if one is not integral to the instrumentation used (P/N Model W-FM7583). If the flow capacity of the generator is exceeded, the FID 1000 and FID 2500 / ZAG will fail to meet its hydrocarbon specification (0.1 ppm for FID 1000, or 0.05 ppm for FID 2500).

Pressure Regulator - The FID 1000 and FID 2500 / Hydrogen pressure is preset to 66 psig internally. In order to optionally regulate the output pressure, the customer needs to install a pressure regulator down stream from the unit. The output pressure can be monitored using the front panel digital display. There is an internal **Pressure Relief Valve** that is preset to 150 psig (10 Barg) in case of excess internal pressure build up. The expelled gas is channeled through the pressure relief port, hydrogen vent, located in the back of the unit.



Figure 6 - Unscrew desiccant cap



Figure 7 - Insert new desiccant cartridge



Figure 8 - Press down firmly on desiccant to seat o-ring



Figure 9 - Make sure the o-ring is centered in the cap before replacing it

Installation and Operation

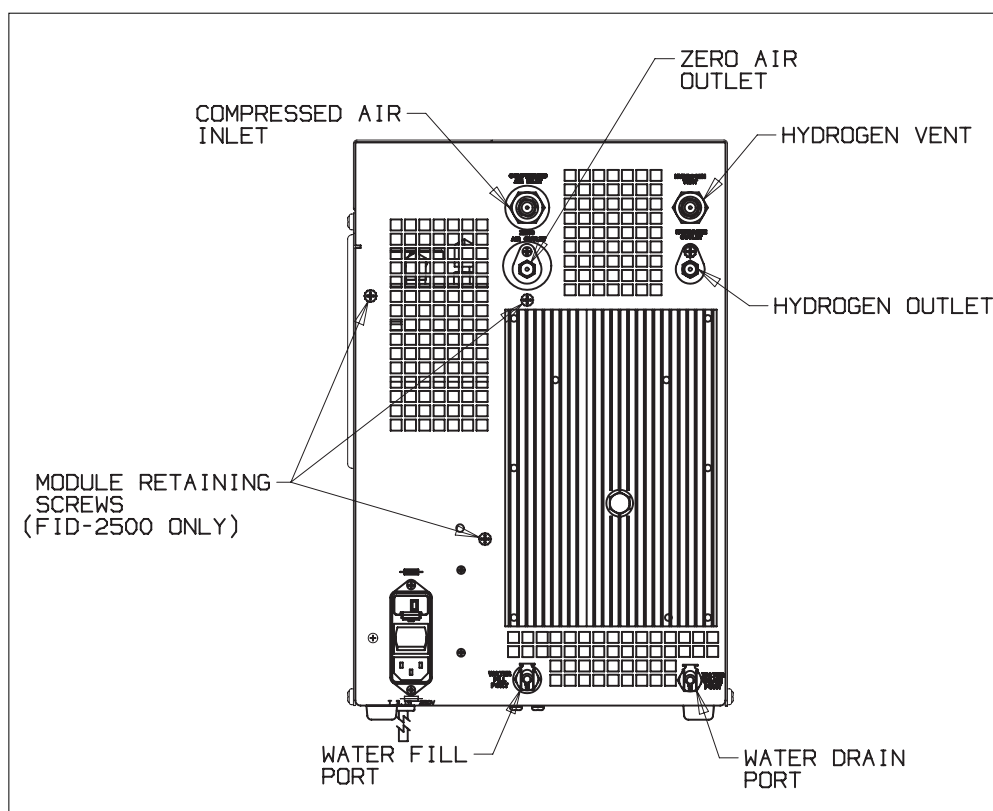


Figure 10 - Rear View of Unit

Start Up

Water Reservoir

The FID Gas Station is equipped with both an Automatic Fill and a Manual Fill Water design. After carefully following all the preparation procedures in the Installation section, proceed as follows:

Autofill

For **Autofill** operation, the FID Gas Station incorporates a detection device which automatically activates a Water Fill Solenoid when the water level is at the REFILL or EMPTY Level. In order to function correctly, the FID gas station must be connected directly to a DIO Water supply. The FID Gas Station/H₂ must be supplied with deionized water with a resistivity of at least 5 Meg – Ohm /cm or greater. Both a Gravity Feed and a Pressure Feed Tubing assembly can be located in the Accessories bag (P/N B02-0318). Select the required tubing, depending on the DIO source, and attach to the Water Fill Port at the back of the FID Gas Station (see Fig 10).

When the DIO set up is ready, turn the Power Switch to On. This automatically opens the internal DIO Solenoid valve and the Resin Bed Reservoir/Water Reservoir will start to fill. The device will continue to fill until the Water level reaches the REFILL mark. This triggers the internal solenoid valve to close and the DIO demand will cease. Do not disconnect the DIO water source if continuous FID/H₂ operation is desired.

Note: The H₂ generator will automatically shutdown if the water level becomes too low and LOW WATER is displayed on the Digital screen.

Installation and Operation

Manual Fill

For **Manual Fill** operation, simply open the top cover lid, locate the DIO Resin Bed Reservoir, loosen the cap and manually fill the device until the desired water level is visible through the Front Panel Display. Replace the cap and close the side cover lid. It will take approximately 2 liters of deionized water to fill the generator. Caution: Fill slowly.

Startup

Open the inlet air supply valve (customer supplied, see Installation section) and adjust the inlet pressure to be between 40 psig and 125 psig (2.7 barg and 8.5 barg) using a (customer installed) pressure regulator. Adjust the output flow (using a customer installed flow controller) to the rated flow for the unit. Turn the generator on using the power switch on the back panel. When power is supplied to the unit, the catalyst module will begin to heat up. The Parker Balston FID 1000 and FID 2500 / ZAG requires approximately 55 minutes to warm up and achieve hydrocarbon removal to 0.1 ppm (see Figure 5 Power Up / Start Up Sequence).

Quick Start Instructions

- 1 Check the Water level. To fill, remove DIO Resin Bed cap and slowly add >5 Meg-Ohm water to full line.
- 2 Connect to suitable line power.
- 3 Supply compressed air regulated to 125 psi Max to Compressed Air Inlet.
- 4 Open user installed shut off valve at **Zero Air Outlet** and close user installed shut off valve at **Hydrogen Outlet**.
- 5 Turn the power switch at the rear of the unit to **ON**.
- 6 Check display for current state of **Hydrogen** and **Zero Air**.
- 7 Time delay for Zero Air (55 minutes) allows it to reach operating temperature. Once time has expired, the unit is ready to provide both Hydrogen and Zero Air.
- 8 Open Hydrogen outlet valve.

Warning: Operating the generator for extended periods of time without compressed air will damage the heater within the catalyst module. Do not supply electrical power to the generator until compressed air is at rated capacity.

Controlled Venting

After replacing any parts downstream of the generator, or upon initial startup, the system will need to be purged to achieve the final purity. To avoid contaminating the downstream equipment, it is suggested that the user install a three way valve in-line nearest the equipment with a variable restrictor (such as a needle valve) on the Hydrogen outlet port. Follow the simple procedure below:

- 1 Close the three way valve that has been installed on the outlet or use the downstream equipment.
- 2 Connect the power cord to the FID 1000 or FID 2500 and turn the power switch to ON. The FID will start to generate Hydrogen. Wait until the internal pressure reaches the desired pressure (approximately 15 minutes).
- 3 Set the output flow rate to 50 cc/min by using the downstream equipment or if a three way valve was installed, then switch the flow to the outlet (or purge port) and set the flow rate using a needle valve. Use the downstream equipment only if impure hydrogen will not ruin the equipment.
- 4 Allow the system to vent in this manner for 30 minutes. The generator and lines should now be purged of air and ready for use.

Installation and Operation

Operation

Operation

After the generator has warmed up, adjust the flow to meet the requirements of the application. **Do not exceed the rated flow of the unit.** If the rated flow of the FID 1000 or FID 2500 ZAG is exceeded, the life and performance of the unit will be adversely affected and the warranty will be void. The outlet air will contain hydrocarbons in excess of 0.1 ppm.

The Parker Balston FID 1000 and FID 2500 ZAG is designed to operate continuously, 24 hours per day, as long as the compressed air supply is not interrupted.

To maintain the highest purity, the FID 1000 and FID 2500 H₂ should be run continuously. Monitor the Hydrogen consumption of the downstream equipment to ensure flow is within the capacity of the generator (see the System Specifications section for rated flows). The Front panel Display should be illuminated as seen in Figure 11.

The water level should be monitored regularly and refilled as necessary, if Manual Fill operation is in use. Otherwise, ensure that the Autofill tubing is installed correctly and connected to a suitable DIO supply. The reservoir holds enough water for at least a week of continuous operation. Water can be added manually by removing the DIO Resin bed cap and slowly adding enough water to reach the FULL mark on the FID 1000/FID 2500 front panel (see the Water Reservoir section in Startup). Reinstall the Resin Bed cap.

To maintain the integrity of the Hydrogen cell, follow the guidelines listed below:

- 1 Keep a supply of deionized water in the reservoir above the REFILL line at all times or ensure that the FID Autofill is directly connected to a DIO water source.
- 2 Minimize the “dead-volume” in the piping between the generator and the downstream equipment.
- 3 Never expose the equipment to temperatures below freezing.
- 4 Never abruptly disconnect the Hydrogen outlet port from the downstream equipment and expose the unit to large flow volumes. The sudden, large demand can permanently damage the cells membrane, causing irreparable damage to the unit. A large demand will trigger the overflow condition and cause the FID 1000 and FID 2500 H₂ side to shutdown.

If the built-in diagnostics trigger a fault condition, and the symptom is displayed, consult the Troubleshooting section of this manual for further instructions.

Diagnostics

The Parker Balston FID gas station has built-in system diagnostics to monitor the operation of the generator and alert the operator both visually and audibly in case of a failure.

Upon Power Up, the front panel Digital Display will be illuminated and the Hydrogen/Zero Air operational status will be displayed (see Figure 11).

The Control circuitry controls the membrane cell current to a safe level and eliminates the possibility of excessive Hydrogen production. If a fault occurs and a fault condition is displayed, follow instructions in the Troubleshooting section to clear and rectify the fault condition.

An audible alarm will sound with the following error conditions are displayed:

- Add water / water empty
- Over pressure of hydrogen cell
- Excess flow demand of hydrogen / overflow / low pressure*
- Zero air overflow / excess hydrocarbons
- Zero air service required

Once the error condition is corrected, the unit will resume operation.

*In the case of hydrogen overflow / low pressure, the unit will have to be shut down and re-started to resume generation of hydrogen gas.

<p>HYDROGEN</p> <p>in Use 79% 66.5 psi</p> <p>ZERO AIR</p> <p>At temperature</p>	NORMAL OPERATION	<p>HYDROGEN Overflow</p> <p>in Use 90% 20 psi</p> <p>ZERO AIR</p> <p>At temperature</p>	HYDROGEN OVERFLOW
<p>HYDROGEN</p> <p>in Use 80% 66.2 psi</p> <p>Desiccant</p> <p>Check the indicator</p>	NORMAL OPERATION WITH DESICCANT REMINDER	<p>HYDROGEN Overflow</p> <p>in Use 0% 0.0 psi</p> <p>ZERO AIR</p> <p>At temperature</p>	HYDROGEN OVERFLOW IF PRESSURE DROPS BELOW 10 psi
<p>HYDROGEN</p> <p>in Use 70% 66 psi</p> <p>Check Resin for 75% Usage</p>	NORMAL OPERATION WITH RESIN REMINDER	<p>HYDROGEN Overflow</p> <p>in Use 0% 0.0 psi</p> <p>ZERO AIR Low temperature</p> <p>Excess Hydrocarbons</p>	ZERO AIR OVERFLOW
<p>HYDROGEN</p> <p>in Use 80% 66 psi</p> <p>Zero Air Service</p>	ZERO AIR SERVICE REQUIRED	<p>PARKER HANNIFIN</p> <p>ZERO AIR & HYDROGEN</p> <p>GAS GENERATOR</p>	POWER UP SEQUENCE
<p>HYDROGEN low water</p> <p>in Use 0%</p> <p>ZERO AIR</p> <p>At temperature</p>	EMPTY WATER	<p>HYDROGEN add water</p> <p>in Use 79% 66.5 psi</p> <p>ZERO AIR</p> <p>At temperature</p>	REFILL WATER
<p>H2 cell = 2.85 V</p> <p>in Use 89% 65.2 psi</p> <p>ZERO AIR</p> <p>At temperature</p>	CELL VOLTAGE ABOVE LIMIT (See Troubleshooting Guide)		

Figure 11 - Front Panel Display

Installation and Operation

Shutdown

If the unit is to be idle for more than 24 hours, the generator should be turned off. Parker recommends allowing the FID 1000 and FID 2500 Generators to run continuously, shutting down the unit only when compressed air is not available or when the generator requires servicing. The continuous operation of the generator maximizes the life of the catalyst heater as well as the Electrolytic Proton Exchange Membrane Cell.

To shut down the Parker Balston FID Gas Station, turn the power switch to the OFF position. Maintain the compressed air flow through the unit for at least 10 minutes to improve heat dissipation. After 10 minutes, turn off the compressed air supply to the generator.



Warning: Do not supply electrical power to the generator until the compressed air flow rate through the unit is at the rated capacity (see Specifications section, page 18). Operating the generator for extended periods of time without compressed air will damage the heater within the catalyst module and void the warranty.

Storage

To store the unit:

- 1 Turn the FID 1000 or FID 2500 OFF and allow the Hydrogen gas to purge slowly until all the internal gas is removed.
- 2 Cap the Hydrogen outlet on the back of the generator or leave it connected to the downstream equipment.
- 3 Fill the DIO Reservoir at least half full with deionized water. Make sure that the cell has at least 2" (5cm) of water showing in the cell assembly tube. This can be viewed through the vents in the back panel.
- 4 Remove the desiccant cartridge and store in a moisture proof container.
- 5 Check the water level in the cell every 6 months to maintain the 2" (5cm) height.

Shipping

Contact The Technical Services Department at 800-343-4048 for a Return Authorization (RA) number and new Packaging if the original is no longer available.

- 1 Purge and bleed the FID 1000 or FID 2500 of all compressed air and hydrogen. Wait until the outlet pressure display reads zero.
- 2 Drain the water from the DIO reservoir using the Water Drain Port Insert (connected to a 3' length of 3/8" OD tubing) and connect it to the drain port located on the back panel. Drain the deionized water into a 4 liter container.
- 3 Press down on the metal tab on the top of the Water Drain Port Connector to remove the Drain Port Insert and Tube once the unit has been drained.
- 4 Remove the desiccant cartridge and store in a moisture proof container. Cover the side port on the inside of the desiccant cartridge with tape and replace the cap.
- 5 Pack the generator carefully in the original packing box or request new packaging from Parker. Be sure to display the RA # on the outside of the box for prompt response.



In order to maintain the warranty on the generator, **ship the unit in a manner that will prevent freezing.** Freezing conditions will cause irreparable damage to the hydrogen cell assembly.

Troubleshooting

All troubleshooting activities should be performed by suitable personnel using reasonable care.



Warning: Any troubleshooting or service activity which requires removal of the generator cover should be done using extreme caution. Exposed AC may be present.

Symptom	Course of Action
No Power	<p>Check power source and connections to the power source.</p> <p>Check terminal connections and power cord.</p> <p>Check power source fuses.</p> <p>Check generator fuses.</p>
Refill /Empty Water	<p>Completely fill DIO Resin Bed Reservoir with deionized water.</p> <p>Auto -Water fill port is blocked / plugged.</p> <p>DIO water supply shut off, ie.. Gravity or Pressure lines closed off.</p> <p>Consult factory if display does not change status.</p>
Hydrogen Overflow	<p>Mass leak detected in system / downstream. If the H₂ pressure drops below 10 psi, the "HYDROGEN OVERFLOW" will be displayed. Shut down then restart generator.</p> <p>Hydrogen demand exceeds generator capacity. Check capacity of equipment and piping downstream and install a flow control device. Shutdown then restart generator.</p> <p>Check internal system piping for leaks. Shutdown then restart generator.</p>
Low Output Pressure	<p>Hydrogen demand exceeds generator capacity. Check capacity of equipment and piping downstream and install a flow control device. Shutdown then restart generator.</p> <p>Check external system piping for leaks. Shutdown then restart generator.</p> <p>Check internal system piping for leaks. Shutdown then restart generator.</p>
No Hydrogen Delivered	<p>Check power connections (see above).</p> <p>Check water level. Generator will shut down if water level is below the EMPTY level.</p> <p>Customer installed shutoff valve is closed; open valve.</p> <p>Check piping for leaks.</p> <p>Consult factory.</p>
Low Zero Air Pressure	<p>Check inlet air pressure. Pressure drop up to 4 psid (0.3 bar) is normal. Minimum inlet air pressure is 40 psig (2.8 barg).</p> <p>Check flow demand and overflow condition. Flow demands in excess of capacity may cause high pressure drop through generator.</p> <p>Check generator for leaks.</p>
Excess Hydrocarbons	<p>The Zero Air has not reached adequate temperature . Allow a minimum startup, warm up period of 55 minutes .</p> <p>Check downstream Zero Air flow demand. If flow capacity of generator is exceeded, the ZAG tower will be below the desired operating temperature and Hydrocarbon removal will be affected.</p> <p>An excessive pressure drop (greater than 4 psig/0.3 bar) may cause a high pressure drop through generator.</p> <p>If demand exceeds capacity, install a flow controller downstream from the zero air output.</p>
Excessive Moisture in the Gas Stream	<p>Dessicant is saturated; change dessicant.</p>
Cell Voltage Above Limit	<p>Check resin bed. If color has changed to orange then replace resin. Drain and flush water from system 3-4 times to remove impurities from water reservoir. Restart. If message still appears, then run generator for 10-15 minutes to cycle water through cell, then drain and refill again. If problem still persists consult factory.</p>

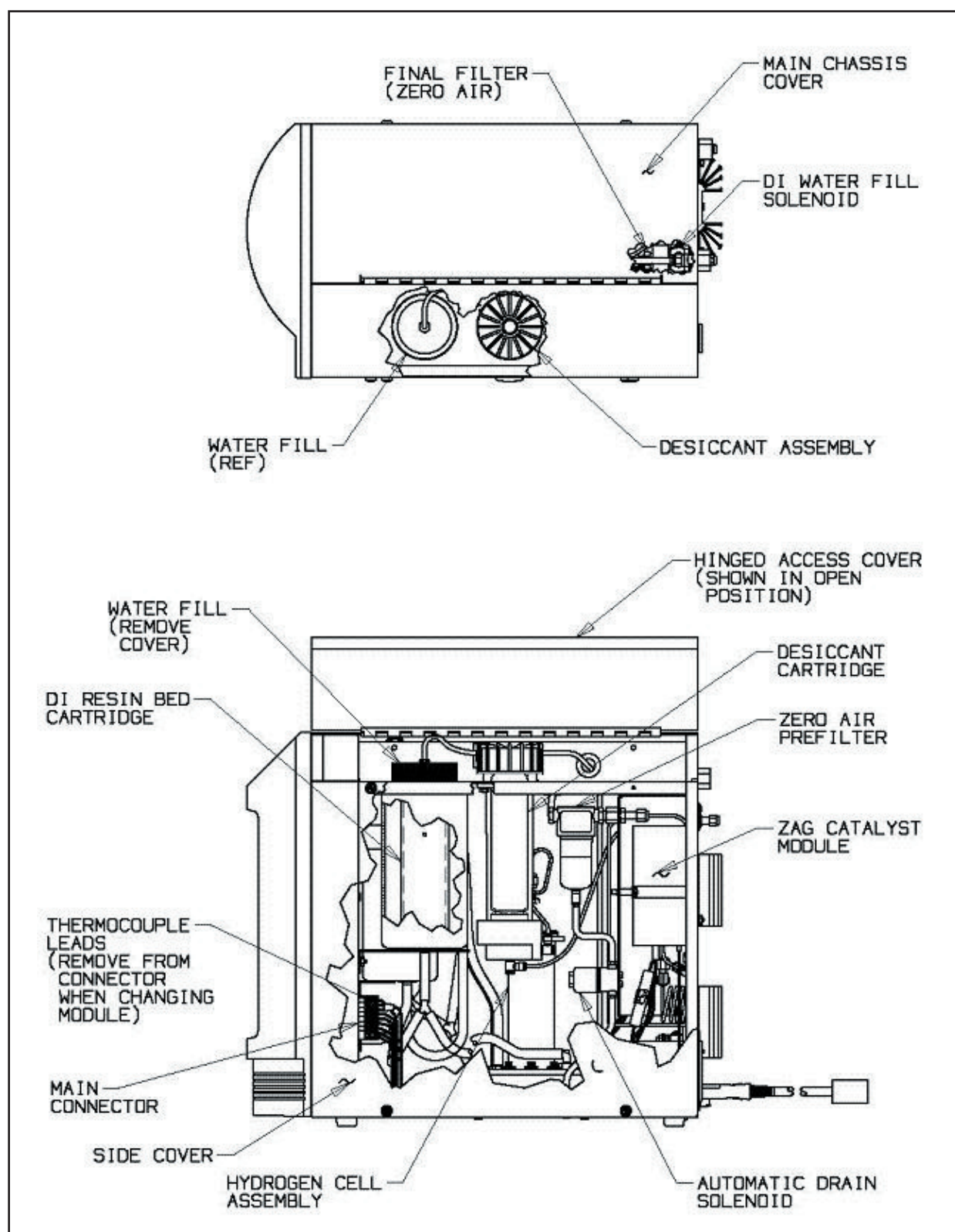


Figure 12 - FID Gas Station, Exploded View

Maintenance

Maintenance

When performing routine maintenance, carefully follow the instructions provided in this section to avoid injury or damage. Service should be performed by persons familiar with the service and safety requirements of electromechanical / electrochemical devices.

General

The primary maintenance tasks required by the Parker Balston FID 1000 and FID 2500 are: changing the prefilter cartridge (annually), changing the sintered metal filter assembly (annually), and replacing the catalyst module (2 years). Each of these components are readily accessible by removing the side panel of the generator. A summary of the replacement part numbers and recommended Service frequency is shown at the end of the Maintenance section. See Figure 12 for the locations of the prefilter, final filter, and catalyst module.

Additional coalescing prefilter cartridges and final filter cartridges for the Parker Balston FID 1000 and FID 2500 Gas Stations may be ordered through your local representative. For convenience, the replacement prefilter cartridge and final sintered metal filter have been assembled into a maintenance kit (P/N MK7583). With proper care and maintenance, the FID 1000 and FID 2500 / H₂ generator will provide years of trouble free operation. No adjustments or calibrations need to be made to the generator. Only routine service is needed to maintain peak operational conditions.



Before Servicing the Parker Balston FID1000 or 2500 Gas Station, isolate the unit from the compressed air and electrical supplies, the hydrogen output, depressurize the prefilter and turn the unit Off.

Prefilter Cartridge Maintenance

The only tool required to change the prefilter cartridge is a Phillips head screwdriver. Use the screwdriver to remove the generator side cover. The Grade BXE prefilter will be accessible from the side of the generator, after the generator cover is removed. The filter cartridge inside the housing should be changed on an annual basis to maintain efficient operation of the system. Remove the filter cartridge housed in this filter assembly by unscrewing the filter bowl from the filter head and unscrewing the element retainer disc from the tie rod. Insert the new filter cartridge (P/N 050-05-BXE) and re-assemble the filter housing in reverse order.

Catalyst Assembly Module Replacement

- Switch power off to unit and unplug generator from power. Allow the compressed air to continue to flow through the unit to improve heat dissipation during cooling. Allow the generator to cool for at least 2 hours.
- Close the (customer installed) inlet air valve.
- Remove Main chassis cover. There are 2 screws on the left side and 2 under the hinged cover of the generator (figure 12).
- Remove Right-side cover. There are 4 screws on the right side of the unit. (figure 12).
- Disconnect Catalyst Module connector located on right side of the unit (figure 12 and 13).
- Disconnect solenoid valve connector (figure 14).
- Locate main connector (figure 12). Using Wago tool, included in replacement module kit, insert tool into main connector as shown in figure 15. Depress tool and remove yellow wire from position 7 of main connector. Similarly remove brown wire from position 8.
- Remove connections to inlet and outlet air ports at the rear of the generator (figure 16).
- Remove 3 fasteners holding the catalyst assembly module at the rear of the generator – See figure 16 for FID 2500 or figure 17 for FID 1000.
- Slowly remove Module from generator.
- Replace with new assembly- which includes a new zero air filter, final filter, catalyst module, and solenoid valve.
- Reverse above procedure – reassemble module into chassis, reconnect air lines, re-attach electrical connectors and insert red and yellow thermocouple wires as shown previously.
- Pressurize the system and check for leaks in the AIR lines and fittings.
- Re-assemble covers to unit and supply power.

Additional maintenance tasks required by the Hydrogen system in the generator are: changing the desiccant cartridge (when the beads turn color or clear), replacing the DIO Resin Bed cartridge (approximately every 6 months), and refilling the water reservoir (weekly). See the Installation and Operation section for details. A summary of the replacement part numbers and recommended service frequency is shown at the end of the Maintenance section.



If necessary, the FID gas station may be wiped clean with a dry cloth on an as needed basis. **Do not use water, aerosols, or other cleaning agents to clean the unit.** Use of any liquid detergent to clean the generator could present an electrical hazard.

Do not use commercial leak detection fluids on any Lexan plastic parts in the generator. These fluids may cause cracking and crazing which leads to part failure. Use a solution of 4-5 ml of liquid dish soap in one liter of water.

Water Refill

Refill the water in the generator whenever the water level reaches the REFILL level displayed on the front panel. Two audio bleeps will be heard as soon as the Refill level is activated. If the FID 1000 and FID 2500 is connected to an external DIO Water source and is permanently connected, the unit will be remotely filled using the Autofill function of the generator.

The water reservoir should last approximately 1 week when the reservoir is filled to the FULL level.

If the LOW WATER level indicator is activated, a distinct constant audio bleep will be heard, until DIO water is added to the generator. The FID 1000 generator will stop producing hydrogen to safeguard the Hydrogen cell from permanent damage. Add water to the generator until the FULL level is reached. The unit will automatically start to produce Hydrogen as soon as the Refill level has been passed, while filling the unit (see Figure 11 for Display Modes).

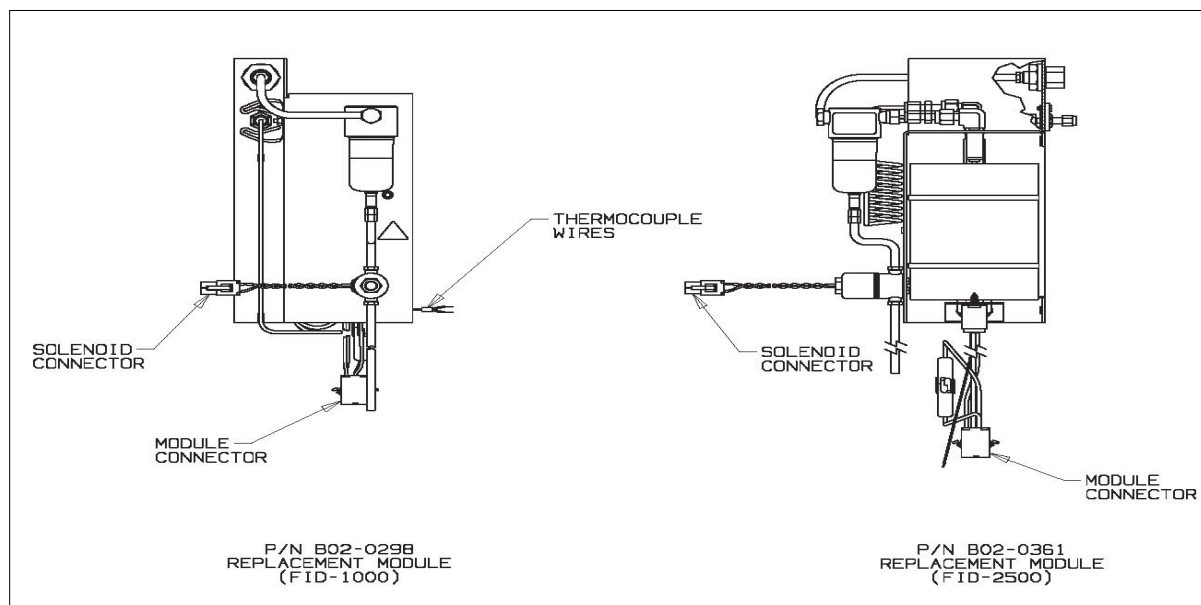


Figure 13 - Catalyst Assembly Module Items

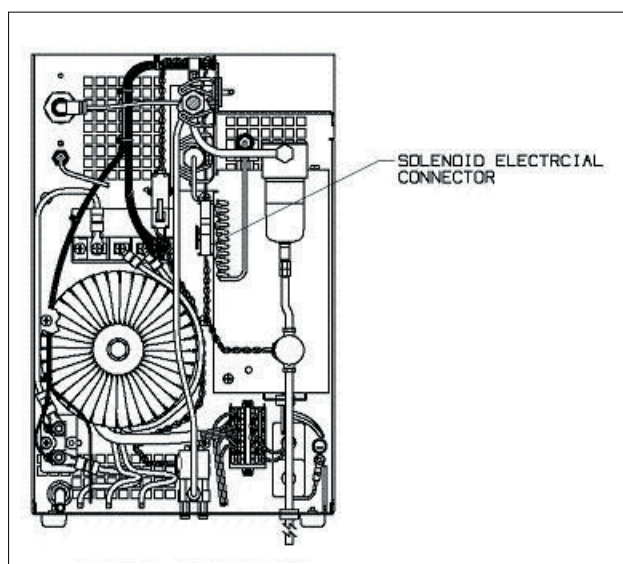


Figure 14 - View Toward Rear of Unit, Model FID-2500

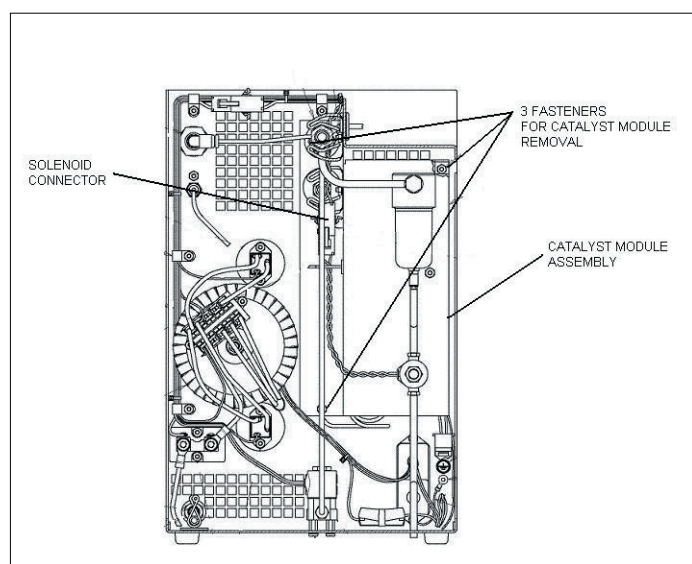


Figure 17 - View Toward Rear of Unit, Model FID-1000

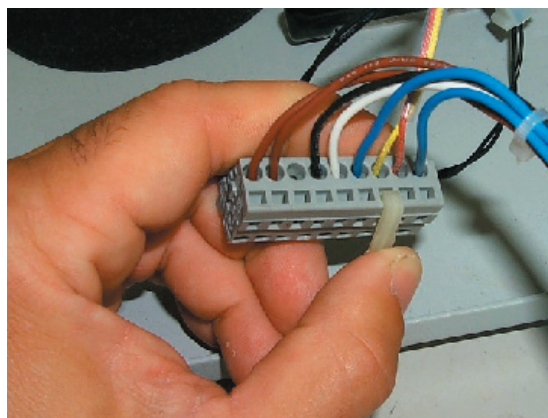


Figure 15 - Thermocouple wire

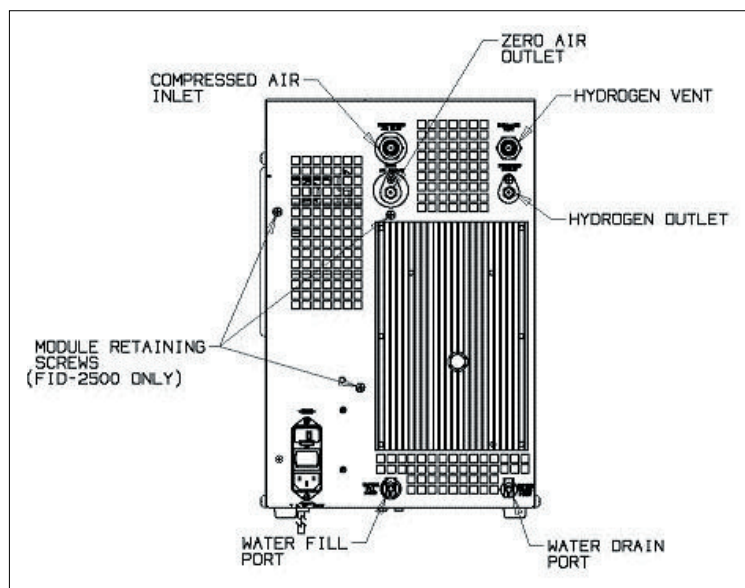


Figure 16 - Rear View (FID-2500 shown, FID-1000 similar)

Maintenance

Desiccant Change

No tools are needed to change the Desiccant cartridge (P/N 1647727). The cartridge should be replaced when the color of the indicator beads turns color. (The blue beads turn to beige or gray and the orange beads turn clear.) Once all the indicating beads have turned color, the cartridge will have approximately 2 days of life left at 90cc/min flow.

- 1 Turn the Power switch to OFF and leave the user installed shutoff in the open position in order to vent the Hydrogen from the unit. Unit must be depressurized before removing desiccant cap. (See Figure 6)
- 2 Lift the top cover lid and unscrew the cap covering the desiccant cartridge. Remove the cartridge from the unit.
- 3 Remove the replacement dessicant cartridge from the moisture proof bag. Add a small amount of deionized water to wet the o-rings on the nipple end of the desiccant cartridge. Push down firmly to seat the o-rings at the bottom of the housing (see Figures 7,8, and 9).
- 4 Replace and center the large o-ring inside the desiccant cap. Tighten the cap securely by hand. Be sure the o-ring seal remains centered and the seal is visible as a black ring around the top and sides.

Note: Most internal leaks are found at the desiccant housing cap o-ring seal, due to improper sealing of the cap. Be sure to seal the cap tightly.

- 5 Turn the power switch ON and perform the Controlled Venting purge as described in the Startup section, then begin using the generator.

Note: For best results, purge the system for one hour to remove any residual oxygen and moisture from the instrument and piping downstream.

Cartridge Regeneration

When the desiccant becomes saturated with moisture, the blue indicating color will turn beige or gray or the orange will turn clear. The expended desiccant cartridge can be regenerated for later use, so long as a moisture proof container is available.

Cold Vacuum Oven - For best results, place the desiccant cartridge in a **cold vacuum oven** and ramp the temperature at 2°C/minute to 150°C while supplying a vacuum. **Do not exceed 175°C.** Regeneration will be complete in 8 hours.

Conventional Oven - If only a conventional oven is available, place the cartridge upright inside the oven to allow the moisture to leave from the top of the cartridge. Apply the following ramp rate and procedure:

- 2 C/min from room temperature to 90°C ,hold at 90°C for two hours.
- 2 C/min from 90°C to 150°C and hold at 150°C for 24 hours.
- Cool the cartridge in a desiccator or low moisture environment until needed in the hydrogen generator.

For either method, do not exceed 175°C. The temperature will not affect the desiccant performance; however, once the beads turn Black (for the Blue Indicator) or remain Clear (for the Orange Indicator), they can no longer be used as a color indicator. Apply a light coat of Dio water to the o-rings prior to inserting the cartridge into the generator plastic housing.

Resin Bed Replacement

The DIO Resin bed cartridge should be rinsed and the Resin bed replaced every 6 months, or whenever the water quality deteriorates, which is detected by a color change in the Resin bed, ie...the color changes from a Dark brownish color to a Orange color. If 75% of the Resin bed has changed color, then the Resin bed should be replaced. No tools are required to change the Resin bed.

Maintenance

- 1 Turn the Power Switch to OFF and make sure that the customer installed Shut off valve is in the OPEN position in order to vent the hydrogen from the generator.
- 2 Lift the top cover lid and unscrew the water reservoir cap. Remove the Resin bed cartridge from the Reservoir bottle.
- 3 Inspect the replacement Resin Bed Deionizer for damage prior to installation into the water reservoir. Replace the Reservoir cap after the resin bed has been reinstalled.
- 4 Use the Water Drain Port with the 1/4" tube connected to it to drain the instrument. There is approximately 2 liters of DIO water in the unit when full.
- 5 Remove the drain port insert by pressing down on the metal tab and pulling the fitting. Refill the unit with deionized water by using either the Autofill or by manually filling the unit with approximately 2 liters of DIO water.

NOTE: Do not allow the DIO Resin bed to dry out; it must be immersed in water to perform.

- 6 Restart the generator in the same manner found in the Startup section.

Fuse Replacement

Occasionally, the fuses in the FID gas station may burn out. The fuses are located in the power receptacle on the back side of the generator. **Before servicing the fuse, turn the unit off and disconnect the power cord from both the power supply and the generator power receptacle.**

To access the fuses, use a small screwdriver to remove the fuse holder located in the back of the unit and in the power receptacle. In the FID Gas station, both the phase and the neutral are fused separately. As a result of this configuration, both fuses should be checked any time fuse replacement is warranted. Replace either one or both with the appropriate fuse and re-assemble.

To maintain the safety and performance integrity of the product, use only the fuse of the size and type detailed in the Specifications, Parts and Accessories sections of this bulletin.

Don't Forget To

- 1 Complete and mail your registration certificate.
- 2 Keep your product certification in a safe place.
- 3 Call the Technical Services Department at 800-343-4048, 8am to 5pm Eastern Time with any questions (North America only). For other locations, please contact your local representative.

Serial Numbers

The serial number for the unit is located on the back of the unit. For your records, and in case service is required, please record the following:

DATE IN SERVICE _____ **SERIAL NO** _____

Please have the serial number available when calling for assistance.

System Specifications, Parts, Accessories

System Specifications

	FID 1000	FID 2500
Hydrogen Purity	99.9995%	99.9995%
ZAG Purity	<0.1 ppm Methane in Air Challenge	<0.1 ppm Methane in Air Challenge
CSA Certification Standard	CAN/CSA C22.2 No 1010.1-92	CAN/CSA C22.2 No 1010.1-92
IEC Certification Standard	IEC 1010/EN61010-1	IEC 1010/EN61010-1
IEC 1010 Installation Category	Category 11	Category 11
IEC 1010 Pollution Degree	Degree 2	Degree 2
UL Safety Standard	UL 3101-1, First Edition	UL 3101-1, First Edition
EMC Compliance	CISPR11:EN55011:1991/EN50082-1:1992	CISPR11:EN55011:1991/EN50082-1:1992
Maximum Flow rate	1000cc/min (ZAG) 90cc/min (H2)	2500 cc/min (ZAG) 250 cc/min (H2)
Total Hydrocarbon Concentration	< 0.1 ppm	< 0.05 ppm
Max Inlet Hydrocarbon Concentration	100 ppm	100 ppm
Pressure Drop at Max. Flow rate	< 5 psid (0.3 bar)	< 5 psid (0.3 bar)
Outlet Air Temperature	ambient + 20°F (+ 11°C)	ambient + 20°F (+ 11°C)
Discharge Pressure	0-90 psig (0-6.2 barg)	0-90 psig (0-6.2 barg)
Hydrogen Outlet Port	1/8" compression, SS	1/8" compression, SS
ZAG Outlet Port	1/8" compression, Brass	1/8" compression, Brass
Hydrogen Relief Port	1/4" Female NPT	1/4" Female NPT
Compressed Air Inlet Port	1/4" Female NPT	1/4" Female NPT
Water Requirements	Deionized Water (> 5 Meg-Ohm /cm)	Deionized Water (> 5 Meg-Ohm /cm)
Max. Ambient Relative Humidity	80 %	80 %
Min/Max Ambient Temperature	60°F/100°F (16°C/40°C)	60°F/100°F (16°C/40°C)
Min/Max Inlet Pressure	40/125 psig (2.7 barg/8.5 barg)	40/125 psig (2.7 barg/8.5 barg)
Altitude	2000 M	2000 M
Electrical Requirements	100-120/200-240 VAC,47-63Hz	100-120/200-240 VAC,47-63Hz
Power Consumption	480 Watts @ 110 vac, 460 watts @ 220 vac	480 Watts @ 110 vac, 460 watts @ 220 vac
Start Up Time	45 minutes	45 minutes
Fuses	120 vac: 5 x 22 mm, Type T, 250 V, 3.15 Amp 220 vac: 5 x 22 mm, Type T, 250 V, 2.0 Amp	5 x 22 mm, Type T, 250 V, 3.15 Amp 5 x 22 mm, Type T, 250 V, 2.0 Amp
Product Dimensions	13"w x 20"h x 23"d (33cm x 51cm x 58cm)	13"w x 20"h x 23"d (33cm x 51cm x 58cm)
Product Weight/Shipping Weight	53 lbs (24 kg)	53 lbs (24 kg)

Replacement Parts


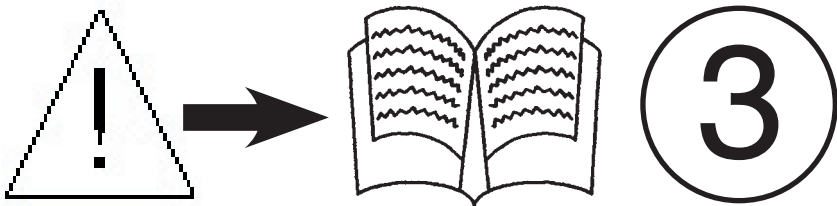



Description	FID 1000	FID 2500	Frequency
Resin Bed Cartridge	B02-0323	B02-0323	When Color Changes 3/4
Dessicant Cartridge	1647727	1647727	When Color Changes
Fuses (117 vac, 3.15 Amp)	13216	13216	As needed
Fuses (220 vac, 2 Amp)	13192	13192	As needed
Maintenance Kit	MK7583	MK7583	1 Year
ZAG Catalyst Module	B02-0298	B02-0361	2 Years
H2 Cell Assembly	B02-0313	7601619	As needed
DIO Water Fill Solenoid	B02-0315	B02-0315	As needed
Auto-drain Solenoid	75612	75612	As needed

Recommended Accessories

Accessory	P/N	
Pressure Regulator (0-130 psig)	72-130-V883	
Installation Kit	IK76803	
Condenser Assembly	72-100	
Flowmeter	W-FM7583	
HydroGen™ Mate	72-231	

*** To ensure consistent product performance and reliability use only genuine Balston replacement parts and filter cartridges.**

Explanation of Warning Symbols

<u>Symbol</u>	<u>Description</u>
	Caution, refer to accompanying documents for explanation.
	Refer to Installation and Operation Manual, warning note #3 for explanation.
	Caution, risk of electric shock.
	Surface may be hot and could cause burns to the skin (found on inside of some units).
	Under certain conditions, metal cabinet will be warm to touch (70°C).



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