



Valco Instruments Co. Inc.

Helium Purifier and Nitrogen Purifier Instruction Manual

For item numbers:

HP2
HP2-220
NP2
NP2-220
I-23572HP2
I-23572NP2

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Introduction

The Valco Helium Purifier (HP2) and Nitrogen Purifier (NP2) provide “point-of-use” carrier gas purification to sub-ppm levels of gaseous impurities. Designed originally for the Valco Trace Gas Analysis system with its Helium Ionization Detectors, the Helium Purifier provides point-of-use ultrahigh-purity helium for use in any chromatographic application requiring high-quality helium or other noble gas (Ar, Ne, Kr, Xe). The Nitrogen Purifier was developed for use with our Electron Capture Detector.

Specifications

	Helium Purifier (HP2)	Nitrogen Purifier (NP2)
Gases purified	He, Ne, Ar, Kr, Xe, Rn	He, Ne, Ar, Kr, Xe, Rn, N ₂
Max. operating pressure	1000 psig	1000 psig
Max. operating temperature	400°C	400°C
Max. flow rate	1 liter/min	1 liter/min
Impurities removed	Outlet impurities less than 10 ppb H ₂ O, H ₂ , O ₂ , N ₂ , NO, NH ₃ , CO, and CO ₂ , based on 10 ppm total inlet impurities. Other impurities removed include CF ₄ , CCl ₄ , SiH ₄ , and hydrocarbons such as CH ₄	Outlet impurities less than 10 ppb H ₂ O, H ₂ , O ₂ , NO, NH ₃ , CO, and CO ₂ , based on 10 ppm total inlet impurities. Other impurities removed include CF ₄ , CCl ₄ , SiH ₄ , and hydrocarbons
Impurities not removed	He, Ne, Ar, Kr, Xe, and Rn	He, Ne, Ar, Kr, Xe, Rn, CH ₄ , and N ₂



WARNING!

This product is *not for use with oxygen* – either pure oxygen or gases with a significant proportion of oxygen. The purifier’s gettering alloy is *pyrophoric at operating temperature*. Use with significant amounts of oxygen can result in combustion of the material, potential damage to the surrounding area, and possible injury.

In no event shall Valco Instruments Co. Inc. be liable for any direct, indirect, special, incidental, or consequential damage, whether based on contract, tort, or any other legal theory and whether advised of the possibility of such damages.

Theory of Operation

The purification substrate in the Valco purifiers is a non-evaporable gettering alloy, with a nominal composition of zirconium, vanadium, and iron. This alloy must be heated so that the oxide layers on the particle surface are eliminated. This process must be performed under a vacuum or in an atmosphere of helium (for the HP2) or nitrogen (for the NP2).

Although the gettering alloy will purify even at ambient temperatures, raising the temperature vastly improves the life span and efficiency of the alloy. However, the elevated temperature causes hydrogen generation, which is trapped only at temperatures below 250°C. Therefore the Valco purifiers have been designed to operate at a fixed temperature gradient which yields a long life span and high efficiency and insures that any hydrogen generated will be trapped.

Accurate temperatures at the inlet (380-400°C) and at the outlet (170-190°C) are maintained with the use of a precision 24 VDC power supply.

Power Supply Requirements

As stated on the purifier, the power supply must conform to EN 61010-1: Section F.2.1 Limited circuit. This section mandates that the power source must be limited to 42.4 VDC or less (open circuit). In addition, the energy must be limited by one of the following means:

- the current under any condition of load, including short circuit, is not more than 8A measured after 1 minute of operation
- the source is *rated* or set to limit its power to 150 VA under any condition of load
- an overload protector or circuit component opens to interrupt the power output at a lower value than 150 VA under any condition including short circuit



The power supply is critical for safe and proper operation of this unit. It is therefore recommended that the purifier be used only with the power supply received with it.

Installation and Operation

This procedure describes a chromatographic installation. Although that is not the only possible application, it is the most common. It is up to the user to determine whether the purifier is suitable for a particular application based upon the specifications of the purifier.

Installation

The Valco HP2 and NP2 are two part systems comprised of the purifier and the power supply. The purifier must be installed in a vertical position to eliminate the possibility of channeling. For best results, do not modify the fittings or tubing lengths; small particles which might be generated by such modifications are difficult to remove and can restrict the flow.

1. Connect the input line (tagged INLET) to a carrier gas cylinder with a high purity regulator. (Save the caps to seal the purifier whenever you remove it from the system.)
2. Purge the system for 15 to 30 minutes at 20 to 30 mL/min to eliminate air from the getter material.



CAUTION: The getter material should never be heated when air is present.

3. Connect the barrel connector of the power supply to the purifier.
4. Connect the power supply to mains (115/230 VAC). The LED on the power supply should come on to confirm power output.
5. Connect the purifier output line to the chromatographic system's carrier gas input line using a 1/16" union (Valco Product Number ZU1).

Activation

When the purifier reaches operating temperature (usually in about 2½ hours) the getter will be activated. Once the getter is activated, active gaseous impurities such as H₂, O₂, H₂O, CO, and CO₂ (plus N₂ for the HP2) are captured and chemisorbed on the getter surface. Only noble gas atoms are not affected. Once adsorbed, oxygen, carbon, and nitrogen atoms cannot be released by the getter material even at its melting point (1400°C), due to the formation of strong chemical bonds with the alloy atoms.

Hydrogen atoms behave quite differently, diffusing into the getter material bulk more quickly than the other atoms and becoming almost uniformly distributed within the bulk. However, hydrogen sorption occurs below 250°C, achieved through the temperature gradient of the trap assembly.

Operation

In normal operation the outside temperature of the purifier is warm, but should not be uncomfortable to the touch. The 24 VDC power supply maintains the purifier trap at a constant temperature, and should be located so that the illuminated LED can serve as a visual indicator of purifier operation.

Removing the HP2 or NP2 from the System

To remove the purifier from the carrier gas line:

1. Disconnect the power supply. Disconnect the output line from the instrument while maintaining carrier flow.
2. Allow several hours for the the getter oven to cool. After the oven reaches ambient temperature, cap the output line and allow the purifier to be pressurized for several minutes.
3. Remove the input line and immediately cap it. This maintains a carrier gas atmosphere on the gettering substrate, increasing its lifetime.

To reinstall, follow the instructions in the **Installation** section at the top of page 3.

Routine Maintenance



Do not open or modify the trap assembly.

In normal usage there is no maintenance required on the purifier or power supply. If the purifier shows signs of saturation it will need replacement. Replacement cartridges can be ordered from Valco using the product numbers below.

For an HP2: I-23572HP2

For an NP2: I-23572NP2

Replacing the Getter Cartridge

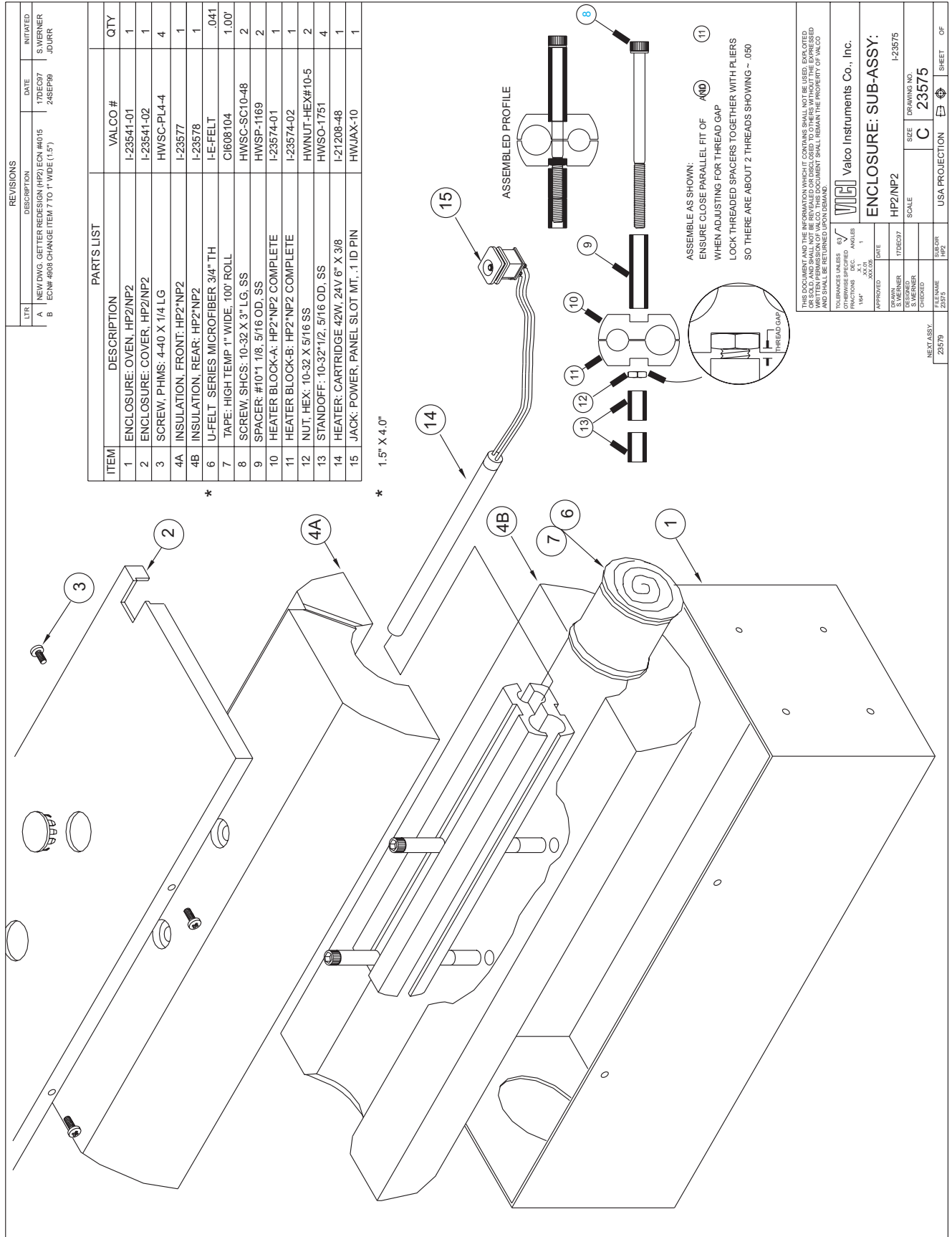
1. Disconnect the power supply from the purifier, but leave the helium flow on.
2. Allow at least two hours for the purifier to cool.
3. Using a thin-edged screwdriver or knife, remove the two hole plugs from the side of the unit and one from the top.
4. The side holes allow access to the two screws which secure the trap. With a 5/32" allen wrench, turn each screw counterclockwise one to two rotations.
5. If the trap is still too hot to the touch, allow more cooling time. If it can be handled, pull it out through the hole in the top of the unit.
6. Disconnect the output line at the fitting, and cap it to allow the trap to pressurize.
7. Have a second cap at the ready. Disconnect the input line at the fitting, and cap it immediately.
8. Insert the new trap, making sure the insulation and feed-through hole plug are snug against the top of the trap. Push the trap assembly down until the feed-through hole plug is resting on the top of the unit.
9. Tighten both allen screws, making sure the trap does not move.
10. Snap in the feed-through hole plug, and both the side hole plugs.
11. Refer to the **Installation** section at the top of page 3 to get the system back in operation.

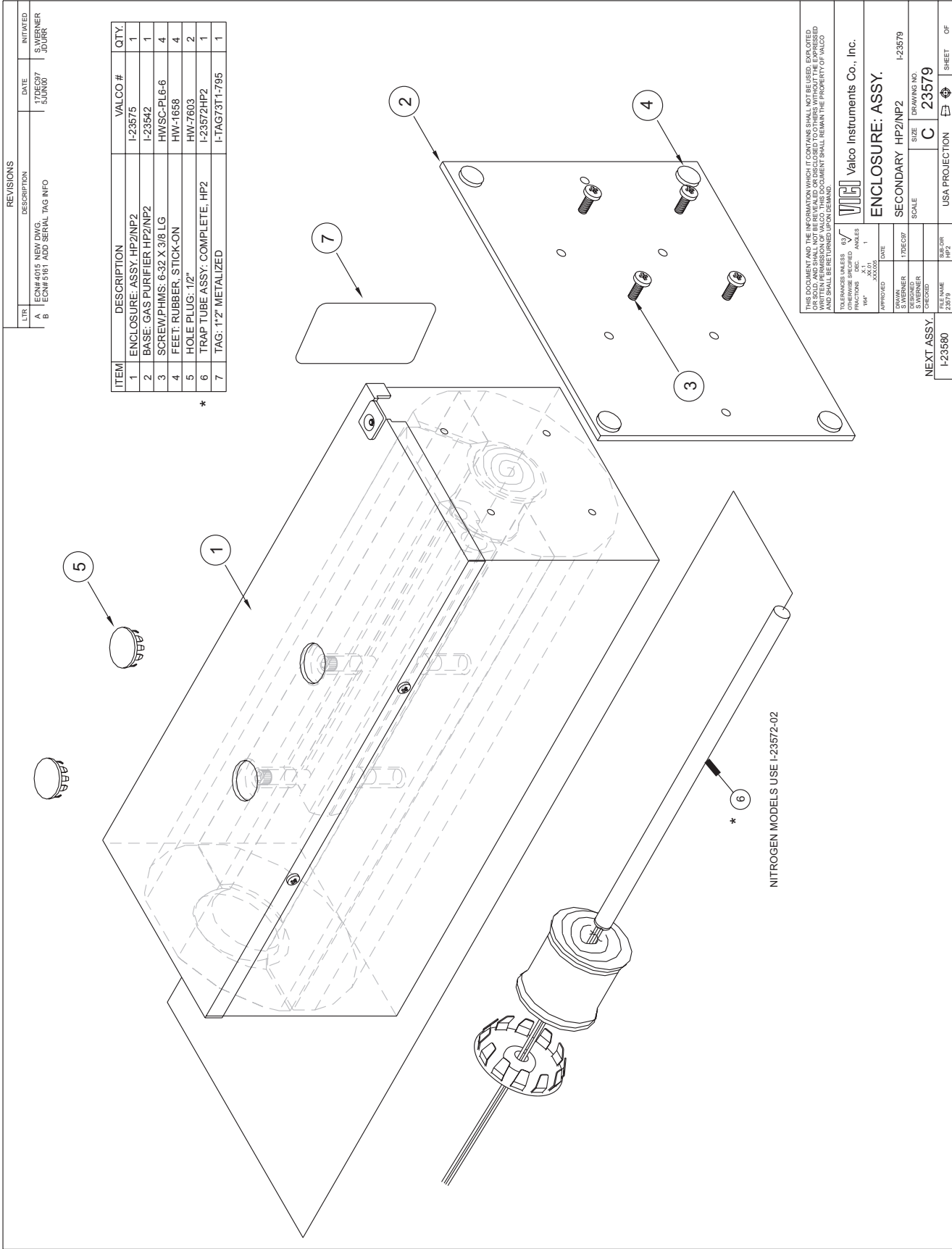
Disposing of Spent Getter Cartridges

Obtain a return authorization number from VICI by emailing tga@vici.com or calling 800-367-8424. The packaged getter cartridge should be clearly marked "Traps for Disposal".

Technical Drawings

Enclosure Assembly	Drawing 23575	Page 7
Secondary Assembly	Drawing 23579	Page 8
Final Assembly HP2/NP2	Drawing 23580	Page 9





ITEM	DESCRIPTION	VALCO #	QTY.
1	ENCLOSURE: ASSY. HP2/INP2	I-23575	1
2	BASE: GAS PURIFIER HP2/INP2	I-23542	1
3	SCREW PHMS: 6-32 X 3/8 LG	HWSC-PL6-6	4
4	FEET: RUBBER, STICK-ON	HW-1658	4
5	HOLE PLUG: 1/2"	HW-7603	2
6	TRAP TUBE ASSY. COMPLETE, HP2	I-23572HP2	1
7	TAG: 1/2" METALIZED	I-TAG73T1-795	1

*

LTR	REVISIONS	DATE	INITIALED
1	ECN# 4016 NEW DIMS.	11/06/07	S. MEYER
2	ECN# 5181 ADD SERIAL TAG INFO	03/06/07	J. BURR

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TOLERANCES UNLESS OTHERWISE SPECIFIED:
 FINISHES: DEC. ANGLE
 UNLESS OTHERWISE SPECIFIED:
 APPROVED: JXXXXX
 DATE: 11/06/07
 SW: JXXXXX
 DESIGNED BY: JXXXXX
 CHECKED BY: JXXXXX
 DATE: 11/06/07

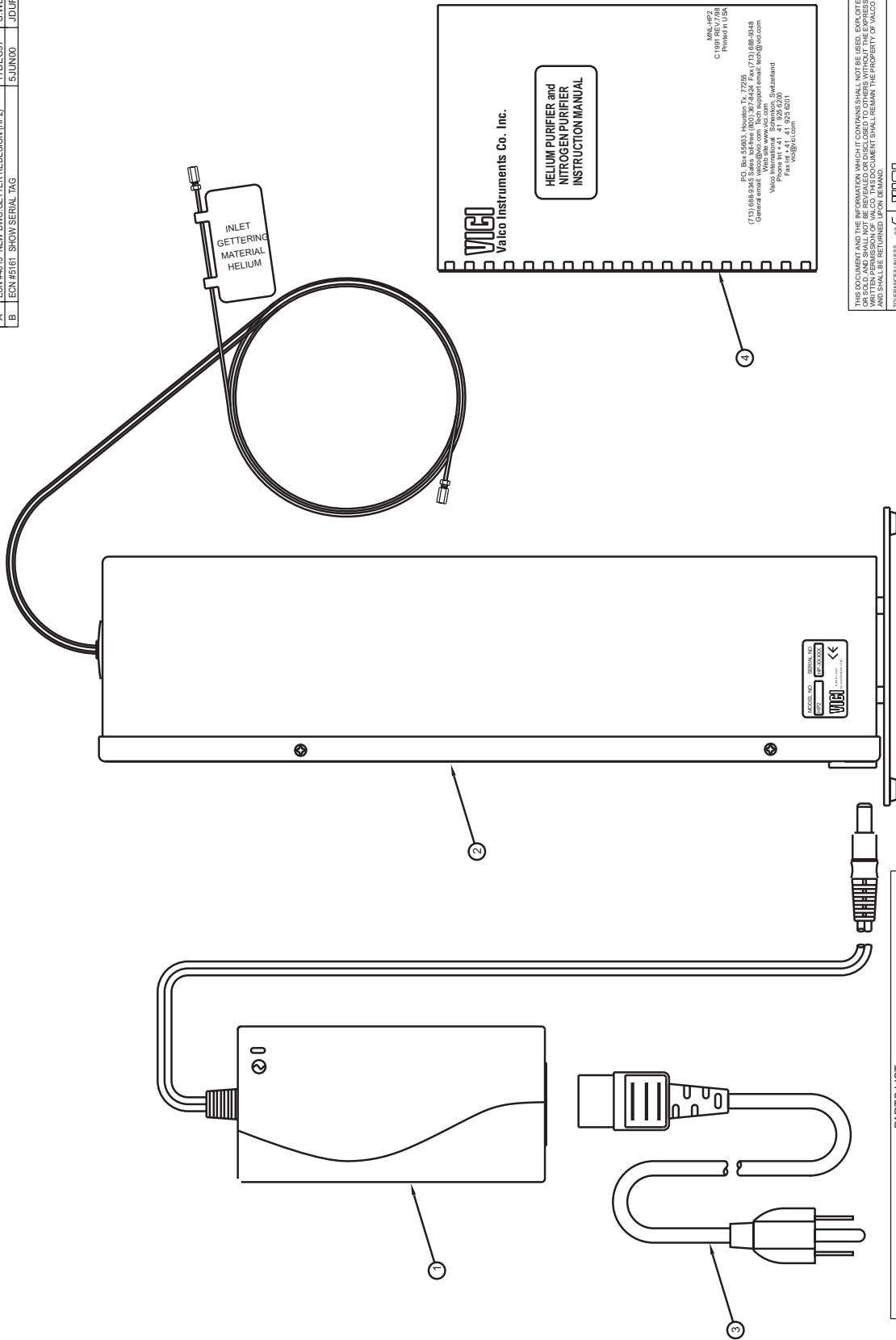
Valco Instruments Co., Inc.
ENCLOSURE: ASSY.
 SECONDARY HP2/INP2 I-23579
 SCALE: C
 DRAWING NO. 23579
 USA PROJECTION

NITROGEN MODELS USE I-23572-02

* 6

ITEM	DESCRIPTION	DATE	INITIALED
1	ENCLOSURE: ASSY. HP2/INP2	11/06/07	S. MEYER
2	BASE: GAS PURIFIER HP2/INP2	11/06/07	J. BURR

REVISIONS			
LTR	DESCRIPTION	DATE	INITIALES
A	EON #44015 NEW DWG GETTER REDESIGN (HP2)	17DEC97	S.WERNER
B	EON #5161 SHOW SERIAL TAG	5JUN00	JDUJRR



PARTS LIST			
ITEM	DESCRIPTION	VALCO #	QTY
1	POWER SUPPLY, 24VDC	PS24VDC-CE	1
2	OVEN ASSY, GETTER	I-23579	1
3	LINE CORD, IEC 320 TYPE	I-W-17600	1
4	MANUAL, HP2	H-MNL-HP2	1

* FOR 220 VAC MODELS USE I-17600

Valco Instruments Co., Inc.

HELIUM PURIFIER and NITROGEN PURIFIER INSTRUCTION MANUAL

MNL-HP2
C 10/91 REV. 7/98
FORM 111-1-98

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VALCO Valco Instruments Co., Inc.

FINAL ASSY: HP2/NP2

SCALE: NONE

SIZE: C

DRAWING NO.: HP2

USA PROJECTION

FILE NAME: 23580

SUBJ: HP2

SHEET: 0F

Warranty

This Limited Warranty gives the Buyer specific legal rights, and a Buyer may also have other rights that vary from state to state. For a period of 365 calendar days from the date of shipment, Valco Instruments Company, Inc. (hereinafter Seller) warrants the goods to be free from defect in material and workmanship to the original purchaser. During the warranty period, Seller agrees to repair or replace defective and/or nonconforming goods or parts without charge for material or labor, or, at the Seller's option, demand return of the goods and tender repayment of the price. Buyer's exclusive remedy is repair or replacement of defective and nonconforming goods, or, at Seller's option, the repayment of the price.

Seller excludes and disclaims any liability for lost profits, personal injury, interruption of service, or for consequential incidental or special damages arising out of, resulting from, or relating in any manner to these goods

This Limited Warranty does not cover defects, damage, or nonconformity resulting from abuse, misuse, neglect, lack of reasonable care, modification, or the attachment of improper devices to the goods. This Limited Warranty does not cover expendable items. This warranty is VOID when repairs are performed by a nonauthorized service center or representative. For information about authorized service centers or representatives, write Customer Repairs, Valco Instruments Company, Inc, P.O. Box 55603, Houston, Texas 77255, or phone (713) 688-9345. At Seller's option, repairs or replacements will be made on site or at the factory. If repairs or replacements are to be made at the factory, Buyer shall return the goods prepaid and bear all the risks of loss until delivered to the factory. If Seller returns the goods, they will be delivered prepaid and Seller will bear all risks of loss until delivery to Buyer. Buyer and Seller agree that this Limited Warranty shall be governed by and construed in accordance with the laws of the State of Texas.

The warranties contained in this agreement are in lieu of all other warranties expressed or implied, including the warranties of merchantability and fitness for a particular purpose.

This Limited Warranty supercedes all prior proposals or representations oral or written and constitutes the entire understanding regarding the warranties made by Seller to Buyer. This Limited Warranty may not be expanded or modified except in writing signed by the parties hereto.