RESPIRONICS®

EverFlo™ Oxygen Concentrator
EverFlo™ Q Oxygen Concentrator

Service & Technical Information

LIMITED WARRANTY

Respironics, Inc. warrants that the system shall be free from defects of workmanship and materials and will perform in accordance with the product specifications for a period of three (3) years from the date of sale by Respironics, Inc. to the dealer. Respironics accessories are warranted to be free of defects in materials and workmanship for a period of 90 days from the time of purchase. If the product fails to perform in accordance with the product specifications, Respironics, Inc. will repair or replace – at its option – the defective material or part. Respironics, Inc. will pay customary freight charges from Respironics, Inc. to the dealer location only. This warranty does not cover damage caused by accident, misuse, abuse, alteration, and other defects not related to material or workmanship.

Respironics, Inc. disclaims all liability for economic loss, loss of profits, overhead, or consequential damages which may be claimed to arise from any sale or use of this product. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty is given in lieu of all other express or implied warranties, including the implied warranties of merchantability and fitness for a particular purpose. In addition, in no event shall Respironics be liable for lost profits, loss of good will, or incidential or consequential damages, even if Respironics has been advised of the possibility of the same. Some states or provinces do not allow the exclusion of limitation of implied warranties or the disclaimer of incidental and consequential damages. Accordingly, the laws of your state or province may give you additional protections.

To exercise your rights under this warranty, contact your local authorized Respironics, Inc. dealer or contact Respironics, Inc. at:

Manufactured for:

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1001 Murry Ridge Lane
Murrysville, PA 15668 USA

Respironics Deutschland
Gewerbestrasse 17
82211 Herrsching, Germany

EC REP

Visit Respironics Home Page on the World Wide Web at:

www.respironics.com

REVISION HISTORY

SECTION NAME (NO.)	DATE	DESCRIPTION
Copyright/Warranty	*05/01/2012*	*Updated to 2012 on copyright.*
Revision History	*05/01/2012*	*Updated various sections.*
Table of Contents	*05/01/2012*	*Updated to reflect section changes.*
Introduction	*11/15/2006*	*Initial Revision.*
Warnings & Cautions	*01/8/2008*	*Added statement to refer to user manual for more information.*
Specifications	*05/01/2012*	*Updated specification chart to include all released models.*
Theory of Operation	*11/15/2006*	*Initial Revision.*
System Setup	*11/15/2006*	*Revised steps.*
Maintenance	*05/01/2012*	*Updated System Pressure Test.*
Troubleshooting	*02/02/2009*	*Reformatted Alarm Table. Added FC2010-31.*
Repair & Replacement	*05/01/2012*	*Updated to reflect current models. Added content from FC2011-02 and FC2011-33.*
Repair Kits	*05/01/2012*	*Updated Compressor and Sieve Canister Kits Model Number Charts. Added content from FC2011-02, FC2011-06 and FC2011-33.*
Testing	*05/01/2012*	*Added 1020016 and 1020017 models. Added necessary content from FC2011-02.*
Tools and Equipment	*05/01/2012*	*Updated to include Tools and Equipment to repair and test EverFlo UltraFill devices (FC2011-14)*
Schematics	*11/15/2006*	*Initial Revision.*

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CHAPTER 6: MAINTENANCE

CHAPTER 7: TROUBLESHOOTING & ALARMS

CHAPTER 8: REPAIR & REPLACEMENT

CHAPTER 1: INTRODUCTION

CAUTION
U.S. federal law restricts this device to sale by or on the order of a physician.

This section provides an introduction to the EverFlo Oxygen Concentrator as well as contact and service training information.

1.0 EVERFLO OXYGEN CONCENTRATOR OVERVIEW

The EverFlo Oxygen Concentrator produces concentrated oxygen from room air for delivery to a patient requiring low flow oxygen therapy. The oxygen from the air is concentrated using a molecular sieve and a pressure swing adsorption process. The EverFlo Oxygen Concentrator is not intended to be life supporting or life sustaining.

1.1 SERVICE NOTICE

The EverFlo Oxygen Concentrator is designed so that trained Service Technicians can perform repair and testing procedures. Only trained and qualified personnel should repair these products using authorized parts.

1.2 SERVICE TRAINING

Respironics offers service training for the EverFlo Oxygen Concentrator.
Training includes complete disassembly of the device, troubleshooting subassemblies and components, and necessary safety testing. For more information, contact the Service Marketing department at:

E-mail: service.operations@respironics.com
Phone: (724) 755-8220
Fax: (724) 925-3960

1.3 SERVICE/TECHNICAL SUPPORT STATEMENT

For technical assistance, please contact Respironics Customer Satisfaction.

U.S.A. and Canada
Phone:1-800-345-6443
Fax: 1-800-886-0245

International
Phone: 1-724-387-4000
Fax: 1-724-387-5012

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CHAPTER 2: WARNINGS & CAUTIONS

Warnings, and cautions are used throughout this manual to identify possible safety hazards, conditions that may result in equipment or property damage, and important information that must be considered when performing service and testing procedures on the EverFlo Oxygen Concentrator. Please read this section carefully before servicing the EverFlo Oxygen Concentrator. Additional Warning and Cautions can be located in the EverFlo User Manual.

WARNING
Warnings indicate the possibility of injury to people.

CAUTION
Cautions indicate the possibility of damage to equipment.

2.0 WARNINGS

WARNINGS
• *For proper operation, your concentrator requires unobstructed ventilation. The ventilation ports are located at the top and bottom of the rear cabinet. Keep the device 6 to 12 (15 to 30 cm) inches away from walls that could impede adequate airflow to the device. Always make sure that these areas are not obstructed by items which may impede ventilation. Do not place concentrator in a small closed space.* • *Servicing of this device must be referred to an authorized and trained Respironics home care provider.* • *Oxygen generated by this concentrator is supplemental and should not be considered life supporting or life sustaining. In certain circumstances oxygen therapy can be hazardous; any user should seek medical advise prior to using this device.* • *Oxygen vigorously accelerates combustion and should be kept away from heat or open flame. Not suitable for use in the presence of a flammable anesthetic mixture with air, with oxygen, or with nitrous oxide.* • *Do not smoke or allow others to smoke or have open flames near the concentrator when it is in use.* • *Do not use oil or grease on the concentrator or its components as these substances, when combined with oxygen, can greatly increase the potential for a fire hazard and personal injury.* • *Do not use the concentrator if either the plug or power cord is damaged. Do not use extension cords or electrical adaptors.* • *Do not attempt to clean the concentrator while it is plugged into an electrical outlet.* • *Avoid handling the molecular sieve material. Respironics recommends the return of the sieve canister assembly to Respironics for any service that involves sieve disposal.* • *Use extreme caution when handling the compressor capacitor as it holds an electrical charge until is it properly discharged.*

WARNINGS (CONT.)
• *Device operation above or outside of the voltage, LPM, temperature, humidity and/or altitude values specified may decrease oxygen concentration levels.* • *If the EverFlo Oxygen Concentrator has been subjected to sub freezing temperatures for an extended period of time, it should be allowed to warm up to the stated operating temperatures before power up. Failure to do so could result in improper performance and or alarm conditions until the device reaches normal operating temperatures.*

2.1 CAUTIONS

CAUTIONS
• *U.S. federal law restricts this device to sale by or on the order of a physician.* • *Do not place liquids on or near the device.* • *If liquid is spilled on the device, turn the power off and unplug from electrical outlet before attempting to clean up a spill.* • *When using liquid leak detector, be careful not to allow it to contact electrical parts.* • *Make sure connections of fittings, tubing, and hoses are secure.* • *Be cautious when using thread sealants because they can cause extensive damage to the internal parts of the device if allowed within tubing or fittings.* • *Clean all exterior cabinet surfaces periodically by wiping with a damp cloth, using a mild detergent and/or hospital disinfectant.* • *Use only Respironics or factory-authorized replacement parts and accessories.*

CHAPTER 3: SPECIFICATIONS & CLASSIFICATIONS

3.0 INTRODUCTION

This chapter identifies the classifications and specifications for the EverFlo Oxygen Concentrator.

3.1 SPECIFICATIONS

Model Numbers	***1020000, 1020001, 1020002, 1020002BR, 1020003, 1020003BR, 1039362, 1039363***	***1020004, 1020005***	***1020006, 1020009, 1020010, 1020011, 1020012, 1020016, 1020017, 1039366, 1039368, 1039370***	***1020007, 1039367***	***1020008***	***1020013***	***1020014, 1020015, 1039364, 1039365***
Voltage	*120 VAC ± 10%*	*230 VAC ± 10%*	*230 VAC ± 10%*	*230 VAC ± 10%*	*230 VAC ± 10%*	*230 VAC ± 10%*	*120 VAC ± 10%*
Operational Power Frequency	*60 Hz*	*60 Hz*	*50 Hz*	*50 Hz*	*50 Hz*	*60 Hz*	*60 Hz*
Power Consumption	*350 W*	*320 W*	*< 300 W*	*< 300 W*	*< 300 W*	*< 300 W*	*350 W*
Oxygen Concentration	*90-96%*	*90-96%*	*90-96%*	*87-96%*	*87-96%*	*90-96%*	*90-96%*
Weight	*14 kg (31 lbs)*	*15 kg (33 lbs)*	*15 kg (33 lbs)*	*15 kg (33 lbs)*	*15 kg (33 lbs)*	*15 kg (33 lbs)*	*14 kg (31 lbs)*
Dimensions	*58 cm (22.8")x x38 cm (15") x 24 cm (9.5") (H x W x D)*						
Sound Level	*45 dBA typ*	*43 dBA typ*	*43 dBA typ*	*< 40 dBA typ*	*43 dBA typ*	*45 dBA typ*	*< 40 dBA typ*
Oxygen Purity Alarms	*Low oxygen at 82% purity (for OPI models ONLY), Very Low Oxygen (< 70%)*						
Operating Temperature	*55°F to 90°F (13°C to 32°C)*						
Storage/ Transport Humidity	*-30°F to 160°F (-34°C to 71°C)*						
Relative Humidity	*15% to 95%, noncondensing*						
Outlet Pressure	*5-7 psi (0.34 - 0.48 Bar)*						
Operating Altitude	*0 to 7,500 ft (0 to 2,286 m)*						

Each EverFlo unit is measured in the factory with an Oxygen Analyzer which measures oxygen concentration with an accuracy specification of +/- .1 %. When using an Oxygen Analyzer with a accuracy specification of +/- 2 % to test the Oxygen Concentration for an EverFlo Oxygen Concentrator, you may receive inaccurate readings below the acceptable pass criteria for the device. This 2% offset should be taken in to consideration when determining if the Ever Flo is functioning properly. A more accurate Oxygen Analyzer may also be used for a more precise measurement of the oxygen purity. As an example, a unit could be measured in the factory with the +/- .1% Oxygen Analyzer to measure 91.1%. If this same unit is then measured with a +/- 2% Oxygen Analyzer, the reading could display a result of 89.1%. With the +/- 2% Oxygen Analyzer, it may inaccurately look like the unit falls below the 90-96% specification, when in fact the unit is within specification.

CLASSIFICATION
The EverFlo Oxygen Concentrator is classified as: • IEC Class II Equipment • Type BF Applied Part • IPX1 Drip Proof • Not suitable for use in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide. • Continuous Operation.
STANDARDS COMPLIANCE
This device is designed to conform to the following standards: • IEC 60601-1 Medical Electrical Equipment, Part 1: General Requirements for Safety • IEC 60601-1-2 2nd edition, Medical Electrical Equipment, Part 1-2: General Requirement for Safety - Collateral Standard: Electromagnetic Compatibility - Requirements and Tests. • ISO 8359 Oxygen Concentrators for Medical Use - Safety Requirements

3.2 EMC REQUIREMENTS

Guidance and Manufacturer's Declaration - Electromagnetic Emissions
This device is intended for use in the electromatic environment specified below. The user of this device should make sure it is used in such an environment.

Emissions Test	Compliance	Electromagnetic Environment Guidance
RF emissions CISPR11	Group 1	This device uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	This device is suitable for use in establishments, including domestic establishments and those directly connected to the public low-voltage power supply network.
Harmonic emissions IEC 6100-3-2	Class A	
Voltage Fluctuations/ flicker emissions IEC 6100-3-3	Complies	

Guidance and manufacturer's declaration - Electromagnetic Immunity			
This device is intended for use in the electromatic environment specified below. The user of this device should make sure it is used in such an environment.			
Immunity Test	**IEC 60601 Test Level**	**Compliance Level**	**Electromagnetic Environment - Guidance**
Electrostatic Discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floor should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/ output lines	±2 kV for supply mains ±1 kV for input/ output lines	Mains power quality should be that of a typical home or hospital environment.
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	±1 kV differential mode ±2 kV common mode	Mains power quality should be that of a typical home or hospital environment.
Voltage dips, short interruptions, and voltage variations on power supply input lines IEC 61000-4-11	<5% U_T (>95% dip in U_T) for 0.5 cycles 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 sec	<5% U_T (>95% dip in U_T) for 0.5 cycles 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 sec	Mains power quality should be that of a typical commercial or hospital environment.
NOTE: U_T is the a.c. mains voltage prior to application of the test level.			
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical home or hospital environment.

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment - Guidance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 Vrms	Portable and mobile RF communications equipment should be used no closer to any part of the Device, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance:** $d = 1.2\sqrt{P}$
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHZ	3 V/m	$d = 1.2\sqrt{P}$ 80 MHz to 800 MHz $d = 2.3\sqrt{P}$ 800 MHz to 2.5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, [a] should be less then the compliance level in each frequency range. [b] Interference may occur in the vicinity of equipment marked with the following symbol: 

Note 1: At 80 MHz and 800 MHz, the higher frequency range applies.
Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

a: Field strength for fixed transmitters such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, and electromagnetic sit survey should be considered. If the measured field strength in the location in which the Device is used exceeds the applicable RF compliance level above, the Device should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the Device.

b: Over the frequency range 150 kHZ to 80MHz, field strengths should be less than 3 V/m.

Recommended Separation Distance Between Portable and Mobile RF Communication Equipment and the Device.

The Device is intended for use in the electromagnetic environment in which radiated RF disturbances are controlled. The user of the Device can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communication equipment (transmitters) and the Device as recommended below, according to the maximum output power of the communications equipment

Rated Maximum Output Power of Transmitter (Watts)	Separation Distance According to Frequency of Transmitter m (meters)		
	150 kHz to 80 MHZ $d = 1.2\sqrt{P}$	80 MHz to 800 MHz $d = 1.2\sqrt{P}$	800 MHz to 2.5 GHz $d = 2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power of the transmitter manufacturer.

Note 1: At 80 MHz and 800 MHz, the higher frequency range applies.
Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

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CHAPTER 4: THEORY OF OPERATION

This section describes the theory of operation for the EverFlo Oxygen Concentrator.

4.0 PNEUMATIC OPERATION

Refer to Figure 4-1 while reading the following discussion.

The room air is drawn into the unit through the air inlet filter by the compressor. The compressed air is routed to the sieve beds through an electronically controlled Solenoid Valve Assembly. The Solenoid Valve alternates the air flow to a pair of sieve beds that allows Oxygen production. The Solenoid Valve Assembly also alternates the flow through the sieve beds to allow purging of the Nitrogen molecules from the sieve beds.

At startup the valve/solenoid is de-energized allowing compressed air to flow through both sieve beds until the pressure sensor builds up to switching pressure. At switching pressure, a 12 volt signal is received at the valve/solenoid closing off the input and allowing the compressed air to cycle through one of the sieve beds. As the air is cycled through one of the sieve beds, the molecular sieve material traps the Nitrogen molecules from the air and allows the Oxygen enriched air to flow through the sieve bed.

At 5 liters of flow approximately 1/3 of the Oxygen enriched air enters the product tank and the other 2/3 of the Oxygen enriched air is passed through an orifice in the sieve bed to purge the trapped Nitrogen molecules from the sieve bed, allowing the sieve material to be ready for Oxygen production during the next cycle.

The concentrated Oxygen is stored in the product tank. The product tank is continuously filled with concentrated Oxygen and the output from the product tank is regulated at 5.5 psig nominal. The product tank pressure is continuously monitored using a pressure sensor. The stored Oxygen is delivered to the patient through a pressure regulator, an externally adjustable flow meter and a microbial filter.

NOTE

In the beginning, the 230V units, had an orifice built into the purge valve. The electronically controlled purge valve controls the Oxygen flow timing from one sieve bed to the other based on the flow meter setting.

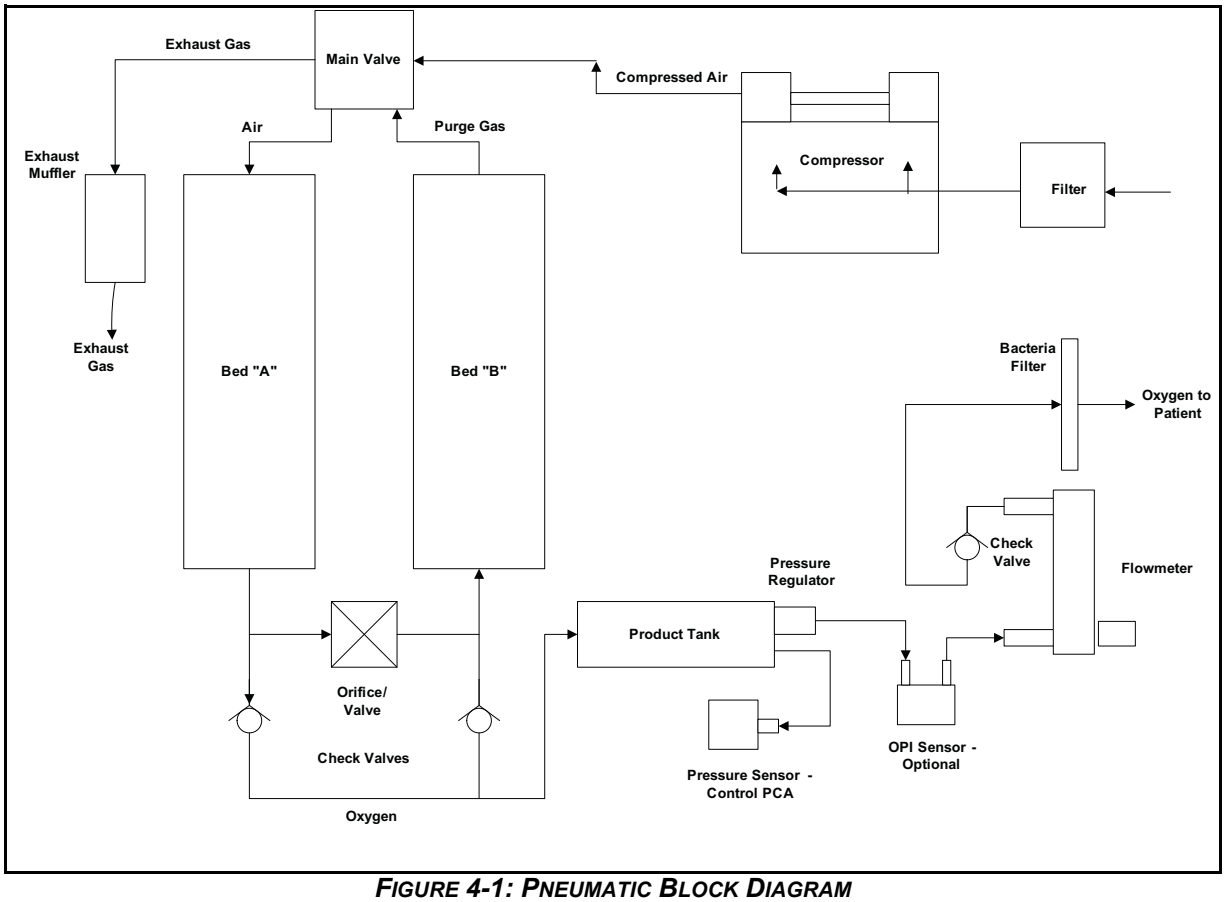


FIGURE 4-1: PNEUMATIC BLOCK DIAGRAM

4.1 ELECTRICAL OPERATION

The EverFlo Concentrator is a medical device which produces concentrated oxygen from room air for delivery to a patient. It uses a molecular sieve and a pressure swing adsorption process to concentrate oxygen from air. The device consists of filters, a compressor, a sieve canister module, a set of valves, a microprocessor-based electronic controller PCA, a flow meter and a cooling fan – all contained within a plastic enclosure.

The EverFlo Embedded Software—via the microprocessor contained on the PCA Controller—controls the sieve valves used to generate the oxygen, measures/monitors the pressure & oxygen levels, drives the Elapsed Time counter (Hour meter), reports exception conditions to the User via visual and audible indicators and provides diagnostic information to a Host computer via an RS232 communications interface.

4.2 PCA CONTROLLER OVERVIEW

All the electric / electronic functions of the EverFlo Concentrator reside on the PCA Controller. A block diagram of the PCA controller is provided in Figure A. The reader is urged to continually refer to this diagram when reading the remaining sections of this document.

The PCA controller can be sub-divided into 2 major sections:

1. Power distribution and DC voltage generation.
2. Monitoring / Control / User Interface.

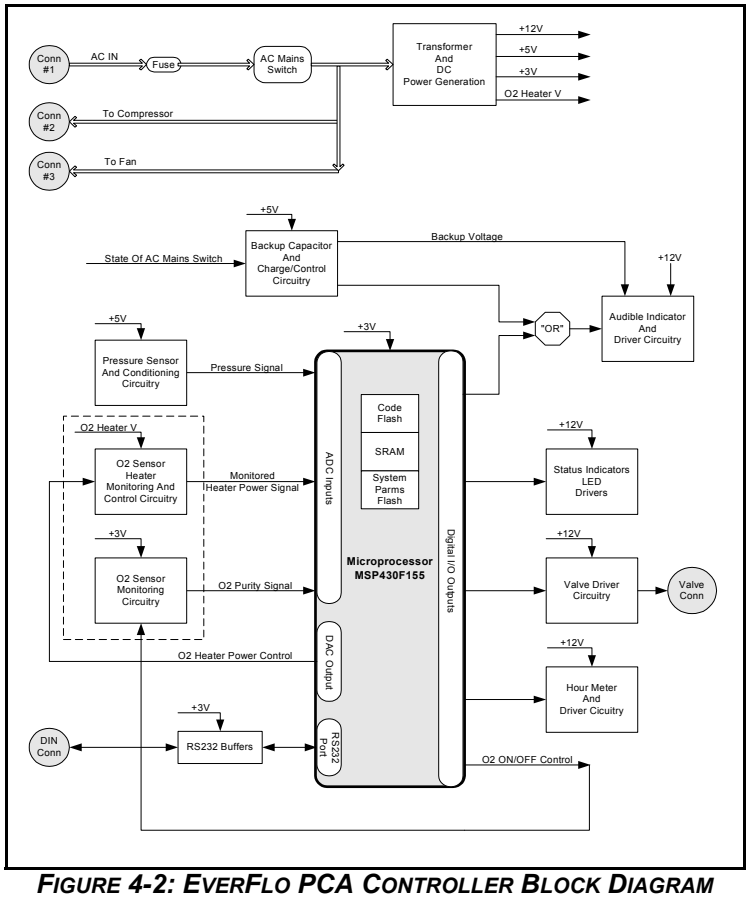


FIGURE 4-2: EVERFLO PCA CONTROLLER BLOCK DIAGRAM

4.2.1 POWER

The AC mains power, via the line cord, is brought onto the PCA and the “switched” AC is distributed to the Compressor, the Cooling Fan and to the AC to DC conversion module. The DC voltages that are generated are used to power the remaining circuitry.

4.2.2 MICROPROCESSOR AND ASSOCIATED CIRCUITRY

The remainder of the PCA controller electronics is centered around the MSP430F155 microprocessor. The microprocessor is the only processing element contained in the EverFlo concentrator. In addition to the microprocessor, the “remaining circuitry” consists of sensors, LEDS, a piezo Audible Indicator, amplifiers / signal conditioners, communication buffers and discrete components.

The embedded software, in conjunction with the microprocessor and its associated hardware, is used to control the sieve valves, measure/monitor the pressure & oxygen levels, control the oxygen sensor, drive the Hour meter, reports exception conditions to the User via visual and audible indicators and provide diagnostic information to a Host computer via an RS232 communications interface.

4.3 PCA DETAILED DESCRIPTION

4.3.1 POWER

POWER DISTRIBUTION

The AC mains power, via the line cord, is routed to the PCA using Connector #1. Fuse protection for the AC mains as well as the ON/OFF (mains) switch are resident on the PCA. When this switch is OFF, all power is removed from the board. The only exception to this is some limited backup power provided by a charged “super cap”. The purpose of this backup power is discussed later in this document.

The “switched” AC power (output side of ON/OFF switch) is distributed to the Compressor via Connector #2, to the AC cooling fan via Connector #3 and to the power generation module contained on the PCA.

DC POWER GENERATION

The “switched” AC power is the input to the DC Power generation module. The module contains a step-down transformer that feeds a full-wave rectifier diode bridge (with filter capacitor) to generate approximately 22 VDC. The transformer has two (2) primary windings thereby accommodating operation from either a 120 VAC or a 230 VAC mains input. A second fuse in the transformer primary circuit is used to protect the transformer from overload and/or short circuit failure conditions.

Using 4 voltage regulators and the aforementioned 22 VDC as an input, this module generates the following voltages:

- **+12 VDC** - The +12 VDC is used to power the 2 sieve valves, the Hour meter, the 3 LEDS and the Audible Indicator. It is also used to power the external RS232 communications interface board that is required for communication with an external Host.
- **+5 VDC** - The +5 VDC is used to power the pressure sensor and the pressure sensor monitoring circuitry. It is also used to charge the backup “super cap”
- **+3 VDC** - The +3 VDC is used to power the microprocessor, the O_2 sensor monitoring circuitry and the RS232 Buffers.
- **O_2 Heater Voltage** - The O_2 Heater voltage is used to power the heater contained in the O_2 sensor. It is a variable voltage capable of delivering an output current of up to 1 AMP. A buck regulator is used to generate this voltage. The value of the regulator output voltage is controlled by the DAC

output of the microprocessor. Varying the DAC output from 0 to 3V yields an O_2 Heater voltage in the approximate range, 0.8 thru 3.2 VDC.

BACK UP CAPACITOR AND ASSOCIATED CIRCUITRY

The PCA contains a 1 Farad “super capacitor” which is used to sound the Audible Indicator when the AC mains power is absent AND the mains switch is in the ON position. The purpose is to alert the User to the fact that there has been a loss of AC mains power (that is, an AC mains power failure, a plug removal, a blown fuse…). The circuitry functions as follows:

1. During normal operation, the capacitor is energized (charged) using the +5 VDC. The capacitor reaches full charge after approximately ½ hour of system on-time.
2. The mains switch has a 2nd set of contacts that are used to determine whether the switch is open or closed. If the switch is closed (in the ON position) and the microprocessor is not functional (no DC power), then the backup circuitry is such that it will turn on the Audible Indicator, using the “super cap” as its energy source.

The “super cap” is capable of sounding the Audible Indicator for a period of greater than 8 minutes, given that it is fully charged.

4.3.2 MSP430 MICROPROCESSOR

The MSP430F155 microprocessor is the main controlling element of the PCA Controller. The processor clock is internal to the microprocessor and its speed is approximately 4 – 5 MHZ. In addition to the internal clock, an external crystal, in conjunction with the microprocessor, is use to generate a more accurate secondary clock whose frequency is 3.6834 MHZ. This clock is used to generate the timing for the ADC and DAC conversion functions, the timing for sequencing the sieve valves, the timing for incrementing the Hour meter and the baud rate timing associated with the RS232 interface.

The MSP430 is more than just a microprocessor; in addition to a processing element, it contains FLASH and SRAM memory and variety of peripheral modules. Following is a partial list of the modules contained within the MSP430F155.

- 16 Kbytes of Code FLASH Memory
- 512 Bytes of SRAM Memory
- 256 Bytes of Info FLASH memory. This FLASH block can be individually erased & programmed without affecting the other FLASH blocks within the microprocessor. In the EverFlo PCA Controller, this FLASH block (aka, the “System Parameter Block”) is programmed via the Host communications interface. Its primary use is to store calibration and configuration data.
- Greater than 20 Digital I/O (DIO) lines
- 12-bit ADC with 8 input channels
- 12-bit DAC with 2 output channels
- Full duplex RS232 Port. In the EverFlo PCA Controller, the communications baud rate is set to 9600 bps

4.3.3 AUDIBLE INDICATOR

The Audible Indicator is a piezo sounder that is resident on the PCA Controller. It is used to alert the User – in conjunction with the LEDS – to the existence of alarms and/or exception conditions.

The driver for the sounder is a single FET switch that either applies or removes the drive voltage (+12VDC or Backup Voltage) to the sounder. When the system is running normally, the FET is controlled by one of the DIO

lines in the MSP430 microprocessor. When AC mains power is not present, the FET switch is controlled by the control line that is part of the back-up power module.

4.3.4 LEDS

The PCA controller contains 3 LEDS – GREEN, YELLOW and RED. The GREEN LED is simply a power-on indicator; it is illuminated when power is first turned on and it stays illuminated until the User turns the power OFF. The drivers for both the RED and YELLOW LEDS is a single FET switch that either applies or removes the +12V drive voltage to the specific LED. Each of the 2 FETS is controlled by a DIO line from the MSP430 microprocessor.

The RED and YELLOW LEDS – in conjunction with the Audible Indicator – are used to alert the User to the existence of alarms and/or exception conditions. The EverFlo software generates 3 different alarm categories; Alarm Type #1, Alarm Type #2 and Alarm Type #3. The LED/Sounder indications associated with each “alarm type” are specified following:

The states of the Alarm Indicators for Alarm Type #1 are:

- RED LED:ON
- YELLOW LED:OFF
- Audible Indicator:ON

The states of the Alarm Indicators for Alarm Type #2 are:

- RED LED:Blinking (1/8 second ON, 15/8 seconds OFF)
- YELLOW LED:ON
- Audible Indicator:Beeping (1/8 second ON, 15/8 seconds OFF)

The states of the Alarm Indicators for Alarm Type #3:

- RED LED: OFF
- YELLOW LED: ON
- Audible Indicator: OFF

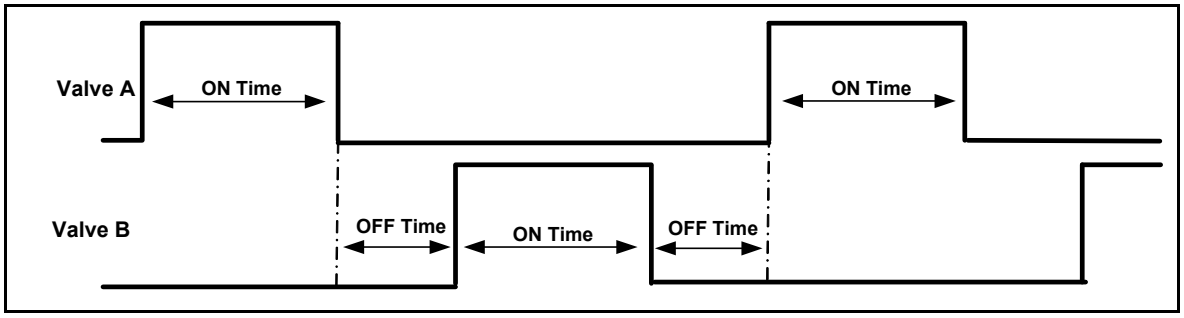
The list below details the alarm type that is generated for each of the alarm/exception conditions detected by the EverFlo embedded software.

EXCEPTION CONDITION	ALARM INDICATION
Code Checksum or RAM failure	*Type # 1*
System Parameters Bad Type	*Type # 1*
Low Pressure Type	*Type # 1*
High Pressure Type	*Type # 1*
No O_2 Flow Type	*Type # 2*
Failed Oxygen (O_2 < 70%)	*Type # 1*
Poor Oxygen (70% < O_2 < 82%) Type	*Type # 3*
Bad Oxygen Sensor Type	*Type # 1*

4.3.5 SIEVE VALVES

The 2 sieve valves are controlled by the microprocessor via 2 DIO lines. The driver for each valve is single FET switch, located on the PCA, which either applies or removes the drive voltage (+ 12V) to the valve solenoid. The solenoids are connected to the PCA via the 4-pin Valve Connector. Also located on the PCA are 2 “catch” diodes; each is connected in parallel with the solenoid coils. The purpose of the diodes is to suppress the transient back-EMF that is created each time one of the solenoids is turned OFF.

The valve timing is determined by the embedded software. It should be noted that the valves are always being sequenced; there are no conditions – other than a “hard” failure – that will cause the software not to sequence the valves. Following is a pictorial depicting the valve sequencing generated by the embedded software.



4.3.6 HOUR METER

The Hour meter is controlled by a microprocessor DIO line. Both the Hour Meter and its driver are located on the PCA Controller. The driver is a single FET switch that – when pulsed by the DIO control line – applies the drive voltage (+ 12V) to the Hour meter. The pulse width is approximately 104 milliseconds and the embedded software generates it at a rate of 1 pulse every six minutes. This pulse rate results in an elapsed time counter with a granularity of 1/0th of an hour.

4.3.7 PRESSURE SENSOR AND ASSOCIATED CIRCUITRY

The Pressure sensor contains a single input port featuring Wheatstone bridge construction and utilizing piezoresistive technology. The bridge excitation is +5V and the output signal is a differential voltage that is proportional to the applied pressure. Both the sensor and its conditioning circuitry are located on the PCA Controller.

The output of the sensor is feed into a differential amplifier with a single-ended, buffered output. This conditioning circuitry is also powered by +5V. The output of the amplifier is feed into an ADC channel on the MSP430 microprocessor.

The pressure sensor is un-calibrated – both in gain and voltage offset. Calibration is therefore required and it is performed at ICT Test. The calibration parameters are stored in the Info FLASH resident in the microprocessor and are used by the embedded software to interpret the ADC pressure readings that are acquired and processed during normal operation.

4.3.8 O_2 SENSOR AND ASSOCIATED CIRCUITRY

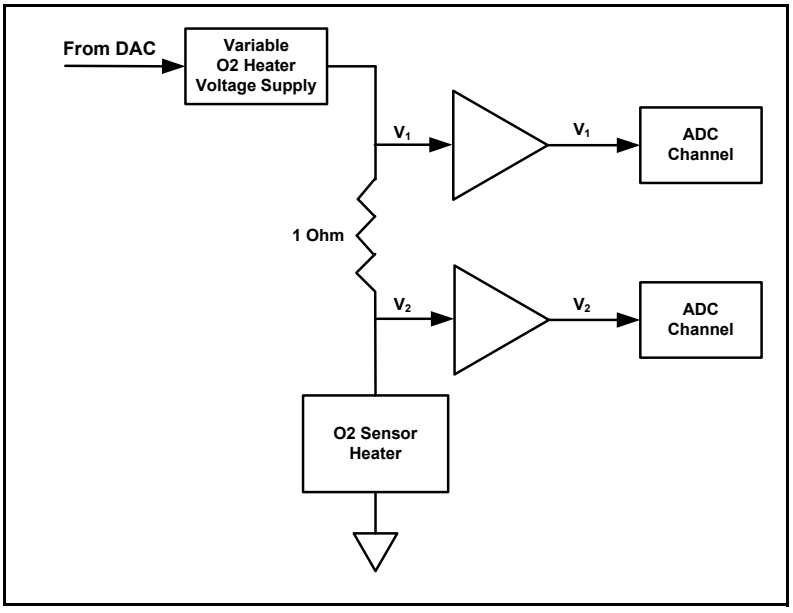
The O_2 sensor and its associated circuitry are both located on the PCA Controller. An air-tight cover with an input and output port is mounted over the sensor. This cover provides the vehicle for which oxygenated air passes thru the sensor.

The O_2 sensor requires a heated, constant temperature environment in order to function properly. When the sensor is heated to its specified value, the sensor output produces a current that is proportional to the O_2 purity percentage. A current amplifier is used to generate a voltage that is proportional to the sensor's output current, thereby generating an O_2 purity signal that is fed to an ADC channel in the microprocessor.

HEATER CIRCUITRY

In order to function correctly, the O_2 heater element requires that a constant power be delivered to it, namely 1.38 watts. The embedded software in the microprocessor continually monitors and adjusts the power being delivered to the sensor so as to maintain the constant 1.38 watt input.

The circuitry utilized to maintain the constant power is depicted, in block form, in Figure 1. However, the pictorial given following provides a more detailed picture of the heater circuitry that is contained on the EverFlo PCA controller. The reader is urged to refer to this figure when reading the specifics involved in delivering constant power to the O_2 sensor's heater element.



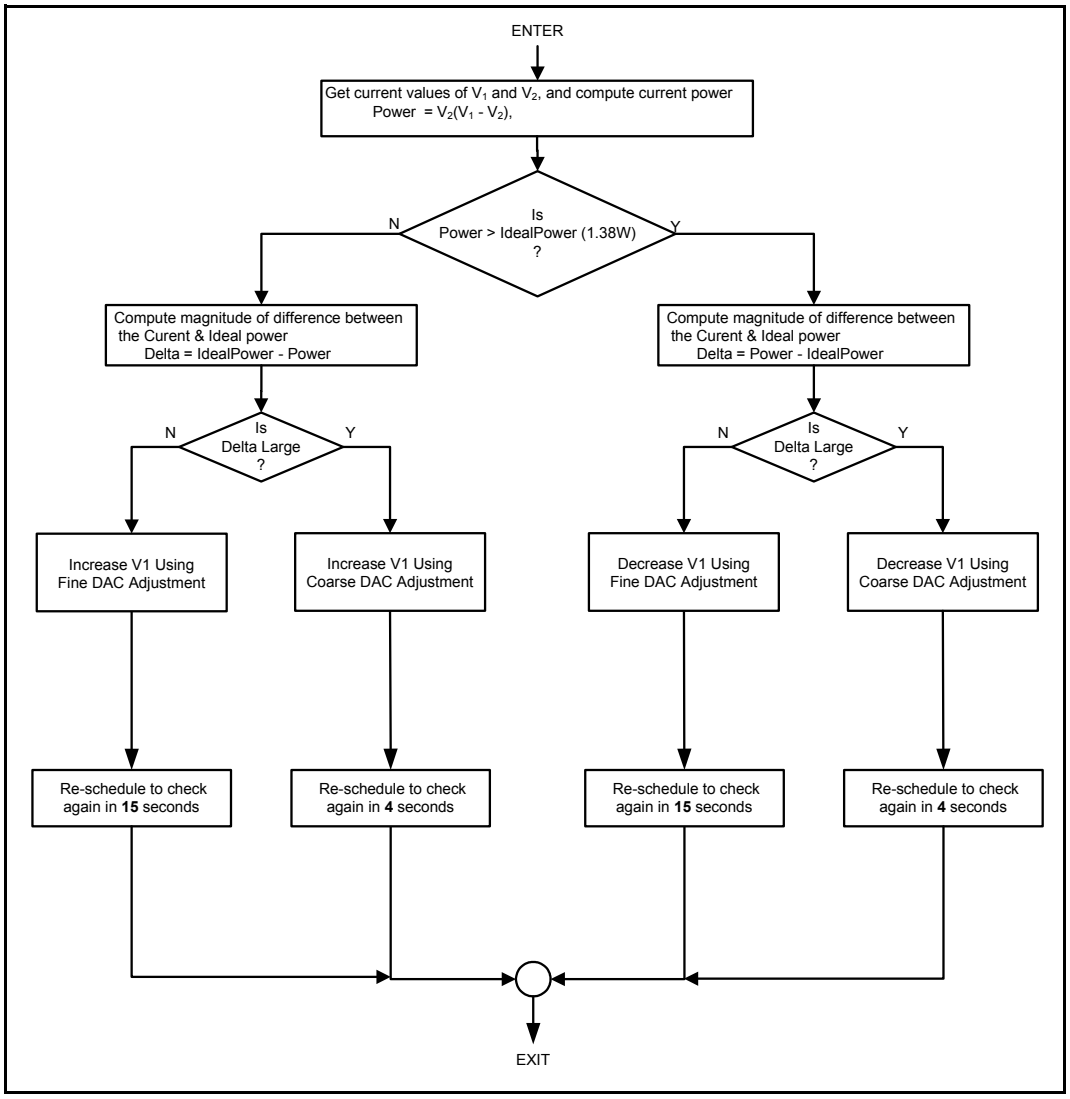
As can be seen from the above quasi-schematic, the instantaneous power being delivered to the heater element of the O_2 sensor is equal to,

Power = V2 (V1 – V2)

Since the embedded software has access to the values of both V1 and V2 via the 2 ADC channels in the microprocessor, then, using the above equation, the software can always compute the power being delivered to the heater element.

Secondly, the embedded software, using the DAC output of the microprocessor, can generate a V1 anywhere in the range, 0.8 thru 3.2 VDC (see section 3.1.2.4) by properly setting the DAC voltage. Therefore, it can always set the power to 1.38 watts.

Using these 2 principles, the embedded software executes the algorithm depicted in the following flow diagram to deliver a constant power of 1.38 watts to the heater element.



OUTPUT CIRCUITRY

- **O_2 Purity Signal** - When the sensor is properly heated, applying a DC bias to the output of the O_2 sensor causes a current to flow that is proportional to the O_2 purity percentage. As mentioned previously, a current amplifier is used to generate a voltage that is proportional to this current. This voltage is fed to an ADC channel in the microprocessor, thereby providing the embedded software with ADC values that correspond to the O_2 purity of the gas flowing thru the sensor and being produced by the concentrator.
- **Sensor Life** - The O_2 sensor life is inversely proportional to the cumulative current that flows thru the sensor. In order to extend the life, the DC bias that is used to generate this current is periodically turned OFF. A microprocessor output line is used to turn the DC bias ON and OFF. This process reduces the cumulative output current flow and therefore extends the life of the sensor. The specifics for periodically turning the DC bias ON and OFF are:
  - The embedded software, via the aforementioned control line, turns the output OFF for 12 minutes. After the 12 minutes have expired, it then turns it back ON for 3 minutes. At the end of

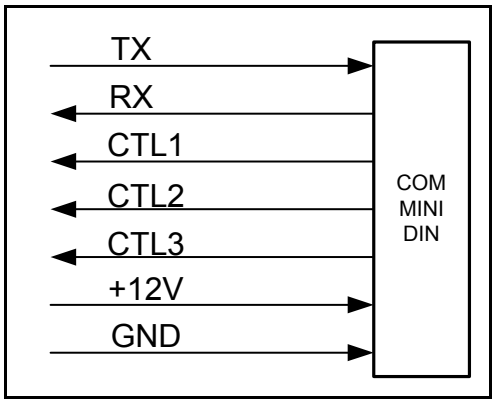
the 3 minute period, the software checks the O_2purity levels. Given that all is operational (no O_2 exception conditions), the software turns the output OFF again, repeating this cycle indefinitely. This results in an output drive duty cycle of 20% (3 minutes ON, 12 minutes OFF) which extends the life by more than a factor of 2.5:1.

- **Calibration** - The O_2 sensor is calibrated during system test. Based on that calibration, ADC "trip points" for both Poor and Failed Oxygen (see section 3.4) are determined. These trip points are stored (programmed) in the Info FLASH, thereby providing the comparison values required to determine O_2 alarm/exception conditions.

4.3.9 RS232 INTERFACE

The microprocessor contains an RS232 port. The TX and RX signals from this port are routed to a 7-pin MINI-DIN connector thru standard buffer elements. The signal levels of the TX and RX pins at the connector are 0V / 3V.

There are a total of 7 signals connected to the MINI-DIN. They are depicted and explained following:



- TX, RX and GND – self-explanatory
- The 3 control lines coming into the PCA are connected to the microprocessor (thru buffers). They are used to support a boot-load process for loading code into the microprocessor.
- The +12VDC supplies the power required by the external RS232 communications interface board

This hardware provides the embedded software the ability to support a full duplex, 9600 bps communications channel. This interface is used to:

1. Receive and program the Info FLASH with the required calibration and configuration data
2. Transmit diagnostic information to a Host system
3. Support a set of maintenance/test transactions

CHAPTER 5: SYSTEM SETUP

NOTE
Please refer to the appropriate User Manual for additional information.

5.0 INTRODUCTION

This section provides information regarding setup and operation of the EverFlo Oxygen Concentrator as needed for servicing, repairing, and testing the device.

5.1 SYSTEM SETUP PROCEDURES

1. Select a location that allows the concentrator to draw in room air without being restricted. Make sure that the device is at least 6 to 12 inches (15 to 30 cm) away from walls, furniture, and especially curtains that could impede adequate airflow to the device. Do not place the device near any heat source.
2. Plug the EverFlo Oxygen Concentrator into an electrical outlet.
3. If you are NOT using a humidifier, connect the cannula to the EverFlo Oxygen Outlet Port, as shown below. Proceed to step 4.

4. If you are using a humidifier follow these steps:
   a. Open the filter door on the back of the device.
   b. Remove the humidifier connector tube from the back of the filter door and replace the filter door.
   c. Fill the humidifier with water following the manufacturer's instructions.
   d. Mount the filled humidifier on the top of the EverFlo device inside the velcro strap.
   e. Tighten the velcro strap around the bottle and secure it so it is held firmly in place.
   f. Connect the humidifier connector tube (that you retrieved from the filter door) to the Oxygen Outlet Port.
   g. Connect the other end of the humidifier connector tube to the top of the humidifier with the elbow in the tubing facing the front.
   h. Connect your cannula to the humidifier bottle according to the humidifier bottle manufacturer's specifications.
5. Press the power switch to the On [I] position. Initially, all the LEDS will illuminate and the audible alert will sound for a few seconds. After that time, only the green LED should remain lit. You can

begin breathing from the device immediately even though it typically takes 10 minutes to reach oxygen purity specifications. The device normally takes 10 minutes to reach oxygen purity specifications.

6. Adjust the flow to the proper setting by turning the knob on the top of the flow meter until the ball is centered on the line marking the specific flow rate.
7. Be sure oxygen is flowing through the cannula. If it is not, refer to the Troubleshooting section of this manual.
8. When you are not using the oxygen concentrator, press the power switch to the Off [O] position.

CHAPTER 6: MAINTENANCE

6.0 DEALER ROUTINE MAINTENANCE

This section describes scheduled and routine maintenance procedures. Normal routine maintenance involves periodic checking, cleaning, and or replacing the following items as necessary:

- Inlet Filter
- Micro-Disk Filter
- Cabinet cleaning
- LPM flow setting to the prescribed level
- Oxygen concentration level

Routine maintenance is very important in prolonging dependability and in reducing costly repairs. Long term maintenance and regular checking of the filters helps assure the efficient operation of the unit.

6.0.1 FILTERS

Respironics recommends checking and replacing the Inlet Filter every two (2) years. Respironics also recommends checking and replacing the Micro-Disk filter as necessary.

6.0.2 CABINET

Commensurate with hospital or homecare policies, Respironics recommends cleaning the cabinet and inspecting for damage as necessary. Ensure that the small holes on the Inlet Filter door are unobstructed. Refer to the Tools and Equipment section for approved cleaning solution.

6.0.3 FLOW SETTING

Commensurate with hospital or homecare policies, Respironics recommends verifying the patient flow setting as necessary.

6.0.4 OXYGEN CONCENTRATION VERIFICATION

Commensurate with hospital or homecare policies, Respironics recommends verifying the oxygen concentration level per homecare provider's policies as necessary. Refer to the Testing section for more detailed instructions on how to check the oxygen concentration level.

6.0.5 COMPRESSOR

Respironics does not require routine maintenance or recommend field service of the EverFlo Oxygen Concentrator compressor. The compressor may require replacement when:

- The system pressure is not within specifications and there are no leaks detected.
- The compressor bearings have worn to a point that make the compressor noticeably louder.

6.0.6 HUMIDIFIER CONNECTOR TUBE AND CONNECTOR

Commensurate with hospital or homecare policies, Respironics recommends disinfecting the tube and connector using 70% isopropyl alcohol.

6.1 EVERFLO OXYGEN CONCENTRATOR MAINTENANCE RECORD

MODEL NUMBER	SERIAL NUMBER

DATE PURCHASED

DATE/HOURS/LPM *(Record at Each Check)*	FILTERS *(Clean & Replace as Necessary)*		OXYGEN CONCENTRATION *(Check Level)*
	Inlet	*Micro-Disk*	

CABINET *(Clean and Inspect as Necessary)*	FLOW SETTING *(Check Setting)*

6.2 System Verification Procedures

The following procedures may be performed at any time to ensure that the EverFlo Concentrator is functioning properly.

6.2.1 System Self Test and Start Up Test

1. Connect the power cord to the proper power source.
2. Turn on the unit by moving the power switch to the ON (I) position and verify the following:
   - All LEDs light up and the audible alarm sounds for two seconds.
   - The unit starts to run.
   - The red and yellow LED lights go off and the audible alarm stops.
   - The green LED stays on.

6.2.2 Power Loss Alarm Test

1. Test the power loss alarm as follows:
   a. Connect the device to a proper power source.
   a. Let the device warm up for two minutes to charge the capacitor.
   b. Disconnect the device from the power source and move the power switch to the On (I) position and verify an audible alarm sounds continuously.
   c. The alarm should have sufficient power to sound for 10 minutes. Verify that the EverFlo Device alarms.
   d. If the audible alarm does not sound, replace the Main PCA.

6.2.3 OUTLET/REGULATED PRESSURE TEST

1. Power up the unit and allow it to run for at least two minutes to stabilize.
2. Set the flow meter to 5 lpm (1 lpm for units equipped with pediatric flow meters).

NOTE

If using the Concentrator tool kit (H647), be sure to remove the DISS outlet fitting from the tubing before proceeding to step 3.

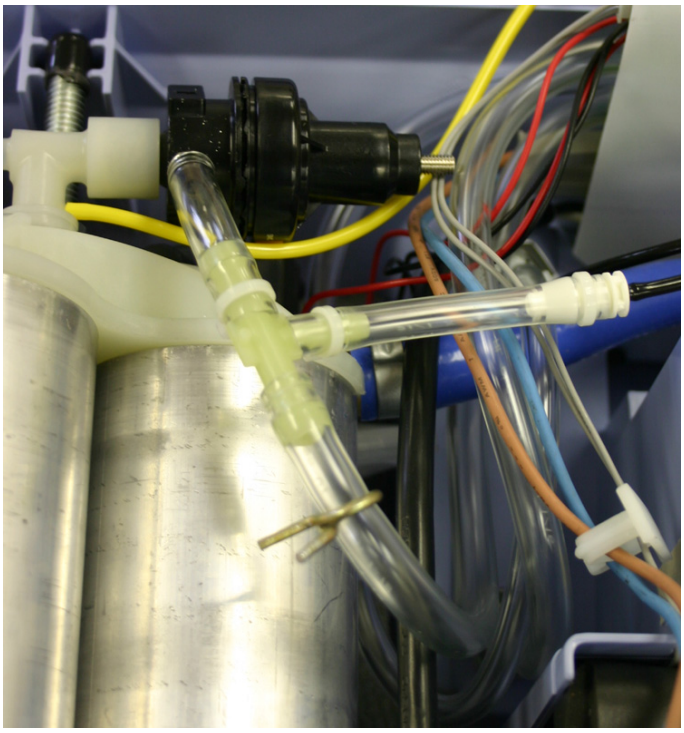
3. Connect the pressure gauge from the tool kit to the outlet barb. The flow ball should drop to 0.0 lpm.

NOTE

Be sure to hold the pressure gauge in a vertical position.

4. If the outlet pressure does not fall between 5.0 and 7.0 psig, perform steps 5 through 14. If the pressure does fall between 5.0 and 7.0 psig, remove pressure gauge, the test is now complete.
5. Turn the unit off.
6. Remove the pressure gauge from the outlet barb.
7. Remove the front and rear cabinets.

8. Insert a “T” from the tool kit in between the regulator and the clear oxygen tubing and connect the pressure gauge.



9. Turn the device on and set the flow meter to 5 lpm (1 lpm for units equipped with pediatric flow meters).
10. With the gauge held in a vertical position, verify that the regulated pressure is at 5.5 ± 0.25 psig.
11. If the regulated pressure needs adjusted, place a 3/32” Allen wrench in the adjusting screw on the end of the regulator.

NOTE

If the regulated pressure is low, turn the wrench clockwise to increase the regulated pressure. If the regulated pressure is high, turn the wrench counter-clockwise.

12. Disconnect the pressure gauge and “T” fitting.
13. Reconnect the clear oxygen tubing to the pressure regulator.
14. Install the front and rear cabinets.

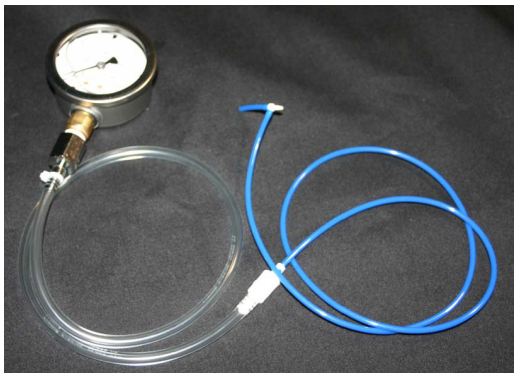
6.2.4 SYSTEM PRESSURE TEST

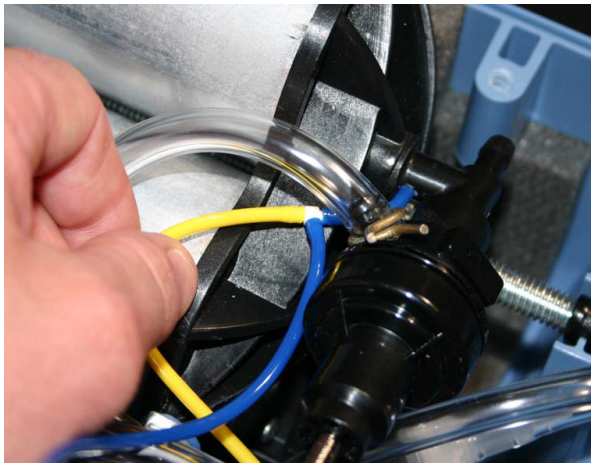
The system pressure test is used to verify the proper operation of the EverFlo Compressor and Sieve Canister Assemblies.

NOTE

If pressures are not within the normal operating pressure, it does not necessarily indicate an issue with the concentrator. The Final Test located in the Testing Chapter of this manual is the only test to be used when determining a known good EverFlo Concentrator from a Concentrator requiring repair.

1. Run the unit with the front and rear cabinets in place for a minimum of one hour.
2. Set the flow to 5 lpm (1 lpm for units equipped with pediatric flow meters).
3. Turn off the Everflo Oxygen Concentrator.
4. Remove the front and rear cabinets from the unit.
5. Disconnect the yellow pressure tubing from the fitting on the Pressure Regulator Adaptor located on top of the sieve canister assembly. Using the pressure gauge, “T” fitting, and pressure tubing supplied with the Concentrator tool kit (RI p/n H647), connect to the Pressure Regulator as shown below.





6. Turn the unit on and allow the unit to cycle for at least two (2) minutes to stabilize.
7. Hold the pressure gauge in a vertical position.

8. Verify pressures against the table below. This table is a reference guideline for system pressures and troubleshooting. If a value is measured outside of these ranges, it may not mean the unit has a fault. If the Outlet Pressure and Outlet Oxygen values are within tolerances, and the unit is not alarming, the unit should be considered acceptable.

EverFlo Model	*Normal Pressure for units equipped with Purge Valves*		*Normal Pressure for units without Purge Valves*	
	Min	*Max*	*Min*	*Max*
1020000 1020001 1020002 1020003 1020002BR 1020003BR 1039362 1039363	*NA*	*NA*	*15*	*27*
1020004 1020005	*NA*	*NA*	*NA*	*NA*
1020006 1020009 1020010 1020011 1020012 1020016 1020017 1039366 1039368 1039370	*16*	*24*	*14*	*25*
1020007 1020008 1039367	*12*	*22*	*12*	*23*
1020013	*NA*	*NA*	*11*	*22*
1020014 1020015 1039364 1039365	*NA*	*NA*	*14*	*24*

9. Record the peak pressure for four cycles.

CYCLE 1	CYCLE 2	CYCLE 3	CYCLE 4

10. Confirm that all peaks are within one (1) psig of each other.

NOTE

If the four cycles are not within specification, refer to the troubleshooting section of the service manual.

11. Turn off the EverFlo Concentrator and disconnect the pressure gauge, “T” fitting, and tubing. Reconnect the yellow tubing to the Pressure Regulator Adaptor located on the top of the Sieve Canister Assembly.
12. Install the front and rear cabinets.

6.2.5 *Oxygen Output Test*

1. Power up the concentrator and allow it to run for a minimum of 15 minutes.
2. Connect a calibrated oxygen analyzer to the outlet fitting of the concentrator.

3. Set the flow to 5 lpm (1 lpm for units equipped with pediatric flow meters).
4. Verify the oxygen reading is as follows:

MODEL NUMBER	OXYGEN PURITY
1020000, 1020001, 1020002, 1020003, 1020002BR, 1020003BR 1020004, 1020005, 1020006, 1020009, 1020010, 1020011, 1020012, 1020013, 1020014, 1020015, 1020016, 1020017, 1039362, 1039363 1039364, 1039365 1039366, 1039368, 1039370	*≥ 90%*
1020007, 1020008, 1039367	*≥ 87%*

6.2.6 MAIN PCA OXYGEN VERIFICATION (OPI UNITS ONLY)

This procedure verifies that the Main PCA is operating properly.

1. Plug the unit into a power outlet.
2. Turn the device on, set the flow to 5.0 LPM, and let it run for 10 minutes.
3. If either the yellow or red LED illuminates after 10 minutes, perform the oxygen output test with a calibrated oxygen analyzer. If the red LED illuminates, the audible alarm should also sound at the same time.

NOTE

The oxygen analyzer used in the following steps must be calibrated to meet the manufacturer's specifications.

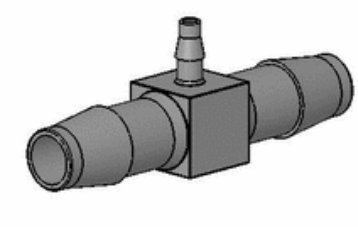
If the device is alarming and the oxygen concentration is measured at 82% or higher, check the device for leaks. If no leaks are found then replace the Main PCA.

6.2.7 COMPRESSOR TEST

This procedure verifies if the Compressor is working properly.

EQUIPMENT REQUIRED FOR OPTION 1

1. White Polypropylene Barbed Tube Fitting Reducing Tee for 3/8" X 1/8" X 3/8" Tube ID, McMaster-Carr Qty 1 of Part #: 5121K851

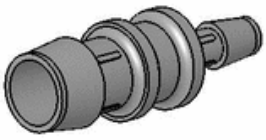


2. Compact Plastic Needle Valve 3/8" Barb X 3/8" Barb Connections, McMaster-Carr Qty 1 of Part #: 7781K33

3. Multipurpose Gauge +/-2% Mid-Scale Accuracy 2" Dial, 1/4" NPT Male Bottom, 0 - 60 PSI, McMaster-Carr Qty of 1 of Part #: 4089K13

4. High Pressure Tubing, 1/8” ID, 3/8” OD, 1/8” Wall, McMaster-Carr, Qty of 1 of Part #: 5439K19

5. Durable Nylon Single-Barbed Tube Fitting Reducing Coupling for 1" X 1/2" Tube ID, White, McMaster-Carr Qty 1 of Part #: 2974K278 (Same as 5463K653)



6. Hose Clamp Qty 5 Clamping range of 1/4” to 5/8”

7. 18” Patient Tubing, Qty 1 of Respironics P/N 1008198
8. TSI Flow Meter, Qty 1 of Respironics P/N 1071679
9. High-Pressure Tygothane Polyurethane Tubing Clear, 3/8" ID, 1/2" OD, 1/8" Wall

10. FDA White Nylon Single Barbed Tube Fitting Adapter for 1/8” Tube ID X ¼” FNPT Thickness, 10’L

11. Stopwatch

EQUIPMENT REQUIRED FOR OPTION 2

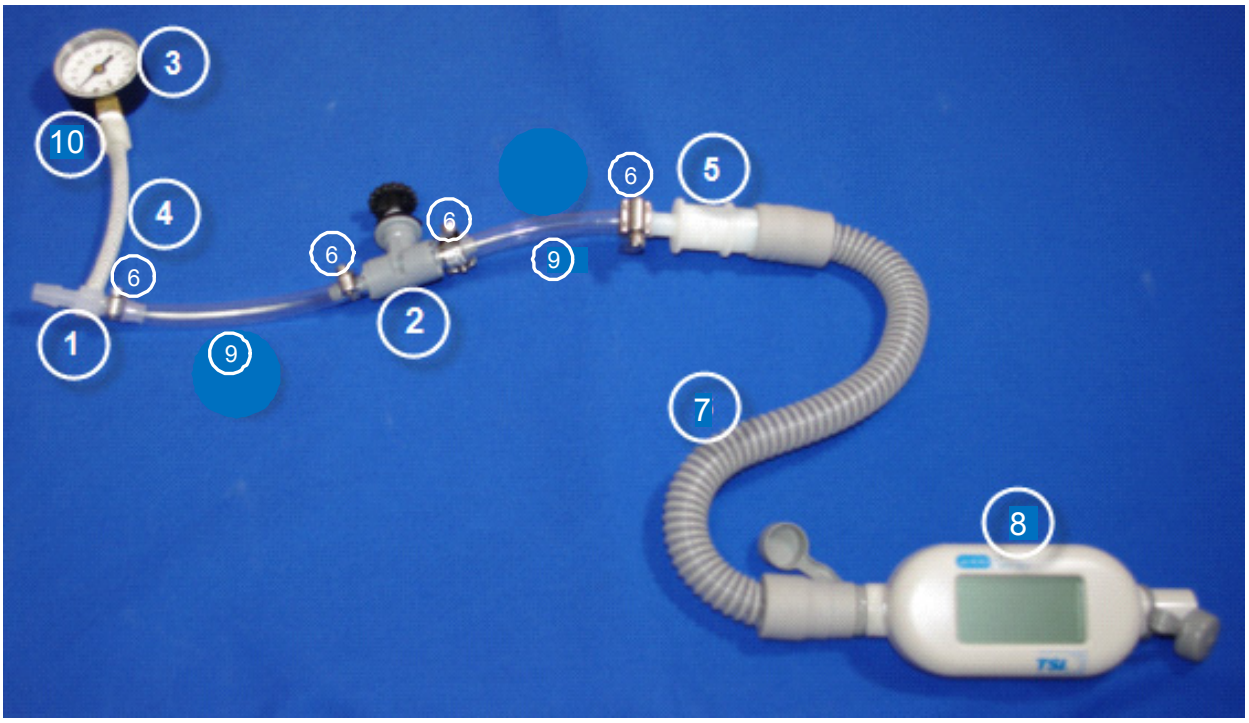
Items 1-4, 6, 9, and 10 as detailed above with the addition of the following items:

1. Male Tube Adapter 1/8” NPT x 3/8” Barb, McMaster-Carr P/N 5372K116

2. Flow Meter, Dwyer Instruments P/N RMA-25

ASSEMBLY INSTRUCTIONS FOR EQUIPMENT OPTION 1

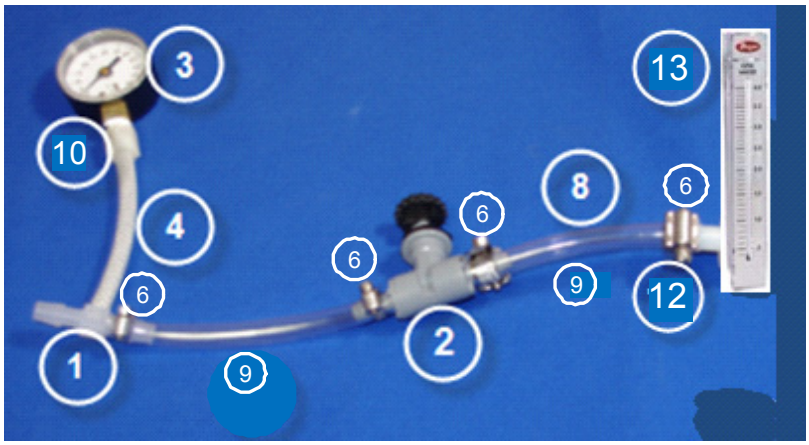
1. Connect the compressor blue outlet tube to Barbed Tube Fitting Reducing Tee (#1) and secure with a hose clamp (#6).
2. Thread the Barbed Tubing Fitting Adapter (#10) to the gauge (#3) using Teflon tape.
3. Connect the Tubing Fitting Adapter (#10) to the Reducing Tee (#1) using the High Pressure Tubing (#4).
4. Install the High Pressure Clear Tubing (#9) to the Reducing Tee (#1) and the Needle Valve (#2) and secure with hose clamps (#6).
5. Install the High Pressure Clear Tubing (#9) to the Needle Valve (#2) and the Single Barbed Tube Fitting (#5) and secure with hose clamps (#6).
6. Install the 18” Patient Tubing (#7) to the Single Barbed Tube Fitting (#5) and the TSI Flow Meter (#8).
7. Install the power adapter to the TSI Flow Meter (#8) and plug into a 120 VAC/60 Hz outlet.



ASSEMBLY INSTRUCTIONS FOR EQUIPMENT OPTION 2

1. Connect the compressor blue outlet tube to Barbed Tube Fitting Reducing Tee (#1) and secure with a hose clamp (#6).
2. Thread the Barbed Tubing Fitting Adapter (#10) to the gauge (3) using Teflon tape.
3. Connect the Tubing Fitting Adapter (#10) to the Reducing Tee (#1) using the High Pressure Tubing (#4).
4. Install the High Pressure Clear Tubing (#9) to the Reducing Tee (#1) and the Needle Valve (#2) and secure with hose clamps (#6).
5. Install the High Pressure Clear Tubing (#9) to the Needle Valve (#2).
6. Install the 1/8” Male Tube Adapter (#12) to the Flow Meter (#13) using Teflon tape.

7. Install the High Pressure Clear Tubing (#9) to the 3/8” Male Tube Adapter (#12) and secure with a hose clamp (#6).



PROCEDURE

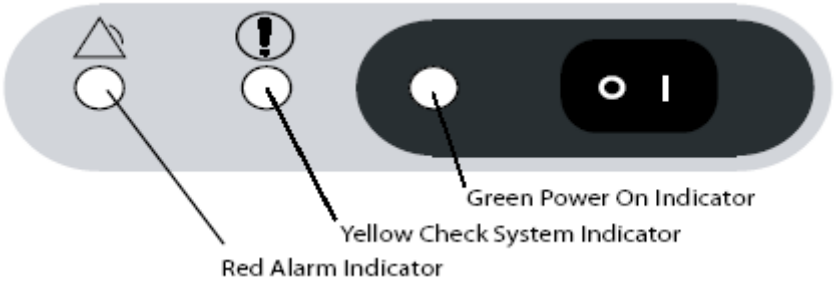
1. Follow the procedures detailed in the EverFlo Service Manual for the removal of the following components:
   a. Filter Cover
   b. Inlet Filter
   c. Rear Cabinet
2. Remove the blue hose running from the Compressor to the Sieve Canister Assembly by carefully cutting the one-eared clamp.
3. Connect the Compressor blue outlet tube to the Test Fixture’s Barbed Tube Fitting Reducing Tee.
4. Install the Inlet Filter to the Compressor’s Inlet Boot.
5. If using Test Fixture Option 1, turn ON the flow meter.
6. Ensure is Compact Plastic Needle Valve is fully open.
7. Turn ON the EverFlo power switch.
8. Start the stopwatch.
9. Adjust Compact Plastic Needle Valve to achieve 20 psi pressure (turning clockwise to increase pressure and turning counter-clockwise to decrease pressure).
10. When time reaches 1 minute, observe and record LPM reading from Flow Meter.
11. Stop the stopwatch.
12. A reading ≥ 69 LPM indicates a “PASS” for that compressor, a reading < 69 LPM indicates a “FAIL”.
13. If the Compressor failed, replace the compressor as per the Service Manual Compressor Replacement instructions.
14. If the Compressor passes, continue to troubleshoot the device per the System Verification Procedures. Manual.

CHAPTER 7: TROUBLESHOOTING & ALARMS

7.0 INTRODUCTION

This section provides service technicians with a troubleshooting table to determine which component(s) is any, must be replaced.

7.1 INDICATORS & ALARMS



COLORED LED	POSSIBLE CAUSE
Yellow LED is blinking. The Red LED is off and the Audible Alarm is beeping periodically.	*The device has detected a high oxygen flow condition.*
Green LED illuminates continuously. The other LEDs are off and the Audible Alarm is silent.	*The device is turned on and working properly.*
The Audible Alarm is sounding continuously. None of the LEDs are illuminated.	*The device is turned on but is not operating. Often this indicates that the device is not plugged in or there is a power failure.*
The Audible Alarm is sounding continuously and all 3 LEDs are illuminated.	*The device had detected a system malfunction.*
Yellow LED illuminates continuously, the Red LED is blinking and the Audible alarm is beeping periodically.	*The device has detected an impeded oxygen flow condition.*
Red LED illuminates continuously and the Audible Alarm is beeping continuously.	*The device has detected a system malfunction.*
Yellow LED illuminates continuously. The Red LED is off and the Audible Alarm is silent.	*The device has detected a low oxygen condition. (For OPI units only.)*

7.2 TROUBLESHOOTING TABLE

SYMPTOM	CAUSE	VERIFICATION	CORRECTIVE ACTION
• *Low pressure*	***Canister to Compressor tubing failure***	• *Verify there are no leaks*	• *Repair leaks in tubing and hoses*
		• *Verify the tubing between the canister and Compressor is connected*	• *Reconnect the tubing*
		• *Verify the tubing is not kinked or pinched*	• *Reposition the tubing*
	Compressor failure	• *Verify there are no leaks in the hose from Compressor to Sieve Canister*	• *Replace clamps or replace hose*
		• *Verify the Compressor is operating correctly*	• *Replace the Compressor*
	Valve Solenoid failure	• *Verify the Valve Solenoid is working*	• *Replace the Valve Solenoid*
		• *Verify wiring harness from the Valve Solenoid to Main PCA are connected*	• *Reconnect the wiring harnesses*
	Sieve Canister leaking	• *Verify there are no leaks in Sieve Canister*	• *Replace the Sieve Canister Assembly*

SYMPTOM	CAUSE	VERIFICATION	CORRECTIVE ACTION
• *High pressure*	***Pressure relief valve***	• *Verify that tubing is not kinked or pinched* • *Verify that the tubing is not damaged* • *Verify the valve wiring harness is connected at the Main PCA* • *Verify the Compressor is working correctly*	• *Reposition the tubing* • *Replace the damaged tubing* • *Replace Valve Solenoid Assembly* • *Replace the Compressor*
	Valve Solenoid failure	• *Verify the Valve Solenoid is working properly* • *Verify the valve wiring harness is connected at the Main PCA*	• *Replace the Valve Solenoid Assembly* • *Reconnect the wiring harness*
• *Constant Audible Alarm (no LED's on)*	***Fuse failure***	• *Verify the continuity of the fuse*	• *Replace the fuse*
• *Fluctuations in oxygen pressure* • *Fluctuation in flow ball*	***Pressure Regulator failure***	• *Verify the flow from regulator is correct* • *Perform Outlet / Regulated Pressure Test*	• *Replace the regulator*
• *Unit will not turn on*	***No power to the unit***	• *Verify the power cord is connected to the wall outlet* • *Verify there is power in the wall outlet* • *Verify if the outlet is connected to a light switch and the switch is in the ON position*	• *Connect the power cord to the wall outlet* • *Check the household fuse or circuit breaker* • *Move the power switch to the ON position*

SYMPTOM	CAUSE	VERIFICATION	CORRECTIVE ACTION
• *LED failure*	***No power to LED's***	• *Verify the power cord is plugged in* • *Verify power in wall outlet* • *Verify that all wiring harnesses are connected* • *Verify the Main PCA is not damaged*	• *Connect the power cord to AC power source* • *Check the household fuse or circuit breaker* • *Connect all wiring harnesses* • *Replace the Main PCA*
• *Unit is inoperable*	***Main PCA failure***	• *Verify the wiring harnesses are connected* • *Verify the wiring harness is not damaged* • *Verify the condition of the fuse on PCA* • *Verify the condition of the Power Cord*	• *Connect the wiring harnesses* • *Check the wiring harnesses for continuity* • *Test the fuse for electrical continuity* • *Verify the Power Cord continuity* • *Replace Power Cord* • *Replace the Main PCA*
• *Start-up alarms in-operable*	***Piezoelectric speaker failure***	• *Verify the solder joints on the piezoelectric speaker*	• *Replace the Main PCA*

SYMPTOM	CAUSE	VERIFICATION	CORRECTIVE ACTION
• *Low oxygen output*	***Sieve bed failure***	• *Verify the oxygen output with a calibrated oxygen analyzer* • *Verify the Compressor is working properly* • *Verify that there are no leaks*	• *Replace the Sieve Canister* • *Replace the Compressor* • *Replace tubing and clamps*
	Compressor failure	• *Verify Compressor is operating properly*	• *Replace Compressor*
• *Low Oxygen percentage indicator not functioning* • *Continuous red LED*	***Main PCA failure***	• *Verify the OPI output*	• *Replace the Main PCA*
• *Warm cabinet temperature*	***Cooling Fan failure***	• *Verify the Cooling Fan connectors are seated properly* • *Verify there is continuity on electrical fan wiring harness* • *Verify there is power to the Cooling Fan* • *Verify the Cooling Fan is not obstructed*	• *Reseat the connectors* • *Replace the fan assembly* • *Reseat the connectors* • *Remove the obstructions from the Cooling Fan*

SYMPTOM	CAUSE	VERIFICATION	CORRECTIVE ACTION
• *Pressure relief valve activated* • *Red LED (constant)* • *Low pressure*	***Cycle failure***	• *Verify Valve Solenoid Assembly operation* • *Verify Valve Solenoid assembly wire harness connection with Main PCA* • *Verify voltage from Main PCA to Valve Solenoid Assembly*	• *Replace Valve Solenoid Assembly* • *Reconnect the Valve Solenoid wiring harness to the Main PCA* • *Replace the Main PCA*
• *Inaccurate oxygen readings*	***Leaks***	• *Verify the hoses are connected to the OPI sensor.* • *Verify that there are no leaks*	• *Reconnect the hoses* • *Reconnect the tubing*
	Main PCA failure	• *Verify the output with a calibrated oxygen analyzer*	• *Replace Main PCA*
	Compressor failure	• *Verify the Compressor output range.*	• *Replace the Compressor*

SYMPTOM	CAUSE	VERIFICATION	CORRECTIVE ACTION
• *Inaccurate oxygen flow*	***Flow Meter failure***	• *Verify the Flow Meter can be adjusted properly*	• *Replace the Flow Meter*
• *Loss of power* • *Low Pressure*	***Compressor thermal switch failure*** • *Compressor temperature allowed to exceed 130 +/- 5 degrees C 266 +/- 5 degrees F*	• *Verify that air flow around concentrator is not blocked* • *Verify that all filters are clan* • *Verify that the thermal switch is closing after cooling*	• *Reposition the concentrator to an open area* • *Replace all dirty filters* • *Replace the Compressor*
NOTE: The thermal switch will reset itself after the cabinet temperature cools below 130 degrees C (266 degrees F).			

7.3 SYSTEM PRESSURE TEST TABLE

SYMPTOM	CAUSE	VERIFICATION	CORRECTIVE ACTION
System Pressure Test • *Abnormal reading*	• *High pressure reading above 25 psig @ 60 Hz @ 5 lpm flow.*	• *Check oxygen percentage at 5 lpm. If Low?*	• *Check for proper valve cycling* • *Replace Sieve Canister*
• *Fluctuating pressure*	• *Difference in Peak pressure is > 1 psig.*	• *Check oxygen percentage at 5 lpm. If Low?*	• *Check for leaks* • *Replace Sieve Canister*
• *Low pressure reading*	• *Low pressure reading below 20 psig @ 5 lpm*	• *Check oxygen percentage at 5 lpm. If Low?* • *Check for leaks* • *Check tubing* • *Check fittings* • *Check for dirty filters* • *Check Compressor for System Pressure*	• *Replace tubing* • *Replace fittings* • *Replace filters* • *Replace Compressor*

CHAPTER 8: REPAIR & REPLACEMENT

8.0 OVERVIEW

This chapter illustrates the replaceable components for the EverFlo Oxygen Concentrator. Procedures for replacing the components are also provided in this chapter.

NOTE

Refer to the proper Testing Section for required testing after component replacement.

NOTE

Refer to the Repair Kits Section for proper repair kit identification.

WARNING

- *To prevent electrical shock, disconnect the electrical supply before attempting to make any repairs to the EverFlo Concentrator.*
- *Use extreme caution when handling the Capacitor. The Capacitor can hold a substantial electrical charge until it is properly discharged.*
- *Even with the unit disconnected from the electrical supply, the Capacitor may still hold an electrical charge strong enough to cause serious bodily injury. DO NOT touch the capacitor terminals simultaneously until the Capacitor has been completely discharged. Discharge the Capacitor by shorting the two posts with an insulated screw driver.*
- *Avoid handling the molecular sieve material. Respironics recommends the return of the sieve canister assembly to Respironics for any service that involves sieve material.*

CAUTION

- *Electronic components used in this device are subject to damage from static electricity. Repairs made to this device must be performed only in an antistatic, ESD-protected environment.*
- *During all repair and replacement procedures, ensure that any connections that are broken during the process (fittings, tubing, and hoses) are reconnected securely.*
- *When using a leak detector, be careful that it does not come in contact with any electrical components.*
- *The fuse on the Main PCA, must be replaced with the fuse called out in the Repair Kits Section of this Service Manual. Failure to do so will result in damage to the unit.*

8.1 FILTER COVER REPLACEMENT

To Remove the Filter Cover

1. Using minimal force, apply pressure to the outside of the Filter Cover.

To install the Filter Cover

1. Place Filter Cover tab into slot.
2. Push the Filter Cover in until it locks.

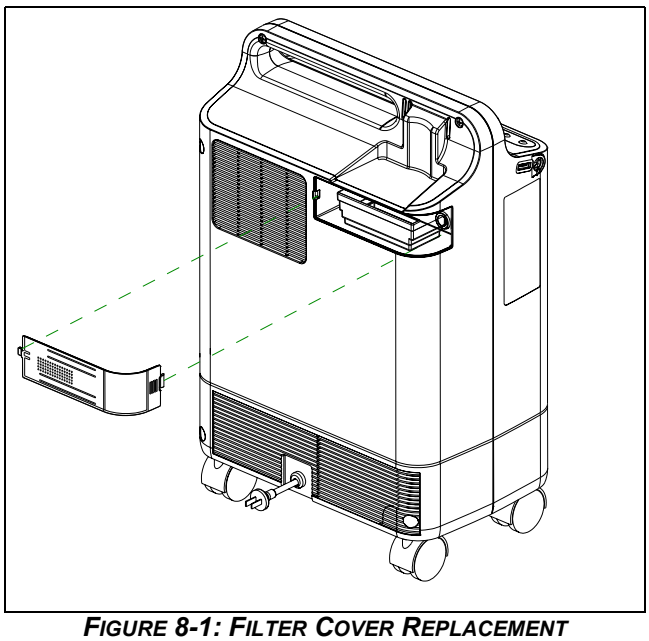


FIGURE 8-1: FILTER COVER REPLACEMENT

8.2 INLET FILTER REPLACEMENT

To remove the Inlet Filter

1. Remove the Filter Cover. Refer to the Refer to the Filter Cover Replacement section for more information.
2. Remove the Inlet Filter.

To install the Inlet Filter

1. Fully seat the Inlet Filter into the Inlet Boot.
2. Install the Filter Cover.

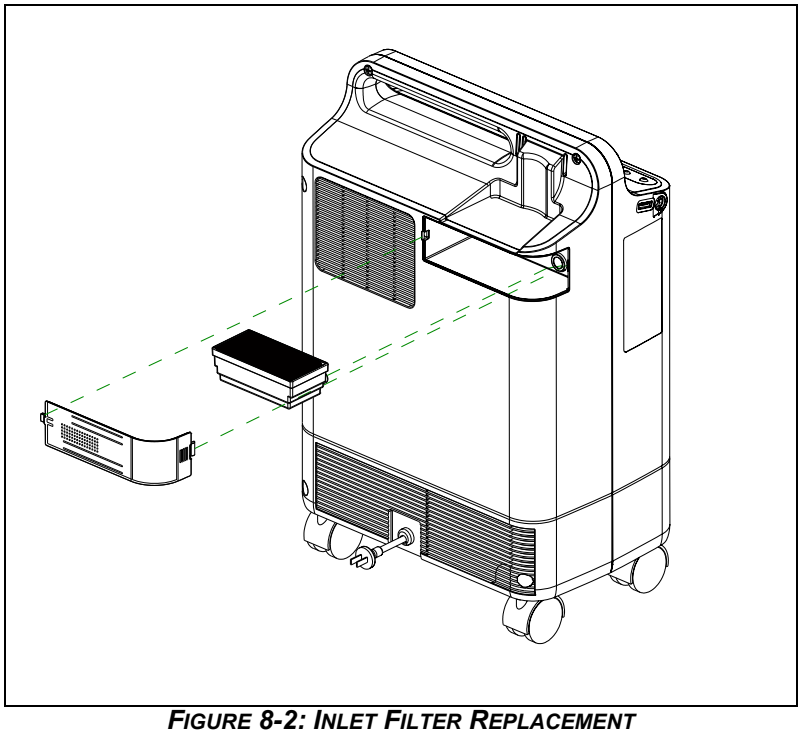


FIGURE 8-2: INLET FILTER REPLACEMENT

8.3 REAR CABINET/POWER CORD REPLACEMENT

To remove the Rear Cabinet/Power Cord

1. Place the concentrator face down on an ESD Protected surface.
2. Remove the Filter Cover. Refer to the Filter Cover Replacement section for more information.
3. Remove the Inlet FIlter. Refer to the Inlet Filter Replacement section for more information.
4. Remove the two phillips screws from the handle of the Rear Cabinet.
5. Remove the four hex screws from the Rear Cabinet.

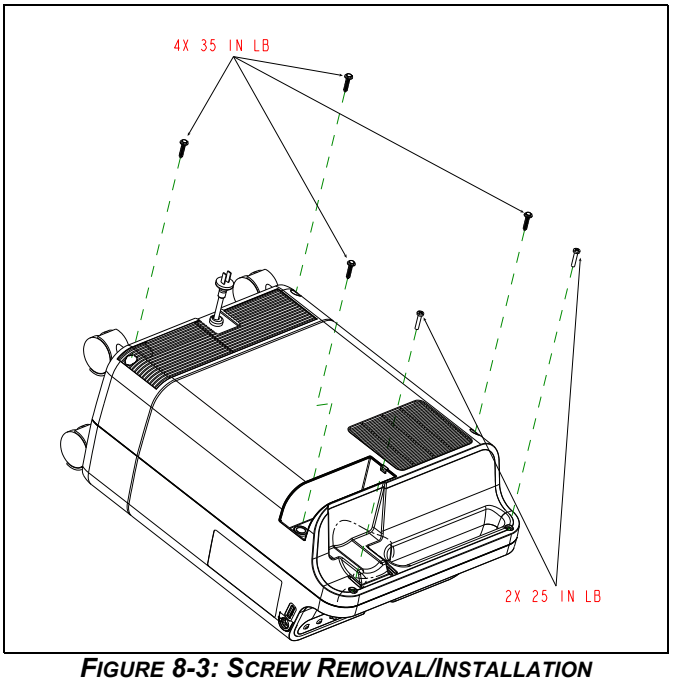


FIGURE 8-3: SCREW REMOVAL/INSTALLATION

6. Using Heyco Pliers release the strain relief from the Rear Cabinet.

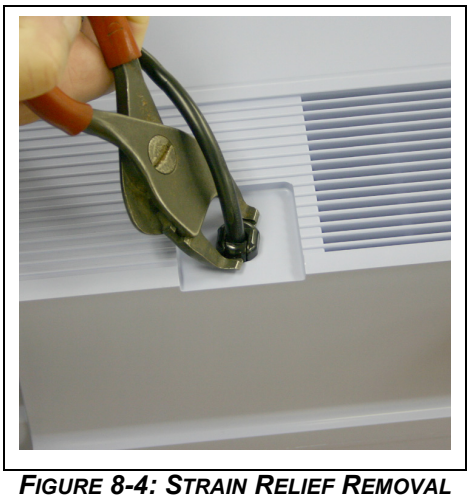


FIGURE 8-4: STRAIN RELIEF REMOVAL

7. Lifting the Rear Cabinet slightly up from the Front Cabinet, fold the Rear Cabinet away from the Front Cabinet.

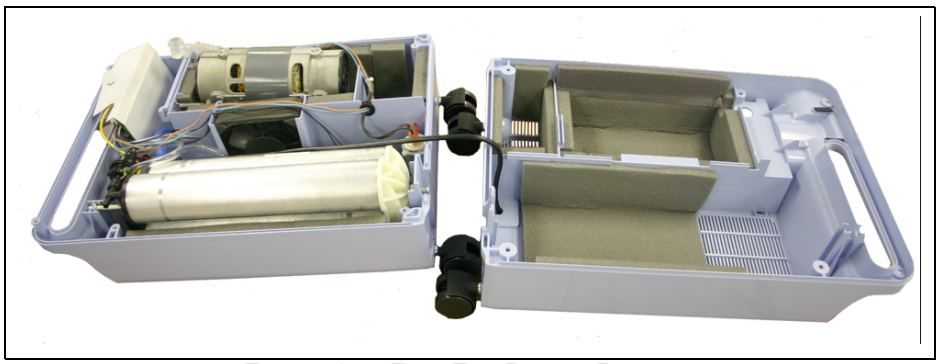


FIGURE 8-5: EVERFLO REPAIR POSITION

8. Cut the two tie wraps securing the Power Cord to the Sieve Canister.

FIGURE 8-6: TIE WRAP LOCATION

9. Unclip the Main PCA shield from the Front Cabinet.

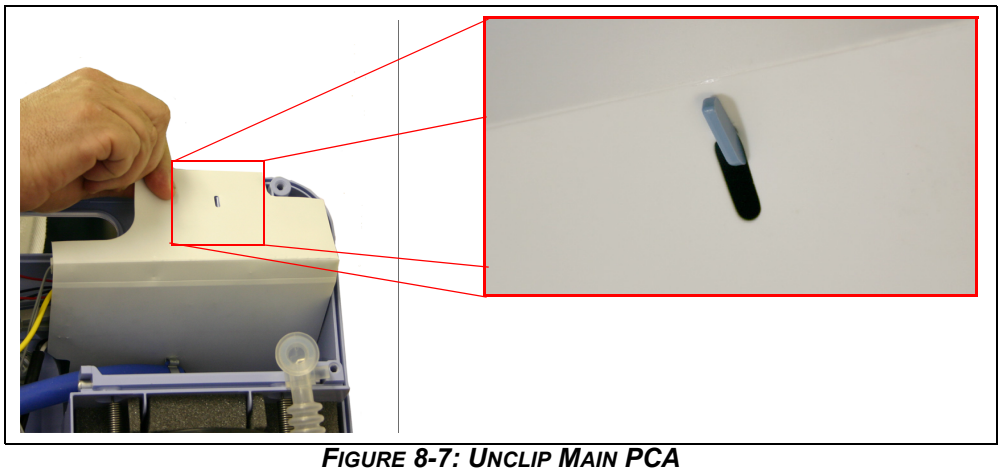


FIGURE 8-7: UNCLIP MAIN PCA

10. Lift Main PCA out of the Front Cabinet.

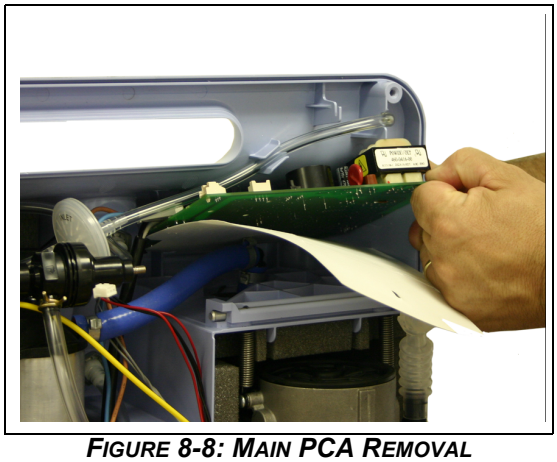


FIGURE 8-8: MAIN PCA REMOVAL

11. Remove the Power Cord wires from the J3 and J4 locations of the Main PCA.
12. Remove the Power Cord from the Rear Cabinet.

To install the Rear Cabinet/Power Cord

1. Thread the Power Cord through the hole in the Rear Cabinet.
2. Connect the Power Cord connectors to the J3 and J4 locations of the Main PCA. Refer to Figure 8-15.
3. Slide the Main PCA into the grooves in the Front Cabinet.
4. Secure the Power Cord Wires against the Sieve Canister with two tie wraps.
5. Place the Rear Cabinet onto the Front Cabinet.
6. Using the Heyco Pliers install the strain relief to the Rear Cabinet.
7. Secure the Front and Rear Cabinets together by torquing the four hex screws (35 in-lbs.) and two phillips screws (25 in-lbs.).
8. Install the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.
9. Install the Filter Cover. Refer to the Filter Cover Replacement section for more information.

8.4 O_2 Quick Coupler Replacement

To remove the O_2 Quick Coupler

1. Remove the Filter Cover. Refer to the Filter Cover Replacement section for more information.
2. Remove the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.
3. Remove the Rear Cabinet. Refer to the Rear Cabinet/Power Cord Replacement section for more information.
4. Cut the tie wrap securing the tubing to the O_2 Coupler.

5. Remove the securing nut from the coupler and push the coupler towards the outside of the device to remove.

To install the O_2 Coupler

1. Insert the O_2 Coupler through the side wall threads toward the inside of the device ensuring that the flat “D” portion of the Coupler is aligned with the flat “D” portion of the pass through hole.
2. Install the securing nut to the O_2 Coupler and tighten.
3. Install the tubing to the O_2 Coupler.
4. Secure the tubing to the O_2 Coupler using a tie wrap.
5. Install the Rear Cabinet. Refer to the Rear Cabinet/Power Cord Replacement section for more information.
6. Install the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.
7. Install the Filter Cover. Refer to the Filter Cover Replacement section for more information.

8.5 EverFlo and EverFlo Q Pressure Regulator Assembly Replacement

To remove the Pressure Regulator Assembly

1. Remove the Filter Cover. Refer to the Filter Cover Replacement section for more information.
2. Remove the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.
3. Remove the Rear Cabinet. Refer to the Rear Cabinet/Power Cord Replacement section for more information.
4. Gently remove the yellow pressure line coming from the Pressure Regulator Adaptor.

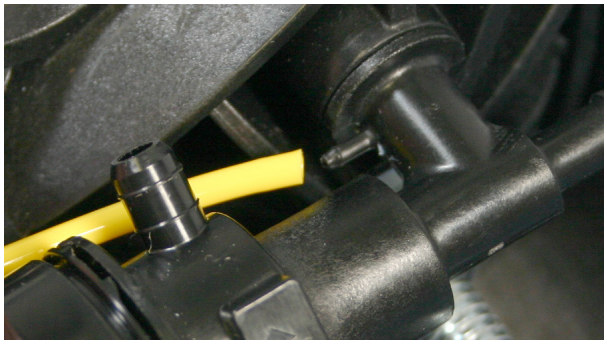


Figure 8-9: Remove Yellow Pressure Line

5. Unlock the Pressure Regulator Adaptor by twisting upwards until the Pressure Regulator stops.
6. Lift the Pressure Regulator Assembly straight up until it clears the Sieve Canister Assembly.
7. Using pliers, loosen the clamp and disconnect the flow tubing from the Pressure Regulator Assembly.

To install the Pressure Regulator Assembly

1. Using pliers, clamp the flow tubing to the Pressure Regulator Assembly.
2. Place the Pressure Regulator Assembly in place by lining the Pressure Regulator Adaptor up with the grooves in the Sieve Canister Assembly.

3. Lock the Pressure Regulator Assembly in place by turing the Assembly downwards.

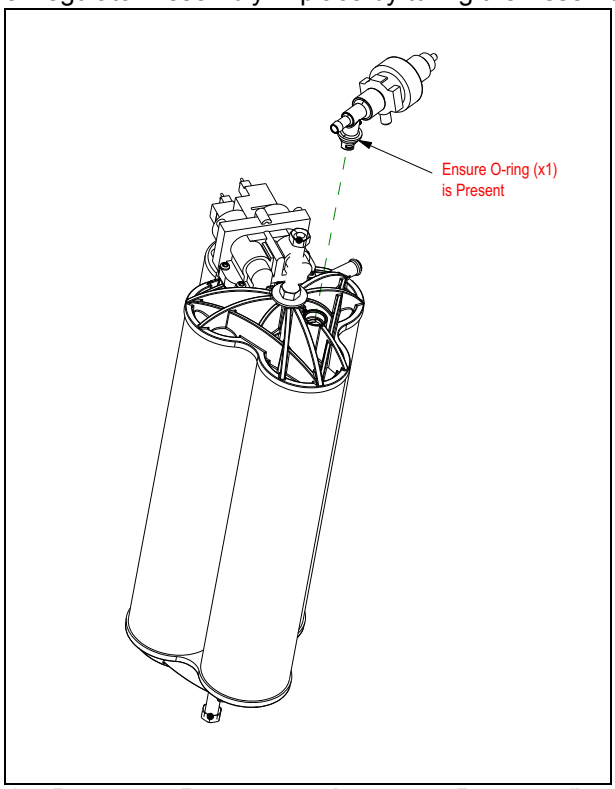


FIGURE 8-10: PRESSURE REGULATOR ASSEMBLY REMOVAL/INSTALLATION

4. Connect the yellow pressure line to the Pressure Regulator Adaptor. Refer to Figure 8-9.
5. Install the Rear Cabinet. Refer to the Rear Cabinet/Power Cord Replacement section for more information.
6. Install the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.
7. Install the Filter Cover. Refer to the Filter Cover Replacement section for more information.

8.6 EverFlo UltraFill Compatible Pressure Regulator Assembly Replacement

To remove the Pressure Regulator Assembly

1. Remove the Filter Cover. Refer to the Filter Cover Replacement section for more information.
2. Remove the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.
3. Remove the Rear Cabinet. Refer to the Rear Cabinet/Power Cord Replacement section for more information.
4. Gently remove the yellow pressure line coming from the Pressure Regulator Adaptor.

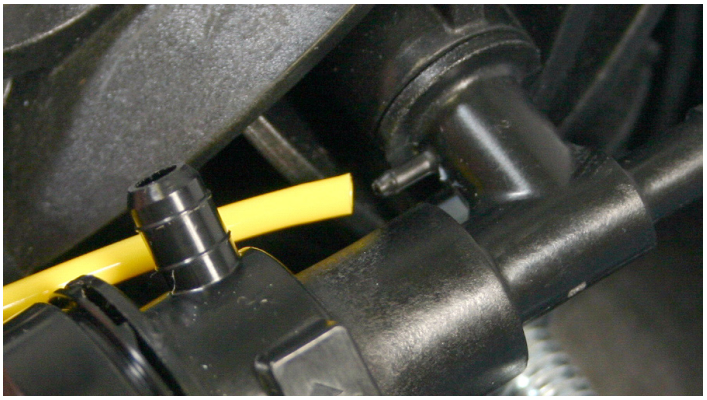


Figure 8-11: Pressure Line Removal

5. Cut the tie wrap securing the tubing to the Pressure Regulator Adaptor and the O_2 Coupler and remove the tubing.

Figure 8-12: Tie Wrap Locations

6. Unlock the Pressure Regulator Adaptor by twisting upwards until the Pressure Regulator stops.
7. Lift the Pressure Regulator Assembly straight up until it clears the Sieve Canister Assembly.
8. Using pliers loosen the clamp and disconnect the flow tubing from the Pressure Regulator Assembly.

To install the Pressure Regulator Assembly

1. Using pliers, clamp the flow tubing to the Pressure Regulator Assembly.
2. Place the Pressure Regulator Assembly in place by lining the Pressure Regulator Adaptor up with the grooves in the Sieve Canister Assembly.
3. Lock the Pressure Regulator Assembly in place by turning the Assembly downwards.

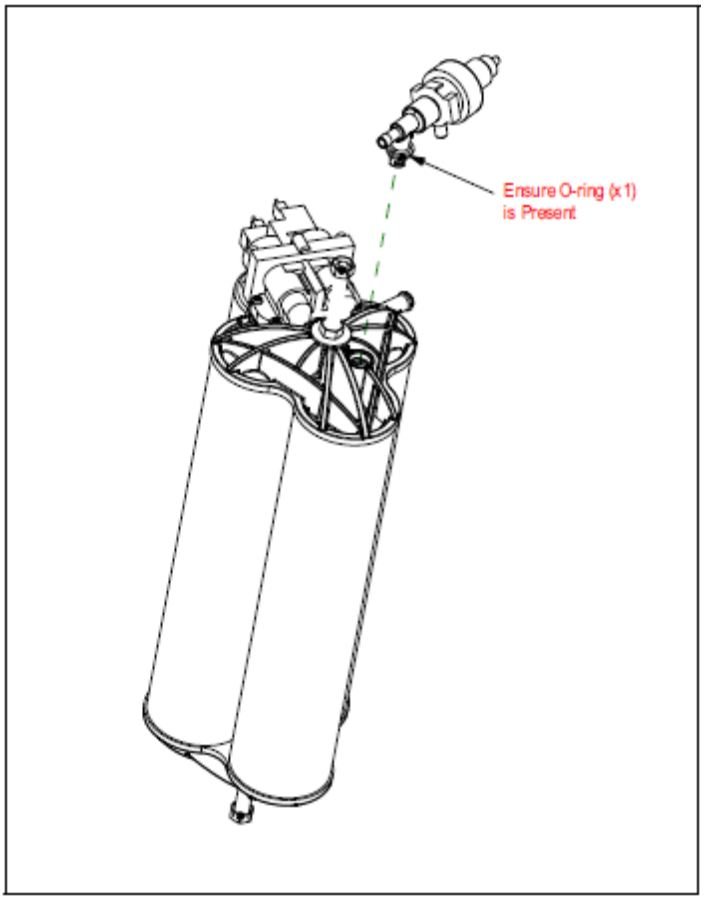


FIGURE 8-13: INSTALLING THE PRESSURE REGULATOR

4. Install the clear tubing to the O_2 Coupler and secure with a tie wrap.

5. Route the clear tubing under the Sieve Canister Assembly.

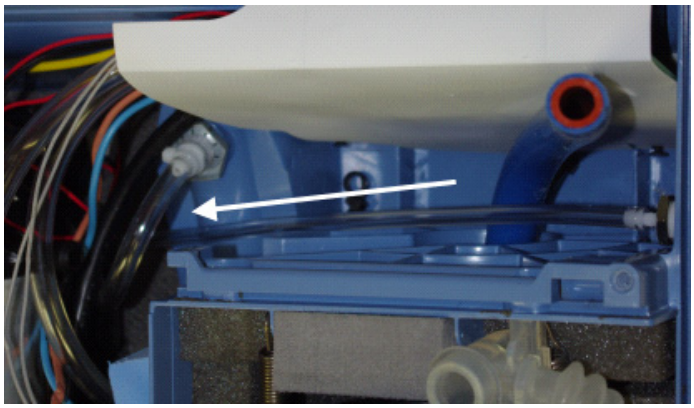


FIGURE 8-14: CLEAR TUBING POSITION

6. Install the clear tubing to the Pressure Regulator Adapter outlet and secure with a tie wrap.
7. Connect the yellow pressure line to the Pressure Regulator Adapter.
8. Install the Rear Cabinet. Refer to the Rear Cabinet/Power Cord Replacement section for more information.
9. Install the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.
10. Install the Filter Cover. Refer to the Filter Cover Replacement section for more information.

8.7 MAIN PCA REPLACEMENT

NOTE

Models 1020002BR and 1020003BR are not reflected in the chart below but should use the same parts as models 1020002 and 1020003.

Reference Chart for Original and New Release Parts, Listed by Model Number:

Model	First Serial Number without Purge Valve	Sieve Bed - Unit *With* Purge Valve	Sieve Bed - Unit *Without* Purge Valve	Main PCA – Unit *With* Purge Valve	Main PCA – Unit *Without* Purge Valve
1020000	Since initial release	N/A	1038825	N/A	1038774
1020001	Since initial release	N/A	1038825	N/A	1038815
1020002	Since initial release	N/A	1038825	N/A	1038815
1020003	Since initial release	N/A	1038825	N/A	1038774
1020004	> 0001938	1038826	1050248	1038816	1052321
1020005	> 0001456	1038826	1050248	1060160	1060161
1020006	> 0027082 See Note	1038826	1052382	1038817	1052380
1020007	> 0008249	1038826	1052382	1038816	1052321
1020008	0004052	1038826	1052382	1038816	1052321
1020009	0002514	1038826	1052382	1038817	1052380
1020010	0006595	1038826	1052382	1038817	1052380
1020011	0002455	1038826	1052382	1038817	1052380
1020012	0002863	1038826	1052382	1038817	1052380
1020013	Since initial release	N/A	1050248	N/A	1050245
1020014	Since initial release	N/A	1050247	N/A	1050246
1020015	Since initial release	N/A	1050247	N/A	1051835
1020016	0001285	1038826	1052382	1038817	1052380
1020017	0002734	1038826	1052382	1038817	1052380

To remove the Main PCA

1. Remove the Filter Cover. Refer to the Filter Cover Replacement section for more information.
2. Remove the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.
3. Remove the Rear Cabinet. Refer to the Rear Cabinet/Power Cord Replacement section for more information.
4. Unclip the Main PCA shield from the locking tab on the Front Cabinet. Refer to Figure 8-7.
5. Remove the Power Cord Connectors from the J3 and J4 locations of the Main PCA. Refer to Figure 8-15.
6. Remove the Fan Connector from the J9 location of the Main PCA. Refer to Figure 8-15.
7. Remove the Valve Solenoid Connector from the J7 location of the Main PCA. Refer to Figure 8-15.
8. Remove the Purge Valve Connector from the J8 location of the Main PCA (230V devices equipped with a Purge Valve Only). Refer to Figure 8-15.
9. Gently remove the yellow pressure line coming from the Pressure Regulator Adaptor from the pressure sensor (SN1) of the Main PCA. Refer to Figure 8-15.
10. Remove the two pieces of flow tubing from the OPI sensor on the Main PCA (OPI devices Only). Refer to Figure 8-15.
11. Slide the Main PCA upward from the grooves in the Front Cabinet.
12. Remove the Compressor Wires from the J2 and J6 locations of the Main PCA. Refer to Figure 8-15.

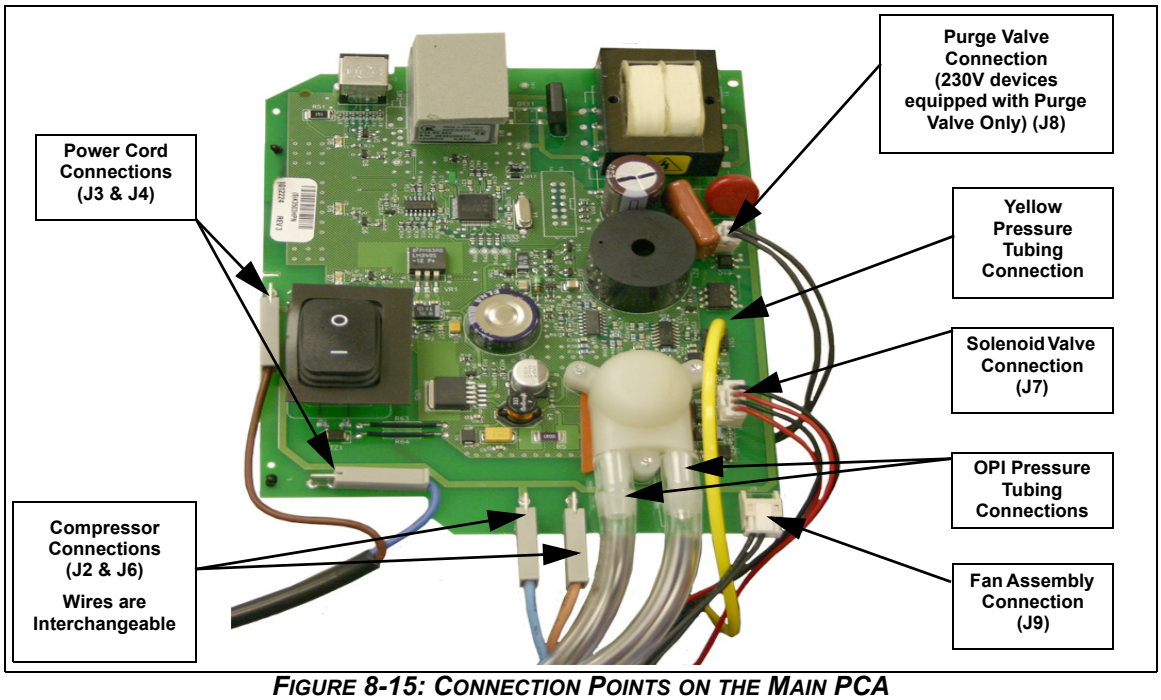
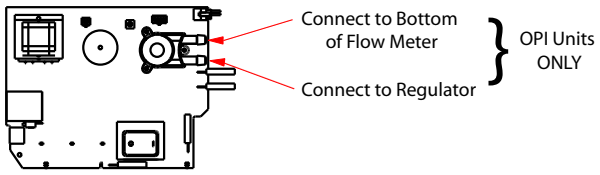


FIGURE 8-15: CONNECTION POINTS ON THE MAIN PCA

To install the Main PCA

1. Connect the yellow pressure line coming from the Pressure Regulator Adaptor to the pressure sensor, location SN1, of the Main PCA.
2. Connect the two pieces of flow tubing to the flow sensor of the Main PCA (OPI devices Only).



PCA DETAIL

3. Connect the Valve Solenoid connector to the J7 location of the Main PCA. Refer to Figure 8-15.
4. Connect the Fan Connector to the J9 location of the Main PCA. Refer to Figure 8-15.
5. Connect the Compressor Connectors to the J2 and J6 locations of the Main PCA. The Compressor wires are interchangeable. Refer to Figure 8-15.
6. Connect the Purge Valve Connector to the J8 location of the Main PCA (230V devices equipped with a Purge Valve Only). Refer to Figure 8-15.
7. Connect the Power Cord Connectors to the J3 and J4 locations of the Main PCA. The long wire should be connected at J3 and the shorter wire connected at J4. Refer to Figure 8-15.
8. Place the Main PCA into the grooves in the Front Cabinet.
9. Connect the Main PCA shield to the Front Cabinet locking tab.
10. Install the Rear Cabinet. Refer to the Rear Cabinet/Power Cord Replacement section for more information.
11. Install the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.
12. Install the Filter Cover. Refer to the Filter Cover Replacement section for more information.

8.8 SIEVE CANISTER ASSEMBLY REPLACEMENT

NOTE

The 230V EverFlo Concentrators have been updated. All 230V models will now be manufactured without a purge valve. To support this change the release of a new Main PCA and Sieve Canister were required.

It is possible to install these new release repair parts into an original unit with the Purge Valve, but both the Main PCA and Sieve Canister without purge valve will need to be replaced.

Models 1020002BR and 1020003BR are not reflected in the chart below but should use the same parts as models 1020002 and 1020003.

Reference Chart for Original and New Release Parts, Listed by Model Number:

Model	First Serial Number without Purge Valve	Sieve Bed - Unit *With* Purge Valve	Sieve Bed - Unit *Without* Purge Valve	Main PCA – Unit *With* Purge Valve	Main PCA – Unit *Without* Purge Valve
1020000	Since initial release	N/A	1038825	N/A	1038774
1020001	Since initial release	N/A	1038825	N/A	1038815
1020002	Since initial release	N/A	1038825	N/A	1038815
1020003	Since initial release	N/A	1038825	N/A	1038774
1020004	> 0001938	1038826	1050248	1038816	1052321
1020005	> 0001456	1038826	1050248	1060160	1060161
1020006	> 0027082 See Note	1038826	1052382	1038817	1052380
1020007	> 0008249	1038826	1052382	1038816	1052321
1020008	0004052	1038826	1052382	1038816	1052321
1020009	0002514	1038826	1052382	1038817	1052380
1020010	0006595	1038826	1052382	1038817	1052380
1020011	0002455	1038826	1052382	1038817	1052380
1020012	0002863	1038826	1052382	1038817	1052380
1020013	Since initial release	N/A	1050248	N/A	1050245
1020014	Since initial release	N/A	1050247	N/A	1050246
1020015	Since initial release	N/A	1050247	N/A	1051835
1020016	0001285	1038826	1052382	1038817	1052380
1020017	0002734	1038826	1052382	1038817	1052380

To remove the Sieve Assembly

1. Remove the Filter Cover. Refer to the Filter Cover Replacement section for more information.
2. Remove the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.
3. Remove the Rear Cabinet. Refer to the Rear Cabinet/Power Cord Replacement section for more information.
4. Remove the Pressure Regulator Adaptor. Refer to the O2 Quick Coupler Replacement section for more information.
5. Remove the Valve Solenoid connector from the J7 location of the Main PCA.
6. Remove the Purge Valve Connector from the J8 location of the Main PCA (230V devices equipped with a Purge Valve Only).

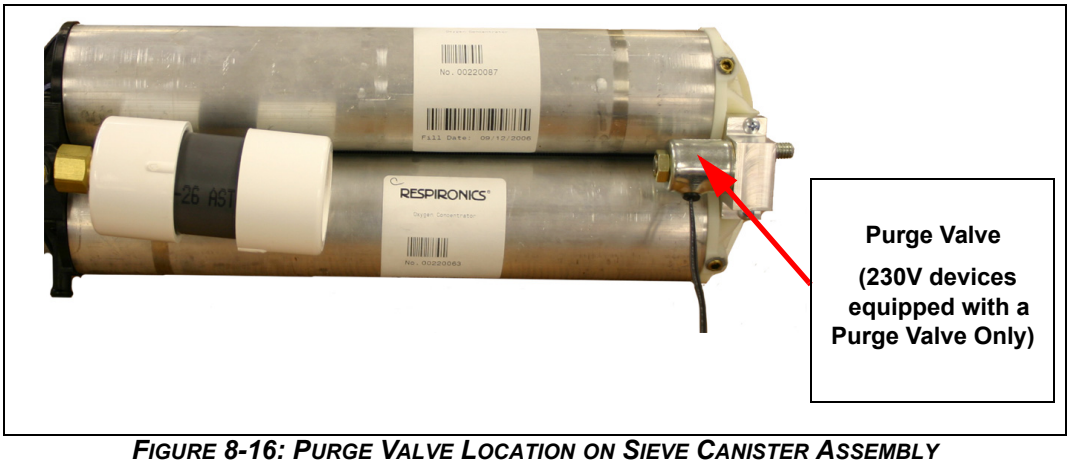


FIGURE 8-16: PURGE VALVE LOCATION ON SIEVE CANISTER ASSEMBLY

7. Disconnect the blue hose going from the Compressor to the Sieve Canister Assembly.
8. Lift the Sieve Canister Assembly up and out of the slots located in the Front Cabinet.

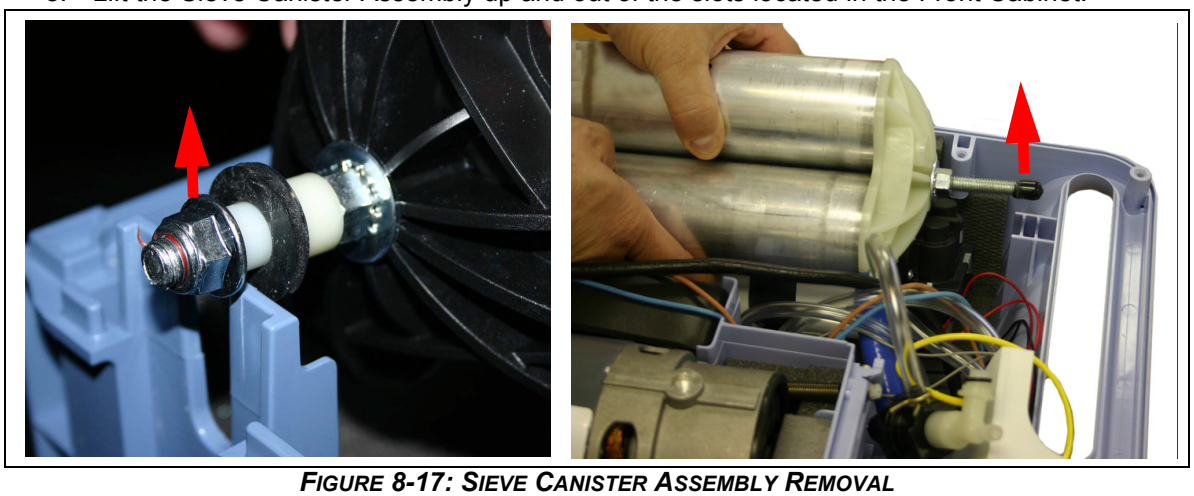


FIGURE 8-17: SIEVE CANISTER ASSEMBLY REMOVAL

9. Remove the Solenoid Valve Assembly from the Sieve Canister Assembly by removing the five phillips head screws.

To install the Sieve Assembly

1. Install the Solenoid Valve Assembly. Refer to the Valve Solenoid Replacement section for more information.
2. Side the Sieve Canister Assembly into the hole in the bottom of the Front Cabinet.

3. Place the top and bottom of the Sieve Canister Assembly into the guide slots in the Front Cabinet.

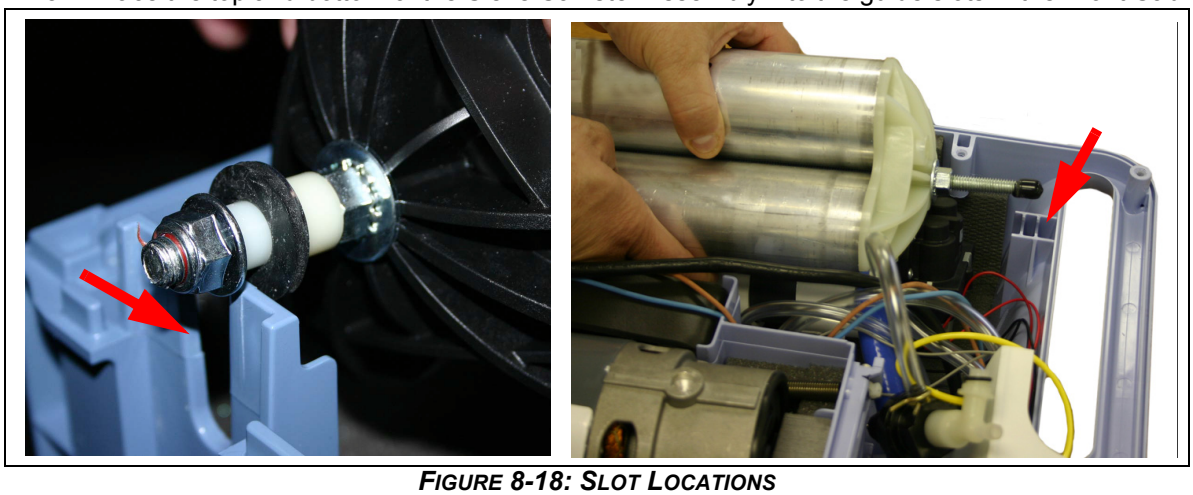


FIGURE 8-18: SLOT LOCATIONS

4. Connect the blue hose from the Compressor to the Sieve Canister Assembly.
5. Connect the Valve Solenoid connector to J7 of the Main PCA.
6. Connect the Purge Valve connector to J8 of the Main PCA (230V devices equipped with a Purge Valve Only).
7. Install the Pressure Regulator Assembly. Refer to the O2 Quick Coupler Replacement section for more information.
8. Install the Rear Cabinet. Refer to the Rear Cabinet/Power Cord Replacement section for more information.
9. Install the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.
10. Install the Filter Cover. Refer to the Filter Cover Replacement section for more information.
11. Install the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.

8.9 VALVE SOLENOID REPLACEMENT

NOTE

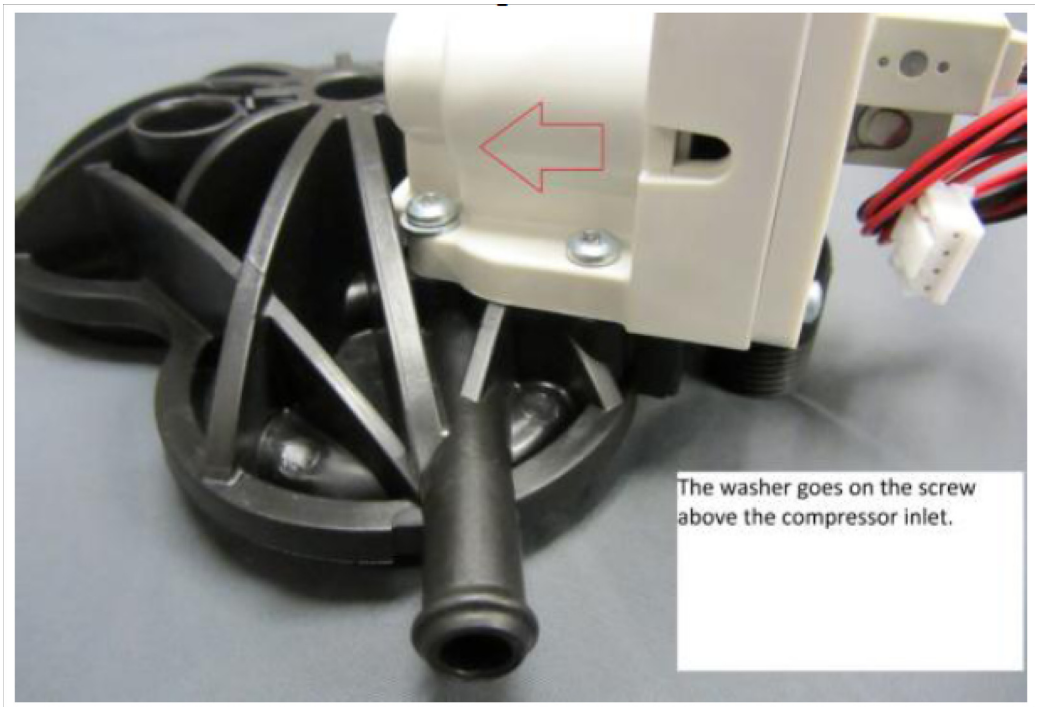
A new solenoid valve supplier, ASCO, has been added to the EverFlo Solenoid Valve Assembly Repair Kit. Also, the original supplier SMC, has released an updated version of their valve. This repair kit may be received with either an ASCO Valve or SMC Valve. These valves are now interchangeable in the manufacture and repair process.

To remove the Valve Solenoid Assembly

1. Remove the Filter Cover. Refer to the Filter Cover Replacement section for more information.
2. Remove the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.
3. Remove the Rear Cabinet. Refer to the Rear Cabinet/Power Cord Replacement section for more information.
4. Remove the Sieve Canister Assembly. Refer to the Sieve Canister Assembly Replacement section for more information.
5. Remove the five screws and washers securing the Valve Solenoid Assembly to the Sieve Canister Assembly.

To install the Valve Solenoid Assembly

1. Place the Valve Solenoid onto the top of the Sieve Canister in the proper location.
2. Place a washer under the one screw as outlined in the picture below.



3. Secure the Valve Solenoid Assembly to the Sieve Canister Assembly by securing the five screws to 8 in-lbs. using the torque sequence listed in Refer to Figure 8-19.

CAUTION

The washer is important so the screw in this location does not penetrate a channel in the valve.

4. Install the Sieve Canister Assembly. Refer to the Sieve Canister Assembly Replacement section for more information.
5. Install the Rear Cabinet. Refer to the Rear Cabinet/Power Cord Replacement section for more information.
6. Install the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.
7. Install the Filter Cover. Refer to the Filter Cover Replacement section for more information.

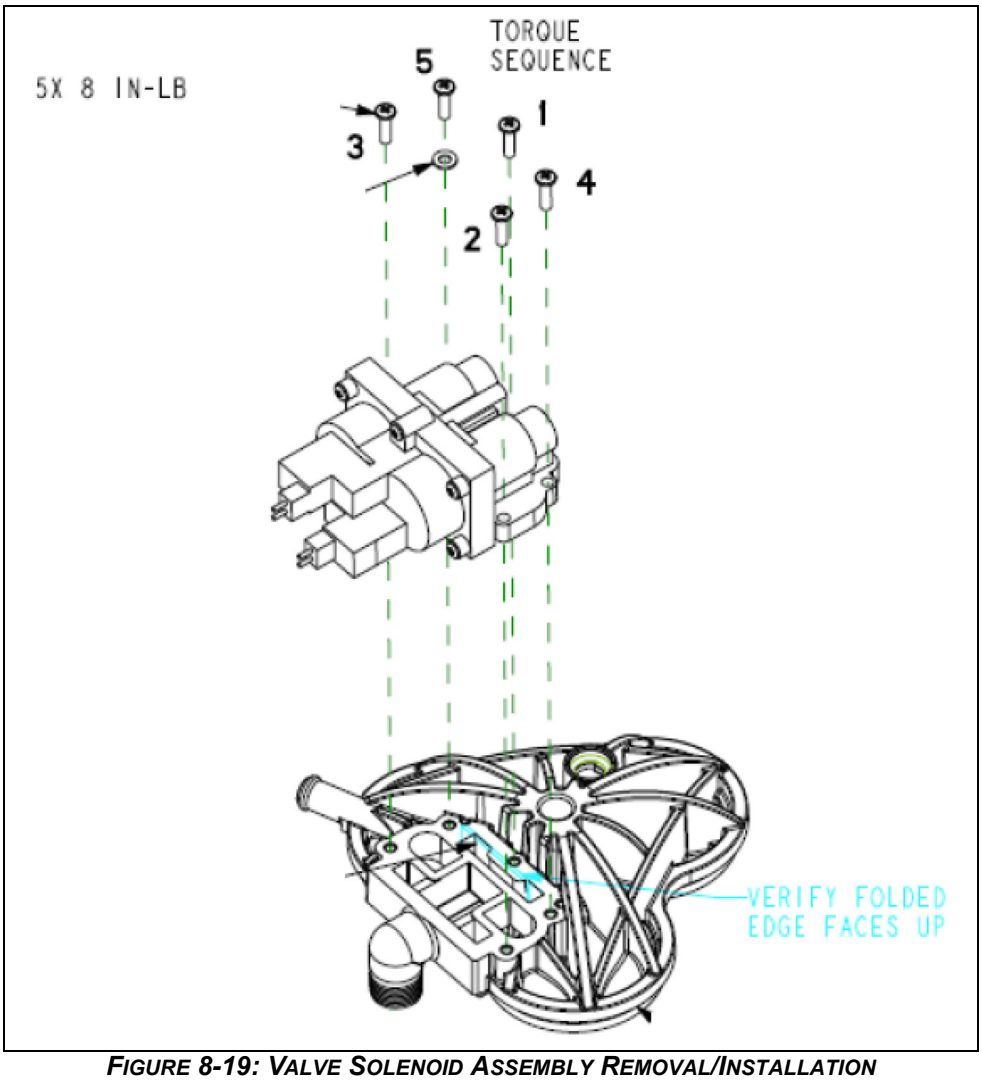


FIGURE 8-19: VALVE SOLENOID ASSEMBLY REMOVAL/INSTALLATION

8.10 COOLING FAN REPLACEMENT

To remove the Cooling Fan

1. Remove the Filter Cover. Refer to the Filter Cover Replacement section for more information.
2. Remove the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.
3. Remove the Rear Cabinet. Refer to the Rear Cabinet/Power Cord Replacement section for more information.
4. Unlock the Main PCA shield from the locking tab on the Front Cabinet.
5. Remove the Cooling Fan Connector from the J9 location of the Main PCA.
6. Remove the Cooling Fan Wire Clip.
7. Lift the Cooling Fan up and out of mounting.

To install the Cooling Fan

1. Place the Cooling Fan into the mounting location in the Front Cabinet.

WARNING
The ensure proper airflow, the concave side of the fan blade must face the compressor. Otherwise it may cause the concentrator to over heat.

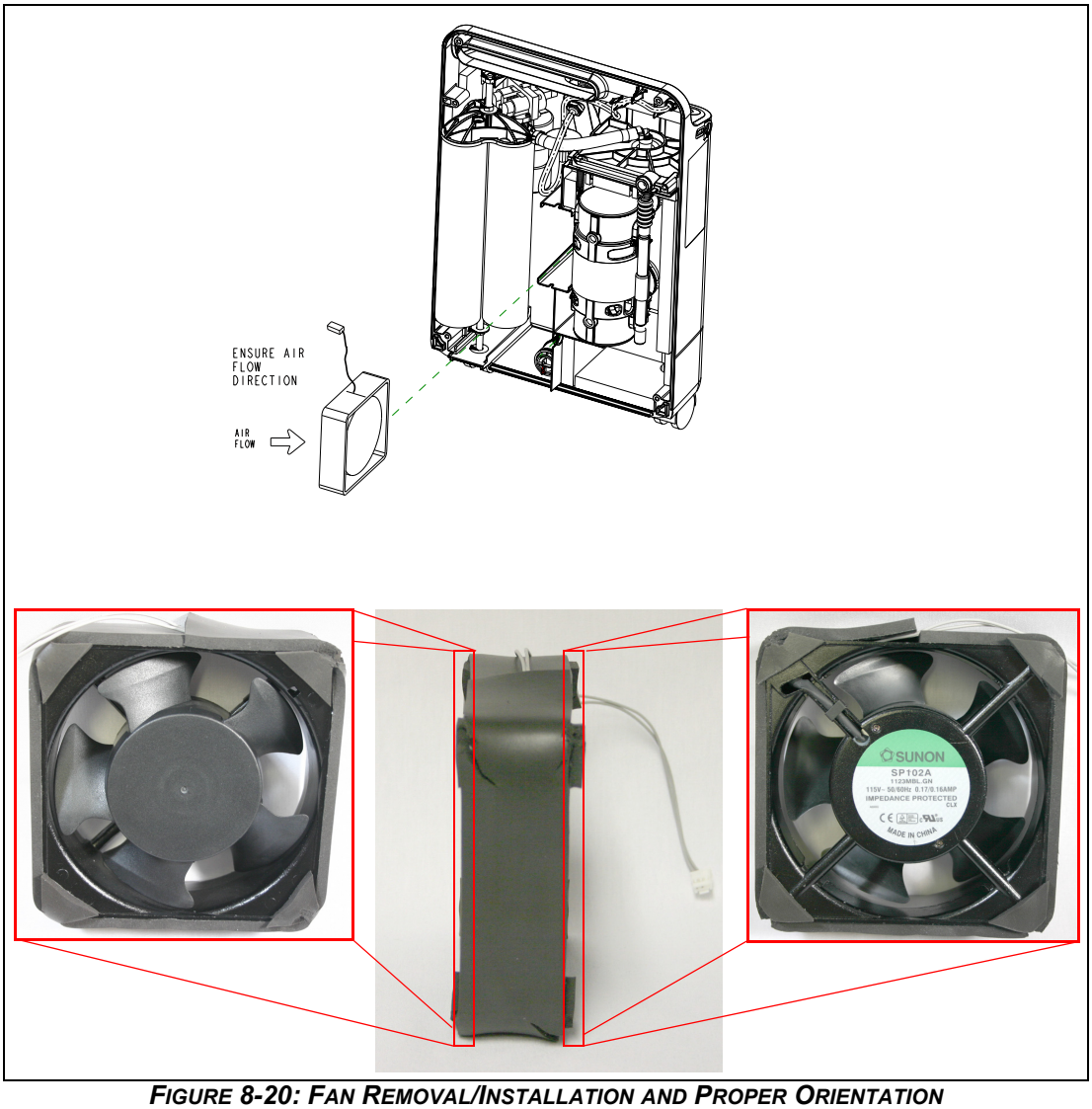


FIGURE 8-20: FAN REMOVAL/INSTALLATION AND PROPER ORIENTATION

2. Connect the Cooling Fan Connector to the J9 location of the Main PCA.
3. Secure the wires using the Cooling Fan wire clip.
4. Connect the Main PCA shield to the Front Cabinet locking tab.
5. Install the Rear Cabinet. Refer to the Rear Cabinet/Power Cord Replacement section for more information.
6. Install the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.
7. Install the Filter Cover. Refer to the Filter Cover Replacement section for more information.

8.11 CAPACITOR REPLACEMENT

To remove the Capacitor

CAUTION

DO NOT touch the capacitor terminals simultaneously until the capacitor has been completely discharged. Discharge the capacitor by shorting the two posts with an insulated screw driver.

1. Remove the Filter Cover. Refer to the Filter Cover Replacement section for more information.
2. Remove the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.
3. Remove the Rear Cabinet. Refer to the Rear Cabinet/Power Cord Replacement section for more information.
4. Remove the two wires connecting the Compressor to the Capacitor.
5. Cut the tie wrap securing the Capacitor to the Front Cabinet.
6. Remove the Capacitor from the unit.

To install the Capacitor

1. Place the Capacitor into the Front Cabinet.
2. Secure the Capacitor to the Front Cabinet with a tie wrap.
3. Connect the two black wires from the Compressor to the Capacitor.
4. Install the Rear Cabinet.
5. Install the Inlet Filter and Filter Cover.

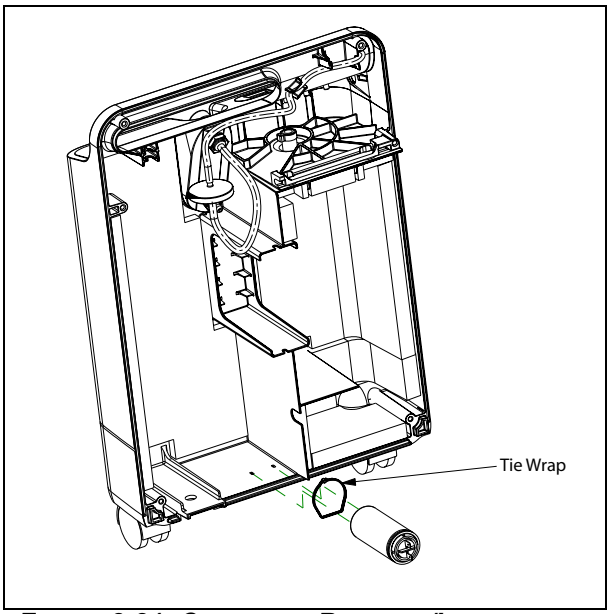


FIGURE 8-21: CAPACITOR REMOVAL/INSTALLATION

8.12 COMPRESSOR REPLACEMENT

To remove the Compressor

1. Remove the Filter Cover. Refer to the Filter Cover Replacement section for more information.
2. Remove the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.
3. Remove the Rear Cabinet. Refer to the Rear Cabinet/Power Cord Replacement section for more information.
4. Remove the Main PCA. Refer to the Main PCA Replacement section for more information.
5. Remove the blue hose running from the Compressor to the Sieve Canister Assembly.
6. Cut the two tie wraps holding the mounting rod in place.

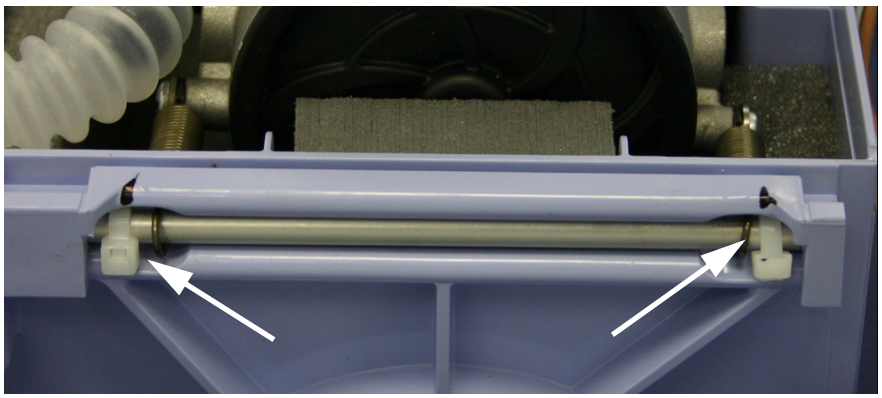


FIGURE 8-22: MOUNTING ROD TIE WRAPS

7. Remove the mounting rod securing the Compressor Springs to the Front Cabinet.

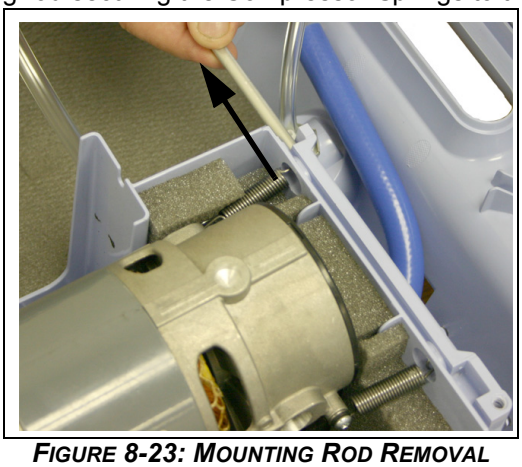


FIGURE 8-23: MOUNTING ROD REMOVAL

8. Disconnect the Compressor wires from the Capacitor.
9. Slightly lift the back of the compressor while threading the blue hose through the hole in the compressor mounting area in the Front Cabinet.

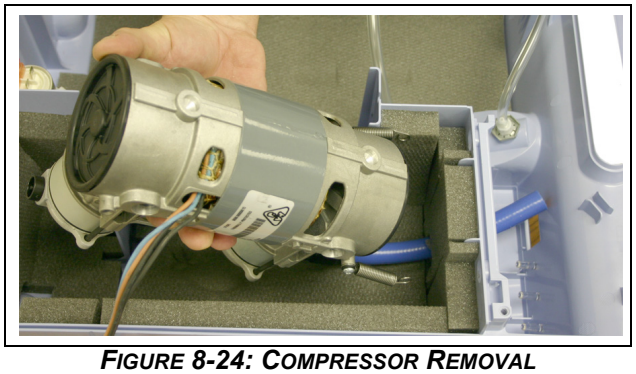


FIGURE 8-24: COMPRESSOR REMOVAL

10. Remove the Compressor from the Front Cabinet.

To install the Compressor

1. While routing the blue hose through the hole in the compressor mounting area, place the Compressor into the Front Cabinet.

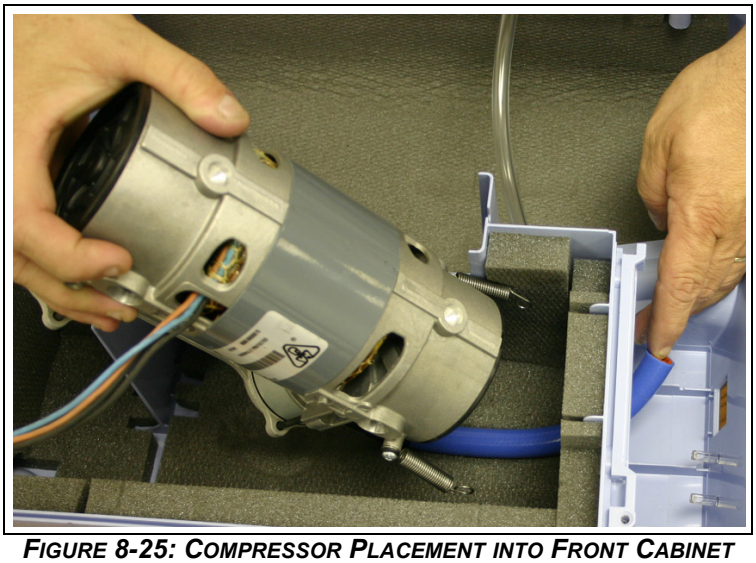


FIGURE 8-25: COMPRESSOR PLACEMENT INTO FRONT CABINET

2. Connect the blue hose to the Sieve Canister Assembly and secure it using a new one-eared clamp.
3. Connect the black Compressor wires to the Capacitor.
4. Place the Compressor springs in the grooves at the top of the Compressor Mounting area.
5. Lock the Compressor in place by sliding the mounting rod though the compressor springs and into place.
6. Install the Main PCA. Refer to the Main PCA Replacement section for more information.
7. Install the Rear Cabinet. Refer to the Rear Cabinet/Power Cord Replacement section for more information.
8. Install the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.
9. Install the Filter Cover. Refer to the Filter Cover Replacement section for more information.

8.13 Micro-Disk Filter & Tubing Replacement

To remove the Micro-Disk Filter & Tubing

1. Remove the Filter Cover. Refer to the Filter Cover Replacement section for more information.
2. Remove the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.
3. Remove the Rear Cabinet. Refer to the Rear Cabinet/Power Cord Replacement section for more information.
4. Remove the Flow Tubing from the DISS Outlet Fitting and the top connection of the Flow Meter.
5. Remove the Flow Tubing from the Micro-Disk Filter.
6. Remove the Pressure Tubing from the Pressure sensor located on the Main PCA (OPI Units Only).
7. Remove the other end of the Pressure Tubing from the bottom connection of the Flow Meter and from the Pressure Regulator (OPI Units Only).

To install the Micro-Disk Filter & Tubing

1. Connect the Pressure Tubing to the Pressure Sensor located on the Main PCA (OPI Units Only).
2. Connect the Other ends of the Pressure Tubing to the Pressure Regulator and bottom connection on the Flow Meter. Refer to Refer to Figure 8-26..

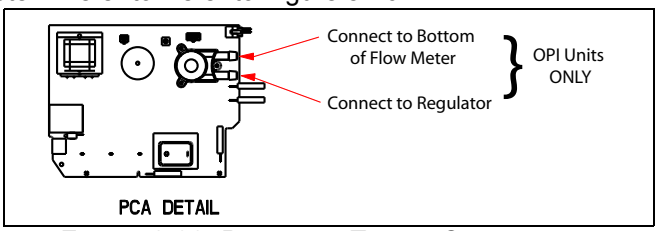


Figure 8-26: Pressure Tubing Connections

3. Connect the Flow Tubing as shown in Refer to Figure 8-27..

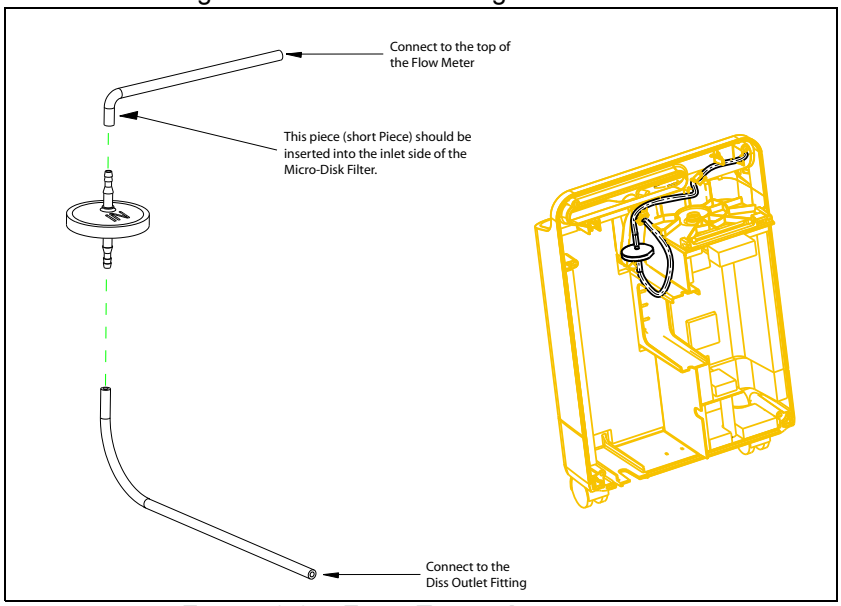


Figure 8-27: Flow Tubing Installation

4. Install the Rear Cabinet. Refer to the Rear Cabinet/Power Cord Replacement section for more information.
5. Install the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.

6. Install the Filter Cover. Refer to the Filter Cover Replacement section for more information.

8.14 Flow Meter Replacement

NOTE

This procedure is acceptable for use when installing a Pediatric Flow Meter.

To remove the Flow Meter

1. Remove the Filter Cover. Refer to the Filter Cover Replacement section for more information.
2. Remove the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.
3. Remove the Rear Cabinet. Refer to the Rear Cabinet/Power Cord Replacement section for more information.
4. Remove the Tubing Connected to the Flow Meter.
5. Using pliers, loosen the two speed nuts from the threaded fitting on the back of the Flow Meter.
6. Remove the Flow Meter from the Front Cabinet.

To install the Flow Meter

1. Align the threaded fittings on the back of the supplied Flow Meter with the holds in the Front Cabinet.

NOTE

The Flow Meter must be mounted with the shaft for the Flow Meter knob at the top.

2. While holding the Flow Meter in place, secure the Flow Meter to the Front Cabinet by hand tightening the two speed nuts.
3. Connect the pressure tubing to the fittings on the Flow Meter.

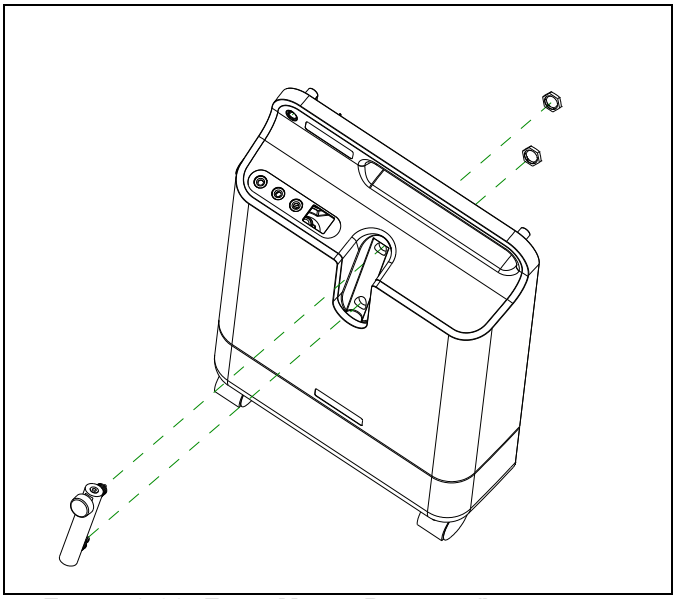


Figure 8-28: Flow Meter Removal/Installation

8.15 FRONT CABINET REPLACEMENT

To remove the Front Cabinet

1. Remove the Filter Cover. Refer to the Filter Cover Replacement section for more information.
2. Remove the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.
3. Remove the Rear Cabinet/Power Cord. Refer to the Rear Cabinet/Power Cord Replacement section for more information.
4. Remove the Main PCA. Refer to the Main PCA Replacement section for more information.
5. Remove the Sieve Canister Assembly. Refer to the Sieve Canister Assembly Replacement section for more information.
6. Remove the Cooling Fan. Refer to the Cooling Fan Replacement section for more information.
7. Remove the Capacitor. Refer to the Capacitor Replacement section for more information.
8. Remove the Compressor Assembly. Refer to the Compressor Replacement section for more information.
9. Remove the Micro-Disk Filter and Tubing. Refer to the Micro-Disk Filter & Tubing Replacement section for more information.
10. Remove the Flow Meter. Refer to the Flow Meter Replacement section for more information.

To install the Front Cabinet

1. Choose the correct EverFlo Label and place it in the appropriate spot on the front cabinet.

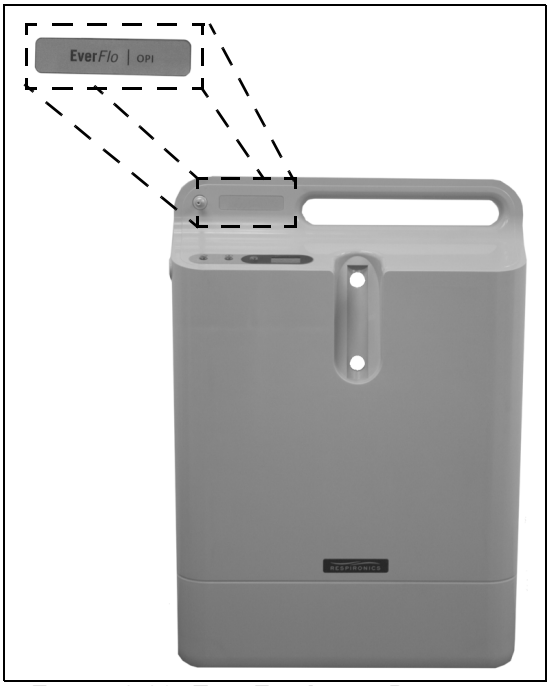


FIGURE 8-29: EVERFLO LABEL PLACEMENT

2. Print out two labels. One must include the serial label of the device and one must contain the model number of the device.

IMPORTANT

The labels MUST be type written. Handwritten text is unacceptable.

NOTE

The following specifications are required for the new Serial and Model number labels.

- *Label Size: 1/2" x 1 3/4" (Maximum Size)*
- *Font Size: 10 Point (Minimum)*

NOTE

The new Serial and Model Number Labels must include the same serial and model number as those of which are on the original label.

3. Place the two labels onto the Front cabinet and align with the clear section of the new Serial/Warning label included in the front cabinet repair kit. Refer to Refer to Figure 8-30.
4. Place the Serial/Warning label over the generic labels and onto the Front Cabinet in the proper location. Refer to Refer to Figure 8-30.

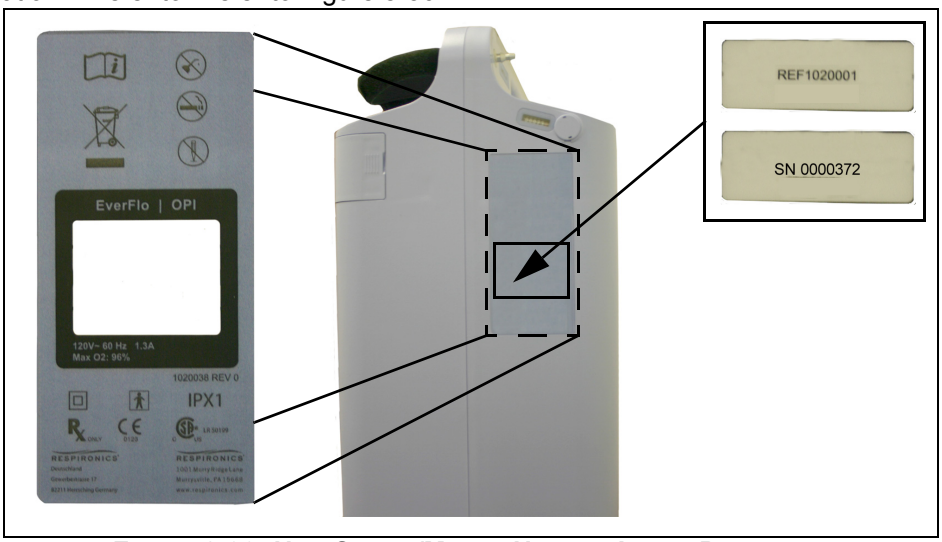


FIGURE 8-30: NEW SERIAL/MODEL NUMBER LABEL PLACEMENT

5. Install the Flow Meter. Refer to the Flow Meter Replacement section for more information.
6. Install the Micro-Disk Filter and Tubing. Refer to the Micro-Disk Filter & Tubing Replacement section for more information.
7. Install the Compressor Assembly. Refer to the Compressor Replacement section for more information.

8. Install the Capacitor. Refer to the Capacitor Replacement section for more information.
9. Install the Cooling Fan. Refer to the Cooling Fan Replacement section for more information.
10. Install the Sieve Canister Assembly. Refer to the Sieve Canister Assembly Replacement section for more information.
11. Install the Main PCA. Refer to the Main PCA Replacement section for more information.
12. Install the Rear Cabinet/Power Cord. Refer to the Rear Cabinet/Power Cord Replacement section for more information.
13. Install the Inlet Filter. Refer to the Inlet Filter Replacement section for more information.
14. Install the Filter Cover. Refer to the Filter Cover Replacement section for more information.

8.16 EverFlo to EverFlo UltraFill Compatible Upgrade Procedures

NOTE

When upgrading an EverFlo or EverFlo Q device to an EverFlo/EverFlo Q UltraFill compatible device, a purity rate of 90% or greater must be established by the device.

For customers who would like to complete the computer based training detailing the upgrade procedures, call customer service and place and order for Training-362. Once the order is entered by Customer Service, your login and password will be emailed to you within 24 business hours. This training is offered free of charge.

8.16.1 Repair Kits Required

- EverFlo T Upgrade Kit – Respironics Part Number 1067340
  Kit Contains: Transfill Regulator Manifold, Pressure Regulator, O-ring, Necessary Tubing and Tie Wraps, Sieve Canister Assembly, O2Quick Coupler, Repair Warning Label, Manual Addendum
- Oxygen Interface Hardware Kit – Respironics Part Number 1073499
  Kit Contains: The kit contains the necessary communication box and cables to connect the Ever-Flo device to the PC in order to update the firmware on the Main PCA.

8.16.2 Tools Required for Upgrade

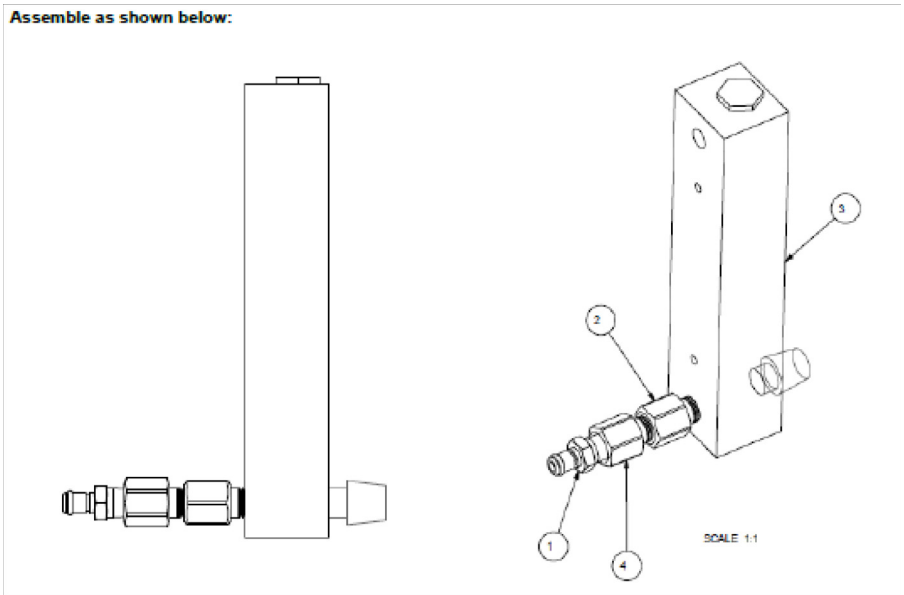
- Philips Head Screwdriver
- 5/16” Hex Head Nut Driver
- D Punch Tool (Greenlee P/N 60077 or equivalent)
- 5/8” box wrench
- 8 in.-lbs Torque Driver
- Needle nose pliers
- Drill and 11/32” bit
- Crimping clamp tool (Respironics p/n H645 (Included in H647 Tool Kit))
- Channel Lock grooved pliers

8.16.3 Additional Supplies Required

- Generic Labels with the following specification
  - Label Size: 1/2” x 1 3/4” (Maximum Size)
  - Ability to print Font Size: 10 Point (Minimum)
- Label Printer

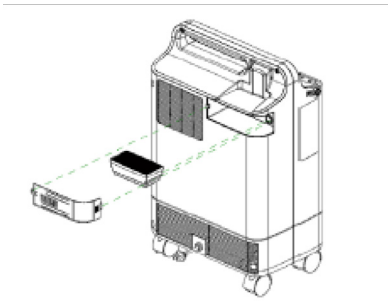
8.16.4 Test Equipment Required for Upgrade

- 1/8” NPT Coupling Insert – Colder P/N MC2402 (or equivalent)
- Brass 1/8” NPT Male to Female Adapter – McMaster-Carr P/N 9171K610 (or equivalent)
- Flowmeter – Dwyer P/N VFB-67-SSV (or equivalent)
- Orifice - .038” – McMaster-Carr P/N 2712T482 (or equivalent)

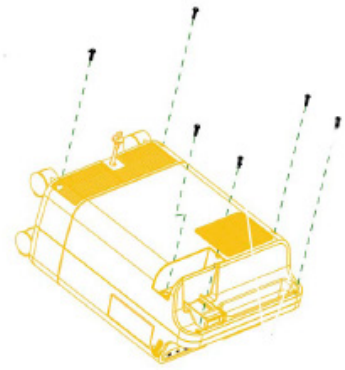


8.16.5 PROCEDURE

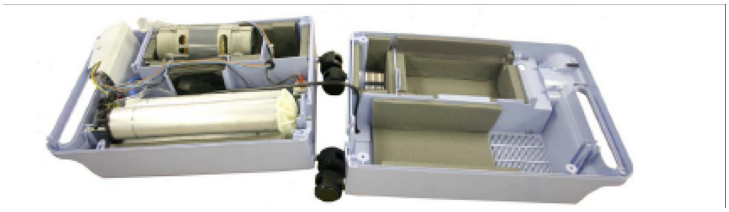
1. Ensure the device is unplugged.
2. Remove the Long Life Filter Cover and the Long Life Filter as shown below.



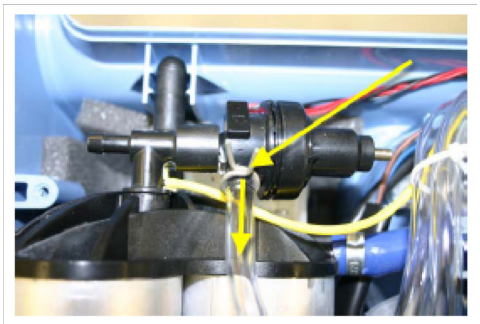
3. Remove the (4) 5/16” Hex screws and (2) Phillips head screws as shown below.



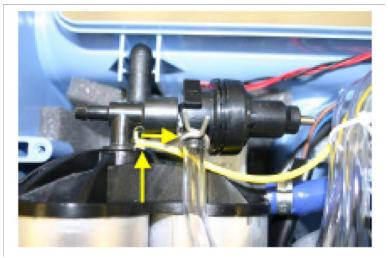
4. Remove the Rear Cabinet from the front cabinet as shown below.



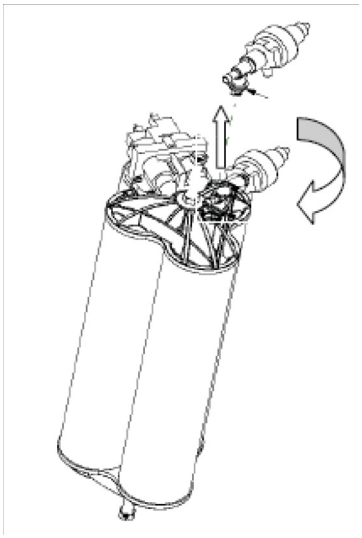
5. Remove the Pressure Regulator outlet tubing by decompressing and sliding the locking spring backwards on the tubing as shown below.



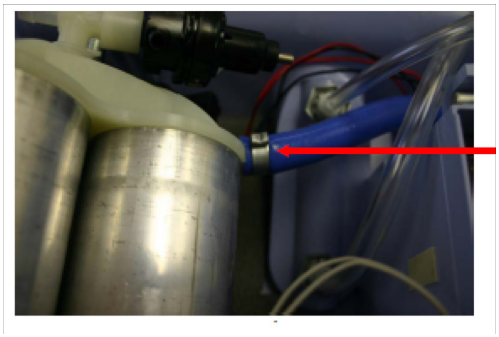
6. Remove the yellow tube from the Pressure Regulator as shown below.



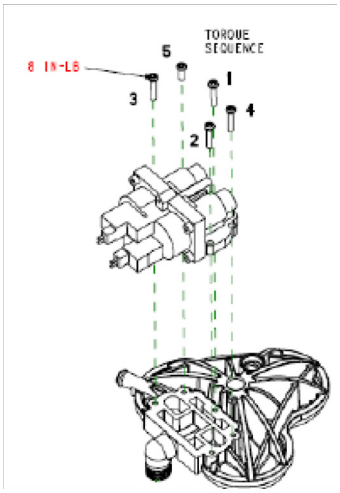
7. Remove the Pressure Regulator Assembly from the Sieve Assembly by rotating the Regulator Assembly “up” and pulling away from the Sieve Assembly as shown below.



8. Remove the Sieve valve power harness from the Main PCA by disconnecting J7 from the Main PCA.
9. Remove the one eared clamp from the Compressor outlet tube nearest to the sieve compressed air inlet.

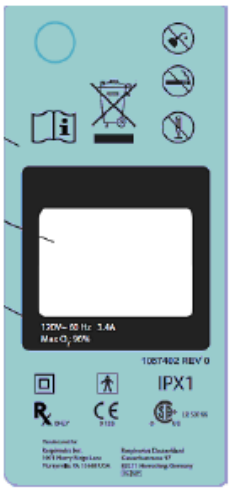


10. Remove the Sieve Canister Assembly from the Front Cabinet.
11. Remove the Sieve Valves from the Sieve Canister Assembly by removing the five phillips screws securing the Valve Solenoid Assembly to the Sieve Canister Assembly.
12. Install the Sieve Valves onto the EverFlo upgraded for use with UltraFill Sieve Canister Assembly by securing the five philips screws to 8 in-lbs. using the torque sequence listed below.

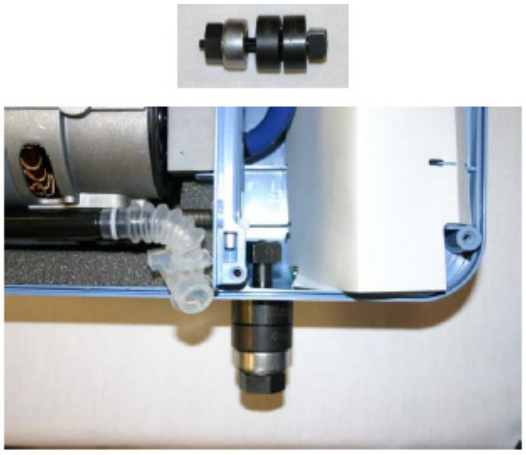


13. Install the EverFlo upgraded for use with UltraFill Pressure Regulator to the top of the Sieve Assembly.
14. Install the section of tubing to the Pressure Regulator Adapter and route behind the Sieve Canister Assembly as shown below.

15. Place the EverFlo upgraded for use with UltraFill Label over the existing label (Do Not Remove the Protective Cover on the Back of the Label). Mark the inner diameter of the hole using a marker.



16. Drill an 11/32” hole through the cabinet at the marked location. Clean all debris left from drilling the Cabinet.
17. Using the D-Shaped Hole Punch (Greenlee P/N 60077 or equivalent), punch the hole in the side of the front cabinet as shown below.



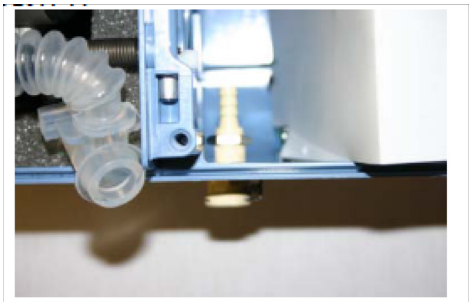
18. Remove the existing label from the newly drilled and punched front cabinet and discard.
19. Print out two labels. One must include the serial label of the device and one must contain the model number of the device. The model number printed on the new label should be the same as the old model number but with a T prefix. For example, if upgrading a model 1020001 device the new label should have T1020001 listed on the generic model number label.

IMPORTANT NOTE

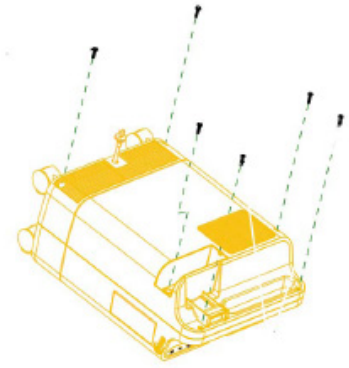
The labels MUST be type written. Handwritten text is unacceptable.

The following specifications are required for the new Serial and Model number labels.
- *Label Size: 1/2” x 1 3/4” (Maximum Size)*
- *Font Size: 10 Point (Minimum)*

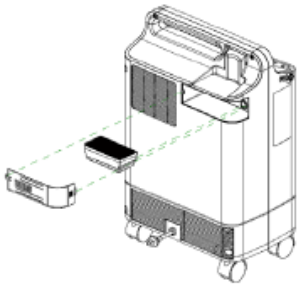
20. Place the two labels onto the Front cabinet and align with the clear section of the new Serial/Warning label.
21. Remove the protective backing from the EverFlo upgraded for use with UltraFill label and place the Serial/Warning label over the generic labels and onto the Front Cabinet in the proper location.
22. Insert the O2 Quick Coupler into the hole in the side of the cabinet.



23. Thread the locking nut to the O2 Quick Coupler and tighten.
24. Attach the tube from the Pressure Regulator and secure with the supplied cable tie.
25. Replace the rear cover securing the (4) 5/16” Hex screws and (2) Phillips head screws as shown below.

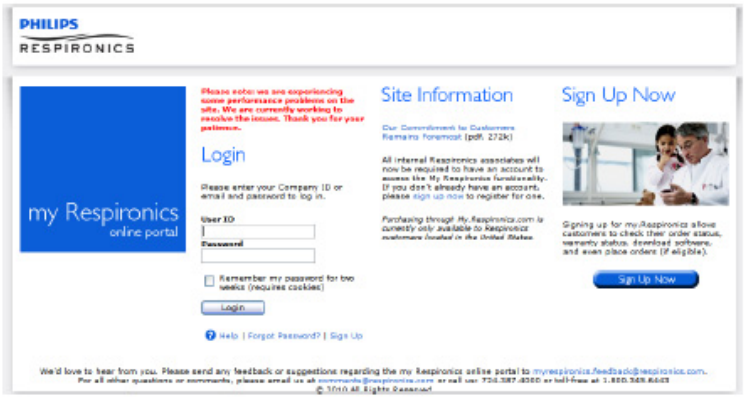


26. Replace the Long Life Filter and Filter Cover as shown below.

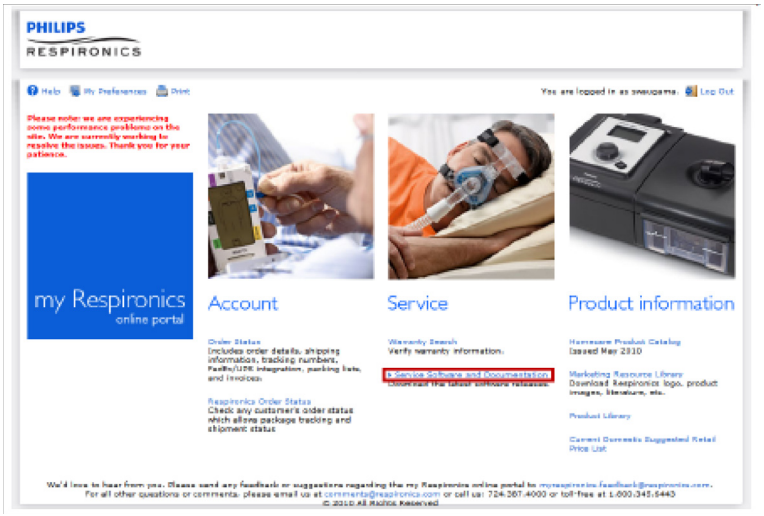


27. Proceed to my.respironics.com.

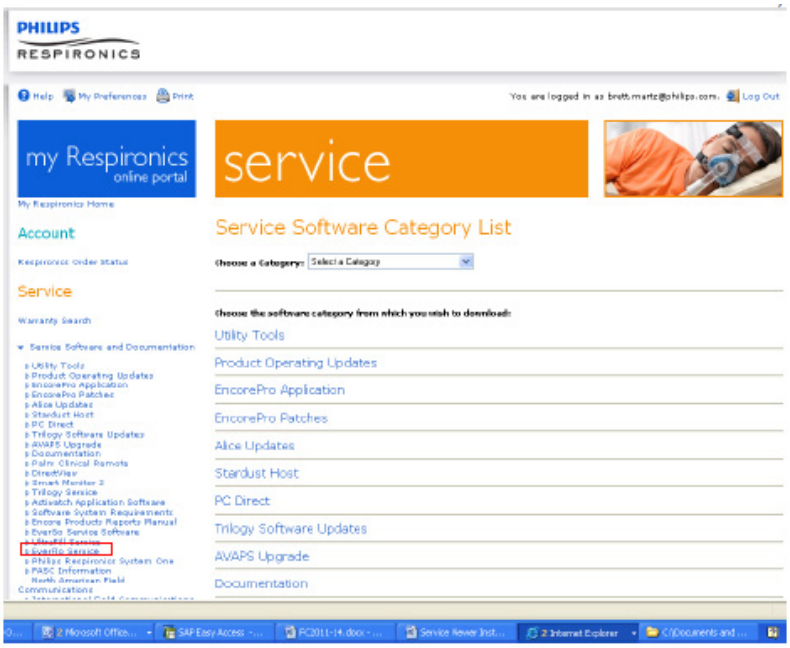
28. Log into your account. If you do not have an account, press the Sign Up Now Button and register.



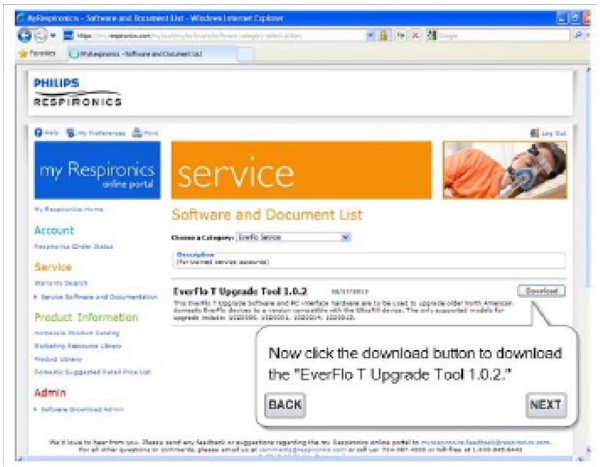
29. Once you have logged in, select Service Software and Documentation.



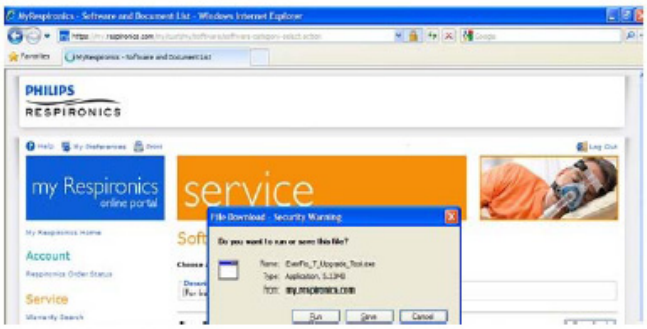
30. Now you have to choose the EverFlo Service category. You can choose the link from the drop-down menu above, from the list in the center of the page, or the list on the left-hand navigation menu.



31. Now click the Download Button to download the “EverFlo T Upgrade Tool 1.0.2”.



32. After downloading the software you should save it to your computer. Click the Save button.



33. When you launch the EverFlo T Upgrade Tool installation, you simply follow the instructions that the software offers. From the first screen click next and follow the on screen prompts.
34. You will need to restart your system for the software to function properly. Click “Restart” to restart your system.
35. Once the PC restarts, open the EverFlo Upgrade Tool.
36. Connect the COM Box (Respironics Part Number 1073499 to the PC and to the EverGo DIN Connector located next to the hour meter on the side of the device.

37. Run the software to install the correct firmware into the device. Once complete disconnect the COM Box from the EverFlo Device and proceed to the testing section of the service manual.

CHAPTER 9: REPAIR KITS

9.0 CHAPTER OVERVIEW

This chapter illustrates the names and components for each of the repair kits for the EverFlo Oxygen Concentrator.

For technical assistance or replacement part ordering information, contact Respironics Product Support.

USA and Canada

Phone: 1-800-345-6443
Fax: 1-800-866-0245
Email: service@respironics.com

International

Phone: 1-724-387-4000
Fax: 1-800-387-5012

Visit Respironics Home Page on the World Wide Web at:

www.respironics.com

9.1 REPAIR KIT REFERENCE TABLE

NOTE

For kits with multiple part number listings, refer to the individual page to ensure proper ordering.

PART NUMBER(S)	REPAIR KIT NAME	PAGE IDENTIFIER
1038834 / 1038835 / 1050251	*Capacitor Assembly Kits*	*9-20*
H649 / H624 / 1026632	*Caster Kits*	*9-15*
1038822 / 1038823	*Compressor Assembly Kits*	*9-7*
1050773	*DIN Outlet Cover Kit*	*9-28*
1051037	*EverFlo Mill Branding Label*	*9-28*
1053746 / 1056622	*EverFlo Overlay Kits*	*9-29*
1058169	*EverFlo Purge Valve Kit*	*N/A*
1038833	*EverFlo w/ OPI Tubing Kit*	*9-18*
1038832	*EverFlo w/o OPI Tubing Kit*	*9-19*
1038836 / 1038837 / 1056621	*Fan Assembly Kits*	*9-21*
1038839	*Filter Cover Kit*	*9-22*
1051038	*Fire Warning Label*	*9-29*
1082784 / H644 / 528	*Flow Meter Kits*	*9-14*
1038809 / 1039576 / 1050254	*Front Cabinet Assembly Kits*	*9-24*
1038830	*Front Cabinet Outlet Kit*	*9-16*
1038841	*Hardware Kit*	*N/A*
1039642	*Humidifier Connector Tube Kit*	*9-23*
1038840	*Humidifier Strap Kit*	*9-26*
1038820	*Inlet Boot Kit*	*9-6*
1038831	*Inlet Filter Kit*	*9-17*
1038789 / 1038790	*Main PCA Fuse Kits*	*9-5*
1038843	*Main PCA Shield Kit*	*N/A*
1038815 / 1038816 / 1038817 / 1050245 / 1050246 / 1052381 / 1052380 / 1067341 / 1082414	*Main PCA w/ OPI Kits*	*9-3*
1038774 / 1051835 / 1060160 / 1060161 / 1067342	*Main PCA w/o OPI Kits*	*9-3*
520	*Micro-disk Filter Kit*	*9-16*
1081743	*O2 Quick Coupler Kit*	*9-29*
1038842	*Packaging Kit*	*N/A*
1038828 / 1038829 / 1039144 / 1039235 / 1039236 / 1039237 / 1039238 / 1039239 / 1050249 / 1050250 / 1056620	*Power Cord Assembly Kits*	*9-13*
365-0001-00	*Pressure Regulator*	*9-9*
1038838	*Pressure Regulator Adaptor Kit*	*9-10*
1038824 / 1075139	*Pressure Regulator Assembly Kit*	*9-8*
1038810 / 1039577 / 1050253 / 1050252	*Rear Cabinet Assembly Kits*	*9-25*
1038825 / 1038826 / 1050248 / 1052382	*Sieve Canister Assembly Kits*	*9-11*
1038827	*Solenoid Assembly Kit*	*9-12*
1052355	*Spring Kit*	*N/A*
1048534	*Whisper Cap Kits*	*9-27*

9.2 MAIN PCA REPAIR KITS

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1038774	*1020000, 1020003, 1020003BR*	*Main PCA Assembly (120V) Power Switch Foam*
1038815	*1020001, 1020002, 1020002BR*	*Main PCA Assembly w/OPI (120V) Power Switch Foam*
1038816	*1020004 Below Serial Number 0001939 1020007 Below Serial Number 0008250 1020008 Below Serial Number 0004053*	*Main PCA Assembly w/ OPI (230V) Low Power Power Switch Foam*
1060160	*1020005 Below Serial Number 0001457*	*Main PCA Assembly (230V) Power Switch Foam*
1038817	*1020006 (outside of serial numbers identified in PN 1052380) 1020009 Below Serial Number 0002515 1020010 Below Serial Number 0006596 1020011 Below Serial Number 0002456 1020012 Below Serial Number 0002864 1020016 Below Serial Number 0001286 1020017 Below Serial Number 0002735*	*Main PCA Assembly w/OPI (230V) Power Switch Foam*
1050245	*1020013*	*Main PCA Assembly w/OPI (230V) Power Switch Foam*
1050246	*1020014*	*Main PCA Assembly w/OPI (120V) Power Switch Foam*
1051835	*1020015*	*Main PCA Assembly (120V) Power Switch Foam*
1052381	*1020004 Above Serial Number 0001938 1020007 Above Serial Number 0008249 1020008 Above Serial Number 0004052*	*Main PCA Assembly w/ OPI (230V) Low Power Power Switch Foam*
1060161	*1020005 Above Serial Number 0001456*	*Main PCA Assembly (230V) Power Switch Foam*

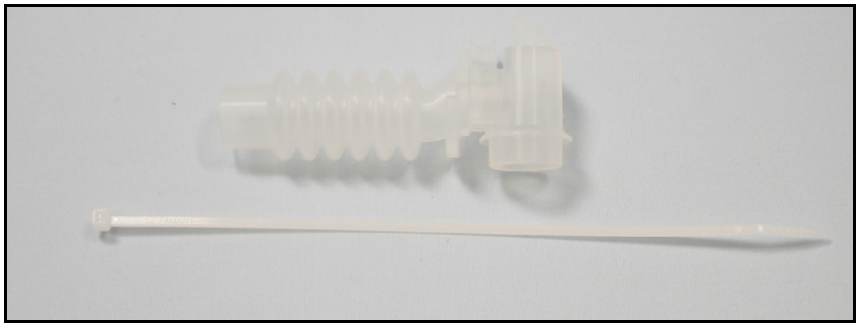
1052380	*1020006 with one of the following serial numbers 15114, 15115, 16032, 16872-16891, 17321-17351, 17353-17359, 17362-17370, 17372, 17374-17380, 17382-17390, 17392-17398, 17400-17402, 17404-17405, 17407-17410, 17412, 17414-17417, 17419-17420, 17423-17435, 17437-17442, 18788-18805, 18807-18813, 18815, 18817-18828, 18830, 18832-18834, 18836, 18837, 18843-18851, 18853, 18855, 18856, 18861, 18862, 18867-18871, 18874, 18875, 18877, 18881, 18882, 18884-18886, 18890, 18892-18898, 18900, 18902, 18906, 18911, 18913, 18916, 18917, 18919, 18921, 18928, 18930, 18932, 18933, 18937-18939, 18942, 18944, 18946-18977, 18979-18981, 18983-18987, 18989, 18990, 18992-19007, 26134-26163, 26900-26999, Any Serial Number Above 0027082* *1020009 Above Serial Number 0002514* *1020010 Above Serial Number 0006595* *1020011 Above Serial Number 0002455* *1020012 Above Serial Number 0002863* *1020016 Above Serial Number 0001285* *1020017 Above Serial Number 0002734*	*Main PCA Assembly w/OPI (230V)* *Power Switch Foam*
1067341	*1039363, 1039364*	*Main PCA Assembly w/OPI (120V)* *Power Switch Foam*
1067342	*1039362, 1039365*	*Main PCA Assembly (120V)* *Power Switch Foam*
1082414	*1039366, 1039368, 1039370*	*Main PCA Assembly w/OPI (230V)* *Power Switch Foam*

9.3 MAIN PCA FUSE KITS

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1038789	*1020000, 1020001, 1020002, 1020002BR, 1020003, 1020003BR, 1020014, 1020015, 1039362, 1039363, 1039364, 1039365*	*7A Main PCA Fuse (120V)*
1038790	*1020004, 1020005, 1020006, 1020007, 1020008, 1020009, 1020010, 1020011, 1020012, 1020013, 1020016, 1020017*	*3.15A Main PCA Fuse (230V)*

9.4 INLET BOOT KIT

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1038820	*All EverFlo Concentrators*	*Inlet Boot* *Tie Wrap (x1)*

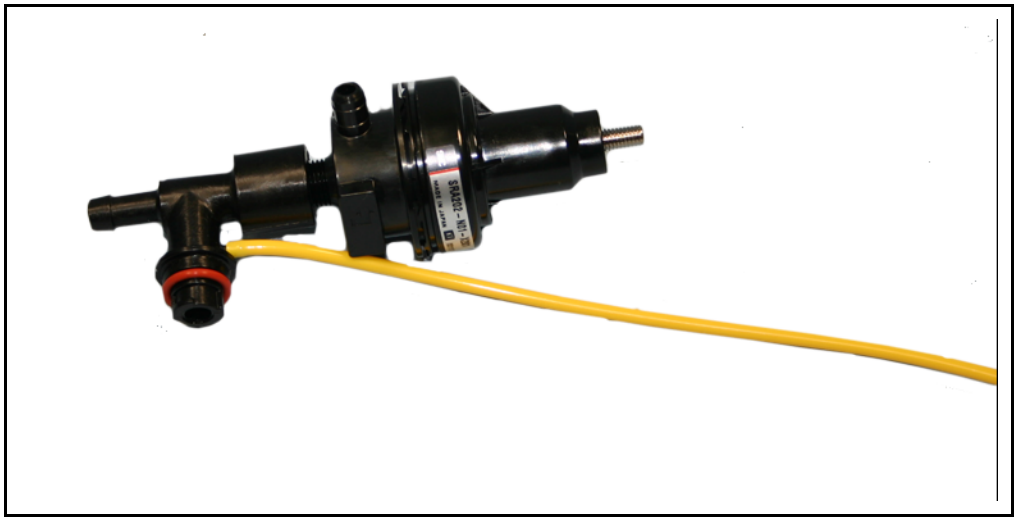


9.5 COMPRESSOR ASSEMBLY KITS

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1038822	*1020000, 1020001, 1020002, 1020002BR, 1020003, 1020003BR, 1020014, 1020015, 1039362, 1039363, 1039364, 1039365*	*Compressor Assembly (120V)* *One-eared Clamp* *Grommet* *Tie Wrap (x1)*
1038823	*1020004, 1020005, 1020006, 1020007, 1020008, 1020009, 1020010, 1020011, 1020012, 1020013, 1020016, 1020017*	*Compressor Assembly (230V)* *One-eared Clamp* *Grommet* *Tie Wrap (x1)*

9.6 PRESSURE REGULATOR ASSEMBLY KIT

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1038824	*1020000 - 1020019*	*Pressure Regulator Assembly* *Yellow Pressure Sensor Hose*
1075139	*1039362, 1039363, 1039364, 1039365*	*Pressure Regulator Assembly* *Yellow Pressure Sensor Hose* *High Pressure Line*

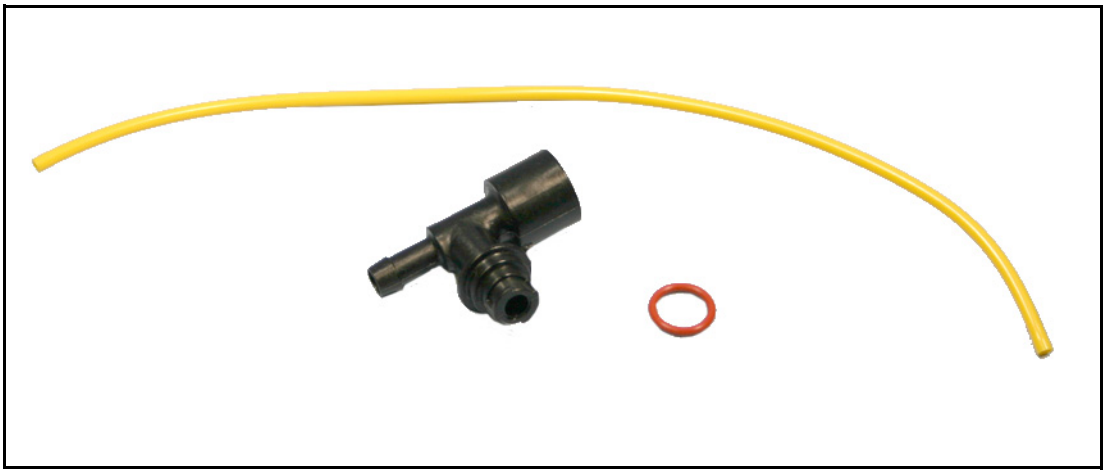


9.7 PRESSURE REGULATOR KIT

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
365-0001-00	*All EverFlo Concentrators*	*Pressure Regulator*

9.8 Pressure Regulator Adaptor Kit

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1038838	*1020000 - 1020019*	*Pressure Regulator Adaptor* *O-ring (x1)* *Yellow Pressure Sensor Hose*
xxxxxxx	*All EverFlo T Concentrators*	*Pressure Regulator Adaptor* *O-ring (x1)* *Yellow Pressure Sensor Hose* *High Pressure Line*

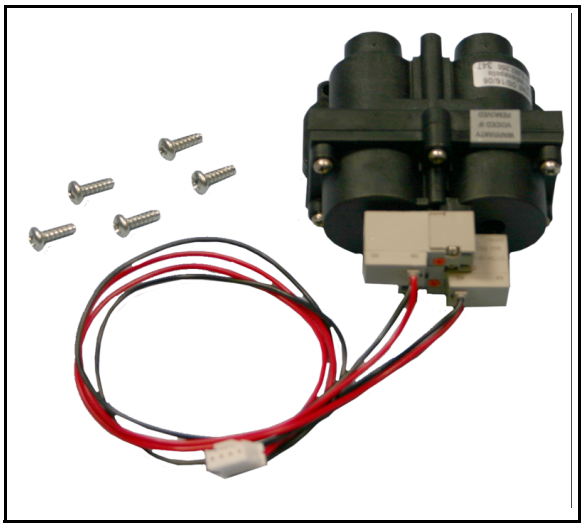


9.9 SIEVE CANISTER ASSEMBLY KITS

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1038825	*1020000, 1020001, 1020002, 1020002BR, 1020003BR, 1020003*	*Sieve Canister Assembly (120V)* *Locking Nut (x1)* *One-eared Clamp (x1)* *Tie wraps (x2)*
1050248	*1020004 Serial Number Above 0001938* *1020005 Serial Number Above0001456* *1020013, 1020014, 1020015*	*EverFlo Q Non-Purge Valve Sieve Canister Assembly* *Locking Nut (x1)* *One-eared Clamp (x1)* *Tie wraps (x2)*
1052382	*1020004 Serial Number Below 0001939* *1020005 Serial Number Below0001457* *1020006, 1020007, 1020008, 1020009, 1020010, 1020011, 1020012, 1020016, 1020017*	*Sieve Canister Assembly (230V) w/o Purge Valve* *Locking Nut (x1)* *One-eared Clamp (x1)* *Tie wraps (x2)*
1067339	*1039362, 1039363, 1039364, 1039365*	*Sieve Canister Assembly (120V)* *Locking Nut (x1)* *One-eared Clamp (x1)* *Tie wraps (x2)*

9.10 SOLENOID ASSEMBLY KITS

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1038827	*All EverFlo Concentrators*	*Solenoid Assembly* *Screws (x5)*



NOTE

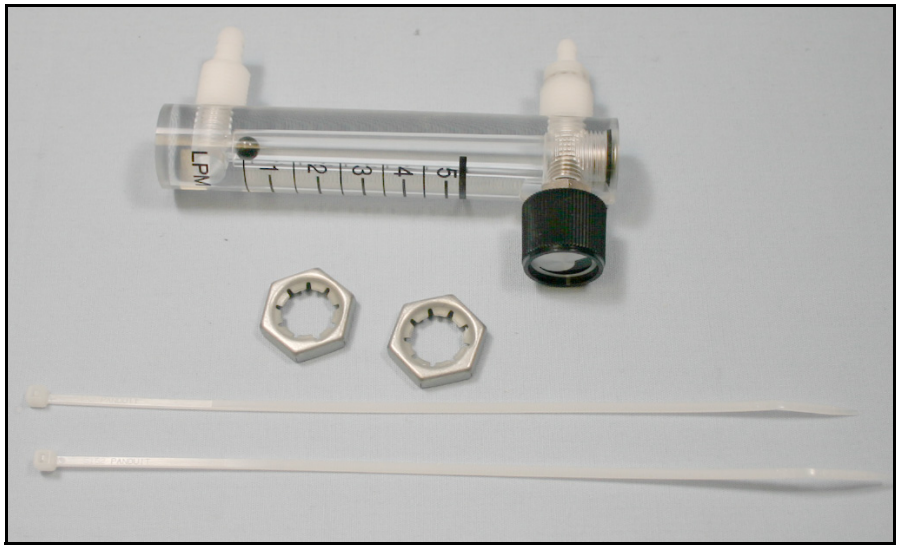
A new solenoid valve supplier, ASCO, has been added to the EverFlo Solenoid Valve Assembly Repair Kit. Also, the original supplier SMC, has released an updated version of their valve. This repair kit may be received with either an ASCO Valve or SMC Valve. These valves are now interchangeable in the manufacture and repair process.

9.11 POWER CORD ASSEMBLY KITS

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1038828	*1020000, 1020001, 1020014, 1020015, 1039362, 1039363, 1039364, 1039365*	Power Cord Strain Relief Tie Wrap (x2)
1038829	*1020002, 1020003*	
1074307	*1020002BR, 1020003BR*	
1039144	*1020004, 1020005*	
1039235	*1020006, 1020007*	
1039236	*1020008, 1020016*	
1039237	*1020009*	
1039238	*1020010*	
1039239	*1020011*	
1050249	*1020012*	
1050250	*1020013*	
1056620	*1020017*	

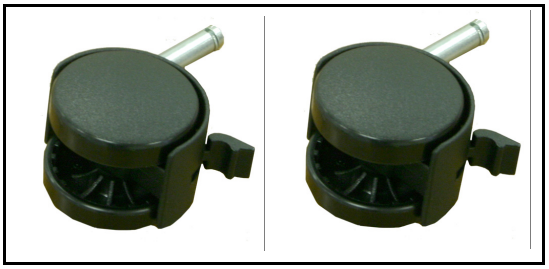
9.12 FLOW METER KIT

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1082784	*All EverFlo Concentrators*	*Flow Meter* *Speed Nuts (x2)* *Tie Wrap (x2)*
H644	*All EverFlo Concentrators*	*Pediatric Flow Meter* *Speed Nuts (x2)* *Tie Wraps (x2)*
528	*All EverFlo Concentrators*	*Locking Flow Meter* *Speed Nuts (x2)* *Tie Wraps (x2)*



9.13 CASTER KITS

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
H624	*All EverFlo Concentrators*	Casters (x4)
1026632	*All EverFlo Concentrators*	Casters (x1)
H649	*All EverFlo Concentrators*	*Caster w/ brake (x2)*

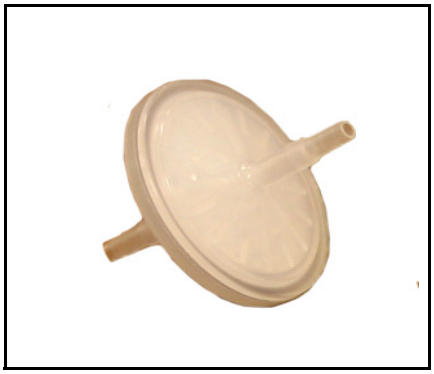


9.14 Front Cabinet Outlet Kit

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1038830	*All EverFlo Concentrators*	*Outlet Barb*

9.15 Micro-Disk Filter Kit

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
520	*All EverFlo Concentrators*	Micro-Disk Filter

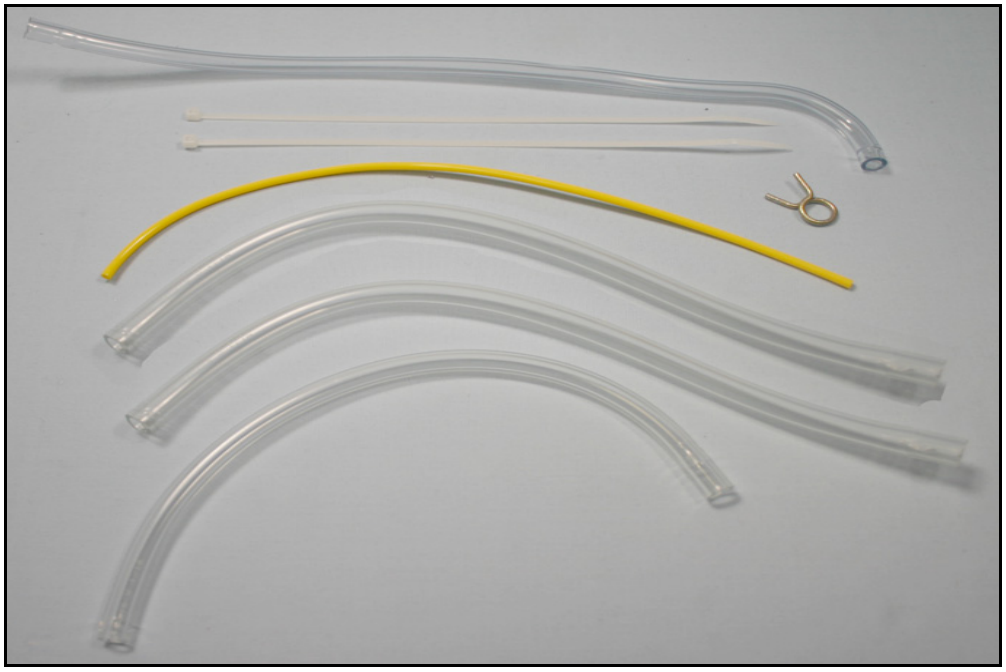


9.16 INLET FILTER KIT

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1038831	*All EverFlo Concentrators*	*Inlet Filter*

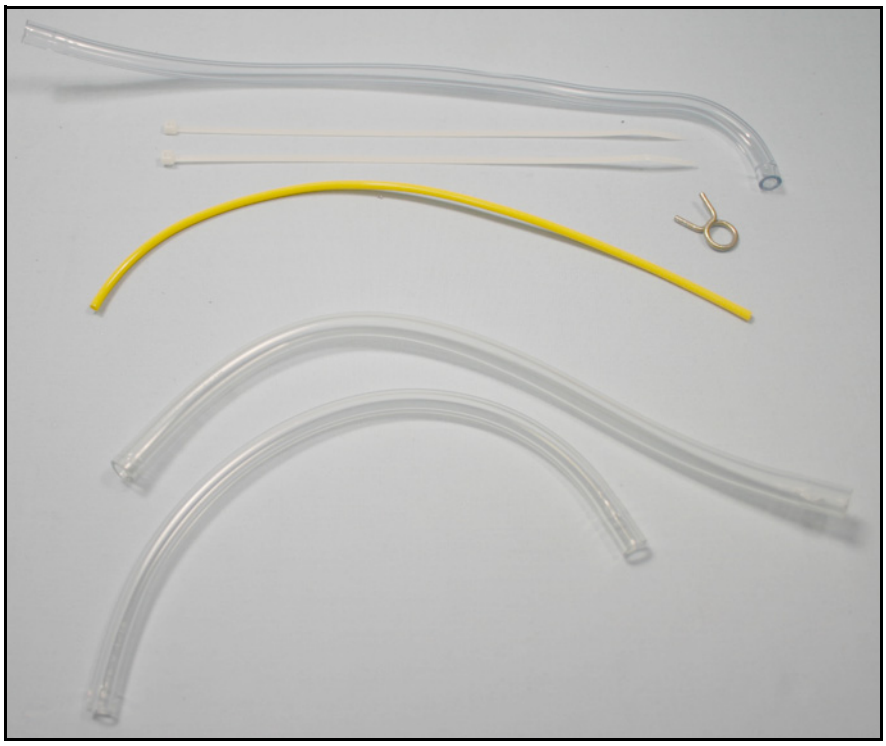
9.17 EVERFLO W/ OPI TUBING KIT

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1038833	*All EverFlo Concentrators*	*3/16" Tubing (x2)* *1/4" Tubing (x2)* *Yellow Pressure Tubing* *Spring Clamp* *Tie Wrap (x2)* *Check Valve* *Instruction Sheet*



9.18 EVERFLO W/O OPI TUBING KIT

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1038832	*All EverFlo Concentrators*	*3/16" Tubing (x2)* *1/4" Tubing (x1)* *Yellow Pressure Tubing* *Spring Clamp* *Tie Wrap (x2)* *Check Valve* *Instruction Sheet*



9.19 CAPACITOR ASSEMBLY KITS

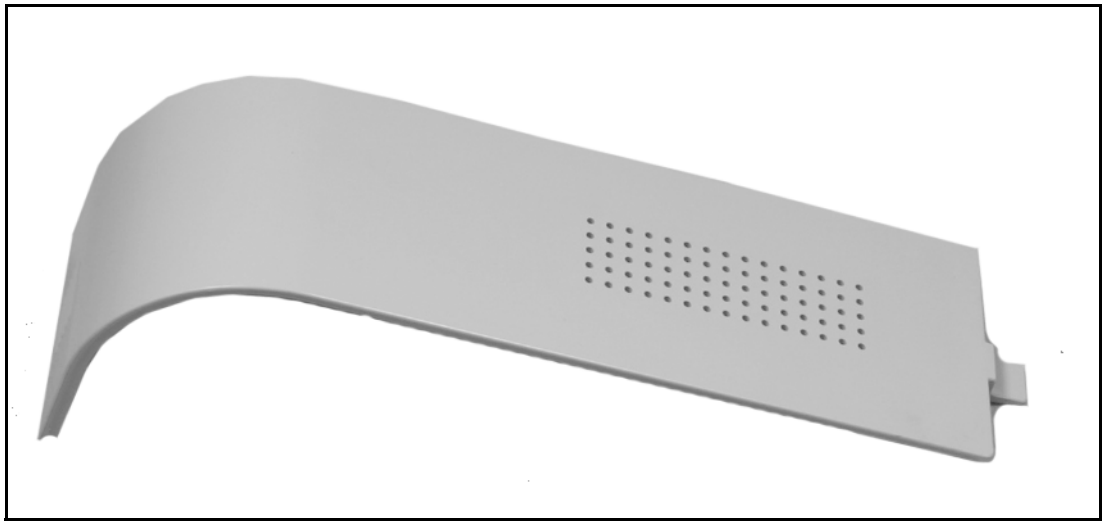
PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1038834	*1020000, 1020001, 1020002, 1020002BR, 1020003BR, 1020003, 1020014, 1020015, 1039362, 1039363, 1039364, 1039365*	*Capacitor Assembly (120V)* *Tie Wrap (x1)*
1038835	*1020004, 1020005, 1020006, 1020007, 1020008, 1020009, 1020010, 1020011, 1020012, 1020016, 1020017*	*Capacitor Assembly (230V)* *Tie Wrap (x1)*
1050251	*1020013*	*Capacitor Assembly (230V)* *Tie Wrap (x1)*

9.20 FAN ASSEMBLY KITS

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1038836	*1020000, 1020001, 1020002, 1020002BR, 1020003BR, 1020003, 1020014, 1020015, 1039362, 1039363, 1039364, 1039365*	*Fan Assembly (120V)*
1038837	*1020004, 1020005, 1020006, 1020008, 1020009, 1020010, 1020011, 1020012, 1020013, 1020016, 1020017*	*Fan Assembly (230V)*
1056621	*1020007*	*Fan Assembly (230V)*

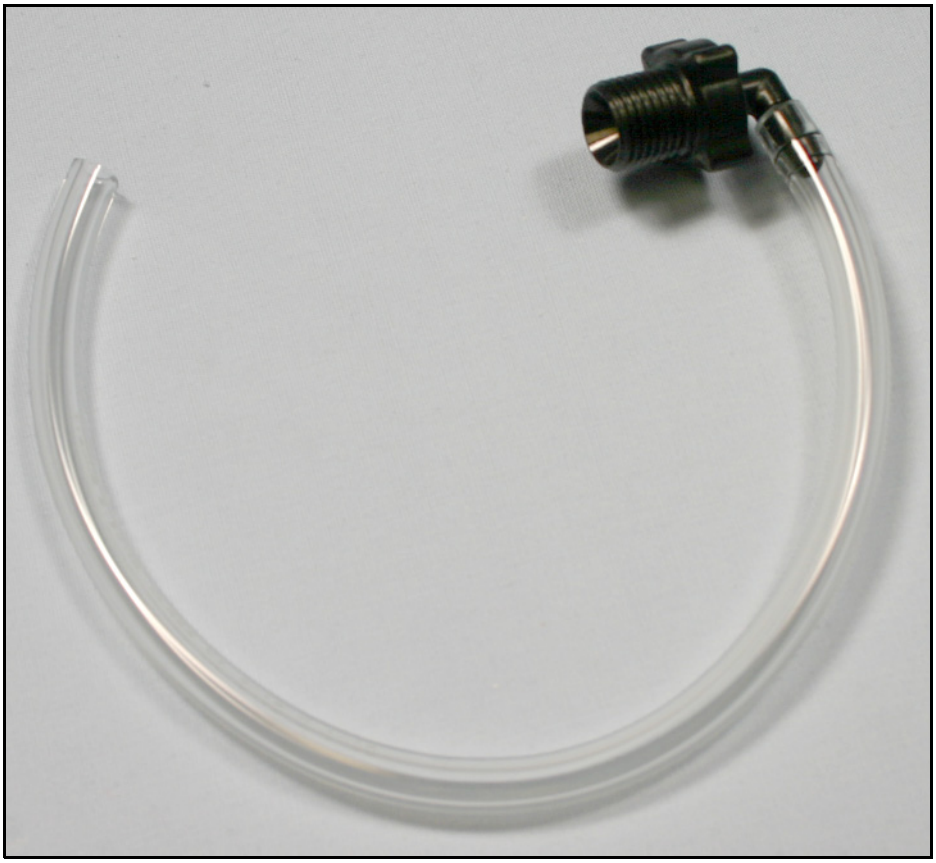
9.21 FILTER COVER KIT

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1038839	*All EverFlo Concentrators*	*Filter Cover*



9.22 HUMIDIFIER CONNECTOR TUBE KIT

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1039642	*All EverFlo Concentrators*	*Humidifier Tube* *Humidifier Fitting*



9.23 FRONT CABINET ASSEMBLY KIT

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1038809	*1020000, 1020001, 1020002, 1020002BR, 1020003BR, 1020003, 1020004, 1020005, 1039362, 1039363*	*Front Cabinet Assembly (120V)* *EverFlo Label* *Tie Wrap (x1)*
1039576	*1020006, 1020007, 1020008, 1020009, 1020010, 1020011, 1020012, 1020013, 1020016, 1020017*	*Front Cabinet Assembly (230V)* *EverFlo Label* *EverFlo w/ OPI Label* *Tie Wrap (x1)*
1050254	*1020014, 1020015, 1039364, 1039365*	*Front Cabinet Assembly (120V)* *EverFlo Q Label* *Tie Wrap (x1)*

9.24 REAR CABINET ASSEMBLY KIT

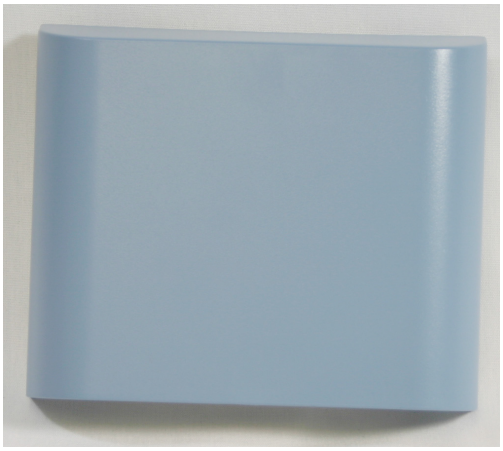
PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1038810	*1020000, 1020001, 1020002, 1020002BR, 1020003, 1020003BR, 1020004, 1020005, 1039362, 1039363*	*Rear Cabinet Assembly* *5/16" Hex Screws (x4)* *Phillips Screws (x2)* *Tie Wrap (x2)*
1039577	*1020006, 1020008, 1020009, 1020010, 1020011, 1020012, 1020013, 1020016, 1020017*	*Rear Cabinet Assembly* *5/16" Hex Screws (x4)* *Phillips Screws (x2)* *Tie Wrap (x2)*
1050253	*1020007*	*Rear Cabinet Assembly* *5/16" Hex Screws (x4)* *Phillips Screws (x2)* *Tie Wrap (x2)*
1050252	*1020014, 1020015, 1039364, 1039365*	*Rear Cabinet Assembly* *5/16" Hex Screws (x4)* *Phillips Screws (x2)* *Tie Wrap (x2)*

9.25 HUMIDIFIER STRAP KIT

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1038840	*All EverFlo Concentrators*	*Humidifier Strap*

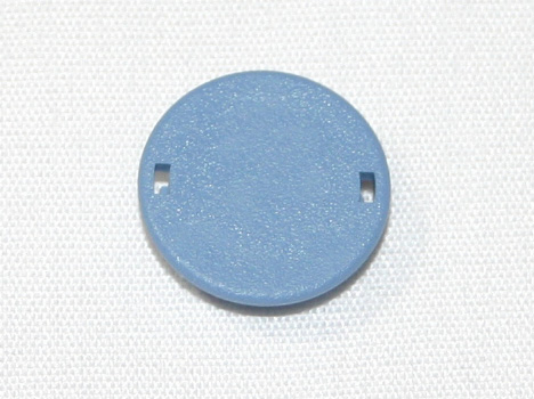
9.26 WHISPER CAP KITS

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1048534	*1020006, 1020007, 1020008, 1020009, 1020010, 1020011, 1200012, 1020013, 1020014, 1020015, 1020016, 1020017*	*Whisper Cap*



9.27 DIN OUTLET COVER KIT

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1050773	*All EverFlo Concentrators*	*DIN Outlet Cover*



9.28 EVERFLO MILL BRANDING LABEL KIT

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1051037	*1020002, 1020002BR, 1020003, 1020003BR, 1020004, 1020005, 1020012*	*EverFlo Mill Branding Label*

9.29 Fire Warning Label Kit

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1051038	*1020007*	*Fire Warning Label*

9.30 EverFlo Overlay Kit

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1053746	*1020000, 1020001, 1020002, 1020002BR, 1020003, 1020003BR, 1020004, 1020005, 1020006, 1020007, 1020008, 1020009, 1020010, 1020011, 1020012, 1020013, 1020016, 1020017, 1039362, 1039363*	*Overlay Label*
1056622	*1020014, 1020015, 1039364, 1039365*	*EverFlo Q Overlay Label*

9.31 EverFlo O2 Quick Coupler Kit

PART NUMBER	CONCENTRATOR MODEL NUMBER	INCLUDED IN KIT
1081743	*1039362, 1039363, 1039364, 1039365*	*O2 Quick Coupler*

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CHAPTER 10: TESTING

10.1 LONG LIFE FILTER TEST

This following test can be performed to determine if the EverFlo Long Life Filter has become restricted.

10.1.1 TESTING PROCEDURE

1. Power up the EverFlo Concentrator and set the flow to 5 LPM.
2. Run the device for 10 minutes
3. Measure and record the Oxygen Concentration (1st Reading).
4. Remove the Door and the Long Life Filter from the concentrator.
5. Wait approximately 3 minutes.
6. Measure and record the Oxygen Concentration (2nd Reading).
7. If the 2nd Oxygen Concentration reading is greater then 2.0 from the 1st Oxygen Concentration reading, the Long Life Filter needs replaced.

10.2 EVERFLO SYSTEM FINAL TEST

The following test must be performed after any repairs to the Everflo Oxygen Concentrator. The results of the test must be entered on the Testing Data Sheet provided and signed, in ink, and dated by the technician performing the test.

This test may also be used as a performance verification procedure on the unit between patient usages.

10.2.1 TEST EQUIPMENT

NOTE

- *The results of this test must be recorded in the space provided on the Testing Data Sheet.*
- *All testing on the unit must be performed at the proper voltage and frequency applicable for the country where the unit is being used.*
- *Before starting the System Final Test, the unit must be turned on and run for a minimum of one hour with the front and back cabinets in place.*

- Concentrator Tool Kit (H647)
- Calibrated Oxygen Analyzer
- Test Flow Meter for EverFlo UltraFill Compatible Devices (Assemble Pieces as shown below)
  - 1/8” NPT Coupling Insert (1)
  - Brass 1/8” NPT Male to Female Adapter (2)
  - Flowmeter (3)
  - Orifice (0.038”) (4)

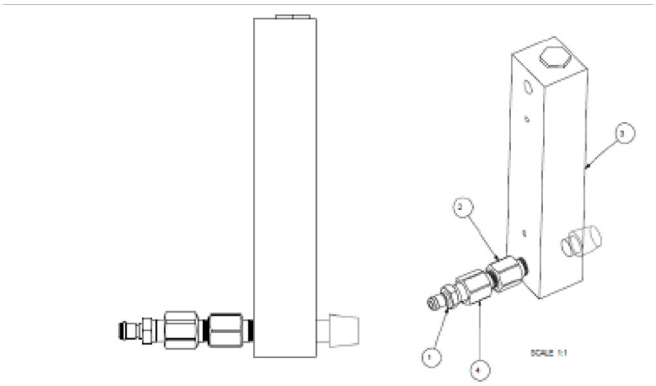


FIGURE 10-1: TEST FLOWMETER ASSEMBLY

10.2.2 TESTING PROCEDURE

1. Ensure that the unit has been run-in for a minimum of 1hour.
2. Record the serial number, located on the rear of the unit, in the space provided on the Testing Data sheet.
3. Record the voltage and frequency at which the unit is being tested.
4. Record the hours from the hour meter on the Test Data Sheet.
5. Verify the flow meter is set to 5 LPM. Connect the test gauge to the outlet barb. Measure the outlet pressure. The outlet pressure should be within 5.0- 7.0 psig. Record the results. For units equipped with a Pediatric Flow Meter, proceed to step 7.
6. With the pressure gauge still connected to the outlet, the flow meter ball will drop down to zero (0) LPM. After approximately 90 seconds the “No Flow” alarm will sound and the yellow LED (Low Oxygen) should illuminate. Record the results.
7. Set the flow meter to two (2) lpm (for units equipped with pediatric flow meters set the flow to 0.1 lpm). Connect a calibrated oxygen analyzer to the outlet barb, measure and record the oxygen concentration. Set the flow meter to five (5) lpm (for units equipped with pediatric flow meters set the flow to 1 lpm). Measure and record the oxygen concentration. Record the results. For OPI devices proceed to step 8. For non OPI devices proceed to step 9.
8. Verify that the OPI is working properly by observing that the red or yellow LEDs are NOT illuminated and the oxygen concentration is above 90% for model numbers 1020001, 1020002, 1020002BR, 1020004, 1020006, 1020009, 1020010, 1020011, 1020012, 1020013, 1020014, 1020016, 1020017, 1039363, 1039364, 1039366, 1039367, 1039368, and 1039370 and above 87% for model numbers 1020007 and 1020008. Record the results.
9. Disconnect the oxygen analyzer and tubing from the outlet of the concentrator. For EverFlo Ultra-Fill Compatible devices proceed to step 10, for all other concentrators proceed to step 15.
10. Set the concentrator flow meter to 1-3 LPM.

11. Connect the Test Flow Meter to the UltraFill port located on the side of the EverFlo.

12. Open the Test Flowmeter flow knob 3-4 turns.
13. Wait at least 1-3 seconds.
14. Read the Test Flowmeter value. Record the results. If the flow is greater than 10 SLPM the unit passes. If the device does not pass testing, troubleshoot per the troubleshooting section of this manual.
15. Reinstall the front and rear cabinets.
16. In ink, sign and date the Testing Data Sheet after all tests have been completed. If the unit has failed any of the tests performed, the unit must be repaired and retested according to this service manual.

10.3 EVERFLO W/O OPI TEST DATA SHEET

NOTE

All information on this data sheet should be entered in the correct location after the associated test was completed. The data sheet must then be signed in ink and dated by the technician performing tests. Enter NA in all unused test boxes.

Step 2
Serial Number: _____

Step 3
VAC: _____ Hz:_____

Step 4
Hour Meter: _____

Step 5

Oxygen Outlet Pressure 5.0-7.0 psig	***PRESSURE GAUGE READING***

Step 6

No Flow Alarms ≤ 90 sec.	***PASS***	***FAIL***

Step 7

Flow Meter Oxygen Concentration	***120V Everflo Model Numbers (1020000, 1020003, 1020003BR, 1020015, 1039362, 1039365) 90-96% @ 2 lpm 90-96% @ 5 lpm***		***230V EverFlo Model Number (1020005) 90-96% @ 2 lpm 90-96% @ 5 lpm***	
	2 lpm	***5 lpm***	***2 lpm***	***5 lpm***

Step 14

	PASS	***FAIL***
O2 Coupler Flow (EverFlo UltraFill Devices Only)		

Signature: _____ Date:_____ Notification Number: _____

(RI internal use Only)

10.4 EverFlo w/ OPI Test Data Sheet

NOTE

All information on this data sheet should be entered in the correct location after the associated test was completed. The data sheet must then be signed in ink and dated by the technician performing tests. Enter NA in all unused test boxes.

Step 2
Serial Number: _____

Step 3
VAC: _____ Hz:_____

Step 4
Hour Meter: _____

Step 5

Oxygen Outlet Pressure 5.0-7.0 psig	***PRESSURE GAUGE READING***

Step 6

No Flow Alarms ≤ 90 sec.	***PASS***	***FAIL***

Step 7

Flow Meter Oxygen Concentration	***120V Everflo Model Numbers (1020001, 1020002, 1020002BR, 1020014)*** ***90-96% @ 2 lpm*** ***90-96% @ 5 lpm***		***230V EverFlo Model Numbers (1020004, 1020006, 1020009, 1020010, 1020011, 1020012, 1020013, 1020016, 1020017, 1039366, 1039367, 1039368, 1039370)*** ***90-96% @ 2 lpm*** ***90-96% @ 5 lpm***		***230V EverFlo Model Number (1020007, 1020008)*** ***87-96% @ 2 lpm*** ***87-96% @ 5 lpm***	
	2 lpm	***5 lpm***	***2 lpm***	***5 lpm***	***2 lpm***	***5 lpm***

Step 14

O2 Coupler Flow (EverFlo UltraFill Devices Only)	***PASS***	***FAIL***

Step 8

OPI Verification	***PASS***	***FAIL***

Signature: _____ Date:_____ Notification Number: _____

(RI internal use Only)

10.5 EVERFLO W/O OPI EQUIPPED W/ PEDIATRIC FLOW METER TEST DATA SHEET

NOTE

All information on this data sheet should be entered in the correct location after the associated test was completed. The data sheet must then be signed in ink and dated by the technician performing tests. Enter NA in all unused test boxes.

Step 2
Serial Number: _____

Step 3
VAC: _____ *Hz:*_____

Step 4
Hour Meter: _____

Step 5

Oxygen Outlet Pressure 5.0-7.0 psig	***PRESSURE GAUGE READING***

Step 7

Flow Meter Oxygen Concentration	***120V Everflo Model Numbers (1020000, 1020003, 1020003BR, 1020015, 1039362, 1039365)*** ***90 - 96% @ 0.1 lpm*** ***90 - 96% @ 1 lpm***		***230V EverFlo Model Number (1020005)*** ***90 - 96% @ 0.1 lpm*** ***90 - 96% @ 1 lpm***	
	0.1 lpm	***1 lpm***	***0.1 lpm***	***1 lpm***

Step 14

	PASS	***FAIL***
O2 Coupler Flow (EverFlo UltraFill Devices Only)		

Signature: _____ *Date:*_____ *Notification Number:* _____

(RI internal use Only)

10.6 EverFlo w/ OPI Equipped w/ Pediatric Flow Meter Test Data Sheet

NOTE

All information on this data sheet should be entered in the correct location after the associated test was completed. The data sheet must then be signed in ink and dated by the technician performing tests. Enter NA in all unused test boxes.

Step 2
Serial Number: _____

Step 3
VAC: _____ Hz:_____

Step 4
Hour Meter: _____

Step 5

Oxygen Outlet Pressure 5.0-7.0 psig	***PRESSURE GAUGE READING***

Step 7

Flow Meter Oxygen Concentration	***120V Everflo Model Numbers (1020001, 1020002, 1020002BR, 1020014)*** ***90-96% @ 0.1 lpm*** ***90-96% @ 1 lpm***		***230V EverFlo Model Numbers (1020004, 1020006, 1020009, 1020010, 1020011, 1020012, 1020013, 1020016, 1020017, 1039366, 1039367, 1039368, 1039370)*** ***90-96% @ 0.1 lpm*** ***90-96% @ 1 lpm***		***230V EverFlo Model Number (1020007, 1020008)*** ***87-96% @ 0.1 lpm*** ***87-96% @ 1 lpm***	
	0.1 lpm	***1 lpm***	***0.1 lpm***	***1 lpm***	***0.1 lpm***	***1 lpm***

Step 14

	PASS	***FAIL***
O2 Coupler Flow (EverFlo UltraFill Devices Only)		

Step 8

OPI Verification	***PASS***	***FAIL***

Signature: _____ Date:_____ Notification Number: _____

(RI internal use Only)

CHAPTER 11: TOOLS AND EQUIPMENT

You should have the following hand tools and supplies available for troubleshooting, testing, and repairing the EverFlo Concentrator.

11.0 COMMON HAND TOOLS

- Antistatic, Electro-Static Discharge (ESD)-protected work station - minimum requirement is a grounded mat and wrist strap
- Phillips Screwdriver - medium (included in H646 Tool Kit)
- 5/16” Hex Driver (5/16” bit included in H646 Tool Kit)
- 6 inch long 5/16” Hex Driver Bit Kit (RI p/n 1040152)
- 9/16” Open-end wrench
- 9/16” Socket
- Heyco Pliers (RI p/n 1040212)
- Torque Wrench 8 in-lbs. (RI p/n 1039183)
- Torque Wrench 25 in-lbs. (RI p/n 1039182)
- Torque Wrench 35 in-lbs. (RI p/n 1039156)
- Fuse Extractor
- Concentrator Tool Kit (H647)
- Diagonals (wire cutters)
- Needle Nose Pliers (insulated)
- Channel Locks (medium)
- One Ear Clamp Pliers (RI p/n H645)
- Pressure Gauge

11.1 EQUIPMENT

- Digital Multimeter (Refer to 11.3)
- Calibrated Oxygen Analyzer (Refer to 11.3)
- 1/8” NPT Coupling Insert (Colder P/N MC2402 or equivalent)
- Brass 1/8” NPT Male to Female Adapter (McMaster-Carr P/N 9171K610 or equivalent)
- Flowmeter (Dwyer P/N VFB-67-SSV or equivalent)
- Orifice 0.038” (McMaster-Carr P/N 2712T482 or equivalent)

11.2 SUPPLIES

- Cleaning Cloth
- Mild Detergent

11.3 ACCEPTABLE TEST EQUIPMENT

11.3.1 DIGITAL MULTIMETER

Specifications

- 3 1/2” digital readout

Acceptable Options

- Fluke 87 or better model
- Any commercially available digital multimeter that meets the above specification.

11.3.2 OXYGEN ANALYZER

NOTE

The oxygen Analyzer used must be calibrated to meet the manufacturer’s specifications.

Specifications

- Range: 0.0% to 100% O_2
- Accuracy +/- 2.0% O_2

Acceptable Options

- MSA MiniOX I-CE Oxygen Analyzer (RI p/n 27009)
- Any commercially available calibrated Oxygen Analyzer that meets the above specifications.

CHAPTER 12: SCHEMATICS

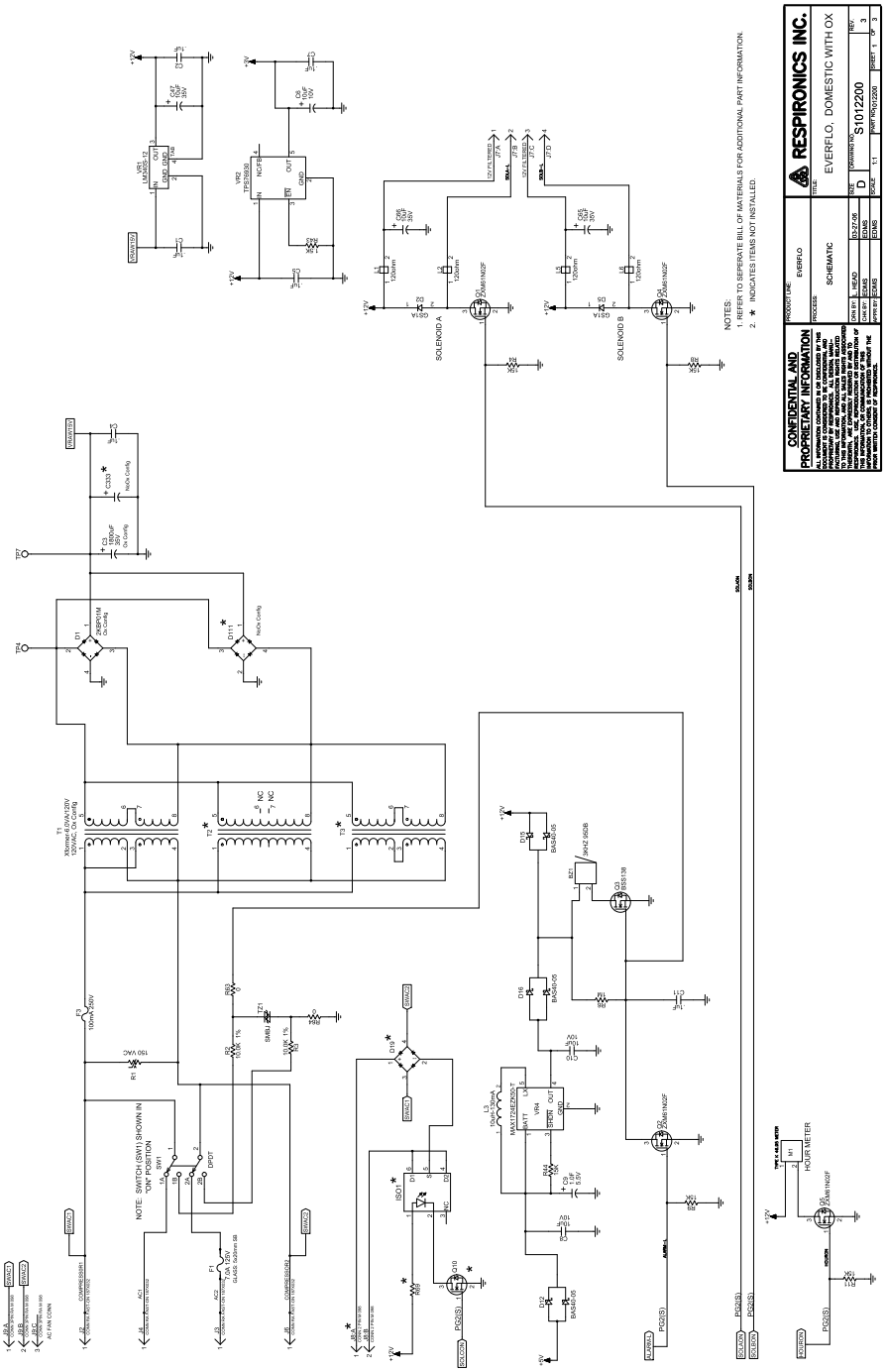
12.0 SCHEMATICS STATEMENT

Schematics are supplied with this manual in direct support of the sale and purchase of this product.

The schematics are proprietary and confidential. Do not copy the schematics or disclose them to third parties beyond the purpose for which they are intended. Patents are pending.

The schematics are intended to satisfy administrative requirements only. They are not intended to be used for component level testing and repair. Any changes of components could effect the reliability of the device, prohibit lot tracking of electronic components, and void warranties. Repairs and testing are supported only at the complete board level.

The schematics are of the revision level in effect at the time this manual was last revised. New revisions may or may not be distributed in the future.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EVERFLO, DOMESTIC WITH OX
S1012200
SCHEMATIC
EVERFLO
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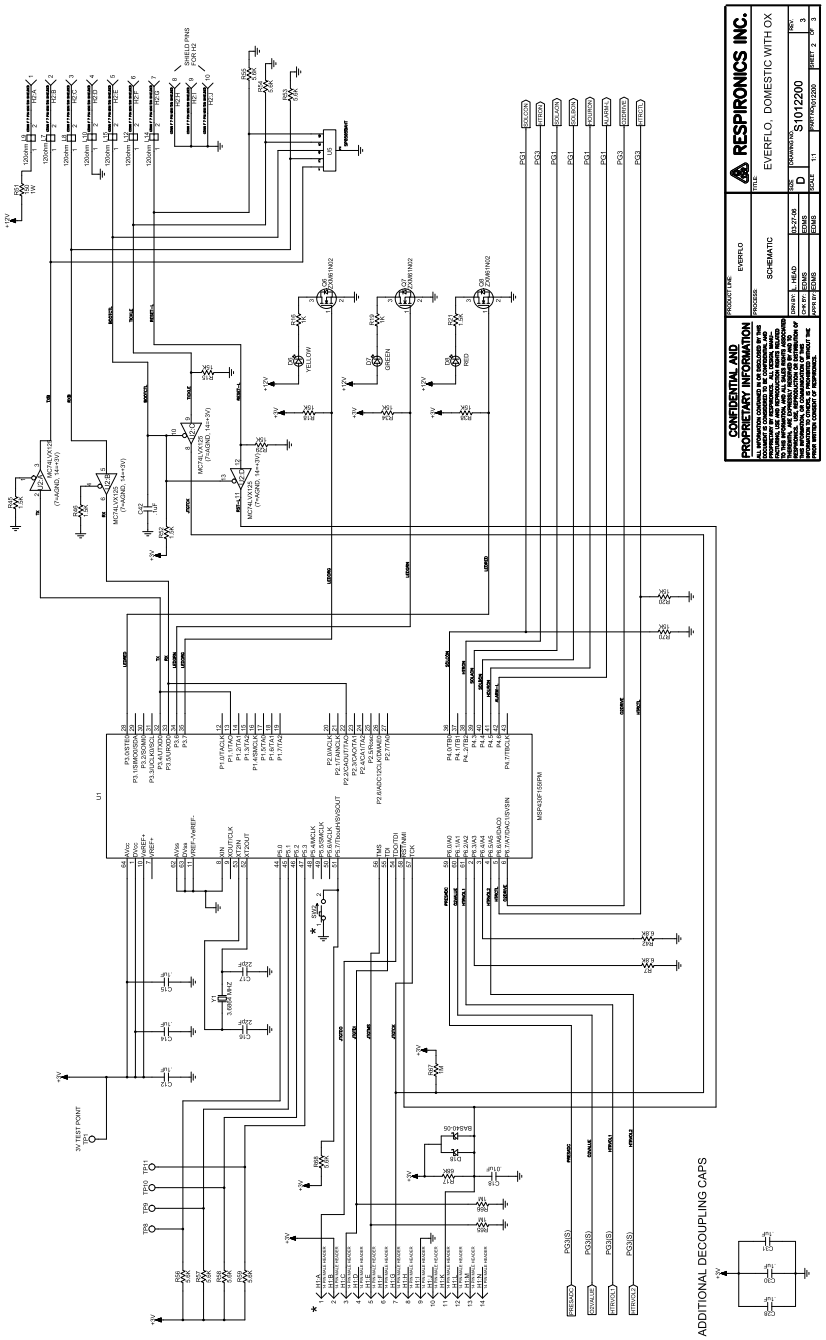
1. REFER TO SEPERATE BILL OF MATERIALS FOR ADDITIONAL PART INFORMATION.
2. ✱ INDICATES ITEMS NOT INSTALLED.
SOLENOID A
SOLENOID B
HOUR METER
NOTE: SWITCH (SW1) SHOWN IN "ON" POSITION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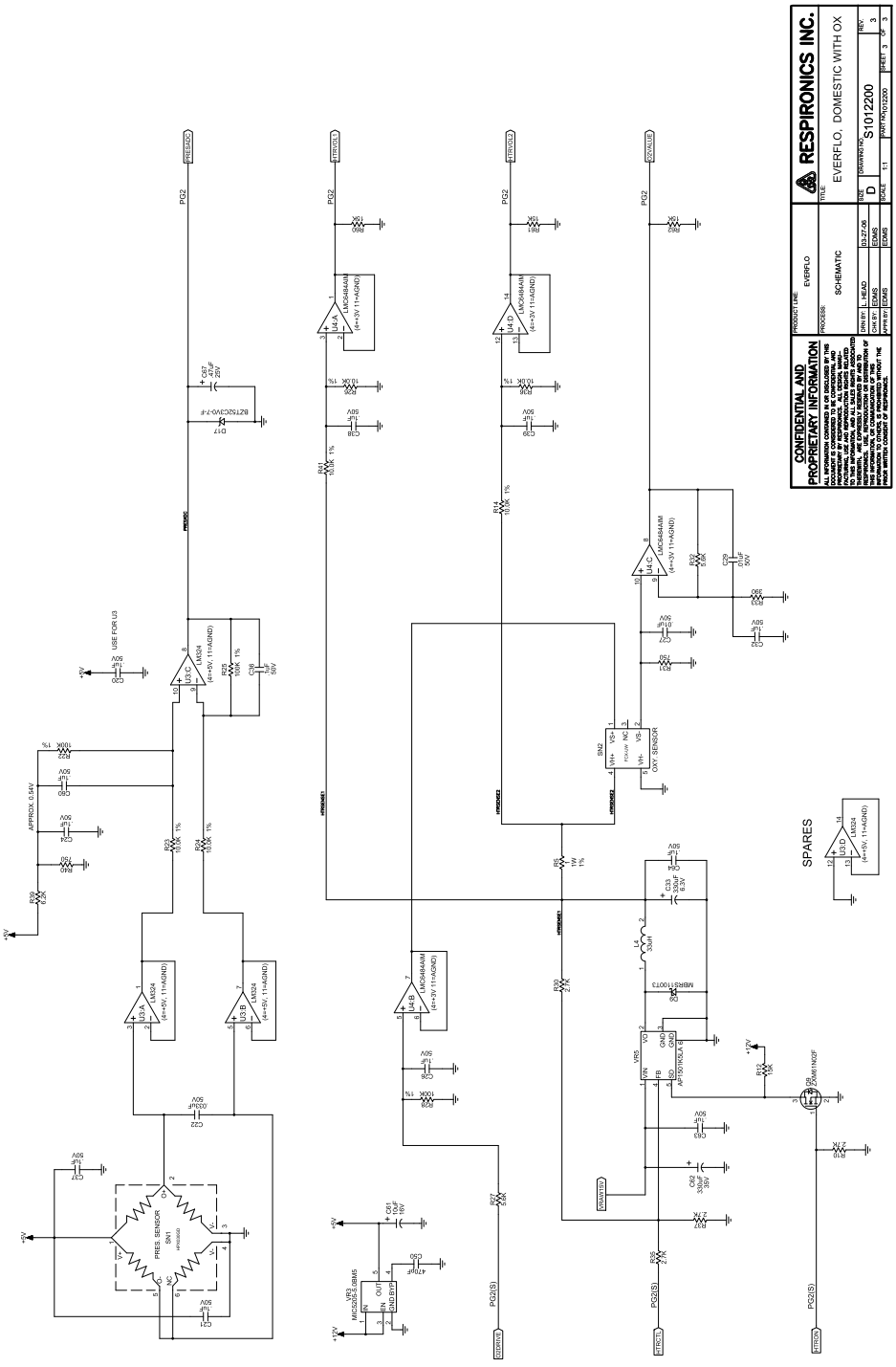
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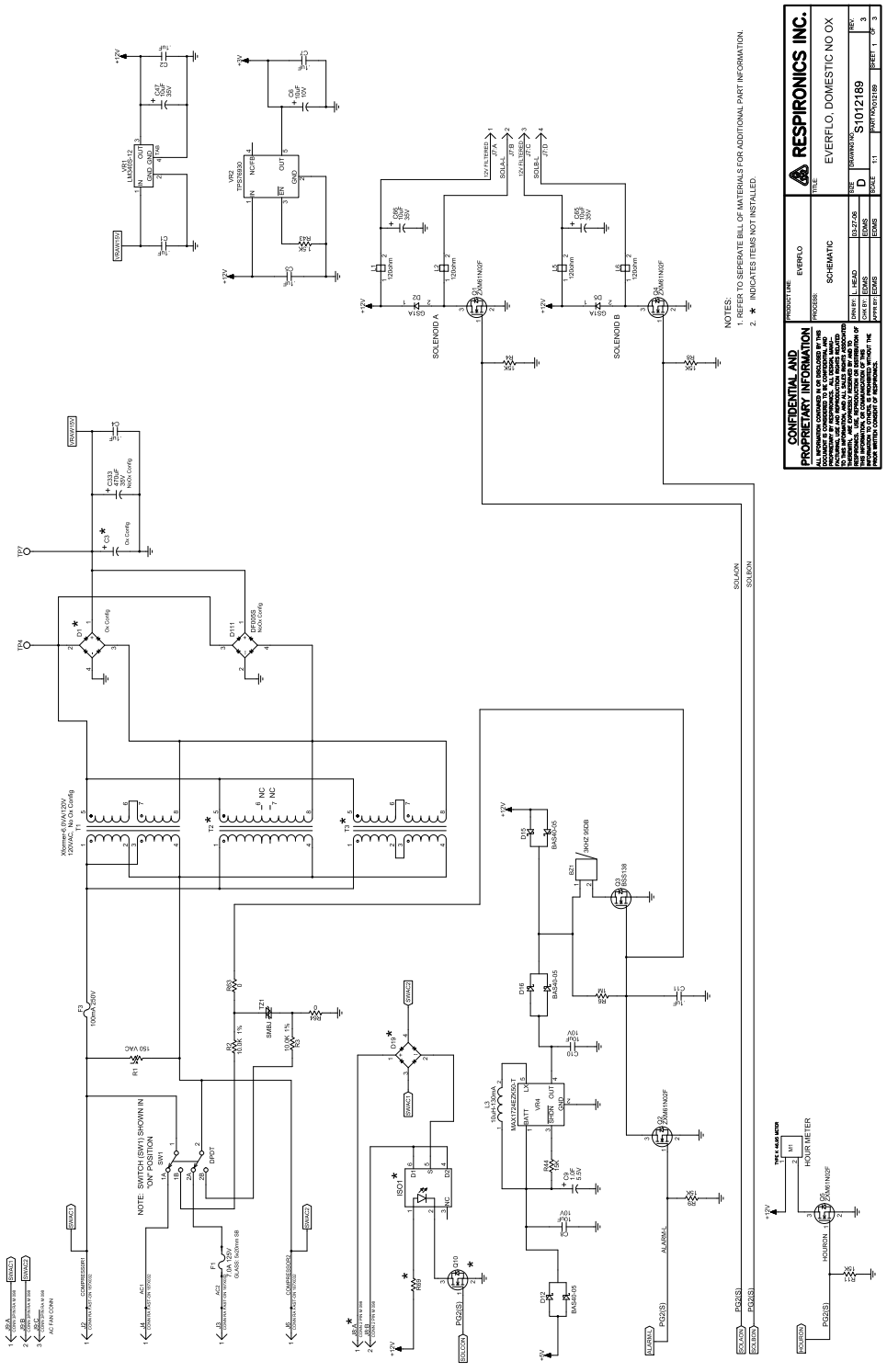
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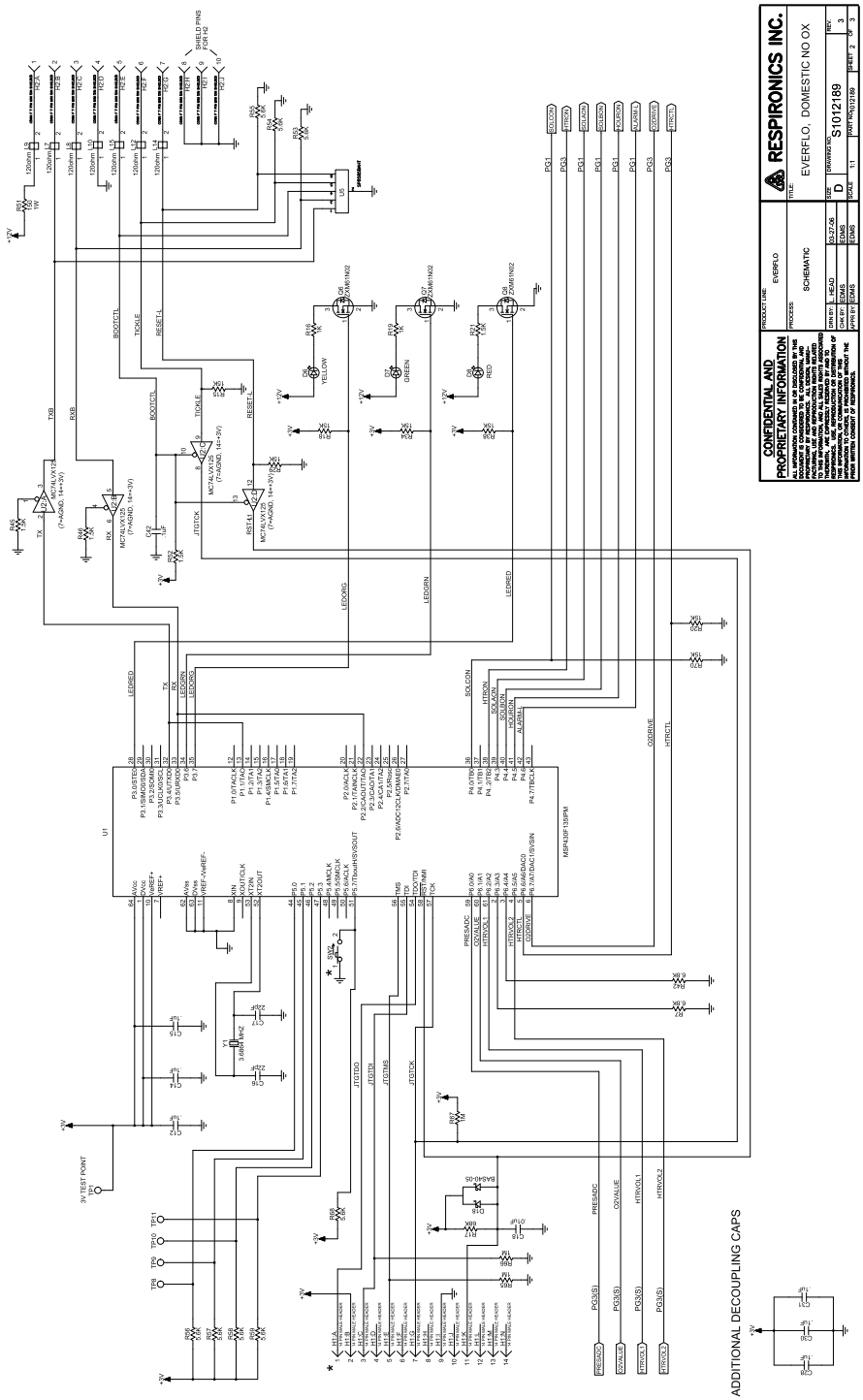
NOTES:
1. REFER TO SEPERATE BILL OF MATERIALS FOR ADDITIONAL PART INFORMATION.
2. ★ INDICATES ITEMS NOT INSTALLED.
SOLENOID A
SOLENOID B
HOUR METER
NOTE: SWITCH (SW1) SHOWN IN OXYGEN POSITION
SOLAON
SOLBON
ALARM1
HOURON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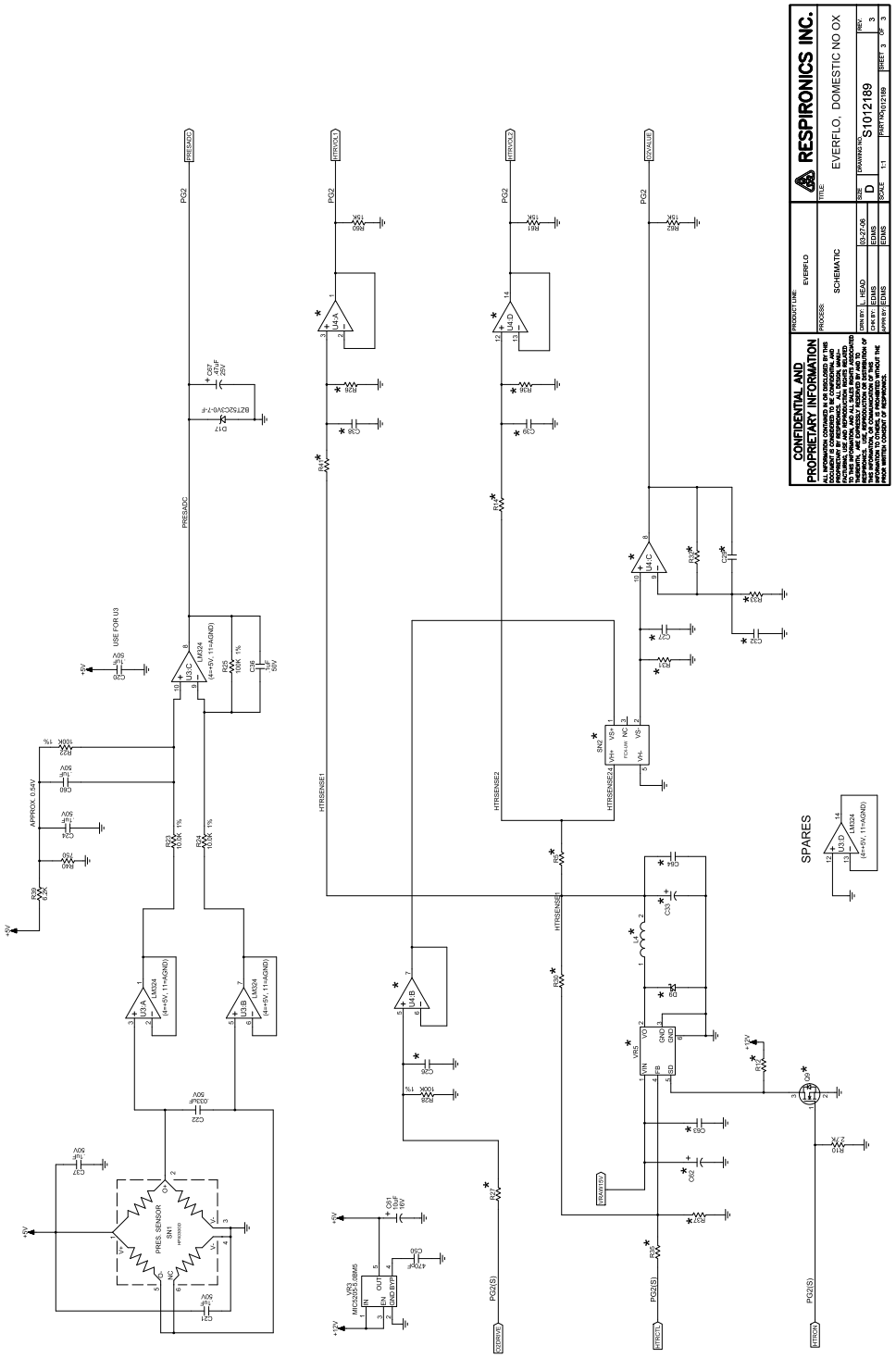
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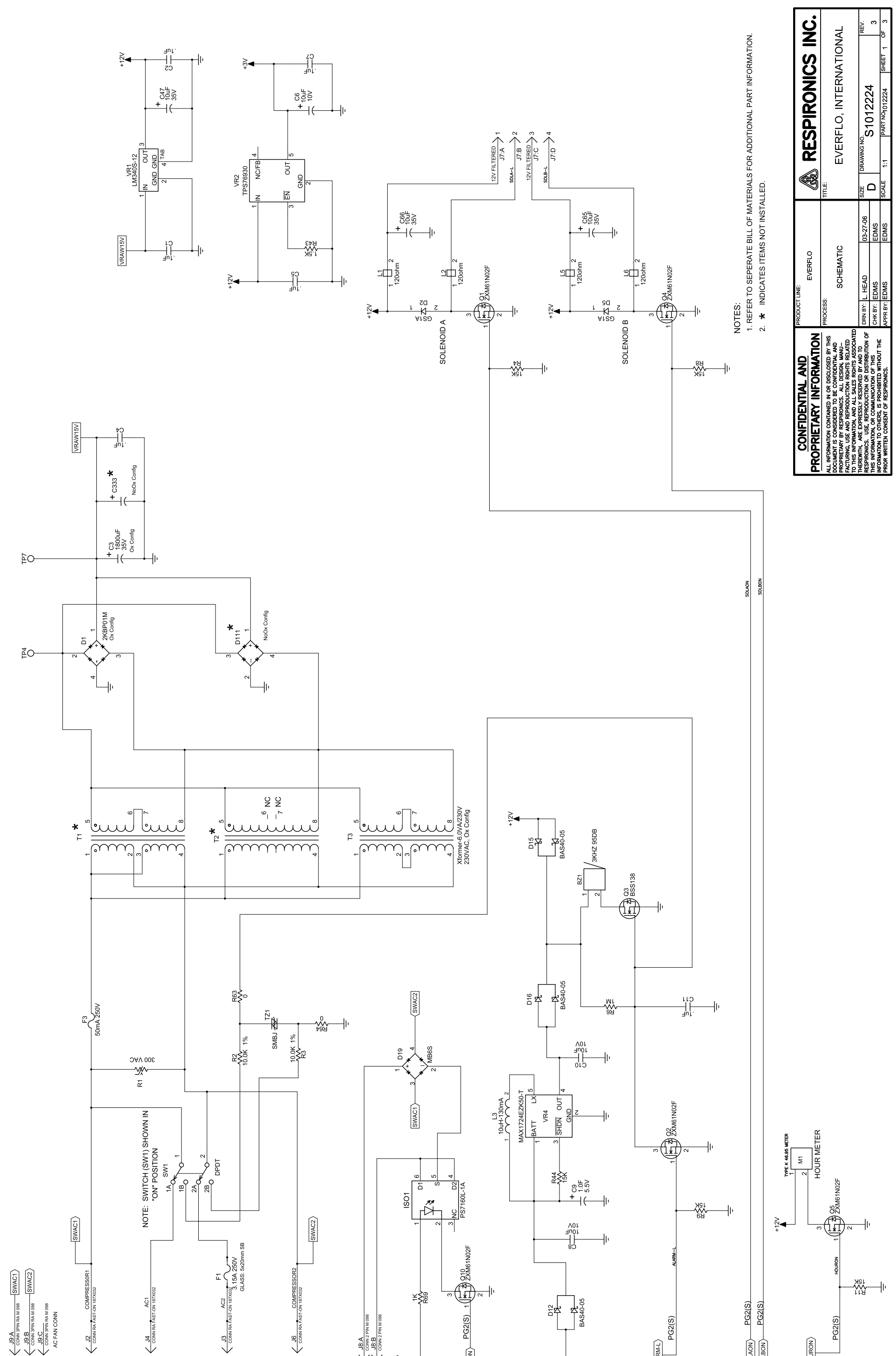
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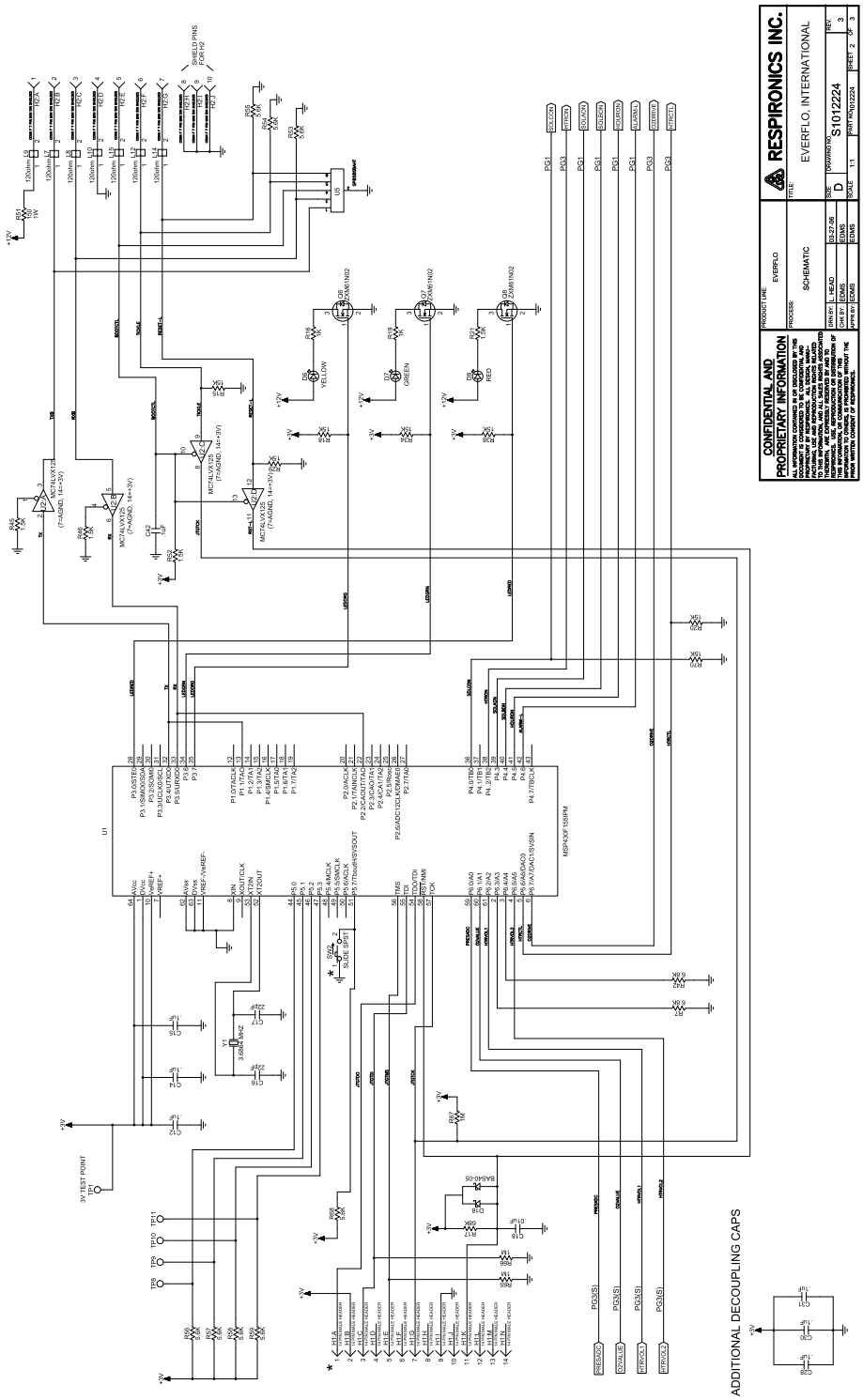
SHEET 1 OF 3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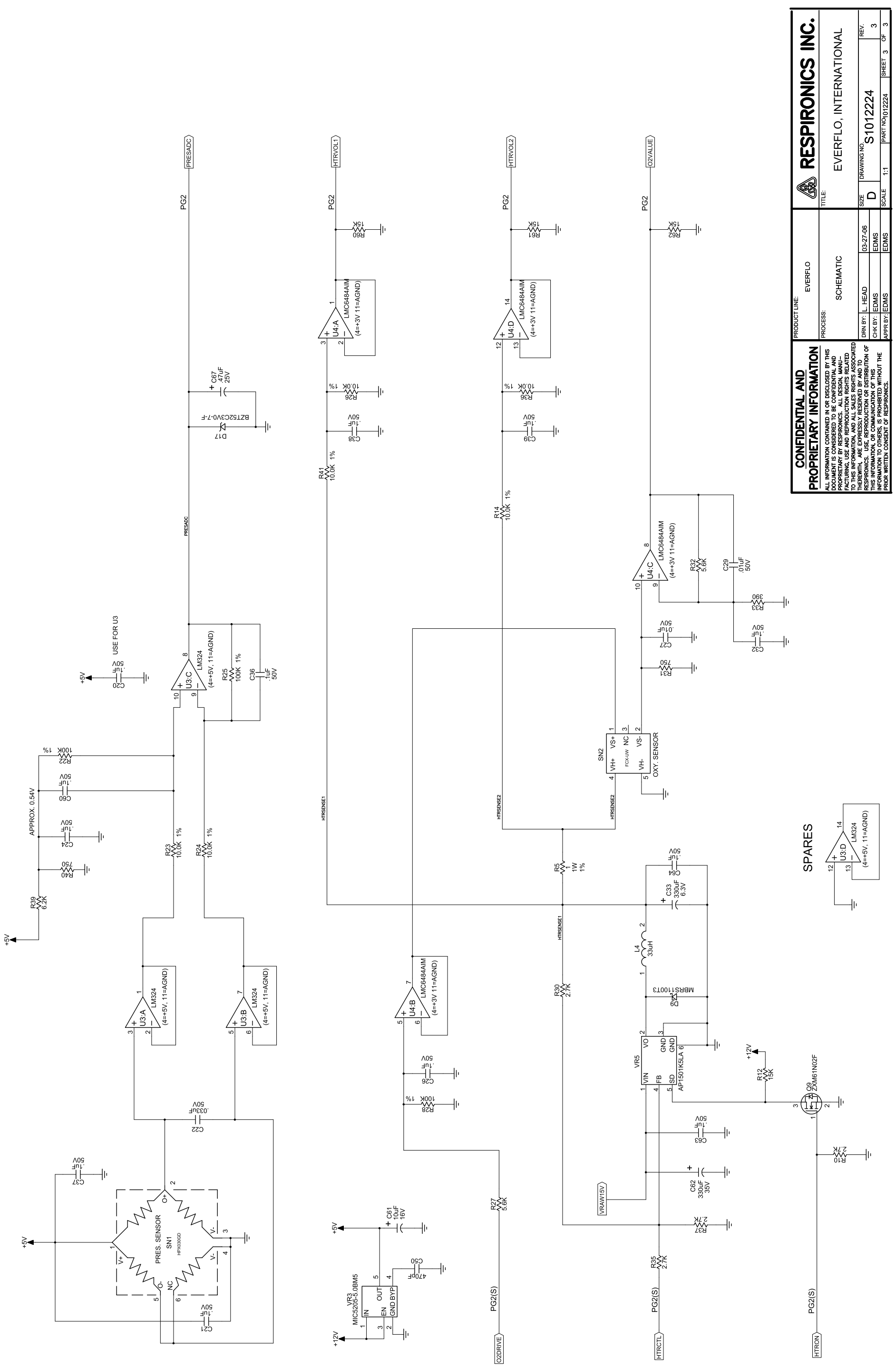
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Murrysville, PA 15668 USA

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Gewerbestrasse 17
82211 Herrsching, Germany

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