

**Nidek Medical Products, Inc  
Nuvo Family Oxygen Concentrators  
NUVO 5, NUVO 8 & NUVO 10 Service Manual**



**Nidek Medical Products, Inc. 3949 Valley East Industrial Drive  
Birmingham, Alabama 35217 USA  
Telephone: (205) 856-7200 • 24-Hour Fax: (205) 856-0533**

<b>Table of Contents</b>		2-4
<b>General Safety Instructions</b>		
	Production and Use of Oxygen	5
	Use and Maintenance of the Device	5
	Standards and Regulations	5-6
<b>Section 1.0</b>		
<b>Introduction</b>		
	1.1 Home Service Provider Responsibility	6-7
	1.2 Important Notice and Symbol Explanations	7
	1.3 Functional Specifications	8
<b>Section 2.0</b>		
<b>Operational Check and Concentration Test</b>		
	2.1 Description of Operation	8
	2.2 Operation Check	9
	2.3 Alarm System	9
	2.3.1 Battery Test	10
	2.3.2 Power Failure Alarm test	10
	2.4 Oxygen Concentration Test and Specification	10-11
<b>Section 3.0</b>		
<b>Patient Instructions</b>		
	3.1 General Instructions	11
	3.2 Routine Maintenance by the Patient	11
	3.2.1 Cleaning the Cabinet Air Filter	11
	3.2.2 Checking the Alarm System Battery	12
<b>Section 4.0</b>		
<b>Home Service Provider Maintenance</b>		
	4.1 Routine Maintenance	12
	4.1.1 Cabinet Air Filter	12
	4.1.2 Final Product Filter Replacement	12
	4.1.3 Inlet Air Filter Replacement	13
	4.1.4 Battery Replacement	13
	4.1.5 Recording Maintenance	13
	4.2 Cleaning and Infection Control	13-14
	4.2.1 Preparing for New Patient Use	14
<b>Section 5.0</b>		
<b>Service</b>		
	5.1 Components	14-15
	5.2 Cabinet Removal	15
	5.2.1 Removing Cabinet Back	15
	5.2.2 Removing Cabinet Front	15
	5.2.3 Removing Control Panel	15
	5.2.4 Main Structure	15
	5.2.5 Caster Replacement	15
	5.3 Compressor	15

	5.3.1 Compressor Replacement	15-16
	5.3.2 Capacitor Replacement	17
<b>5.4</b>	Process Control Valve	17
<b>5.5</b>	Sieve Module Replacement	18
	5.5.1 Sieve Module Removal	28
	5.5.2 Sieve Module Installation	18
<b>5.6</b>	Cabinet Fan Replacement	19
<b>5.7</b>	Circuit Board Replacement	19-20
	5.7.1 Circuit Board Removal	20
	5.7.2 Circuit Board Installation	20
	5.7.3 Timing Board Removal	20
	5.7.4 Timing Board Installation	21
<b>5.8</b>	Product Regulator Check and Setting	21
	5.8.1 Product regulator cleaning or rebuilding	21
<b>5.9</b>	Pressure Switch Replacement	22
<b>5.10</b>	Circuit Breaker Replacement	22
	5.10.1 Circuit Breaker Removal	22
	5.10.2 Circuit Breaker Installation	22
<b>5.11</b>	I/O (ON/OFF) Power Switch Replacement	22
	5.11.1 I/O (ON/OFF) Power Switch Removal	22
	5.11.2 I/O (ON/OFF) Power Switch Installation	23
<b>5.12</b>	Buzzer Replacement	23
<b>5.13</b>	Hour Meter Replacement	23
<b>5.14</b>	Flow Meter Replacement	23
	5.14.1 Flow Meter Removal	23
	5.14.2 Flow Meter Installation	23
<b>5.15</b>	Power Cord Replacement	23-24
<hr/>		
<b>Section 6.0</b>		
<b>Troubleshooting</b>		
<b>6.1</b>	Air Pressure Test (P1)	24-25
	6.1.1 High Air Pressure	26
	6.1.2 Low Air Pressure	26
<b>6.2</b>	Product Pressure Test (P2)	26-27
	6.2.1 High Product Pressure	27
	6.2.2 Low Product Pressure	27
<b>6.3</b>	General Troubleshooting	27-29
<b>6.4</b>	Troubleshooting Chart	30-32
<b>6.5</b>	Tool Kit and Pressure Test Gauge	33

---

## **Appendices**

### **Exploded Drawings**

<b>A-1:</b>	Pneumatic Flow Chart	34
<b>A-2:</b>	Electrical Schematic	35
<b>A-3:</b>	Base Assembly, 5LPM STD	36
<b>A-3.1:</b>	Base Assembly, Common	37
<b>A-3.2:</b>	Base Assembly, 10LPM 230V	38
<b>A-4:</b>	Main Structure Assembly Front View, 5LPM	39
<b>A-4.1:</b>	Main Structure Assembly Rear View, 5LPM	40
<b>A-4.2:</b>	Main Structure Assembly Front View, 8LPM	41
<b>A-4.3:</b>	Main Structure Assembly Rear View, 8LPM	42
<b>A-4.4:</b>	Main Structure Assembly Front View, 10LPM	43
<b>A-4.5:</b>	Main Structure Assembly Rear View, 10LPM	44
<b>A-5:</b>	Compressor Assembly	47
<b>A-6:</b>	Control Panel Assembly; Front View	49
<b>A-6.1:</b>	Control Panel Assembly; Rear View	50
<b>A-7:</b>	Front Cabinet Assembly	52
<b>A-8:</b>	Rear Cabinet Assembly	53
<b>A-9:</b>	Sieve Module Assembly	54
<b>A-10:</b>	Maintenance Log	56-57

## General Safety Instructions

### Production and use of oxygen

Oxygen is not a flammable gas, but accelerates the combustion of materials. To prevent fire risks, the **Nuvo Family** units should be kept away from flames, incandescent sources or sources of heat (cigarettes) and combustible products such as oil, grease, solvents, aerosols, etc.

Do not use in an explosive atmosphere.

Prevent oxygen from accumulating on upholstered seats or any other fabric. If the concentrator operates without being administered to a patient, locate it so that the flow of gas generated is dissipated into the air.

Locate the equipment in a free space (filter to the rear and below) which is well ventilated and free of fumes or atmospheric pollution.

### Use and Maintenance of the Device

Use the electric cable provided and check that the voltage of the mains socket used complies with the electrical characteristics of the appliance indicated on the manufacturer's plate on the rear of the appliance.

Do not use an extension cord or multiple sockets which can create sparks and therefore pose a fire risk.

Use of the **Nuvo Family** units must be restricted solely to oxygen therapy on medical prescription in compliance with the daily rate and duration.

Use in other circumstances may represent a hazard to patient health.

Do not use in a specifically magnetic environment (MRI, etc.).

The **Nuvo Family** has an audible alarm intended to warn the user of any problems. The user must determine the maximum distance away from the units, based on the sound levels in the environment, to ensure that the alarm is always audible.

### Standards & Regulations

#### In compliance with UL60601-1 [EN60601-1] (para 6.82.b):

"The manufacturer, assembler, installer or importer are not considered to be responsible for consequences or the safety, reliability and characteristics of a device unless,

- the assembly, extensions, adjustments modifications or repairs have been performed by persons authorized by the manufacturer,

- the electrical installation of the corresponding premises complies with appropriate regulations and codes,
- the device is used in accordance with the instructions for its use.

If the replacement parts used for periodic servicing by an approved technician do not comply with the manufacturer's specifications, the manufacturer is absolved of all liability in the event of an incident.

**Do not open the equipment when it is powered on: risk of electrocution.**

This device complies with the requirements of the FDA Quality System Regulation and EU Directive 93/42/EEC, but its operation may be affected by the use in the surrounding area of appliances such as diathermy, high frequency electro-surgical instruments, defibrillators, short wave treatment appliances, cell-phones, CB devices and other portables, microwave ovens, induction hot plates or remote control toys, and more generally, by electromagnetic interference exceeding the levels specified in standard IEC(EN) 60601-1-2.

## **1.0 Introduction**

### **1.1 Home Service Provider Responsibility**

All Home Service Providers of the Nidek Medical **Nuvo Family** Oxygen Concentrator must assume responsibilities for handling, operational check-out, patient instruction, and maintenance. These responsibilities are outlined below and throughout this manual.

#### **WARNING**

**Nuvo Family** units must not be used for or with any life-supporting or life sustaining applications. Patients unable to communicate discomfort while using this device may require additional monitoring. Advise patients to immediately notify their Home Service Provider(s) and/or physician(s) in case of an alarm or any discomfort.

As a Home Service Provider, you must do all of the following:

- Inspect the condition of each **Nuvo family** unit immediately upon delivery to your business location. Note any sign of damage, external or internal, on the delivery receipt, and report it directly to both the Freight Company and Nidek Medical Products, Inc. immediately.
- Check the operation of each **Nuvo Family** unit before delivery to a patient. Always operate the unit for a reasonable length of time and check that the oxygen concentration level is within specifications as referred to in Section 2.4. Test the battery and power disconnect alarm as described in Section 2.3 of this manual.
- Deliver **Nuvo Family** units only to patients authorized by a physician's prescription. The **Nuvo Family** unit must not be used as a life-supporting or life sustaining device. A backup supply of oxygen must be available.

- Instruct patients how to use the **Nuvo Family** unit in conjunction with the Patient Manual.
- Instruct patients to notify their physicians and/or Home Service Providers if they experience any signs of discomfort.
- Instruct each patient how to perform routine maintenance of the cabinet air filter and how to check the alarm system battery, if equipped. (Refer to Section 3.2.)  
Be available to service each patient at any time. Maintain the **Nuvo Family** unit in accordance with Section 4.0.

Repair components and replace parts only as outlined in this manual. Use only Nidek Medical parts for replacement in **Nuvo Family** Oxygen Concentrators.

- Refer to the **Nuvo Family** Product Warranty if parts replacement is required within the warranty period.

## 1.2 Important Notice and Symbol Explanations

As you read the manual, pay special attention to the WARNING, CAUTION, and NOTE messages. They identify safety guidelines or other important information as follows:

WARNING:	Describes a hazard or unsafe practice that can result in severe bodily injury or death.
CAUTION:	Describes a hazard or unsafe practice that can result in minor bodily injury or property damage.
NOTE:	Provides information important enough to emphasize or repeat.

The following harmonized symbols (pictograms), used for non-English language countries, will be located on the exterior of the **Nuvo Family** unit:



Read the accompanying documents; particularly the patient operating guide.



Store, ship and use the device in an upright condition.



No smoking within five feet of this device, oxygen-carrying tubing, or accessories.



Do not use any oil or grease on or near the device.



Do not use near an open flame.

### 1.3 Functional Specifications

Dimensions:	15.5 x 15.6 x 27.8 in. (394 x 396 x 706 mm) (Pre 2/16 Nuvo 10 230V unit height: 29.8 in. (760 mm))
Weight:	54.0 lb (24.0 kg) (Pre 2/16 NUVO 10 230V 64.5 lb (29.3 kg))
Electrical Requirements:	115 V AC, 60 Hz, 410 watts avg - Nuvo 5 230 V AC, 50/60 Hz, 420 watts avg - Nuvo 5 115 V AC, 60 Hz, 500 watts avg - Nuvo 8 230 V AC, 50/60 Hz, 490/625 watts avg - Nuvo 8 115 V AC, 60 Hz, 700 watts avg - Nuvo 10 230 V AC, 50 Hz, 600 watts avg - Nuvo 10
Capacity:	5 (Nuvo 5), 8 (Nuvo 8), or 10 (Nuvo 10) liters per minute at 90% oxygen (Based on 70°F [21°C] at sea level)
Accuracy:	Flow meter $\pm 5\%$ full scale. (Based on pre-calibrated analysis.)
Concentration:	1-5 (Nuvo 5), 2-8 (Nuvo 8), or 2-10 (Nuvo 10) liters per minute at 90% + 5.5 %/ - 3%
Response Time:	Acceptable concentration is normally achieved in about 90 seconds; allow 5 minutes to attain full concentration.
Positioning:	Operate the unit in an upright position, maintaining at least six inches of open space on all sides for ventilation.

## 2.0 Operational Check and Concentration Test

### 2.1 Description of Operation

Air enters the **Nuvo Family** Oxygen Concentrator through an external cooling air intake filter. This filtered air enters the compressor via a suction resonator and fine filter, which quiets the suction sounds made by the compressor. Pressurized air then exits the compressor and passes through a heat exchanger, which reduces the temperature of the compressed air. Next, an electronic valve system directs the air into one of two sieve beds that contain molecular sieve. The special characteristic property of molecular sieve is that it physically attracts (adsorbs) nitrogen when air passes through this material, thus enabling the production of high purity oxygen.

There are two sieve beds or adsorbent columns; while one produces high purity oxygen, the other is purged of the nitrogen it adsorbed (collected) while it was producing oxygen. Each column produces oxygen for approximately 5.5 seconds and delivers it to the product storage volume in the end of the column. Oxygen exits the adsorbent column through a pressure regulator, flow control valve, flow meter, and final product filter. The flow control valve, which is part of the flow meter,



controls the flow rate of oxygen delivered to the patient. The **Nuvo Family** unit delivers up to 95% oxygen concentration at rated flow. The remaining constituents of the product gas stream are nitrogen and argon, both of which are part of the air we breathe, are inert and are completely safe.

## 2.2 Operational Check

Nidek Medical runs each device through a burn in period and tests every **Nuvo Family** Oxygen Concentrator thoroughly after manufacture before releasing for shipment. As the home service provider, it is your responsibility to perform the following test to ensure that no damage occurred in shipping or handling.

1. Open and inspect all concentrator cartons upon receipt. Unpack each unit and remove it from its carton. Inspect the unit itself for damage. If the exterior of the carton is damaged, or the unit itself is damaged, note it on the freight bill signed by the driver.
  - Before plugging the unit into the wall outlet, actuate the I/O (ON/OFF) switch to the I (ON) position and note that the audible alarm sounds continuously. (See Section 2.3). Move the switch to the 0 (OFF) position.
2. Plug in the power cord of the unit, and set the I/O (ON/OFF) switch to the I (ON) position. Check to see that the following occurs:
  - The compressor runs, listen for the sound.
  - Exhaust air flows out of the bottom of the unit.
  - OPTIONAL for Units Equipped with Oxygen Concentration Status Indicator (OCSI): The OCSI green light flashes until the oxygen concentration reaches 85% @ 60 Hz and 83% @ 50 Hz. (approximately two minutes).
3. Turn the flow meter adjustment knob counterclockwise until it stops (wide open). The flow meter should register in excess of max flow plus 0.5 liters/min. If not, refer to Section 5.8 to adjust the product regulator.
4. Perform an oxygen concentration test, as described in Section 2.4.

## 2.3 Alarm System

The **Nuvo Family** Oxygen Concentrator is equipped with an alarm system, which sounds an intermittent and loud alarm when a power failure occurs or when one or more cycle variables are not within specification. It sounds an alarm if the high or low pressure indicators are activated (standard models and those OCSI Models manufactured after Jan 2018) or if the optional OCSI detects lower than predetermined levels of oxygen concentration. The alarm remains on until you correct the alarm condition or you set the I/O (ON/OFF) switch to the 0 (OFF)

position. Refer to Section 6.0 for a list of probable alarm causes.

### **2.3.1 Battery Test**

If equipped, the **Nuvo Family** unit battery should be checked by observing that the continuous alarm sounds when the I/O (ON/OFF) switch is moved to the I (ON) position when the unit is unplugged from the wall outlet.

### **2.3.2 Power Failure Alarm Test**

To test the power failure alarm, perform the following actions:

Unplug the power cord from the wall outlet, and set the I/O (ON/OFF) switch to the I (ON) position.

This should immediately activate the intermittent audible alarm. If it doesn't, refer to the troubleshooting chart in Section 6.0 of this manual.

## **2.4 Oxygen Concentration Test and Specification**

To ensure that the output of oxygen from the device is within specification, you must perform an oxygen concentration test. Test the unit upon delivery to a patient and at periodic intervals. Home Service Providers, based on their expertise and documentation, may establish and implement their own plans for checking oxygen concentration. Consult Nidek Medical's Service and Maintenance Log (A-12) for the recommended intervals for testing.

1. If an oxygen humidifier bottle is used, remove it from the oxygen outlet.
2. Connect a calibrated oxygen concentration analyzer to the oxygen outlet.
3. Set the I/O (ON/OFF) power switch to the I (ON) position. (It takes approximately five minutes for the oxygen concentration to stabilize.) Take oxygen concentration readings over a period of several minutes to reduce any cyclic variations
4. Verify that the product flow rate delivered by the unit matches the patient's prescription and does not exceed the capacity of the unit.
5. Disconnect the oxygen analyzer, and reconnect the humidifier bottle (if used) and any other equipment / accessories that may be required.
6. Adjust the flow meter adjustment knob to the prescribed flow rate.

### **NOTE:**

Do not measure oxygen concentration output after the product stream passes through a humidifier bottle, erroneous readings will result and your oxygen concentration measuring device might be damaged.

## Nidek Medical **Nuvo Family** Concentration Specifications

<u>Unit</u>	<u>Liter Flow</u>	<u>Specification</u>	<u>Within Specification</u>
Nuvo 5	1 to 5 l/min	90% + 5.5 / - 3%	87% or higher
Nuvo 8	2 to 8 l/min	90% + 5.5 / - 3%	87% or higher
Nuvo 10	2 to 10 l/min	90% + 5.5 / - 3%	87% or higher

### **3.0 Patient Instructions**

#### **3.1 General Instructions**

It is important that patients thoroughly understand how to operate the Nidek Medical **Nuvo Family** unit. This enables proper treatment as prescribed by a qualified, licensed physician. You must explain that the purpose of this therapy is to alleviate symptoms. If patients experience any discomfort or the unit alarms, they must notify their Home Service Provider and/or physician immediately. You, as the Home Service Provider, are responsible to see that each patient receives the Patient Manual. Explain each step in the operation of the unit to the patient in reference to this manual.

#### **3.2 Routine Maintenance by the Patient**

To ensure accurate output and efficient operation of the unit, the patient must perform two simple routine maintenance tasks:

- Clean the cabinet air filter
- Check the alarm system

##### **3.2.1 Cleaning the Cabinet Air Filter**

###### **NOTE:**

The patient must clean this filter weekly, as described below. The filter may require daily cleaning if the **Nuvo Family** unit operates in a harsh environment such as a house heated by wood, kerosene, or oil, or one with excessive cigarette smoke.

- 
- 1 Remove the dirty cabinet air filter from the back of the **Nuvo Family** unit.
- 
- 2 Wash the dirty filter in warm water with household detergent, and rinse.
- 
- 3 Use a soft absorbent towel to remove excess water.
- 
- 4 Reinstall the clean cabinet air filter on the grille in the back of the unit.
- 

##### **3.2.2 Checking the Alarm System Battery**

See Procedure described in Paragraph 2.3.1

## **4.0 Home Service Provider Maintenance**

### **4.1 Routine Maintenance**

The **Nuvo Family** unit has two filters and may have a 9-volt battery, if equipped, that require scheduled maintenance and replacement.

To ensure that the output of oxygen from the unit is within specification, you must perform an oxygen concentration test. Test the unit upon delivery to a patient and at periodic intervals. Home Service Providers, based on their expertise and documentation, may establish and implement their own practices for checking oxygen concentration. The interval established may be longer or shorter than 90 days, which is the default time period recommended for providers who do not choose to establish their method.

Nidek Medical does not require preventive maintenance on the concentrator. You do not need to perform any maintenance as long as the **Nuvo Family** unit remains within specifications at the prescribed flow rate. (Refer to Section 2.4)

#### **4.1.1 Cabinet Air Filter**

The external cabinet air filter is located on the back of the unit; it is easily removed by hand. Instruct the patient to clean this filter weekly. (Refer to Section 3.2.1.)

#### **NOTE:**

The filter may require more frequent cleaning if the **Nuvo Family** unit operates in a harsh environment such as a house heated by wood, kerosene, or oil, or one with excessive cooking, cigarette smoke or atmospheric dust.

#### **4.1.2 Final Product Filter Replacement**

The final product filter does not require periodic replacement; it needs to be replaced only if it restricts oxygen flow. It is suggested that it be replaced whenever the sieve module is repaired or replaced and after the compressor is rebuilt.

1. Set the I/O (ON/OFF) switch to the 0 (OFF) position, and unplug the power cord.
2. Remove the cabinet back to locate the final product filter. **NOTE:** Observe the flow direction of the filter before removal.
3. Separate the silicone tubing from both sides of the filter.
4. Install the new filter with the inlet side in the same position as before. Push the tubing together so that it overlaps the barbs of the final product filter connections.
5. Record information about the final product filter replacement in Appendix 12 of this manual and online at [www.nidekmedical.com](http://www.nidekmedical.com) under the 'Maintenance Log' tab.
6. Reinstall the cabinet back.

### 4.1.3 Inlet Air Filter Replacement

The inlet air filter requires inspection at each patient visit. The filter should be replaced annually, or more often depending on the environment.

1. Set the unit I/O (ON/OFF) switch to the 0 (OFF) position, and unplug the power cord.
2. Remove the rear cabinet access panel to locate the intake filter.
3. Remove filter from the unit, and replace with a new filter.
4. Record information about the filter replacement in Appendix 12 of this manual and online at [www.nidekmedical.com](http://www.nidekmedical.com) under the 'Maintenance Log' tab.
5. Reinstall the access panel.

### 4.1.4 Battery Replacement

If equipped, each time the **Nuvo Family** unit is turned on, the alarm must sound loudly for approximately five seconds to indicate a good battery. An alarm that does anything other than sound loudly for five seconds indicates a weak battery and requires replacement. For units with OCSI, actuate the switch with the power cord unplugged to test the battery. To replace the battery, take the following steps:

1. Set the I/O (ON/OFF) switch to the 0 (OFF) position, and unplug the power cord.
2. Remove the access panel in the cabinet back.
3. Pull the battery from the mounting slot and remove the connection wires.
4. Attach the new battery to the connector and reinsert it into the mounting slot.
5. Set the I/O (ON/OFF) switch to the I (ON) position to test the alarm.
6. Record the battery replacement information in Appendix 12 of this manual and online at [www.nidekmedical.com](http://www.nidekmedical.com) under the 'Maintenance Log' tab.
7. Reinstall the access panel.

### 4.1.5 Recording Maintenance

As the Home Service Provider, it is suggested that you record all routine maintenance and repairs performed on the **Nuvo Family** unit, including hours and dates of service in Appendix 10 of this manual and online at [www.nidekmedical.com](http://www.nidekmedical.com) under the 'Maintenance Log' tab.

## 4.2 Cleaning and Infection Control

With the growing concern about possible cross infection from home oxygen equipment (i.e., oxygen concentrators) from one home care patient to another, appropriate cautions should be exercised. The organisms of most concern are M. Tuberculosis, HIV, and Viral Hepatitis. These are potentially pathogenic.

Tuberculosis can survive outside of the human body, but its mode of transmission is by droplet nuclei. When infected individuals cough, they release droplet nuclei into the air, and these carry the Tuberculosis organism. Another person may breathe in these droplet nuclei, but prolonged exposure to the infected person is usually necessary for infection to occur.

HIV and Viral Hepatitis are both viruses, which are not living cells themselves but which can duplicate when in a living “host” cell. Both of these organisms are usually passed on by person-to-person contact, and both need to be in the human body to survive. Once outside the body, viruses can survive for only a short period of time.

#### **4.2.1 Preparing for New Patient Use**

When you remove the **Nuvo Family** unit from a patient’s home, always dispose of the used nasal cannula and humidifier bottle. Clean the exterior of the **Nuvo Family** unit with a soapy water solution or commercial detergent cleaner to remove any debris, organic or otherwise. Be careful not to get any liquid into the interior of the unit.

Next, clean the exterior with either a common chemical disinfectant or a bleach solution\* and allow it to air dry. For the bleach solution, wear eye and skin protection to prevent exposure to the chlorine. Retest the **Nuvo Family** unit before you return it to your inventory.

Replace the cabinet air filter between each patient’s use or clean with warm soapy water if it is in good condition. Clean this filter at least once per week or more frequently if operated in a dusty environment.

\*Make the bleach solution a 1:100 dilution of 5.25% sodium hypochlorite. Mix one part household bleach (e.g., Clorox) with 99 parts cold tap water. To measure the solution easily, take 1/4 cup of household bleach, and mix it with a gallon of cold tap water. Allow the mixture to sit on potentially contaminated surfaces for 10 minutes.

### **5.0 Service**

#### **5.1 Components**

The design of the Nidek Medical **Nuvo Family** Oxygen Concentrator allows for easy access and removal of most components. This allows you to perform scheduled maintenance, repair, and replacement of parts with minimal time and effort. The inlet air filter and battery are conveniently located inside the small access panel in the cabinet back.

#### **CAUTION:**

For your safety, be sure to set the I/O (ON/OFF) switch to the 0 (OFF) position and unplug the power cord before you service the **Nuvo Family** Oxygen Concentrator.

**NOTE:**

Record all scheduled maintenance. (Refer to Section 4.1.5.)

**5.2 Cabinet Removal****5.2.1 Removing Cabinet Back**

To remove the cabinet back, remove two screws near the base (one on each side) and two inset screws at the top just under the handle.

**5.2.2 Removing Cabinet Front**

To remove the cabinet front, remove two screws near the base (one on each side) adjacent to the rear cabinet screws and two inset screws at the top just under the handle. It is necessary to remove the cabinet back to access the top screws.

**5.2.3 Removing Control Panel**

Eight screws hold the control panel in place; the front cover must be removed to access these screws. It is necessary to remove the electrical wiring and pneumatic tubing to fully release the control panel.

**5.2.4 Main Structure**

The weight and forces of the internal components rest solely on four parts: the main structure, the compressor plate, the base-plate and the base. These parts were specially designed and formed. They should never require replacement under normal use.

**5.2.5 Caster Replacement**

The casters are a push in type that do not require any fasteners. Lay the device on its back to access the casters from the bottom. Pull them straight out away from the bottom.

**5.3 Compressor**

The compressor is the pump within the oxygen concentrator that supplies air to the separation process performed by the sieve beds. The pressure generated by the compressor forces oxygen to flow out of the top of the sieve columns.

The compressor is the likely cause of two potential specific problems:

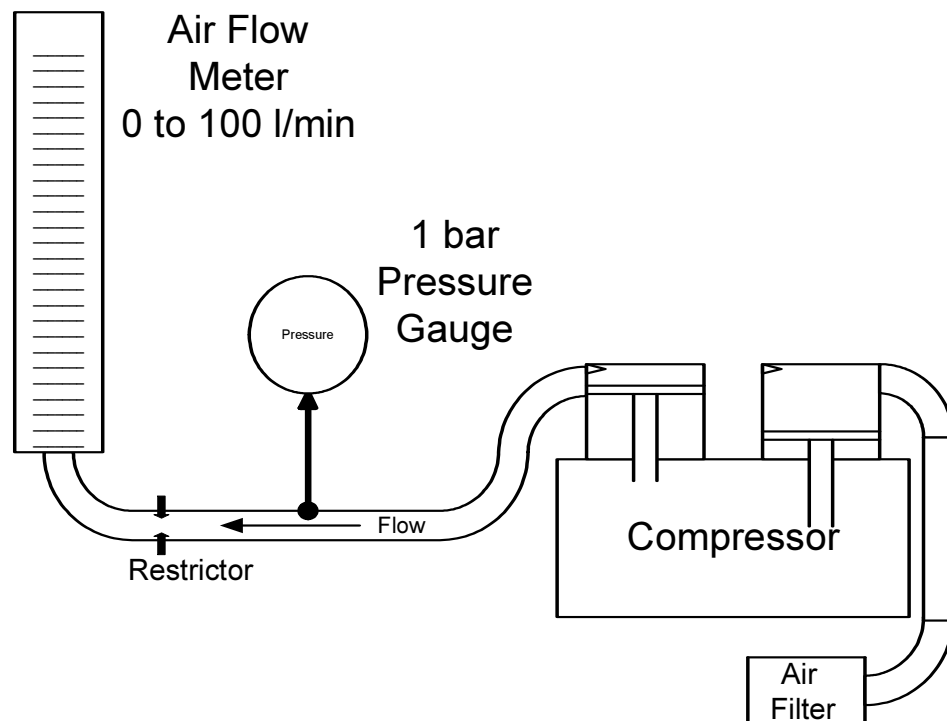
- a. An insufficient amount of air is supplied to the process.
- b. An excessive sound level.

- Air Supply

Compressor output refers to how much compressed air the compressor can produce. This depends upon the model of the compressor, length of stroke, piston diameter, speed of rotation and condition of seals. The cup seals form the seal between the piston and the cylinder wall. As the cup seals wear, the output begins to gradually decrease. This reduction in compressor output results in less air, and thus less oxygen, entering the sieve beds. Therefore, the production of oxygen decreases.

Because this drop in oxygen production occurs over a long period of time, preventive maintenance on the compressor is not required.

You can continue a patient's therapy on the **Nuvo Family** unit as long as the oxygen concentration level at the prescribed liter flow rate is within Nidek Medical's specification limits. Refer to Section 2.4.



- Sound Level

The sound level is largely determined by the condition of the compressor's bearings.



There are four bearings located within the compressor that allow the inner components of the compressor to rotate. If the bearings wear to the point that they become loose and noisy, the compressor becomes noticeably loud and needs servicing. The life of a compressor is determined primarily by its operating temperature. It is extremely important that the inlet cooling air filters are cleaned and replaced as required.

### **5.3.1 Compressor Replacement**

#### **Remove Compressor Assembly**

To remove the compressor assembly for exchange, follow the steps listed below:

1. Set the unit's I/O (ON/OFF) switch to the 0 (OFF) position, and unplug the power cord.
2. Remove the cabinet back and front.
3. Disconnect the suction tube.
4. Disconnect the two compressor power cable leads and the two leads to the capacitor at the inline connector.
5. Remove the three screws that connect the compressor plate to the base of the unit, lift and slide out the compressor assembly.
6. Remove tie wrap from compressor plate wiring harness.
7. Remove compressor from the plate by removing the four compressor bolts.
8. Remove the intake and exhaust fittings.

#### **Compressor Assembly Installation**

To install a new or rebuilt compressor assembly, follow the steps listed below:

1. Perform the compressor removal procedure in reverse order.
2. Leak test all connections.

### **5.3.2 Capacitor Replacement**

The capacitor helps the compressor to start and run more efficiently. If the compressor cannot start, the capacitor may be defective and require replacement. The capacitor should be replaced every three years or 15,000 hrs. To replace the capacitor, take the following steps:

1. Set the unit's I/O (ON/OFF) switch to the 0 (OFF) position, and unplug the power cord.
2. Remove the rear and front cabinets.
3. Disconnect the two leads to the capacitor and remove the nut from the mounting screw.
4. Remove the nut and washer below the capacitor.
5. To install the new capacitor, connect the leads and replace the capacitor and associated hardware.

## 5.4 Process Control Valve

The **Nuvo Family** unit uses an electronic valve system valve assembly to control the air separation process. There is a feed port that connects to the heat exchanger and an exhaust port that connects to the exhaust muffler outlet. There are three possible valve states as follows:

1. Air feed connected to sieve bed A and exhaust connected to sieve bed B.
2. Air feed connected to sieve bed B and exhaust connected to sieve bed A.
3. Air feed connected to sieve bed A & B, both exhaust closed (normal de-energized condition).

The control valve of the **Nuvo Family** unit requires no scheduled maintenance. If a valve does not function as required, it is best to replace the complete sieve module as it is probable that one or both of the beds has been damaged.

## 5.5 Sieve Bed/Module Replacement

### CAUTION:

Do not expose molecular sieve (contents of bed) to air for an extended period of time. Prolonged exposure of molecular sieve to the moisture in room air results in contamination and permanent damage to the sieve material. Keep all openings to the sieve beds sealed during periods of storage.

### NOTE:

If replacement is necessary, you must replace the entire module at the same time. It is recommended to replace the sieve bed and control valve module as a complete assembly.

### 5.5.1 Sieve Bed/Module Removal

1. Set the unit's I/O (ON/OFF) switch to the 0 (OFF) position and unplug the power cord.
2. Remove the cabinet back.
3. Disconnect the 3/8-inch air inlet tube from the side of the valve body.
4. Disconnect the 1/4-inch product outlet tube from the top of valve.
5. Disconnect the electrical wiring from each solenoid valve, noting there color and position.
6. Remove the tie-wrap (24" from around module).
7. Remove "Z" bracket; from the top of the module.
8. Lift the module up and out of the base plate.

### 5.5.2 Sieve Bed/Module Installation

To install the sieve beds, follow the sieve bed/module removal procedure in reverse order. It is very important to properly connect all tubes to eliminate leaks.

To check for leaks, take the following steps.

1. Plug in the unit.
2. Set the unit's I/O (ON/OFF) switch to I (ON) for three minutes with the flow meter closed to pressurize the system.
3. Apply soapy water around all of the hose connections at the valve and check for leaks.

#### CAUTION:

There is an electrical shock hazard with the Power ON. Be careful that no water contacts any of the electrical connections or components.

#### NOTE:

Small leaks can affect a concentrator's performance and can cause contamination of the sieve. Careful leak testing is important.

### 5.6 Cabinet Fan Replacement

The cabinet fan for the **Nuvo Family** unit is located under the compressor. Refer to the troubleshooting chart in Section 6.0 of this manual for instances where replacement of the fan may be required.

To replace the cabinet fan in the **Nuvo Family** unit, take the following steps:

1. Set the unit's I/O (ON/OFF) switch to the 0 (OFF) position and unplug the power cord.
2. Remove the front and back cabinets.
3. Follow the procedure in 5.3.1 to remove the compressor assembly.
4. Disconnect the fan leads.
5. Position the new cabinet fan so that the air flow arrow points toward the bottom and the electrical connections. Be sure that the electrical wires do not interfere with the rotation of the fan.
6. Connect the fan leads and place the fan on the mounting pins.
7. Replace compressor assembly.
8. Reinstall the front and back cabinets.

### 5.7 Circuit Board Replacement

The printed circuit board controls the alarm system functions.

Consult the troubleshooting chart in Section 6.0 to determine when to replace the printed circuit board.

## CAUTION:

The Printed Circuit Board (PCB) contains components that are sensitive to electrostatic discharge (ESD) that can damage the board if not handled properly. As when handling any ESD sensitive PCB, observe standard ESD safety procedures. These procedures include the following:

- Handle the PCB by the edges only.
- Work on a grounded ESD mat.
- Wear a grounded wrist strap.
- Store PCB in anti-static bags only.

### 5.7.1 Circuit Board Removal (Note that the Circuit Board on the OCSI unit is different to the Circuit Board on the standard unit.)

1. Set the I/O (ON/OFF) switch to the 0 (OFF) position, and unplug the power cord.
2. Remove the front and cabinet backs.
3. Remove the control panel to which the circuit board is attached.
4. Disconnect the 7-pin connector from the circuit board.
5. Disconnect tubing from each end of the black sensor tube on the OCSI unit, noting their position and orientation.
6. **Non OCSI units only:** Cut tie-wrap and remove pressure sensor line.
7. Remove three screws that attach the board to the control panel.
8. Remove the circuit board.

## NOTE:

Handle the new circuit board only by the edges to prevent electrostatic damage to the unit.

### 5.7.2 Circuit Board Installation

1. Locate the circuit board to line up the attachment points.
2. Install the three mounting screws.
3. Reinstall the tubing to each end of the black sensor tube as it was before.
4. **Non OCSI unit only:** Reinstall the pressure sensor line and tie-wrap.
5. Plug in the 7-pin connector.
6. Reinstall the control panel and the front and cabinet backs.

### 5.7.3 Timing Board Removal, If Equipped

1. Set the I/O (ON/OFF) switch to the 0 (OFF) position, and unplug the power cord.
2. Remove the cabinet back.
3. Disconnect the 6 and the 4 pin connectors as well as the 6 spade connectors from the Timing Board.
4. Remove the mounting screws.
5. Remove the circuit board.

**NOTE:**

Handle the new circuit board only by the edges to prevent electrostatic damage to the unit.

**5.7.4 To reinstall the timing board, reverse the removal procedure.****5.8 Product Regulator Check and Setting**

The product regulator enables you to set the maximum flow of oxygen output by the **Nuvo Family** unit. To check for proper adjustment of the product regulator, take the following steps:

1. Set the I/O (ON/OFF) switch to the I (ON) position.
2. Allow the unit to run for a few minutes.
3. Remove the front and cabinet backs.
4. Connect a pressure gauge directly to the patient outlet.
5. The pressure should read 7 psi (48.3 kPa) on Nuvo 5, 15 psi (103.4 kPa) on Nuvo 8, and 20 psi (137.9 kPa) on Nuvo 10. Tolerance is +/- 15%.
6. Adjust the regulator if necessary. Turn the knob clockwise to increase the output pressure (requires a 5/32 hex wrench).
7. Reinstall the cabinet front and cabinet backs.

**5.8.1 Product Regulator Cleaning or Rebuilding**

Clean or rebuild the product regulator if the flow meter ball fluctuates more than 1/4 of a liter or if the regulator cannot be adjusted.

1. Set the I/O (ON/OFF) switch to the 0 (OFF) position, and unplug the power cord,
2. Remove the front and rear cabinets.
3. Cut the tie wrap holding the regulator in place. Remove from the main structure.
4. Adjust the product regulator fully counterclockwise to unload the spring. This makes disassembly and reassembly easier.
5. Remove the diaphragm. (Clean or replace it.)
6. Use a hex-head screwdriver to unscrew the diaphragm stem guide located in the center of the regulator body to gain access to the seat,
7. Remove the seat. Be careful not to lose the spring located behind the seat.
8. Replace the seat or clean by blowing clean air on and around it.
9. With the spring behind the seat, screw the diaphragm stem guide back into the body of the regulator. (Do not over tighten.)
10. Install a clean or replacement diaphragm.
11. Put the large spring and slip ring into the bonnet, and screw the bonnet onto the regulator body.
12. Reinstall the regulator, mounting it securely to the main structure.
13. Reset the product regulator as described in Section 5.8.1.

## **5.9 High or Low Pressure Switch Replacement (Standard Unit only)**

The high and low pressure alarms are activated by a pressure transducer located on the circuit board adjacent to the mains switch.

1. Set the I/O (ON/OFF) switch to the 0 (OFF) position, and unplug the power cord.
2. Remove the back and front cabinets and the control panel.
3. Disconnect the 7 pin connector from the circuit board.
4. Disconnect tubing from pressure sensor by cutting tie-wrap.
5. Remove the circuit board and replace with a new one.
6. Test the alarm system, as described in Section 2.3.
7. Reinstall the control panel and the front and back cabinets.

## **5.10 Circuit Breaker Replacement**

### **5.10.1 Circuit Breaker Removal**

1. Set the I/O (ON/OFF) switch to the 0 (OFF) position, and unplug the power cord.
2. Remove the cabinet front and back.
3. Disconnect the circuit breaker leads.
4. Unscrew the circuit breaker retaining ring (front of control panel) while holding the circuit breaker body in place.
5. Remove the circuit breaker from the control panel.

### **5.10.2 Circuit Breaker Installation**

Follow the removal procedure for the circuit breaker in reverse order to install the new circuit breaker.

## **5.11 I/O (ON/OFF) Power Switch Replacement**

### **5.11.1 I/O (ON/OFF) Power Switch Removal**

1. Set the I/O (ON/OFF) switch to the 0 (OFF) position and unplug the power cord.
2. Remove the cabinet front and back.
3. Unscrew the eight Phillips-head screws that hold the control panel to the main structure.
4. Disconnect the I/O (ON/OFF) switch leads from the back of the switch being careful to note the color and position of each specific wire.
5. Push on the back of the power switch, while holding in its four retaining tabs, and remove the switch through the front of the control panel.

### **5.11.2 I/O (ON/OFF) Power Switch Installation**

Follow the removal procedure for the I/O (ON/OFF) power switch in reverse order to install a new power switch.

### **5.12 Buzzer Replacement**

The buzzer is a fixed component on the circuit board and is not individually replaceable.

### **5.13 Hour Meter Replacement**

1. Set the I/O (ON/OFF) switch to the 0 (OFF) position, and unplug the power cord.
2. Remove the cabinet back.
3. Disconnect the hour meter leads.
4. Push hour meter mounting tabs inward from the hour meter.
5. Remove the hour meter from the main structure.
6. Install the new hour meter into its mounting location, and push the mounting tabs outward to secure hour meter. Make sure that the hour meter is mounted right side up.
7. Reconnect the hour meter leads.
8. Reinstall the cabinet back.

### **5.14 Flow Meter Replacement**

#### **5.14.1 Flow Meter Removal**

1. Set the I/O (ON/OFF) switch to the 0 (OFF) position, and unplug the power cord.
2. Remove the front and back cabinets, as well as the control panel. Ref. 5.2.1 thru 5.2.3. On units with OCSI, it is necessary to also first remove the circuit board.
3. Remove the 3/8-inch silicone oxygen tubing from the flow meter fittings.
4. Unscrew the flow meter nuts with a wrench or deep socket.
5. Remove the flow meter through the control panel.

#### **5.14.2 Flow Meter Installation**

To install a new flow meter, follow the flow meter removal procedure in reverse order. Then perform a leak test on the connections.

### **5.15 Power Cord Replacement**

1. Set the I/O (ON/OFF) switch to the 0 (OFF) position and unplug the power cord.
2. Remove the cabinet back.
3. Slide the power cord strain relief reinforcement upwards to remove it from the mounting location at the rear of the base.

4. Disconnect the power cord leads from the terminal quick connects.
5. Connect the leads on the new power cord at the terminal quick connects.
6. Reinstall the power cord strain relief into the base of the unit.
7. Reconnect the cabinet back.

## **6.0 Troubleshooting**

### **6.1 Air Pressure Test (P1)**

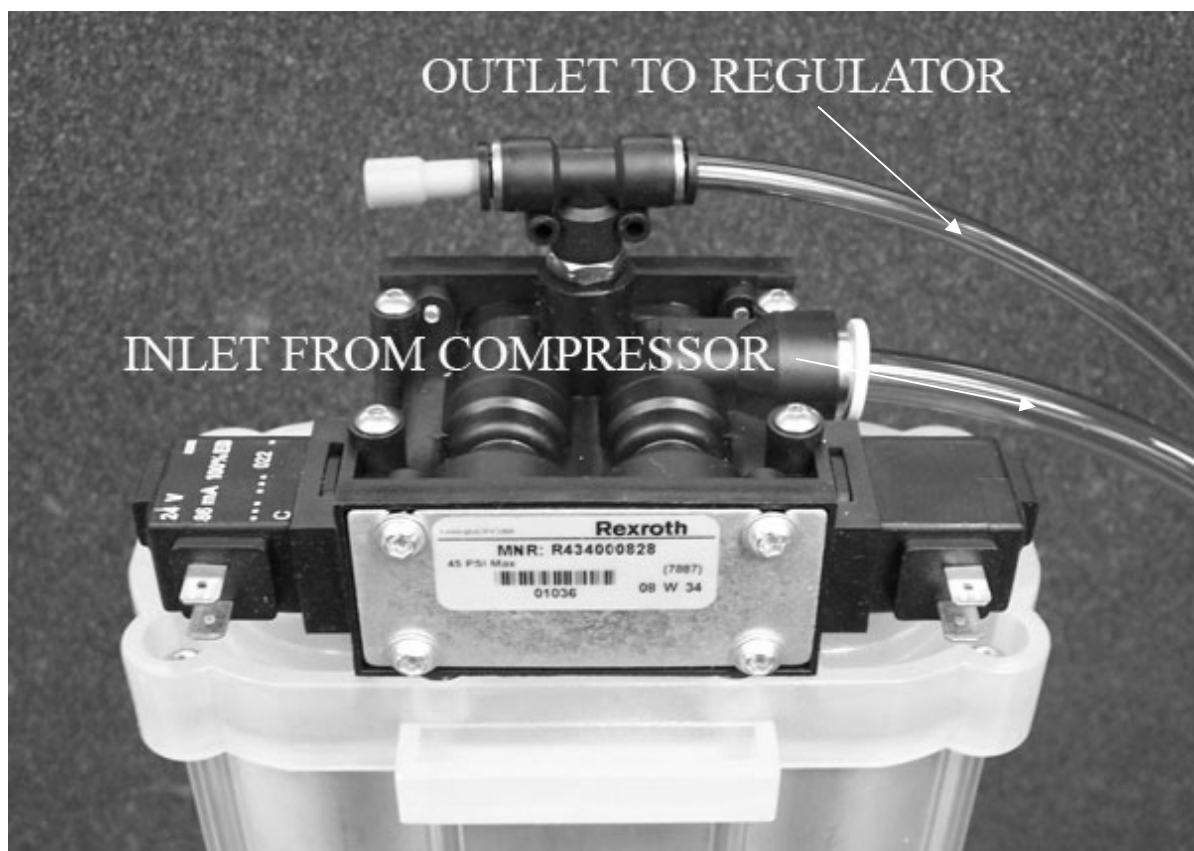
Testing the operating pressure is a useful diagnostic tool when a concentrator has low purity and requires servicing. Units functioning normally do not require operating tests.

Use the following procedure to test the operating pressure of the unit.

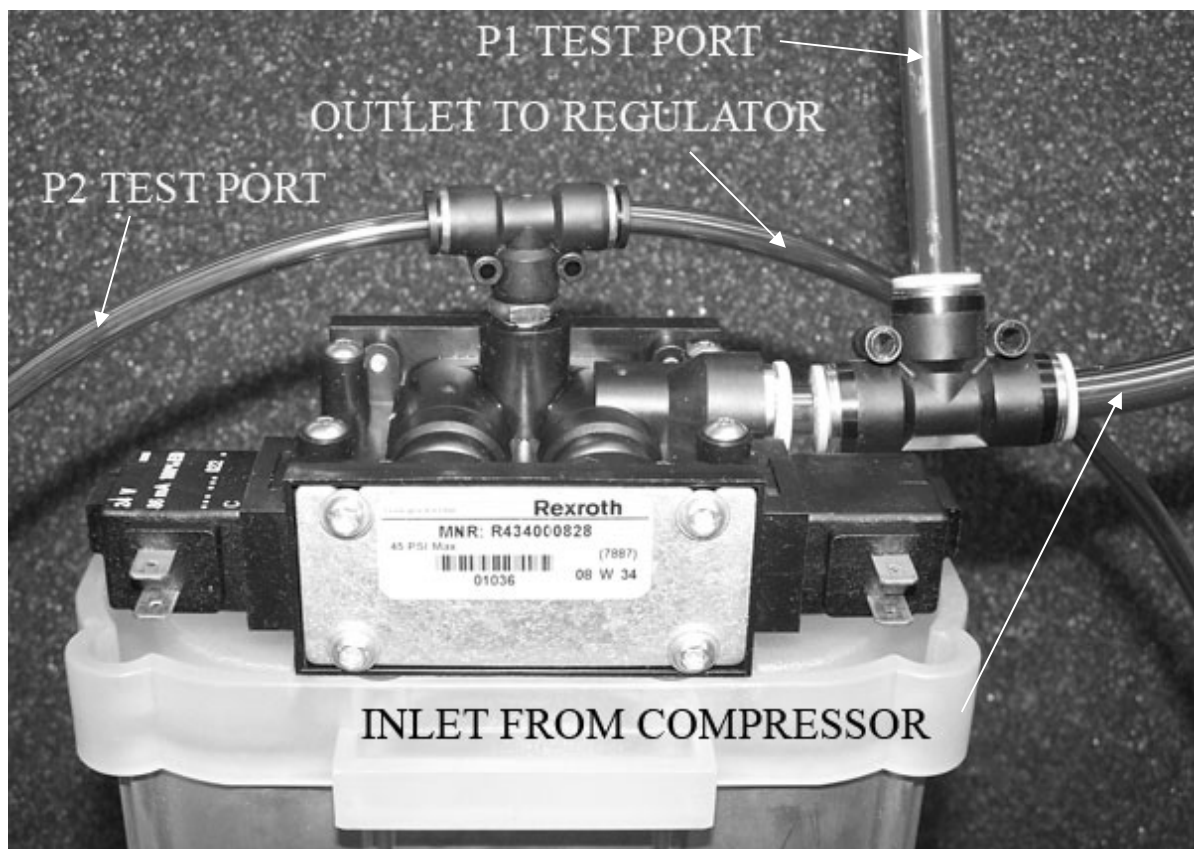
1. Set the I/O (ON/OFF) switch to the 0 (OFF) position, and unplug the power cord.
2. Remove the cabinet rear.
3. Remove the air supply tubing going to the control valve and install the test port T-fitting. Figure 6.1.1 shows the normal operating configuration for the unit. Figure 6.1.2 shows the installation of the test ports.
4. Connect the pressure test gauge to the test port.
5. Plug in the power cord, and set the I/O (ON/OFF) power switch to the ON position. Set the flow meter to max flow, and allow the unit to run at least five minutes.
6. Observe the maximum and minimum readings on the pressure test gauge.
7. The maximum reading should not exceed 40 psig (275 kPa). The minimum reading should not be less than 13 psig (90 kPa).

**NOTE** When you turn the unit on, it will take several minutes to reach normal operating pressures.





**Fig. 6.1.1**



**Fig 6.1.2**

### **6.1.1 High Operating Air Pressure (P1)**

Higher than normal operating pressure may indicate any of the following:

- A restrictive exhaust muffler, which does not allow the waste (purge) gas to exit the system freely.
- Contaminated sieve beds. Change the sieve beds.

### **6.1.2 Low Operating Air Pressure (P1)**

Lower than normal operating pressure may indicate any of the following:

- A restriction in the suction resonator or air intake filter, this limits the amount of room air available to the compressor. Disconnect the suction tube at the compressor, and allow the unit to operate without the suction resonator to see if normal operating pressure returns.
- An improperly operating control valve. Confirm that the control valve does not have a leak.
- A leak in the unit, which allows system pressure to escape. Leak test the unit.
- A compressor with reduced output.

Ensure that the concentration level at the desired liter flow is within specifications listed in section 2.4. If it is below specifications, replace or repair the compressor.

## **6.2 Product Pressure Test (P2)**

Testing the product pressure is a useful diagnostic tool when a concentrator has low purity and requires servicing. Units functioning normally do not require operating tests.

Use the following procedure to test the product pressure of the unit.

1. Set the I/O (ON/OFF) switch to the 0 (OFF) position, and unplug the power cord.
2. Remove the cabinet rear.
3. Remove the plug from the T-fitting atop the valve and install the test port tubing (1/4" OD tubing is required). Figure 6.1.1 shows the normal operating configuration for each unit. Figure 6.1.2 shows the installation of the test port tubing.
4. Connect a pressure test gauge to the P2 test port tubing.
5. Plug in the power cord, and set the I/O (ON/OFF) power switch to the ON position. Set the flow meter to max flow, and allow the unit to run at least five minutes.

6. Observe the maximum and minimum readings on the pressure test gauge. The maximum reading should not exceed 40 psig (275kPa). The minimum reading should not be less than 13 psig (90 kPa).

### **6.2.1 Low Product Pressure (P2)**

Lower than normal operating pressure may indicate any of the following:

- An inlet air filter that limits the amount of room air available to the compressor. Disconnect the suction tube at the compressor, and allow the unit to operate without the suction resonator to see if normal operating pressure returns.
- An improperly operating control valve. Confirm that the control valve does not have a leak.
- A leak in the unit, which allows system pressure to escape. Leak test the unit.
- A compressor with reduced output. Ensure that the concentration level at the desired liter flow is within specifications listed in Section 2.4. If it is below specification, replace or repair the compressor.

### **6.2.2 High Product Pressure (P2)**

Higher than normal operating pressure may indicate any of the following:

- A restrictive exhaust muffler, which does not allow the waste (purge) gas to exit the system freely.
- Check exhaust muffler for any restrictions
- Contaminated sieve beds. Change the sieve beds.

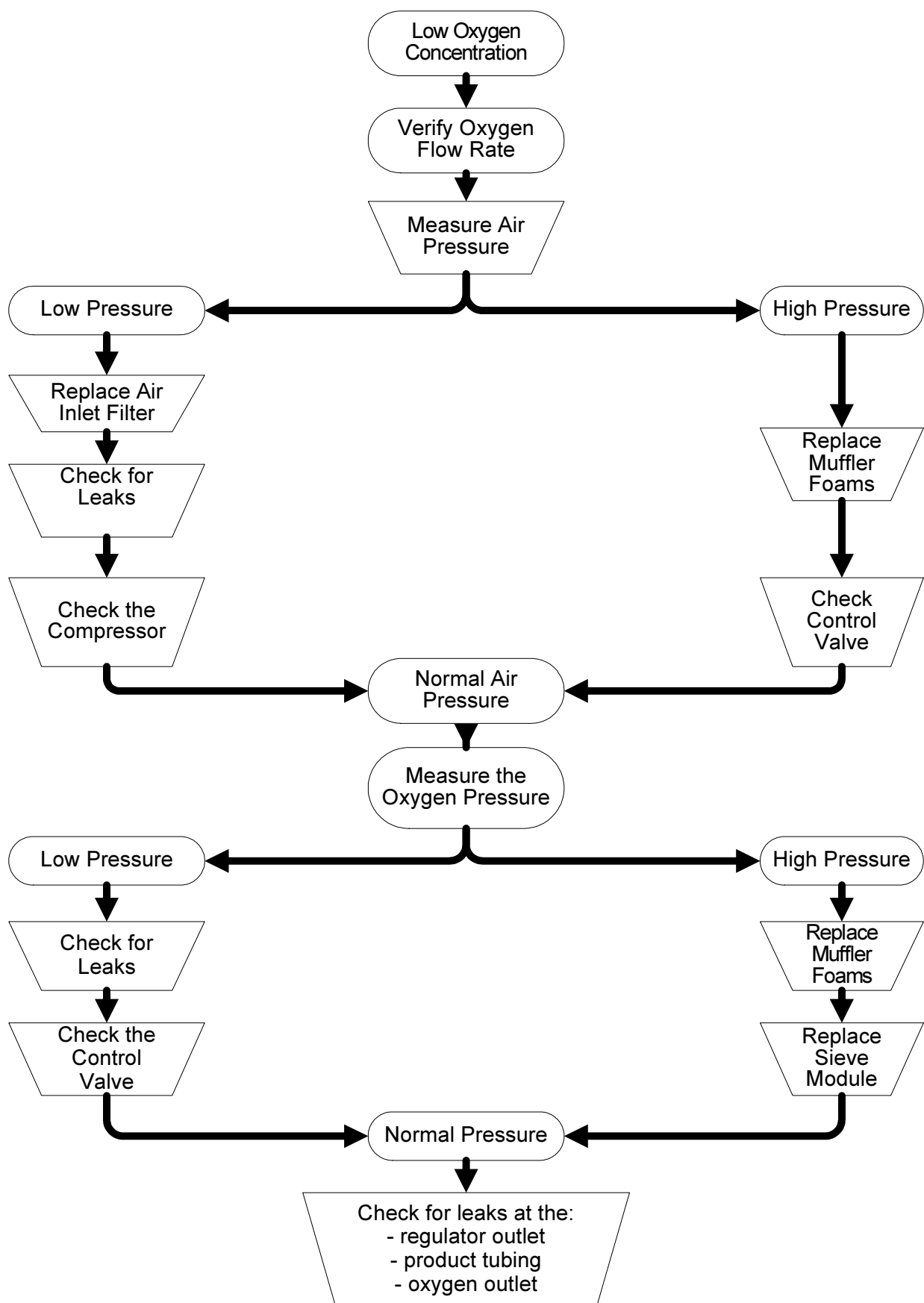
## **6.3 General Troubleshooting**

Before reviewing the troubleshooting chart, the following steps may be useful to isolate any malfunctions:

1. Turn the concentrator on. If unit does not turn on, refer to troubleshooting chart.
2. Make sure all filters are clean.
3. Turn flow meter completely open, up to the highest setting. The ball should rest at the top of the scale. If setting is not greater than max flow plus 0.5 l/min, adjust regulator so that the ball level exceeds max flow plus 0.5 l/min with the flow meter completely open.
4. Connect test pressure gauge to the outlet fitting of the unit. The pressure should read approximately 7 psig (48.3 kPa) for Nuvo 5, 15 psig (103.4 kPa) for Nuvo 8 or 20 psig (137.9 kPa) for Nuvo 10, all +/- 15%

5. Connect test pressure gauge to the P1 test port on the valve inlet. The pressure should be cycling between approximately 13 and 40 psig (90 and 275 kPa).
6. Make sure the unit is cycling properly by observing the pressure gauge cycle between a high and a low pressure. If the unit is not cycling properly, refer to troubleshooting chart.
7. Make sure that the unit is leak free by testing all tubing connections and fittings with leak testing solution. Protect circuit board from solution and start leak test at the compressor outlet, following the air flow through the unit to the oxygen outlet. Repair all leaks by tightening connections and fittings.
8. Set the concentrator at max flow and connect pressure test gauge to P2 at the top of the sieve module. Determine pressure parameters by observing high and low pressure points on the gauge. It should cycle between approximately 13 psig and 40 psig (90 to 275 kPa). If pressures are high or low, refer to the troubleshooting chart.
9. Review troubleshooting chart to isolate and repair any other malfunctions.

**The following diagnostic flow chart will help to isolate potential problems.**



## 6.4 Troubleshooting Chart

Problem	Probable Cause	Solution
Compressor does not run.	No power to unit.	Check wall outlet for power.
Constant audible alarm with I/O (ON/OFF) power switch in ON position.	Unit circuit breaker tripped or faulty.	Reset or replace circuit breaker.
	Faulty electrical connections. Defective circuit board.	Check electrical connections.
	Defective I/O (ON/OFF) power switch.	Check power switch. Replace I/O (ON/OFF) power switch.
Compressor runs with intermittent alarm. Concentration at 8 L/MIN is within specifications.	Defective high/low pressure switch. Kinked tubing.	Replace and retest pressure switch, if a standard board is installed.
Compressor shuts down intermittently,	Restricted air flow through unit.	Clean inlet filter, or remove obstruction.
	Unit overheating due to improper location.	Locate unit away from heating source, providing adequate ventilation on all sides.
	Defective cooling fan.	Replace fan.
Compressor does not start. I/O (ON/OFF) power switch in ON position, intermittent alarm, and cabinet fan turns.	Extreme cold start.	Allow unit to reach room temperature.
	Compressor thermally cut off due to excessive heat. NOTE: It will not restart unit it cools down,	Blocked air intake or defective cooling fan. Clear obstruction, or replace cooling fan.
	Defective capacitor.	Replace capacitor.
	Faulty electrical connection for compressor.	Check electrical connections for compressor.
Compressor runs with intermittent low pressure alarm and low oxygen concentration.	Leak	Leak test and repair leak.

<b>Problem</b>	<b>Probable Cause</b>	<b>Solution</b>
Compressor runs with intermittent high pressure alarm and low oxygen concentration.	Defective sieve module.	Replace sieve module.
	Restriction in exhaust muffler.	Replace or clean muffler foam.
	Defective valve.	Replace sieve module.
Compressor relief valve releases (popping sound).	Defective control valve.	Replace control valve.
	Contaminated sieve module.	Replace sieve module.
	Defective relief valve.	Replace relief valve.
Constant alarm with I/O (ON/OFF) switch in ON position. Circuit breaker repeatedly trips.	Defective circuit breaker.	Replace circuit breaker.
	Defective capacitor.	Replace capacitor.
	Defective compressor.	Replace compressor.
	Defective circuit board.	Replace circuit board.
	Faulty electrical connection.	Repair electrical connection.
Alarm does not sound.	Dead battery.	Replace battery.
	Incorrectly installed battery.	Reinstall battery with correct polarity.
	Faulty electrical connection.	Repair electrical connection.
	Defective I/O (ON/OFF) switch.	Replace I/O (ON/OFF) switch.
	Defective buzzer.	Replace control board.
	Defective pressure sensor.	Replace and test control board (Standard unit only).
Flow meter fluctuates.	Improperly set or faulty product regulator.	Check regulator setting/clean, repair, or replace regulator.
		Test for leaks.
	Leak.	Replace compressor
	Worn compressor.	Replace flow meter.
	Defective flow meter.	
	Kinked tubing	Check tubing that connects the top of the sieve beds.

<b>Problem</b>	<b>Probable Cause</b>	<b>Solution</b>
Cooling fan does not turn.	Defective cooling fan.	Replace cooling fan.
	Defective electrical connections.	Check electrical connections.
Limited or low flow.	Restriction in humidifier or tubing.	Replace humidifier or tubing.
	Product regulator set too low.	Adjust regulator setting.
	Leak.	Leak test and repair leak.
	Weak compressor.	Check system pressure, and rebuild or exchange compressor.
	Air flow obstruction.	Check filter, suction resonator, and suction tube for obstruction.
Low concentration.	Inlet air filter is dirty or partially blocked.	Replace inlet air filter.
	System leak	Leak test and repair leak.
	Faulty compressor	Check system pressure, and rebuild or replace compressor.
	Unit temperature too high,	Blocked air intake or dirty inlet air filter, faulty cooling fan.
	Contaminated sieve module.	Check that P1 and P2 pressures are within range. Replace sieve module.
	Defective control valve.	Repair or replace sieve module.
	Restriction in exhaust muffler,	Replace or clean exhaust muffler.
	Restriction of inlet air.	Check inlet tubing for obstruction and remove.



## 6.5 Tool Kit and Pressure Test Gauge

The tools needed for you to properly service the **Nuvo Family** unit are listed below:

- Requires no special tools; generally available tools including common pliers, channel lock, wire cutters, needle-nose pliers, slotted-head screwdriver, long Phillips head screwdriver, 8-inch adjustable wrench, 7/16-inch socket, 7/16-inch combination wrench, 5/8-inch combination wrench and 3/8-inch combination wrench.
- For convenience, it is desirable to have a battery operated drill motor available to remove and install screws.
- An accurate pressure test gauge to take both high and low pressure readings on the **Nuvo Family** unit should be kept available at all times. This gauge connects to the pressure test ports on top of the air tank and on top of the sieve bed.

## Appendices

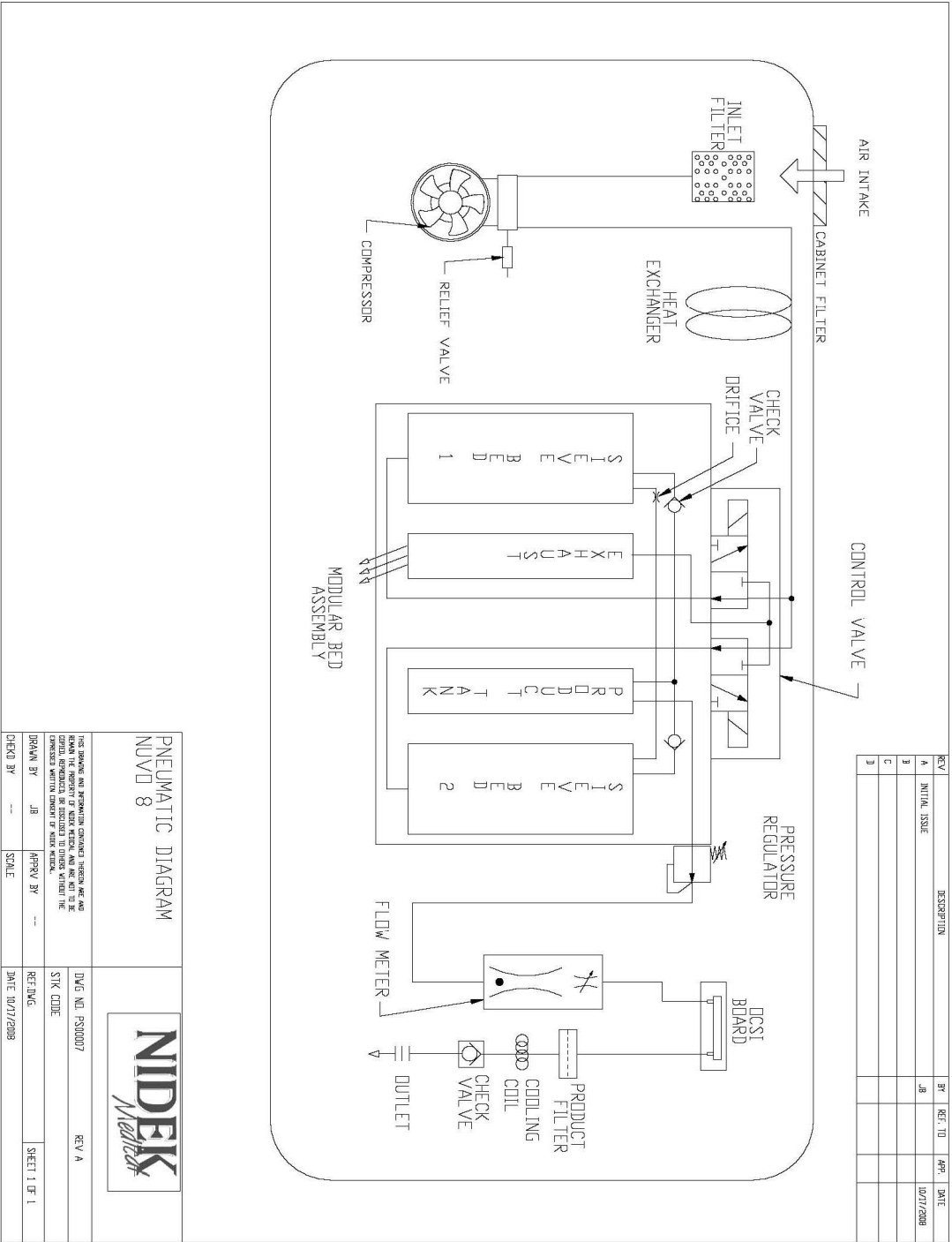
### Drawings

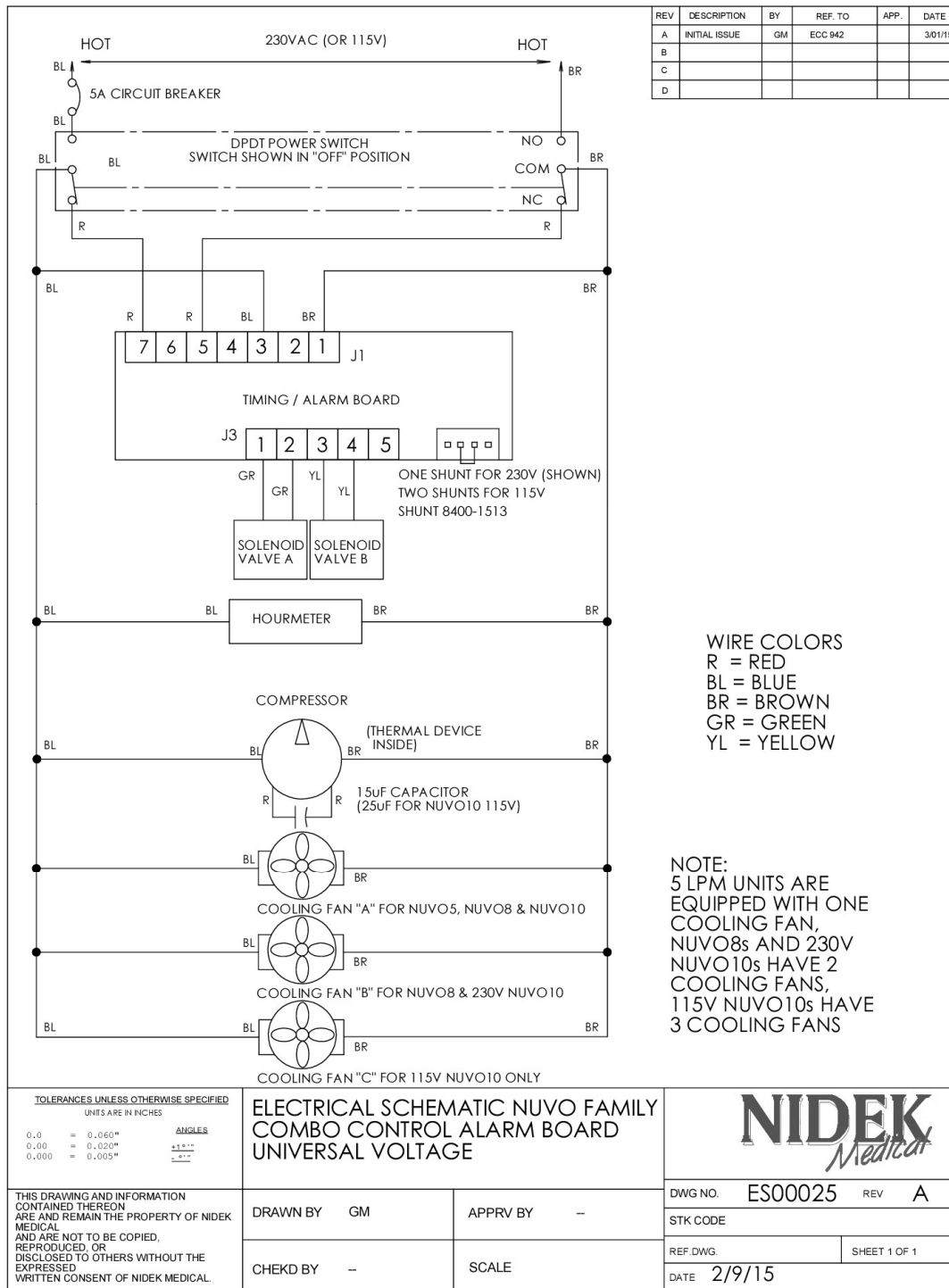
Pneumatic Flow Chart	A-1
Electrical Diagram	A-2

### Exploded Drawings

Base Assembly, 5LPM STD	A-3
Base Assembly, Common	A-3.1
Base Assembly, 10LPM 230V	A-3.2
Main Structure Assembly (front), 5LPM	A-4
Main Structure Assembly (rear), 5LPM	A-4.1
Main Structure Assembly (front), 8LPM	A-4.2
Main Structure Assembly (rear), 8LPM	A-4.3
Main Structure Assembly (front), 10LPM	A-4.4
Main Structure Assembly (rear), 10LPM	A-4.5
Compressor Assembly	A-5
Control Panel Assembly (front)	A-6
Control Panel Assembly (rear)	A-6.1
Front Cabinet Assembly	A-7
Rear Cabinet Assembly	A-8
Sieve Module	A-9
Maintenance Log	A-10

Refer to Thomas Compressor Manual (FSM 0159 Rev A dtd 07/04) for compressor rebuild procedures. Call Nidek Medical customer service to obtain a pdf file copy.

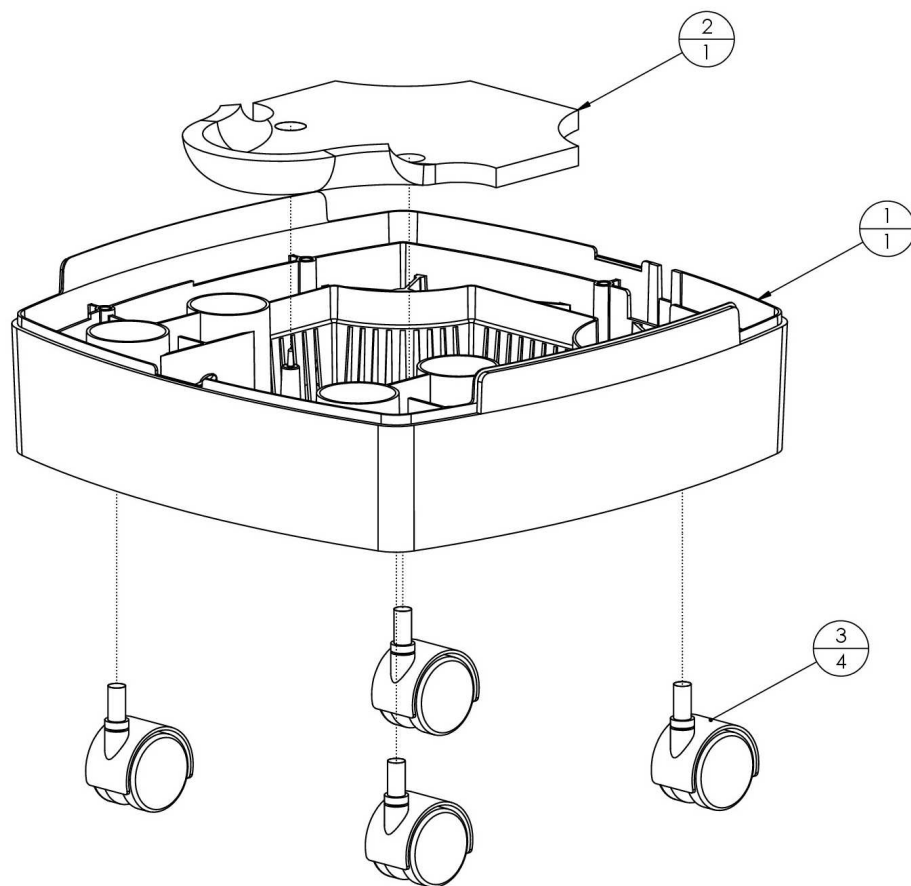




CAD FILE ES00025 Rev A, Electrical Schematic NUVO5,8,10 Combo

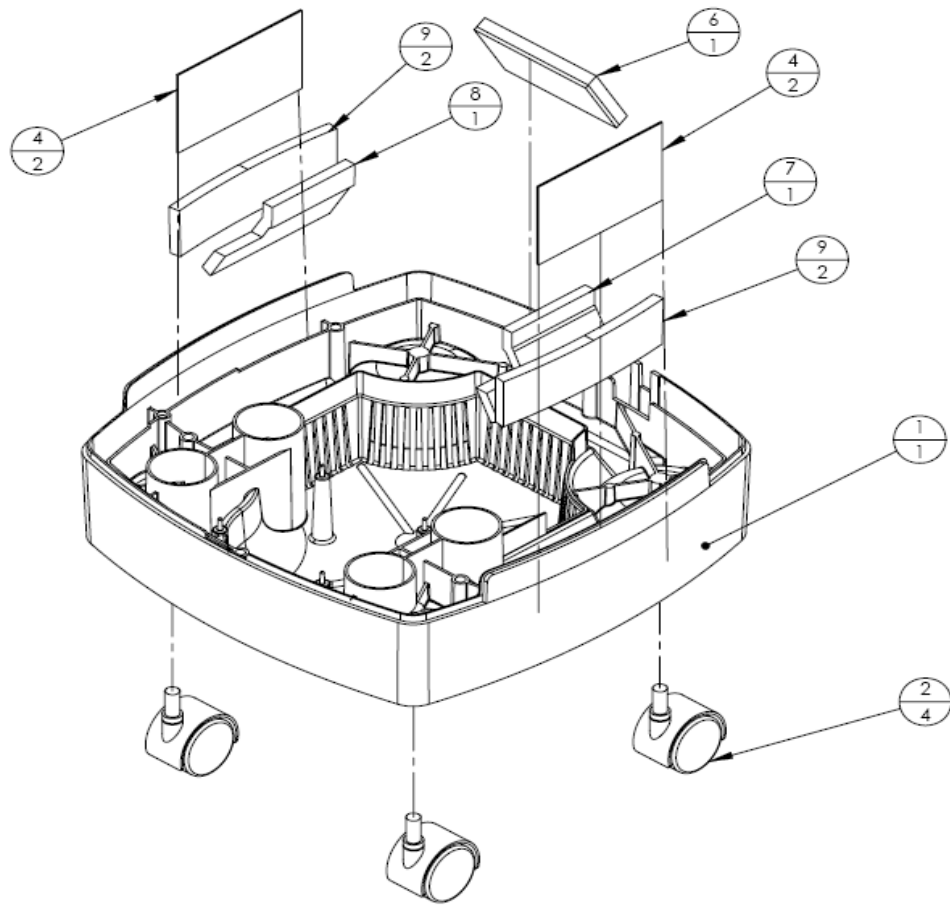
## A-2, Electrical Schematic

ES00025



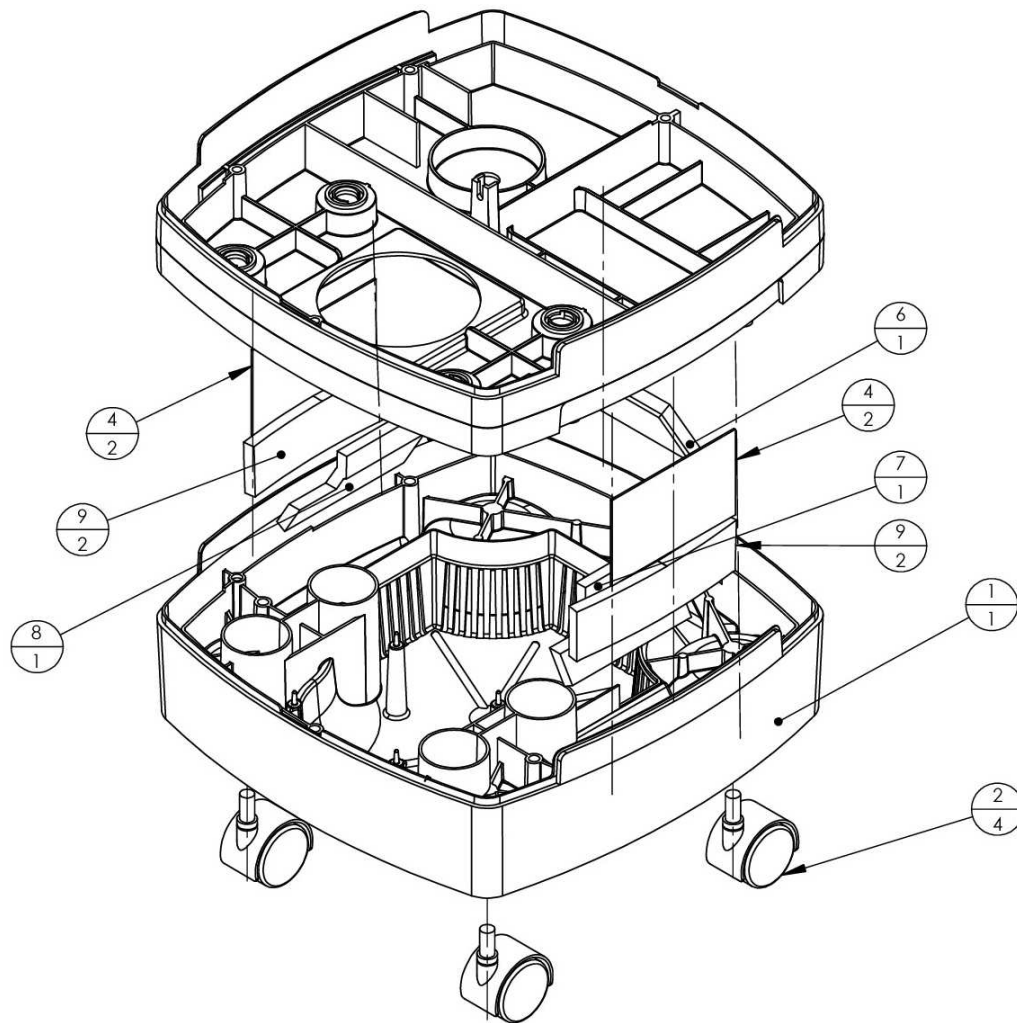
**A-3, Base Assembly, 5LPM STD**

**Use Assembly #0100-0300-A for the 5LPM STD unit**



### A-3.1, Base Assembly, Common

Use Assembly #0100-0300Q-B for the 5LPM OMS unit  
 Use Assembly #0300-0380 for the 8LPM unit & 10LPM units after 2/16



### A-3.2, Base Assembly, for Older 10LPM 230V

**Use Base Assembly #0100-0390 for those 230V units made prior to 2/16.**

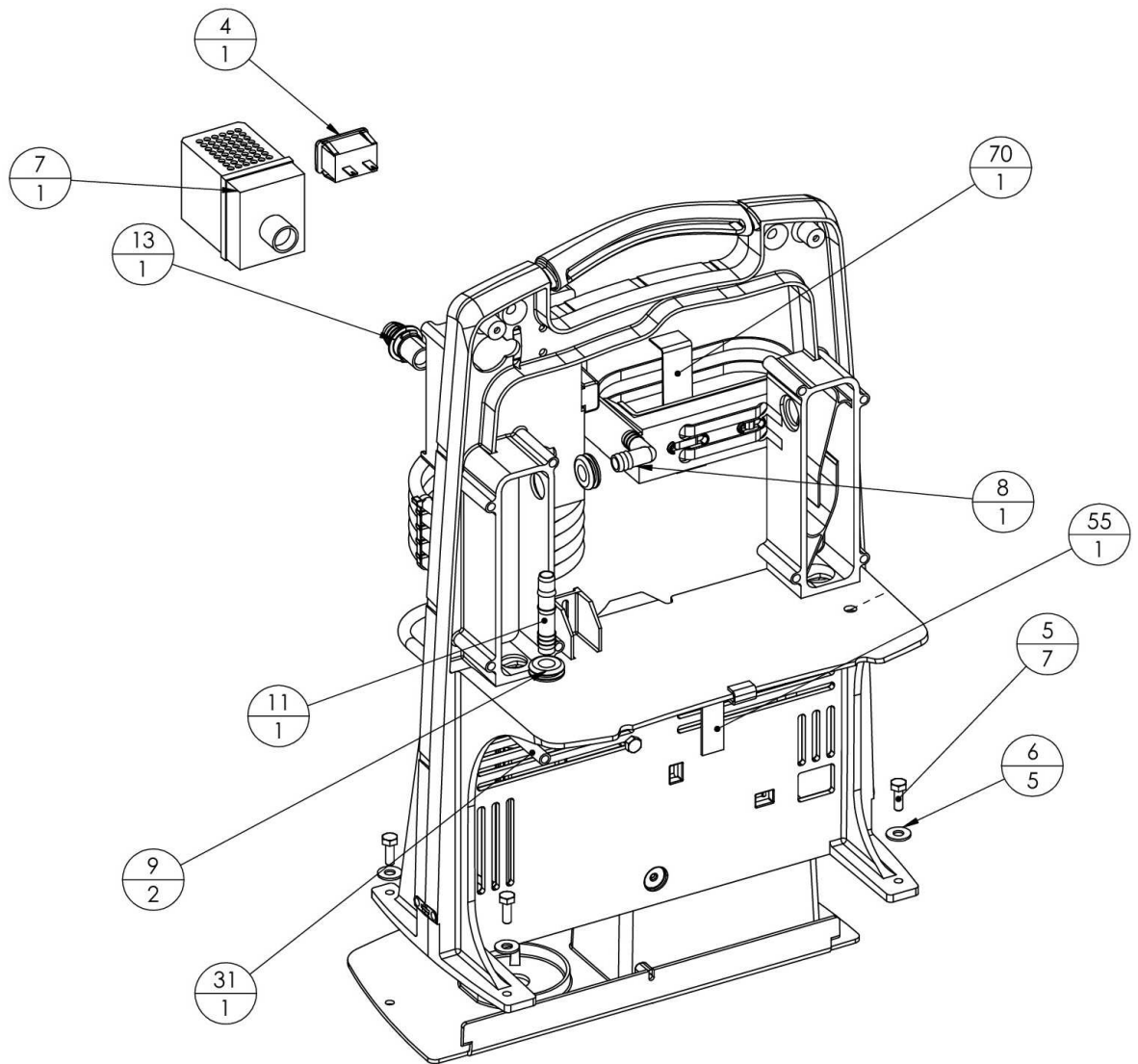
Part Reference Number	Call-Out Number	Part Description	Qty Required	Unit of Measure
9250-1000 <sup>a</sup> c230V <sup>S</sup>	1	BASE, NUVO	1	EA
9251-1502 <sup>b</sup> c115V	1	BASE, MODIFIED FOR 8LPM UNIT	1	EA
8300-8068 <sup>a</sup> <sup>b</sup> <sup>c</sup> <sup>S</sup>	2	CASTER	4	EA
9250-1083 <sup>a</sup>	3	FOAM, BASE BOTTOM	1	EA
9250-1066 <sup>S</sup>	3	FOAM, BASE ASSY.	1	EA
9251-2502 <sup>c</sup> 230V	4	BASE EXTENSION, NUVO 10	1	EA
9251-1309	4	ISODAMP,BASE,LF/RT INSIDE	2	EA
9251-1314 <sup>a</sup>	5	FOAM, BASE FAN WRAP	1	EA
9251-1315	6	FOAM,BASE FAN REAR INSIDE WALL	2	EA
9251-1316	7	FOAM,BASE RT. WALL INSIDE	1	EA
9251-1317	8	FOAM,BASE LT. WALL INSIDE	1	EA
9251-1318	9	FOAM,BASE L/R OUTSIDE WALL	2	EA

<sup>a</sup> Specific to 5LPM model

<sup>b</sup> Specific to 8LPM model

<sup>c</sup> Specific to older 230V 10LPM model (not used after 2/16)

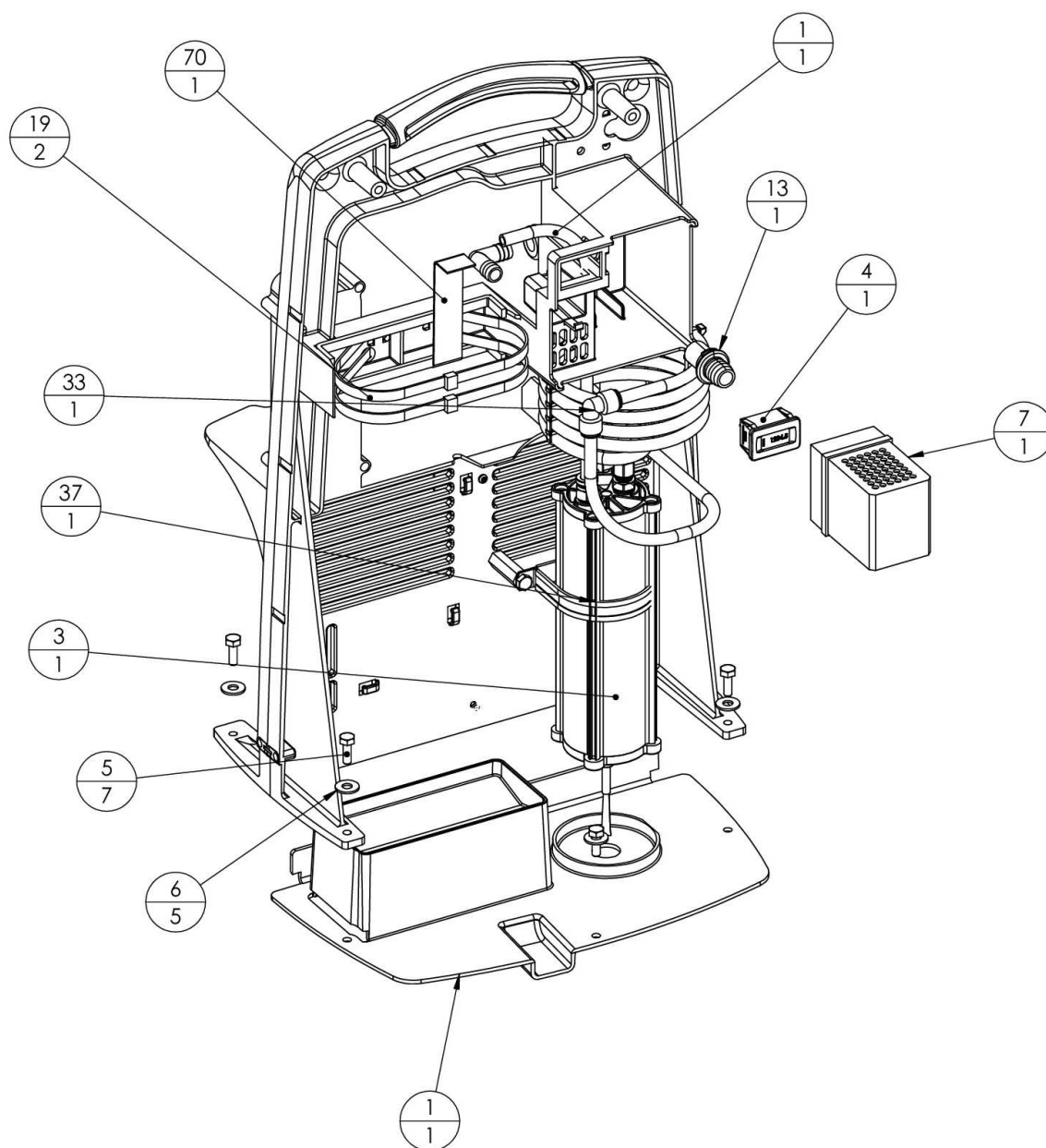
<sup>S</sup> Only these parts are used in 5LPM STD models



**A-4, Main Structure Assembly 5LPM unit**

**FRONT VIEW**

**0140-0361 REV A**

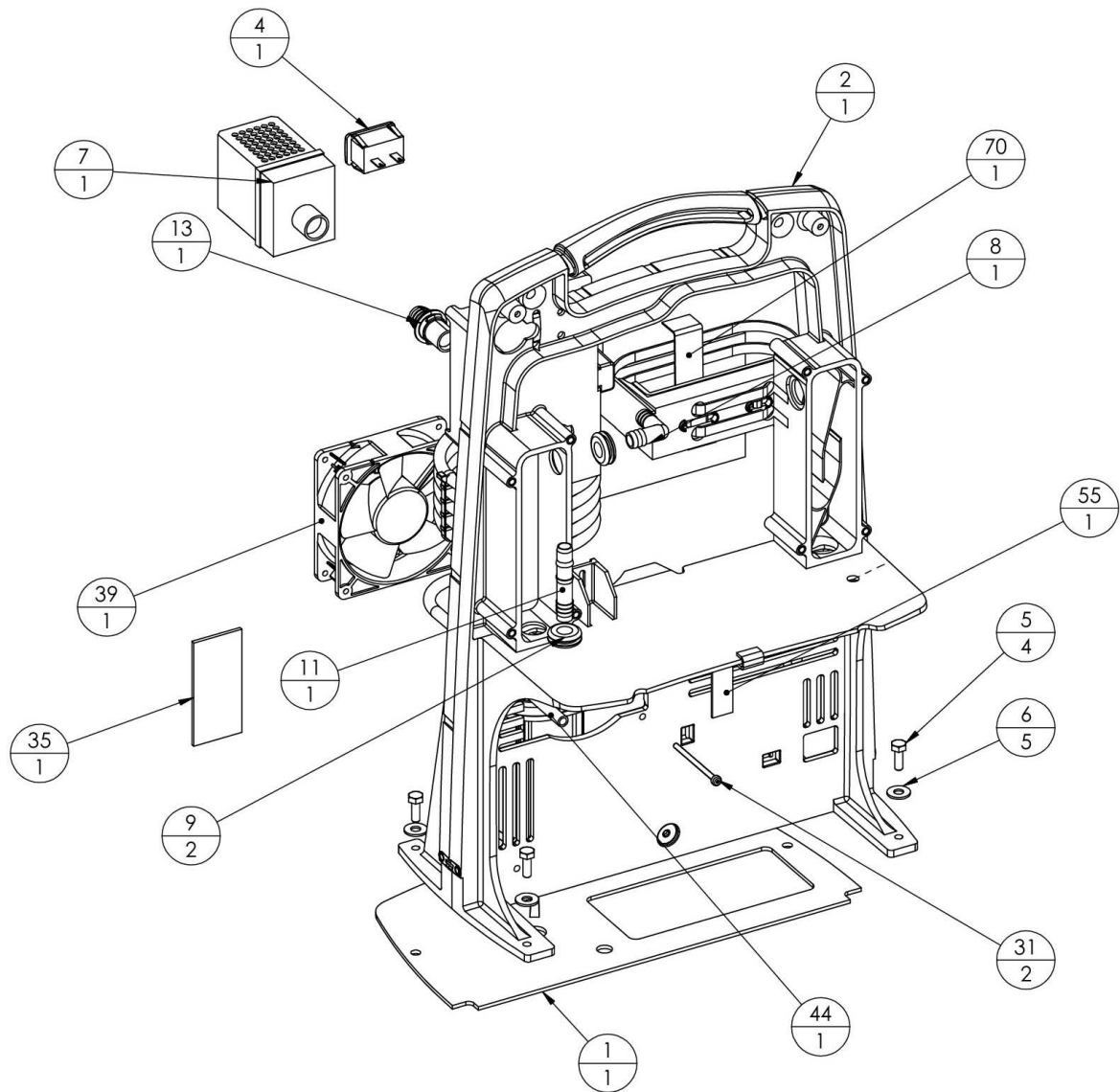


# **A-4.1, Main Structure Assembly 5LPM unit**

**REAR VIEW**

**0140-0361 REV A**



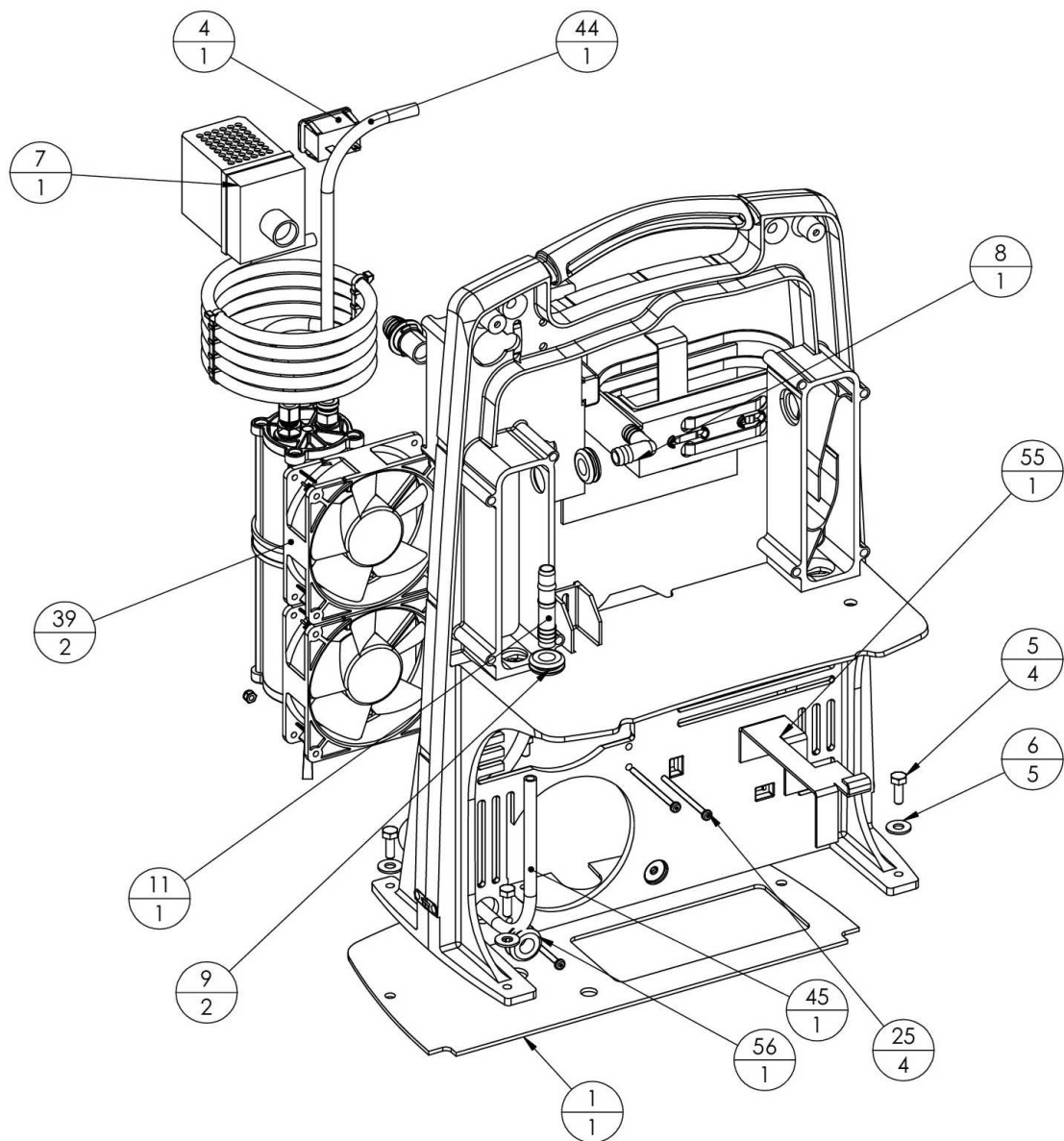


#### A-4.2, Main Structure Assembly 8LPM unit

##### FRONT VIEW

Use Assembly #0140-0380 for the 115 volt unit  
 Use Assembly #0140-0381 for the 230 volt unit





#### A-4.4, Main Structure Assembly 10LPM unit

##### FRONT VIEW

Use Assembly #0140-0390 for the 115 volt unit  
 Use Assembly #0140-0391 for the 230 volt unit



## A-4-1, MAIN STRUCTURE ASSEMBLY PARTS

Part Reference Number	Call-Out Number	Part Description	Qty Required	Unit of Measure
9251-1601 <sup>a</sup>	1	BASE, PLATE MODIFIED	1	EA
9251-1501 <sup>b c</sup>	1	BASE, PLATE MODIFIED	1	EA
9251-1506 <sup>a</sup>	2	STRUCTURE, 5LPM MAIN NUVO	1	EA
9251-1503 <sup>b d</sup>	2	STRUCTURE, 8LPM MAIN NUVO	1	EA
9251-1603 <sup>c</sup>	2	STRUCTURE, 10LPM MAIN NUVO	1	EA
9251-1911	3	MOISTURE SEP ASSY EXTRUDED	1	EA
8400-5018	4	HOURMETER AC 100-230 v 50/60	1	EA
9250-1047 <sup>a b c</sup>	5	BOLT, 1/4 -20 X 3/4" LG. GRADE 2	6 <sup>a</sup> or 4 <sup>b c</sup>	EA
9251-1610 <sup>d</sup>	5	BOLT, 1/4 -20 X 2 3/4" LG. GRADE 2	4	EA
9250-1020	6	WASHER, FLAT 1/4"	7 <sup>a</sup> or 5 <sup>b c d</sup>	EA
9250-1180 <sup>a b</sup>	7	FILTER, AIR INLET	1	EA
9200-0051 <sup>c d</sup>	7	FILTER, AIR INTAKE LOW NOISE	1	EA
6814-9228	8	ELBOW, 1/2 DOUBLE BARB, NYLON	1	EA
9250-1030	9	GROMMET, RUBBER	2	EA
9600-1017 <sup>a</sup>	10	NUT, COUPLING 1/4"	1	EA
9251-9226	11	CONNECTOR, LONG NYLON 1/2 HOSE	1	EA
9250-1059	13	CONNECTOR, MOLDED INLET	1	EA
9251-1533	19	TIE-WRAP, 24" LONG	2	EA
9250-1102	21	FOAM, KIT VIBRATION	1	EA
9030-6008	22	TIE-WRAP, 4.5" LONG	8	EA
9250-1047 <sup>a b c</sup>	25	BOLT, 1/4 -20 X 3/4" LG. GRADE 2	3 <sup>a</sup> or 1 <sup>b c</sup>	EA
9251-1611 <sup>d</sup>	25	BOLT, 1/4 -20 X 2 1/2" PHILLIPS	1	EA
6120-9854 <sup>a</sup>	27	SCREW #6 TYPE ~A~ X 1/2, SHEET	4	EA
9200-0502 <sup>b c d</sup>	28	NUT, 8-32 NYLON LOCKING	4 <sup>b</sup> or 7 <sup>c d</sup>	EA
9251-1552	29	UNIVERSAL WIRING HARNESS SMC V	1	EA
9251-1318 <sup>a</sup>	30	FOAM, BASE L/R OUTSIDE WALL	2	EA
9251-1520 <sup>b c d</sup>	31	SCREW, 8-32X 2.5" PHILLIPS	3 <sup>b</sup> or 6 <sup>c d</sup>	EA
9251-1518	33	CLAMP, 3" SS HX	1	EA
9251-1524 <sup>b c d</sup>	35	FOAM VENT COVER LEFT	1	EA
9251-2504 <sup>a</sup>	36	FOAM, MSR SUPPORT RING	1	EA
9251-1525 <sup>b c d</sup>	36	FOAM VENT COVER RIGHT	1	EA
9250-1023 <sup>c b115V</sup>	39	FAN, 115V LOW NOISE	1 <sup>b</sup> or 2 <sup>c</sup>	EA
8400-1034 <sup>d b230V</sup>	39	FAN, 230V LOW NOISE HI FLOW	1 <sup>b</sup> or 2 <sup>d</sup>	EA
9251-1634	44	TUBING, 3.8"ODX 12.5"LG NYLON	1	EA
9251-1535 <sup>a</sup>	45	TUBING, 3/8"ODX 19"LG	1	EA
9251-1536 <sup>b</sup>	45	TUBING, 3.8"ODX 16"LG	1	EA
9251-1635 <sup>c d</sup>	45	TUBING, 3.8"ODX 26"LG PTFE	1	EA
9250-1163	48	FITTING, 3.8" TUBE ELBOW	1	EA
9251-1185 <sup>d</sup>	49	RESONATOR NUVO8 QUIET	1	EA

### A-4-1, MAIN STRUCTURE ASSEMBLY PARTS (cont'd.)

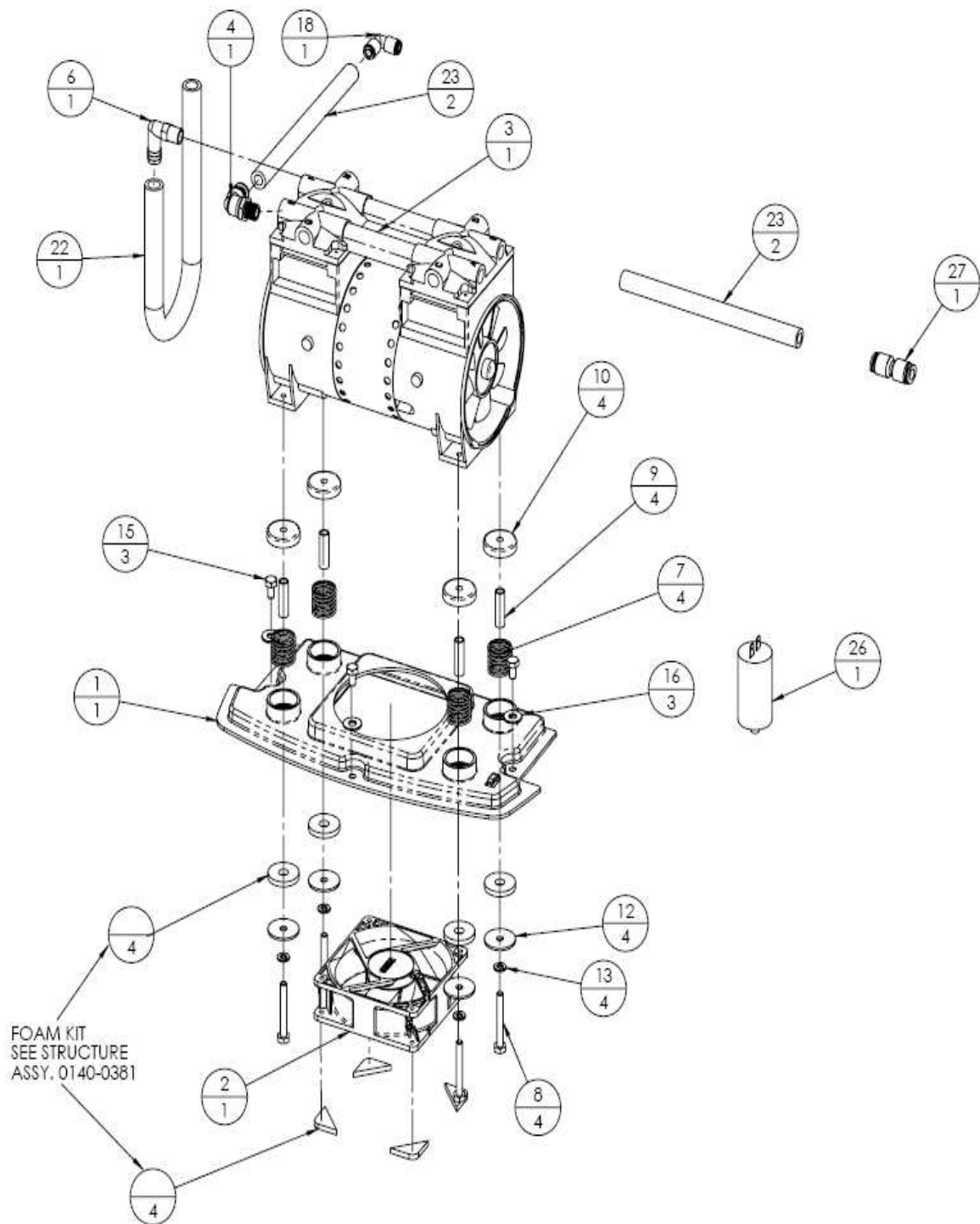
Part Reference Number	Call-Out Number	Part Description	Qty Required	Unit of Measure
6500-4088 <sup>d</sup>	51	TUBING, 5/16"ODX 18"LG	1	EA
9251-1636 <sup>d</sup>	54	CLAMP, SNAP ON	1	EA
9251-1637 <sup>d</sup>	55	ISOLATOR, CABLE TYPE	1	EA
9251-1030 <sup>d</sup>	56	GROMMET, RUBBER	1	EA
8500-1014 <sup>d</sup>	58	WASHER, #6 FLAT	2	EA
9251-1642 <sup>d</sup>	59	FTG, STRAIGHT 5/16 TUBE X 1/4 NPT	1	EA
9251-1723	60	WIRING, VALVE HARNESS NUVO8	1	EA
8400-0152 <sup>d</sup>	61	FITTING, COMPRESSOR THOMAS	1	EA
9251-1030 <sup>c</sup>	66	GROMMET, RUBBER	1	EA
9251-1554 <sup>a</sup>	70	BRACKET, SIEVE BED	1	EA
9251-1534 <sup>b c d</sup>	70	BRACKET, SIEVE BED	1	EA

<sup>a</sup> Specific to 5LPM model

<sup>b</sup> Specific to 8LPM model

<sup>c</sup> Specific to 10LPM 115V model

<sup>d</sup> Specific to 10LPM 230V model



### A-5, Compressor Assembly

Use Assembly #0200-0360 for the 5LPM 115V unit  
 Use Assembly #0200-0365 for the 5LPM 230V unit  
 Use Assembly #0200-0380 for the 8LPM 115V unit  
 Use Assembly #0200-0385 for the 8LPM 230V unit  
 Use Assembly #0200-0390 for the 10LPM 115V unit  
 Use Assembly #0200-0395 for the 10LPM 230V unit  
**A-5-1, COMPRESSOR ASSEMBLY PARTS**

Part Reference Number	Call-Out Number	Part Description	Qty Required	Unit of Measure
9250-1018 <sup>a b c</sup>	1	PLATE, COMPRESSOR	1	EA
9250-1023 <sup>115</sup>	1	FAN, 115V LOW NOISE	1	EA
8400-1034 <sup>230</sup>	1	FAN, 230V LOW NOISE HI FLOW	1	EA
7355-3638 <sup>a115</sup>	3	COMPRESSOR, 115/60 NEXUS 5LPM	1	EA
9251-1515 <sup>b115</sup>	3	COMPRESSOR, 115/60 NEXUS 8LPM	1	EA
9251-1615 <sup>c115</sup>	3	COMPRESSOR, 115/60 NEXUS 10LPM	1	EA
7355-3639 <sup>a230</sup>	3	COMPRESSOR, 230/50 NEXUS 5LPM	1	EA
9251-1532 <sup>b230</sup>	3	COMPRESSOR, 230/50 NEXUS 8LPM	1	EA
9251-1632 <sup>d*</sup>	3	COMPRESSOR, 230/50 NEXUS 10LPM	1	EA
9251-1732 <sup>d**</sup>	3	COMPRESSOR, 2750 CGHI60 230V/50	1	EA
9251-1052	4	FITTING, PLASTIC 1/4" MNPT 3/8" TUBE	1	EA
9250-1167 <sup>d</sup>	4	FITTING, 3/8 TBEx3/8NPT PL3/8-N3	1	EA
6191-5003	6	ELBOW, NYL 1/4 NPT X 1/2 HOSE	1	EA
6814-9222 <sup>d</sup>	6	ELBOW, 3/8 MNPT X 1/2 HOSE NYL	1	EA
9251-1016	7	SPRING, COMPRESSOR VIBRATION	4	EA
9251-1105	8	SCREW, SHOULDER HEX HEAD	4	EA
9250-1112	10	CAP, COMPRESSOR SPRING TOP	4	EA
8400-1019 <sup>230</sup>	11	BREAKER, CIRCUIT 5 AMP W/ NUTS	1	EA
8400-1018 <sup>115</sup>	11	BREAKER, CIRCUIT 10 AMP W/ NUTS	1	EA
9250-1047 <sup>a b</sup>	15	BOLT, 1/4 -20 X 3/4"LG. GRADE 2	3	EA
9251-1611 <sup>c d</sup>	15	BOLT, 1/4 -20 X 2 1/2"LG. GRADE 2	3	EA
9250-1020	16	WASHER, FLAT 1/4"	7	EA
9030-6008	21	TIE-WRAP 4.5" OVERALL	1	EA
9250-1027	22	HOSE, PREFORMED, CLEAR	1	EA
8400-1513	23	SHUNT, TYCO VOLTAGE SELECTION	2 <sup>115</sup> or 1 <sup>230</sup>	EA
9250-1322 <sup>a b d</sup>	26	CAPACITOR, 15UF W/ STUD MOUNT	1	EA
9251-1647 <sup>c</sup>	26	CAPACITOR, 25UF W/ STUD MOUNT	1	EA
9250-1160 <sup>a</sup>	50	FLOMETER, .5-5.0 LPM	1	EA
9251-1526 <sup>b</sup>	50	FLOMETER, 2-8.0 LPM	1	EA
9251-1616 <sup>c d</sup>	50	FLOMETER, 2-10.0 LPM	1	EA

<sup>a</sup> Specific to 5LPM model

<sup>b</sup> Specific to 8LPM model

<sup>c</sup> Specific to 10LPM 115V model

<sup>d</sup> Specific to 10LPM 230V model

<sup>115</sup> Specific to 115V models

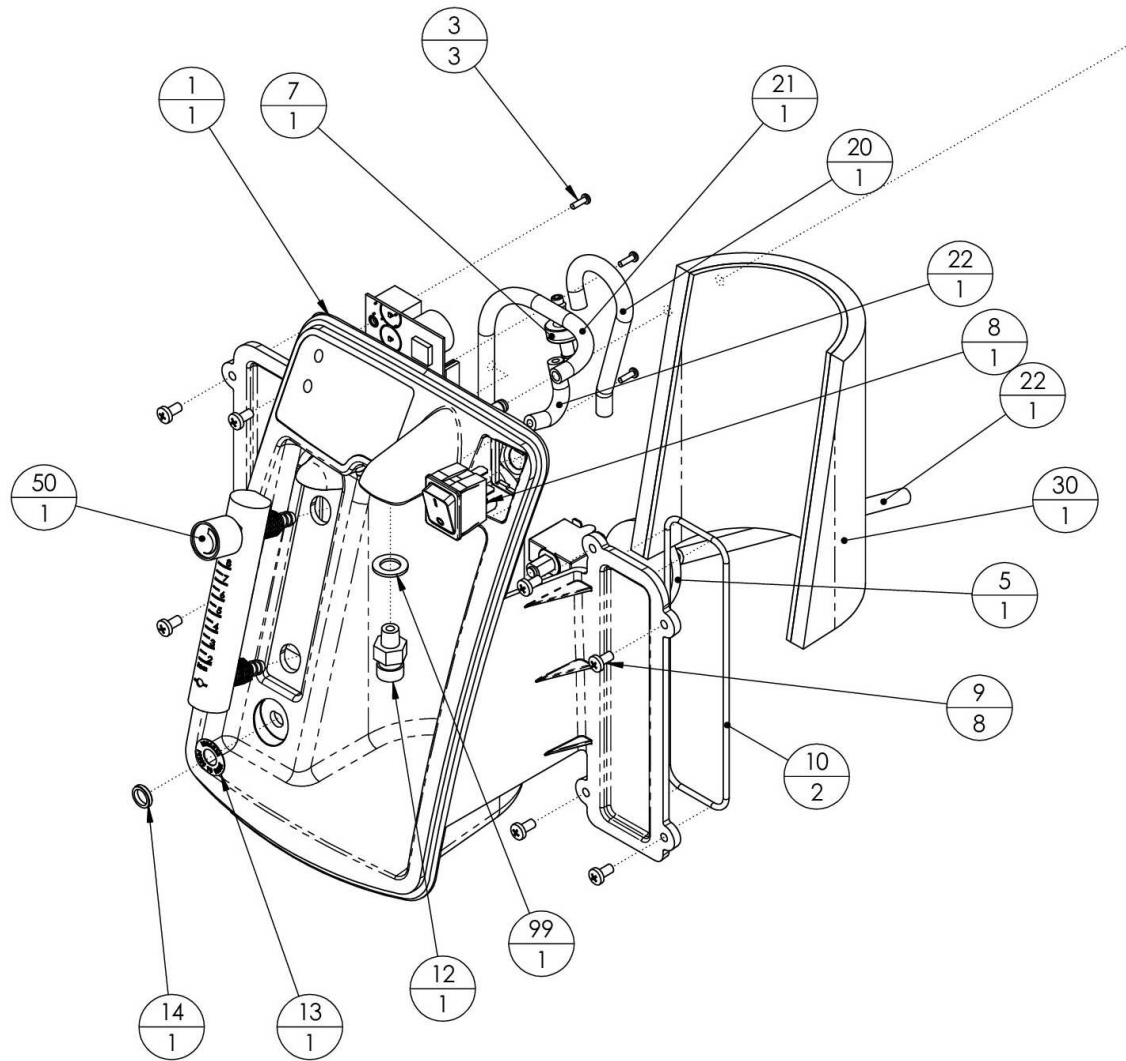
<sup>230</sup> Specific to 230V models

\* The 10LPM 230V compressor for those units made after 2/16.\*

\*\* The 10LPM 230V compressor for those units made prior to 2/16.

See also upgrade kit to upgrade 230V 10LPM to newer compressor 6500-4675

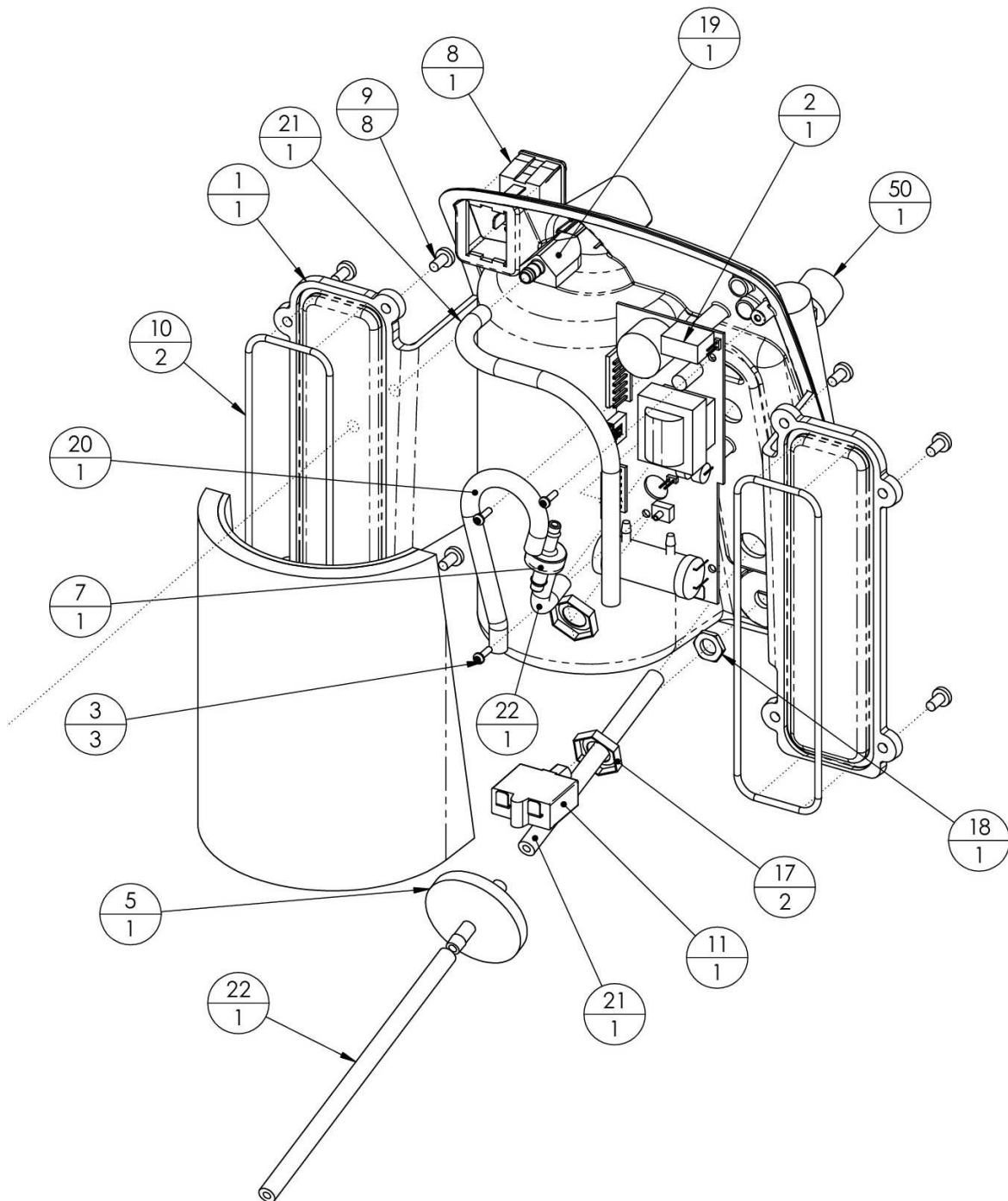




## A-6 Control Panel Assembly

### FRONT VIEW

Use Assembly #0300-0380 for STD units  
 Use Assembly #0300-0385 for OMS units



## A-6.1 Control Panel Assembly

### REAR VIEW

Use Assembly #0300-0380 for STD units  
 Use Assembly #0300-0385 for OMS units

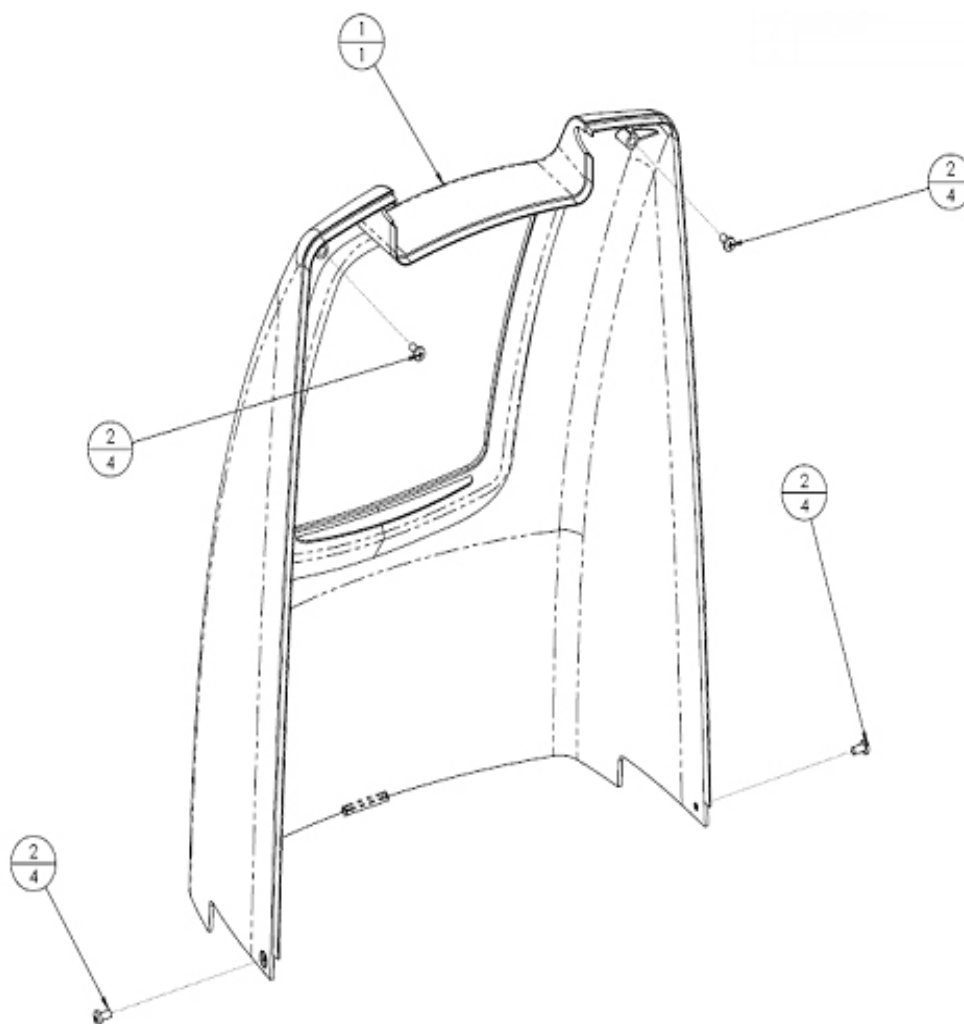
## A-6-1 CONTROL PANEL ASSEMBLY

Part Reference Number	Call-Out Number	Part Description	Qty Required	Unit of Measure
9250-1005	1	PANEL, CONTROL	1	EA
8400-1304 <sup>o</sup>	2	BOARD, TIMING OMS NF PL 5LPM	1	EA
8400-1306 <sup>s</sup>	2	BOARD, TIMING STD PL 5LPM	1	EA
9250-1045	3	SCREW, PLASTITE #4X3/8" PAN.HD	3	EA
9250-1041	4	HOSE 5/32 X 11/32 X 5 LONG SIL	1	EA
7631-1053	5	FILTER, BACTERIAL	1	EA
7854-6051	6	HOSE 5/32 X 11/32 X 3 LG SIL	1	EA
6956-9674	7	VALVE, CHECK 1/4 HOSE MPC A975	1	EA
9251-1008	8	SWITCH, POWER UNIVERSAL, NUVO	1	EA
9250-1050	9	SCREW, 10-32 X 3/8 PAN HD.PHIL	8	EA
9250-1040	10	O-RING, 5.0"ID X .125 THICK	1	EA
9251-1122	12	HUMIDIFIER FITTING DISS	1	EA
9250-1021	19	HUMIDIFIER BLOCK	1	EA
7854-6052	20	HOSE 5/32 X 11/32 X 2" LG SIL	1	EA
7854-6054	21	HOSE 5/32 X 11/32 X 10" LG SIL	1	EA
7854-6055	22	HOSE 5/32 X 11/32 X 7" LG SIL	2	EA
8400-1513 <sup>o</sup>	25	SHUNT, ADD TO DEFEAT NO FLOW	1	EA
9251-1300	30	FOAM, CONTROL PANEL WRAP	1	EA
9251-0130	99	O-RING, DISS OUTLET TUBE -012	1	EA

<sup>o</sup> Specific to OMS models

<sup>s</sup> Specific to STD models

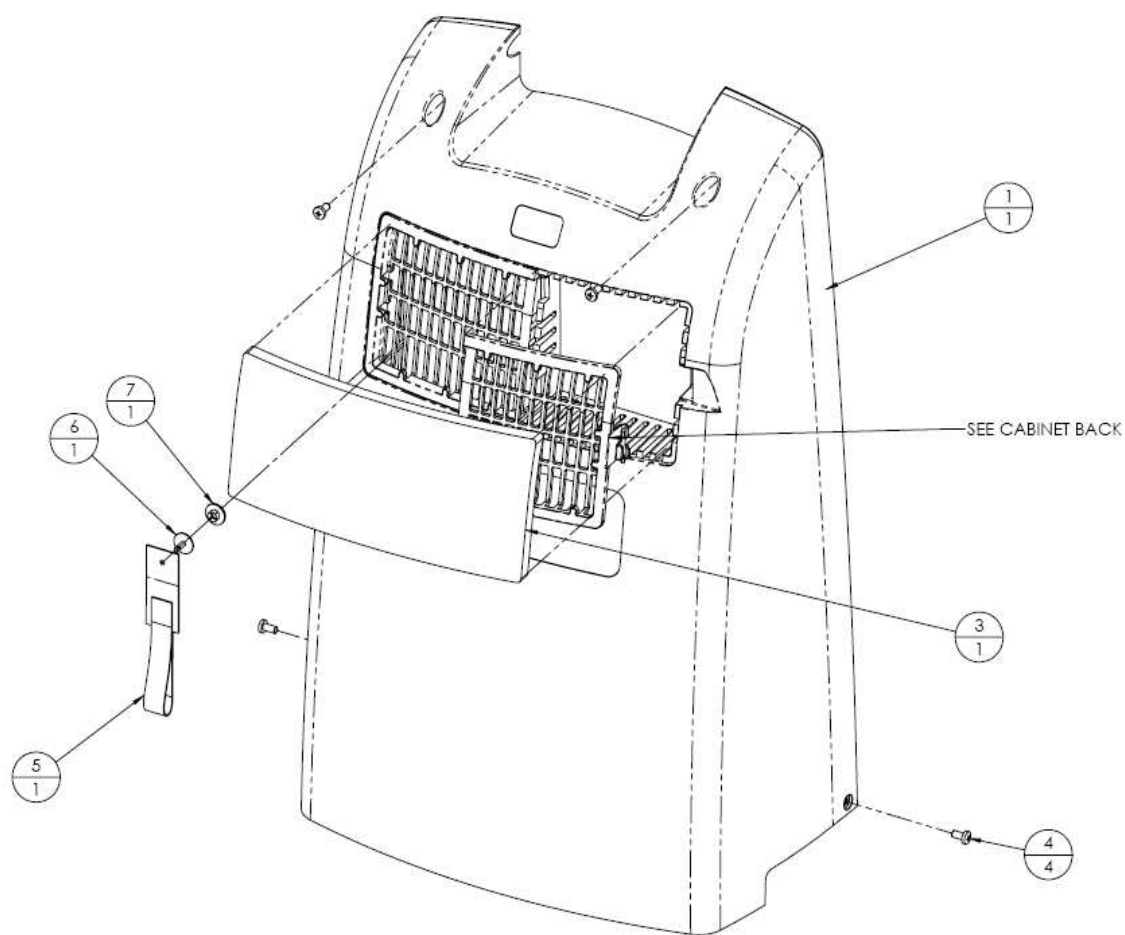
\*See "A-5-1, COMPRESSOR ASSEMBLY PARTS" for items 11 and 50 called out in the preceding two schematics.



### A-7, Front Cabinet Assembly

0500-0380 REV A

Part Reference Number	Call-Out Number	Part Description	Qty Required	Unit of Measure
9250-1002	1	CABINET, FRONT NUVO	1	EA
9250-1050	2	SCREW, 10-32 X 3/8 PAN HD.PHIL	4	EA



### A-8, Rear Cabinet Assembly

0550-0380 REV A

Part Reference Number	Call-Out Number	Part Description	Qty Required	Unit of Measure
9250-1200	1	CABINET, BACK W/ ACCESS DOOR	1	EA
9250-1025	3	FILTER, CABINET INLET	1	EA
9250-1050	4	SCREW, 10-32 X 3/8 PAN HD.PHIL	4	EA
8400-0022	5	RETAINER, CORD VELCRO	1	EA
8400-0023	5	RETAINER, CORD RIVET	1	EA
6490-9922	6	SNAP RIVET, NYLON 0.320/0.340	1	EA
6490-9925	7	SNAP RIVET, NYLON FEMALE	1	EA



### A-9-1, SIEVE MODULE ASSEMBLY PARTS

Part Reference Number	Call-Out Number	Part Description	Qty Required	Unit of Measure
8400-1200	3	VALVE ASSY, REXROTH	1	EA
0600-0415 <sup>a</sup>	4	BASE MODULE LITE 5 LPM .035, 13"	1	EA
0600-0425 <sup>b c</sup>	4	BASE MODULE LITE 8/10 LPM 0.40, 17"	1	EA
8400-2060AP	40	REGULATOR, 2-PORT KIT	1	EA

<sup>a</sup> Specific to 5LPM model

<sup>b</sup> Specific to 8LPM model

<sup>c</sup> Specific to 10LPM model

# Appendix 10 Nidek Medical Oxygen Concentrator Service and Maintenance Log

Model Number \_\_\_\_\_

Serial Number \_\_\_\_\_

## Initial Inspection

1. Upon receipt, check the unit for shipping damage. Notify shipping company if damaged.
2. Verify that cabinet air filter and the inlet air filter are in place.
3. Plug the unit into an electrical outlet, turn the unit 'ON,' and check the audible/visual alarms.
4. Set the flow meter/flow control at the maximum recommended flow rate and allow the unit to run for 15 minutes.
5. Using a calibrated oxygen analyzer, verify concentration is greater than 87 percent.

## Routine Service Check

Perform routine servicing as shown in the chart below. Record the activities performed in the log provided on the following page.

1. Record the elapsed usage time in hours.
2. Check oxygen concentration with a calibrated oxygen analyzer.
3. Verify audible alarm and indicator light functions between patients and every two years.
4. Inspect filters and replace as necessary.

## Between-Patient Maintenance

1. Remove oxygen tubing, cannula, and humidifier bottle and discard.
2. Wash or replace the humidifier tubing if used.
3. Wash or replace the cabinet air filter.
4. Clean the concentrator cabinet.
5. Check oxygen concentration and flow. If the unit performs within specification, the final product filter does not need to be replaced between patients.

## Patient/Caregiver Maintenance

1. Inspect the Oxygen tubing, cannula, and humidifier bottle - clean as needed according to manufacturer's instructions.
2. Wash the cabinet air filter weekly with a mild detergent solution. Dry before reinstalling onto the device.

The routine service intervals shown below depend on the conditions in which the devices are used. They reflect the **minimum recommendation** when operated in a clean environment. As conditions can vary widely, the homecare provider or patient caregiver is responsible to determine:

- the character of the environment in which the concentrator is to operate.
- a maintenance schedule with intervals based on the environment in which the unit is operating/functioning.

**Standard Servicing Intervals are shown below. Intervals used by the homecare service provider and/or patient caregiver should be more frequent when conditions of usage dictate.**

Nidek Medical Oxygen Concentrator Routine Service Intervals				
Check Percent Oxygen Concentration	Cabinet Air Filter	Inlet Air Filter	Final Product Filter	Capacitor
OCSI Models: Every 15,000 hours or 3 years. Std Models: Every 5,000 hours or 1 year.	Wash the filter each week in a mild detergent solution. Dry before reinstalling.	Inspect at each patient visit. Replace annually, or more often depending on environment.	Replace at each compressor service / module replacement.	Replace at each compressor service / module replacement.



**Serial Number**\_\_\_\_\_ **Model**\_\_\_\_\_

## Inspection Prior to Putting Into Service

## In-Service Checks

**Medical device regulations require users and service personnel to notify manufacturers of any incidents that, if repeated, could cause injury to any person.**

**Please update maintenance log information upon each service at [www.nidekmedical.com](http://www.nidekmedical.com) under the 'Maintenance Log' tab.**