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On Site Gas Systems, Inc.

Manufacturers / Designers of Oxygen & Nitrogen Generating Equipment

POGS 33 C

Portable Oxygen Generation System33 LPM

Revision April 2008

INSTALLATION, OPERATION, MAINTENANCE & SERVICE MANUALS

Manufactured by:

On Site Gas Systems, Inc.

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A BUSINESS INCORPORATED IN THE STATE OF CONNECTICUT, U.S.A.

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Technical Bulletins

As improvements are made to the POGS 33 and the POGS 33 manual, minor changes that do not warrant a new revision to the manual will be released and distributed in the form of Technical Bulletins. The Technical Bulletins will describe any modifications to the manual and/or POGS 33, and should be kept with the Installation, Operation, Maintenance and Service manual.

DANGER, WARNING, CAUTION, IMPORTANT, and NOTE Statements

DANGER, ***WARNING***, ***CAUTION and NOTE***, statements are used throughout this manual to emphasize important and critical information. You must read these statements to help ensure safety and to prevent product damage. The statements are defined below.

DANGER

DANGER indicates an imminently hazardous situation, which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.

WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, could result in minor or moderate injury. It may also be used to alert against unsafe practices.

IMPORTANT

An IMPORTANT statement is used to notify people of installation and operation information that is important, but not hazard-related.

NOTE

A NOTE statement is used to highlight information that may be helpful, but is not hazard related.

GLOSSARY

Adsorber Bed or Adsorber Vessel	A vessel, or tank used to hold molecular sieve in the oxygen generator
Adsorption	Physical adsorption of a substance, as in a sponge with water, incorrectly referred to as "absorption", which is more accurately a chemical process.
Ambient Air	Air surrounding the component, including its inherent temperature and dew point.
Argon	A colorless, odorless inert gaseous element found in the air.
ASME	American Society of Mechanical Engineers
Backup Oxygen	A method of redirecting contained oxygen to flow back to patients or equipment in the event of a power failure, or oxygen flow demand exceeds the capabilities of POGS 33.
Bed	A vessel or tank used to hold molecular sieve in the oxygen generator
Calibration	The act of calibrating; to standardize an instrument by determining the deviation from a standard so as to ascertain the proper correction factors.
Cannula	A small flexible tube inserted into a body cavity (such as nostrils) for draining off fluid or introducing medication (such as oxygen)
CE	Conformite Europeene: CE Marking (European Standard)
CO	Carbon Monoxide
Coalescing Filter	Filters oil.
Condensate	A product of condensation.
Configuration	A particular arrangement of parts or components.
Dew point	The temperature at which a vapor begins to condense.
DISS Fitting	Diameter Index Safety System Fitting
FDA	Food and Drug Administration
HEPA	High Efficiency Particulate Air Filter, commonly used in medical oxygen and medical air
High-Volume Booster	High-Volume Oxygen Cylinder Filling Pressure Booster: boosts up to 66LPM
HP	Horse power
HV Booster	High Volume Booster
Humidifier Bottle	A container to which water is added and medical gas passes through to add moisture to the gas.
Knurled Knob	A knob with a series of small ridges or beads on a surface to aid in gripping
Lbs	Pounds
Leak Check	A procedure to check for leaks in a system’s lines
Leak Solution	The solution used in the leak check procedure.
LPM	Liters per Minute (flow rate)
Microboost	Small Volume Oxygen Cylinder-Filling Pressure Booster: boosts up to 19 SCFH
MIL Spec	Military Specification [Standard]
Molecular Sieve	A crystalline substance (as a zeolite) characterized by uniformly sized pores of molecular dimension that can adsorb small molecules and is used especially in

GLOSSARY

	molecule separations
N2	Nitrogen
NFPA	National Fire Protection Agency (standard)
O2	Oxygen
P&ID	Process and Instrumentation Diagram
Particulate Filter	Filters particles and water.
Power Surge	A spike in electrical current, or power
PPM	Parts Per Million, (a method of defining purity levels)
Product Receiver	A vessel or tank that receives, or holds, or stores the final product of oxygen.
PSA	Pressure Swing Adsorption – A method of gas separation
PSIG	Pounds per square inch gauge
POGS	Portable Oxygen Generation System built by On Site Gas Systems
RIX	Brand name of Microboost and High-Volume O2 Booster
SCFH	Standard cubic feet per hour (flow rate)
SCFM	Standard cubic feet per minute (flow rate)
Sieve Bed	A cylinder filled with Zeolite Molecular Sieve material
Tethered	To fasten or restrain by a tether.
USP	United States Pharmacopoeia [Manufacturing Standard]
Y-Fitting	A device used to split the flow of gas (such as oxygen) from one hose to two hoses.
Zeolite	A crystalline substance (as a zeolite) characterized by uniformly sized pores of molecular dimension that can adsorb small molecules and is used especially in separations
ZMS	Zeolite Molecular Sieve

1 Introduction

1.1 Company Presentation

On Site Gas Systems is established as a world leader in the design and supply of systems for generation of nitrogen and oxygen. We have been manufacturing Nitrogen and Oxygen Generators since 1987. Information about our products and our company can be found at our web site: www.onsitegas.com.

On Site Gas Systems activities include full responsibility for conceptual and detailed engineering design, procurement, fabrication, supply and installation of packages for various industries worldwide.

1.2 Overview

The POGS 33 uses the latest PSA technology, and utilizes Zeolite Molecular Sieves (ZMS) to separate oxygen from the other gases contained in air. The Oxygen Generator uses two “beds” of ZMS to separate compressed air into a high-pressure oxygen product stream and low-pressure nitrogen-enriched exhaust stream. A particulate filter is included to remove impurities from the feed air. A HEPA filter is placed inline to filter the final oxygen product. Each Oxygen Generator comes pre-tested and fine-tuned to meet the customer specified flow rate at 90-96% oxygen purity.

1.3 System Components

1.3.1 The POGS 33 consists of 4 key components:

Feed Air Compressor

Generator

Accessory Kit with Microboost

High Volume (HV) Booster (optional)

1.4 Overall Process

Ambient air enters the Feed Air Compressor, where it becomes compressed and dried. The compressed, dried air then flows into the Generator where Medical Air and Oxygen are produced.

To produce Medical Air, the compressed air is filtered for use.

To produce Oxygen: Oxygen is separated from the Nitrogen in the air, the Nitrogen is released into the atmosphere, and Oxygen-enriched air, produced to meet specified purity standards for USP 93% oxygen.

Cylinders can be filled with Oxygen, using either the Microboost or the High-Volume (HV) Booster (optional components).

In addition, either Booster along with the Generator itself can provide Backup Oxygen from filled cylinders, using the Backup Oxygen system. This unit takes the oxygen from filled or partially filled cylinders and backflows the oxygen through a regulator to the Oxygen Receiver, through to the Oxygen Outlet Ports.

1.5 Maintenance

Maintenance is simple, yet necessary. Feed Air Compressor and filter maintenance procedures are especially important and should be followed carefully. If the recommended maintenance procedures are followed, the POGS 33 will provide you with many years of reliable service.

1.6 Limits of Liability

Buyer's exclusive remedy for all claims shall be for damages, and seller's total liability for any and all losses and damages arising out of any cause whatsoever including, without limitation, defects in or defective performance of the system, (whether such claim be based in contract, negligence, strictly liability, other tort or otherwise) shall in no event exceed the purchase price of the system in respect to which such cause arises or, at seller's option, the repair or replacement of such; and in no event shall seller be liable for incidental, consequential or punitive damages resulting from any such cause.

Seller shall not be liable for, and Buyer assumes all liability for the suitability and the results of using oxygen by itself or in any manufacturing or other industrial process or procedure, all personal injury and property damages connected with the possession, operation, maintenance, other use or resale of the System. Transportation charges for the return of the System shall not be paid unless authorized in advance by Seller.

IMPORTANT

Any modifications made by customer without the consent of ON SITE GAS SYSTEMS, Inc will void the product purity and output specifications.

1.7 Warranty

The Generator and Feed Air Compressor are warranted against defects in materials and workmanship, under normal use and operation, as applicable on the warranty listed below. All boosters and other accessories/options are covered by the original equipment manufacturer's warranty.

The On Site Gas Systems Warranty includes the following:

Free repair or replacement of component parts where defects occur within the first twelve (12) months of operation or twelve (12) months from the date of invoice, whichever comes first.

These warranties shall be null, void, inoperative, and not binding upon On Site Gas Systems, Inc. if a defect or malfunction occurs in the product or any part thereof from any feed air malfunction, or improper filter element maintenance, or repair, attempted repair, adjustment or servicing by anyone other than an authorized representative of On Site Gas Systems, or external causes. Said warranty shall extend and apply to the Oxygen Generator only while said system is owned and used exclusively by the original purchaser.

NOTE

THERE ARE NO EXPRESS WARRANTIES BY ON SITE GAS SYSTEMS INC., OTHER THAN THOSE SPECIFIED HERE. NO WARRANTY OF TITLE AS PROVIDED IN THE UNIFORM, COMMERCIAL CODE SHALL BE IMPLIED OR OTHERWISE CREATED UNDER THE UNIFORM COMMERCIAL CODE, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY AND WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

1.8 Service Return Policy

If it is necessary to return a system for service, follow the procedure given below.

If the system cannot be repaired at the site, then the owner must obtain a written **Return Goods Authorization number,** which references the **model** and **serial number**, from On Site Gas Systems, Inc. No items will be accepted for service or credit unless On Site Gas Systems, Inc. has issued prior written authorization.

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All items are to be returned with the original packaging material, if possible. Make sure that all items are packaged for safe return to On Site Gas Systems. On Site will not be responsible for damages that occur in transit. Any damage that occurs to the system because of failure to adhere to this procedure will be the sole responsibility of the customer. Contact On Site Gas Systems, Inc. for a return shipping address.

Shipping charges must be prepaid on all returns.

2 Safety Information

The following section outlines the basic safety considerations regarding use of your Oxygen Generator. Please refer to the technical references for additional information.

NOTE

Read carefully and act accordingly before installing, operating or repairing the unit.

a) The operator must employ safe working practices and rules when operating the Oxygen Generator.

b) The owner is responsible for maintaining the unit in a safe operating condition.

c) Always use approved parts when performing maintenance and repairs. Make sure that replacement parts meet or exceed the pressure requirements.

d) Only authorized, trained and competent individuals must perform installation, operation, maintenance and repair.

WARNING

Use only materials with compatible pressure rating on product pipelines and components.
All parts must be free of grease/oil.

e) Completely depressurize the Generator, Feed Air Compressor and Microboost or HV Booster prior to performing any mechanical work, including changing the filters.

f) Do not use Generator in a sealed room due to venting of nitrogen-enriched exhaust gas.

g) The nitrogen-enriched exhaust gas must be vented to the outside or to a large, well-ventilated room to avoid suffocation due to lack of oxygen.

DANGER

Pressurized gases are contained within the Feed Air Compressor and Generator.
High-pressure gases are dangerous and may cause injury or death if handled or used inappropriately.

h) Never allow high-pressure gas to exhaust from an unsecured hose. An unsecured hose may exhibit a whipping action, which can cause serious injury. If a hose should burst during use, immediately power down the Feed Air Compressor.

i) Never disable or bypass any safety relief valves on the feed air receiver or oxygen receiver.

j) Always make certain that the electrical system is “locked-out” and that the unit is unplugged prior to performing any electrical work.

NOTE

If any statement or specification within this booklet, especially with regard to safety, does not agree with legislation or standard industry practices, the more demanding shall apply.

3 Specifications and Site Requirements
Specifications

Generator - Maximum Output (At Sea Level)

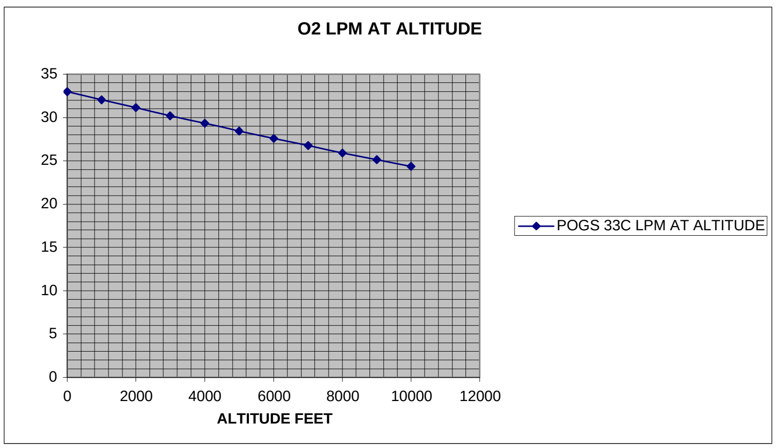
a. Oxygen…………………….	USP 93% +/- 3%
33 LPM @ 50 PSIG
Standby @ 70 PSIG

b. Medical Air………………...	Up to 30 LPM @ 50 PSIG

c. Compressor Air…………..	462 LPM @100 PSIG
Standby @ 110 PSIG

d. Oxygen Alarm……………..	@ < 89% oxygen purity

e. Medical Air Alarm………..	@ > 10 ppm CO
@ > 40°F Dew Point



Cylinder Filling

a. Microboost……………….. Input:up to 7 LPM @ min 24 PSIG
Output: 7 LPM @ 2200 PSIG

b. Optional: 2P HV Booster……. Input: up to 56 LPM @ min 24 PSIG
Output: 56 LPM @ 2200 PSIG

CYLINDER FILL TIME CHART to 2200 PSIG

	FILL RATE	**D (370 L)**	**E (620 L)**	**H (6000 L)**
MICRO BOOST	***7 LPM***	***52 MIN***	***1.5 HRS***	
2P HV w/ 1POGS	***33 LPM***	***12 MIN***	***19 MIN***	***3 HRS***
2P HV w/ 2POGS	56 LPM	***7 MIN***	***11 MIN***	***1.8 HRS***

NOTE: For reference only. Actual fill time may vary due to environment or altitude.

Electrical

a. Generator……………………… 115V/60Hz/1PH/1A
b. Feed Air Compressor………… 208-240V/60Hz/3PH/15.5A
   i. Optional Single Phase.. 230V/60Hz/1PH/25A
   ii. Optional- 50 Hz……….. 230V/50Hz/1PH/27A
c. Microboost…………………… 115/60Hz/1PH/6A
d. Optional: HV Booster……….. 115/60Hz/1PH/19A

Physical Dimensions

a. Generator……………………… 52"L x 28"W x 24"H
b. Feed Air Compressor………… 29"L x 27"W x 27"H
   i. Optional Single Phase.. 29"L x 27"W x 36"H
   ii. Optional 50 Hz………… 39"L x 34"W x 34"H
c. Microboost…………………… 18"L x 12"W x 24"H
d. Optional: 2P HV Booster……….. 35"L x 28"W x 24"H

Weights based on Transportation Setup

a. Generator……………………… 265 lbs
b. Feed Air Compressor………… 215 lbs
   i. Optional Single Phase.. 247 lbs
   ii. Optional 50Hz………… 275 lbs
c. Accessory- Microboost Box,
including Microboost ………… 220 lbs
d. Microboost only……………… 115 lbs
e. Optional: 2P HV Booster ……… 275 lbs

Site Specifications

Feed Air Compressor

DANGER

The Feed Air Compressor Supply Air Inlet Assembly <u>must</u> be located at least 50 feet from any sources of Carbon Monoxide. Sources of Carbon Monoxide include vehicles, power generators, heaters, stoves, and any equipment containing an internal combustion engine.

If the Feed Air Compressor is located in an area that may contain Carbon Monoxide, the Remote Supply Air Hose must be utilized to locate the Supply Air Filter Assembly in a clean air environment.

Ideally, the Feed Air Compressor should be located indoors. Although the Feed Air Compressor is designed to operate in mild inclement weather, if outdoor location is required, the location must provide protection from severe weather (heavy precipitation, blowing sand, etc). Protection from direct sunlight must be provided to maintain ambient temperature under 120ºF/48ºC.

Generator

The Generator must be operated indoors only, protected from the elements.

Microboost or HV Booster

The Microboost or HV Booster must be operated indoors.

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1 Service Overview

The POGS 33 is designed for in field repair from system or component failure. Trained maintenance personnel should perform any necessary repairs using approved repair parts that have been included in the spare parts kit. Trained personnel can perform repairs in the field, so sending the unit back to the manufacturer is not necessary.

How to Purchase Spare Parts

Order spare parts through On Site Gas Systems

35 Budney Rd., Newington, CT 06111 USA
Telephone: 860.667.8888
Fax: 860.667.2222
Email: pogs@onsitegas.com
Website: www.onsitegas.com (through "Contact Us")

Methods of payment accepted

A. Cash, check, money order, or wired monies

B. Credit card

C. Letter of credit

D. Approved credit with deposit

1.1 Tools and Equipment Required for Service

Tool	Detailed Types
Adjustable Wrench	6" 8" 12"
Screwdrivers	Phillips Slotted
Electrical Kit:	Multi Tool Wire Cutters Meter
Channel Lock Pliers	Wire Cutters
Allen Wrench Set	Ameri. Std, Metric
Utility Knife	
Teflon Tape	
Leak Check Fluid	Snoop
Grease	Baldor Polyrex
Hand Held Oxygen Sensor	
Flow Meter	1 SCFH
SMC Fittings	
T type wrench	
Torque Wrench	15 " lbs to 175" lbs
Grease Gun	
Gear Puller	

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2 Theory of Operation

2.1 Feed Air Compressor Theory of Operation

The Feed Air Compressor supplies air to the Generator. The air that is compressed by the Feed Air Compressor is obtained from the air surrounding the Feed Air Compressor (ambient air) as follows:

A. Ambient air enters through the Supply Air Filter Assembly and enters the Scroll Compressor.

B. The Scroll Compressor compresses the air.

C. The compressed air then travels through a heat exchanger for cooling.

D. Cooled compressed air travels through a Check Valve to prevent flow back through the Scroll Compressor when the Feed Air Compressor goes into standby mode.

E. After the Check Valve, the compressed air is fed to the Feed Air Outlet Port, through the Feed Air Hose, to the Generator.

2.2 Generator Theory of Operation

A. Compressed air enters the Generator through a particualte filter and is stored in the Air Receiver Tank. The Air Receiver compensates for surges in demand of compressed air. The Air Receiver also allows the compressed air to cool further, and collects the condensate (water) from the compressed air.

B. For Medical Air, the compressed air flows through an Inline HEPA Filter, then a regulator to keep the Medical Air at 50 PSIG, then the Medical Air Dryer, and then a needle valve to control flow.

C. For Oxygen, the compressed air is fed through the Main Valve Assembly into one of the Sieve Beds. The sieve bed adsorbs the nitrogen from the compressed air, and oxygen flows through the top port of the Sieve Bed.

D. While one Sieve Bed is being fed compressed air, the Main Valve allows the other Sieve bed to exhaust the nitrogen it adsorbed through the Muffler Assembly.

E. The oxygen then flows through an inline filter to remove particles, and through a check valve.

F. The Purity Flow Valve controls the flow of oxygen after the check valve into the Oxygen Receiver.

G. Oxygen is stored in the Oxygen Receiver until ready for use.

H. On the bottom of the Oxygen Receiver, a pressure switch monitors oxygen pressure. Once oxygen pressure reaches 70 PSIG, the Generator goes into standby mode.

I. When oxygen is needed, it flows through an Inline HEPA Filter and through the Oxygen Outlet Pressure Regulator to Oxygen Outlet Ports.

Molecular Sieve Action

The Generator is a two-bed adsorber system. The Generator consists of two adsorber vessels filled with molecular sieve, a valve assembly, air filters, pressure regulator, and product receiver. Dry, compressed air (21% Oxygen, 78% Nitrogen, <1% argon) at about 65 PSIG / 4.5 bar is passed through the air filters, and then through the feed air Inlet. Clean and dry air is directed to one of the adsorber beds where nitrogen and water vapor is adsorbed faster than oxygen in the pore structure of the molecular sieve, thus increasing the oxygen purity of the product gas stream to 90-96%. This product flows out of the top of the adsorber bed; through the Purity Flow valve, and into low pressure Oxygen Receiver at a pressure slightly below the feed air pressure.

Molecular Sieve Purging

A portion of the intermediate product produced is directed through the purge orifice. This oxygen is allowed to flow back through the other sieve bed and out through the exhaust muffler at atmospheric pressure. This action purges the molecular sieve of nitrogen, and prepares the bed for the next cycle.

Cycling

The pressure in the sieve beds is equalized after about 30 seconds, before the next cycle starts. The beds switch roles; the first bed is purged while the second bed produces oxygen product. The active bed will remain on-line until just prior to becoming saturated with nitrogen. When the cycle is completed, the controller will exhaust the saturated bed, and pressurize the fresh adsorber bed. This allows a continuous flow of oxygen gas from the unit for as long as the unit is in operation.

Exhaust and Product Flow

Nitrogen-enriched exhaust gas is piped to the atmosphere through a silencer. Dry oxygen product stream, with the specified maximum oxygen content exits the adsorber vessels and is stored in the Oxygen Receiver.

Oxygen Analyzer Operation

The Oxygen Analyzer display is located on the front of the Generator Control Panel. The Oxygen Sensor is mounted in the Generator interior. The Oxygen Sensor receives a small sample flow from the Oxygen Receiver to continuously monitor the oxygen purity. The Oxygen Analyzer receives power from the Generator Electrical System and will be active whenever the Generator Power Switch is in the “ON” position.

3 Troubleshooting

This section provides a diagnostic tool to identify the cause of operation problems, and to isolate problems to the component level.

3.1 Troubleshooting Charts

The following charts indicate causes for faults in each system component. For corrective action, perform the diagnostic steps and refer to the Repair Method or Procedure section.

3.2 Compressor Faults

Symptom	Possible Cause	Diagnostic Procedure	Repair method or Procedure
No Green Light	Breaker	Locate blue button circuit breaker and check if it has tripped Insure power to breaker with a meter	Reset // cycle breaker
	House Power	Follow Cord to source Insure connections Insure Power to Source Trace to generation /operating / breaker	Connect
	Connections Pushed-in Pins Loose Screws	Use ohm meter as required Look for damaged pins Check screws to terminal block are secure	Reconnect Repair Tighten
Doesn't Run	Generator not on	Line Pressure at 110 psig, compressor on standby	
	Air Tank Pressure	Check that line pressure is set at 110 psig and the gage reads < 110 psig.	Procedure 5.36
	Pressure Switch Not properly set	Check Air Gage readings during operation. Should turn off at 110P psig and on at 90 psig	Procedure 5.36
	Starter Box Button	Remove starter box cover, Check if blue button inside the starter box tripped Verify mechanical linkage actuates button	Reset Button
	Heaters Tripped or Wrong size	Reset Blue Button Verify the 3 heaters in the starter box are H2012B-3. Verify switch settings are M & C	Procedure 5.33
	Motor Overheats	Check power to the motor, if yes the thermal switch has opened. Check temperature does not exceed 115 deg F and 46 deg C. Verify fan plug is attached	Allow cool time Locate unit in shade Attach Plug
Won't Shut Off	Reversed I/O	Check that generator inlet hose is not connected to the compressor inlet fitting.	Connect inlet to outlet
	Air tank Pressure	Confirm < 110 psig	Reset to 110 psig
	Leak	Pressurize System, use leak detection fluid on all fittings look for bubbles	Procedure 5.30
	Pressure Switch Not properly set	Check air gage readings, if set above 110 psig it's set too high	Procedure 5.36
Drain Line Constant	Solenoid Valve Open	Check connections	Connect
	Blue Regulator Open	Check to see if the regulator cap is cracked Check to see if the regulator is out of adjustment	Procedure 5.23

3.3 Oxygen Generator Faults

Symptom	Cause	Diagnostic Procedure	Repair method or Procedure
No Air Output	Clogged Air Input Filter	Visually check for dirty inlet filters. (P/N 06)	Replace dirty filter
No Lights	Breaker	Locate circuit breaker and check if tripped Insure power to breaker with meter	Reset and Cycle
	House Power	Follow Cord to source Insure connections Insure Power to Source Trace to generation /operating / breaker	Plug in Meter Meter
	Power Switch	Confirm On	Turn On
	Molex Connector	Locate connector and confirm contact	Repair
	Standby Pressure Switch	Check Connections	Procedure 5.35
	LED burned-out or not connected	Check Connections	Replace
Low Air Tank psig	Manual Drain Open	Check that valve handle is at 9:00 closed position	Close Valve Replace
	Med Air Open	Check that 3 Medical Air Ports valve handles are at 9:00 closed position	Close Valve Replace
	Inlet Air Leaking	Check inlet air with leak detection fluid	Tighten Connection
	Auto Drain Stuck Open	Check Electrical Connections Check correct part number (04F20O1106ACF4C1)	Replace
	Leaks	Pressurize System, use leak detection fluid on all fittings look for bubbles	Procedure 5.30
	Bad Gage	Check Gage function	Procedure 5.20
	Process Valves	Check Air Saver, Inlet and Exhaust Valves	Procedures 5.27, 5.28, 5.29
Won't reach Stand-by	Too Much O2 Flow	Check that O_2 output is less than 33LPM	Adjust O_2 flow meters to 33 LPM max
	Med Air System	Check that Medical Air Output is less than 30 LPM	Adjust Med Air flow meters to 30 LPM max
	Leaks	Pressurize System, use leak detection fluid on all fittings look for bubbles	Procedure 5.30
	Pressure Switch Setting	Check that the O_2 gage is set to 70 psig	Procedure 5.35
	Process Valves	Check Pure Flow and Cross-Over Valves	Procedures 5.24, 5.25
	Check Valves	Check if stuck open, closed or clogged.	Procedure 5.22
	Timing	Check 60 second cycle, (2, 10 and 20) Timing	Procedure 5.37
	Sieve Material	Check for Blockage	
Dust on Mufflers	Sieve material	Excessive dusting through the mufflers may be due to sieve material getting wet.	Contact On Site Gas Systems
Timer Motor Faulty	Broken fingers	Check Timing of 60-second cycle. 20 sec pure flow on, 10 sec pure flow valve off, 2 sec air saver	Procedure 5.37

3.4 Alarm Faults

Symptom	Cause	Diagnostic Procedure	Repair method or Procedure
Low Flow	Worn Tip Seal	Hook CFM meter to output of scroll compressor. Assure (14.7) CFM @100 psig output	Procedure 5.38
Pressure	Too Much O2 Flow	Check that O_2 output is less than 33 LPM	Adjust O_2 flow meters to 33 LPM max
	Leaks	Pressurize System, use leak detection fluid on all fittings, and look for bubbles.	Procedure 5.30
	Med Air System	Check that Medical Air output is less than 30 LPM	Adjust Medical Air flow meters to 30 LPM max
	Timing	Check 60 second cycle, (2 10 and 20) Timing	Procedure 5.37
	Process Valves	Check Pure Flow, Cross Over, Air Saver, Inlet, Exhaust valves	Procedures 5.24, 5.25, 5.27, 5.28. 5.29
	Check Valves	Check if stuck open, closed or clogged.	Procedure 5.22
CO	CO Contamination	Look for CO source from fuel powered motors, or fork lifts.	Install remote hose extension and move inlet filters away from CO source
	Calibration OFF	Verify Calibration	Procedure 5.31
	Faulty	Calibrate and replace as necessary	Procedure 5.31
Dew Point	Faulty Drier	Verify Dew Point with Alternative Source	Procedure 5.32
	Sensor Fault	Check Display	Procedure 5.32
CO Flow	Process Valve	Check Function of Mac Valve	Procedure 5.26
	Analyzer Filter	Check if low flow indicator and audio alarm activate and if display reads “Low Flow Alarm”.	Clean orifice
	Sample Valve Position	Check Position	Put to open position
	Faulty Dryer	Check for Flow post Dryer, if no flow	Replace
Purity	Warm Up Time	Check hour meter and assure machine runs for at least 45 minutes	Run Machine > 45 minutes
	Excessive Flow	Verify sample flow of O_2 does not exceed 33 LPM and sample flow of Medical Air does not exceed 30 LPM	Reset flow to 33LPM and 30 LPM
	Leaks	Pressurize System, use leak detection fluid on all fittings, look for bubbles.	Procedure 5.30
	Analyzer Calibration	Check that the calibration procedure was performed.	Procedure 5.40
	Sensor Out of Cal	Check that the calibration procedure was performed.	Procedure 5.40
	Sensor Age	Verify the sensor is more than two years based upon Date Code Table	Appendix II
	Faulty Setting	Verify Settings	Procedure 5.34
	Sensor Orifice Closed	Verify flow post orifice is approximately 1 SCFH	Procedure 5.41
	Air temperature	Check temperature of surrounding air does not exceed 115 deg f or 46 deg c	Move unit into shade or cooler area.

	Humidity	Check for moisture in the airlines. Check that the water trap is not clogged and is expelling water. Check that the mufflers are not emitting dust. Check that the Med Air 2200 is reading < 39 deg f.	Empty Water trap.
	Timer	Verify Timing Check 60 second cycle, (2, 10 and 20) seconds Timing	Adjust timing Procedure 5.37
	Process Valves	Check Pure Flow, Cross Over, Air Saver, Inlet, Exhaust valves	Procedure 5.24, 5.25, 5.27, 5.28, 5.29
	Air Tank Pressure	Verify it is operating between approximately 58 psig to 93 psig and shuts down at 110psi.	Procedure 5.23, 5.35
	Compressor Pressure Regulator	Open too Much	Procedure 5.23, 5.35

3.5 Microboost Faults

Symptom	Cause	Diagnostic Procedure	Repair method or Procedure
Power	Input Power	Check Power Switch and Outlet	Procedure 5.14.1
	Manual Start	Insure that switch is engaged	Press to Engage
	Power Reset	Verify if reset button has "popped" out.	Press to Engage
O2 Input	O2 Gen Valve Closed	Check if position of valve is at 9:00 (closed)	Turn valve to 12:00 (open)
	Leaks	Pressurize System, use leak detection fluid on all fittings, and look for bubbles.	Procedure 5.16
	Regulator Set too Low	Verify settings average 24psi while system runs	Procedure 5.14.4
No Output	Open Valves	Insure only fill valves are open, (cylinder and manifold). Check that closed valve does not flow	Close unused valve or replace.
	Cylinder Size/Flow Rate	Verify flow rates and fill time for cylinder size. Verify non-filling valves are closed.	Fill Rate Table Close valve.
	Leaks	Pressurize System, use leak detection fluid on all fittings, look for bubbles.	Procedure 5.16

3.6 HV Booster Faults

Symptom	Cause	Diagnostic Procedure	Repair method or Procedure
Power	Input Power	Check Power Switch and Outlet	Turn On
	Manual Start	Insure that switch is in position	Press to Engage
	Auto Start / Pressure Switch	Insure input pressure > 28 psig	Adjust to > 28 psig
	Breaker	Open electrical panel and check breaker is not tripped.	Reset
O2 Input	O2 Gen Valve Open	Insure valve is open	Open Valves
	Leaks	Pressurize System, use leak detection fluid on all fittings, and look for bubbles.	Procedure 5.42
	Regulator Set too Low	Verify regulator set at 35 psig. Booster should turn on at 28 psig and off between 25 to 20 psig.	Reset 00 Regulator
No Output	Open Valves	Insure valves are open (cylinder and manifold)	Open Valves
	Leaks	Pressurize System, use leak detection fluid on all fittings, and look for bubbles.	Procedure 5.42

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4 Shutdown for Service

This procedure is used when the POGS 33 needs configuration changes made after the Initial Startup procedure has been performed.

This includes:

procedures that require the hoses between the Feed Air Compressor and Generator to be disconnected and/or changes to the power source.

This does not include:

4.1 POGS 33 Shutdown

A. Close all four (4) Oxygen Outlet Valves on the Generator Control Panel by turning them to the 9:00 position.

B. Close all three (3) of the Medical Air Outlet Valves by turning them to the 9:00 position.

C. Wait for the Generator to move into Standby Mode, as indicated by the STANDBY Indicator on the Control Panel.

D. Turn the Power Switch on the Generator Control Panel OFF.

E. Turn the Compressor Power Switch on the Compressor Interior Cover OFF.

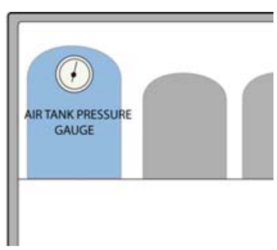
4.2 Relieve Air Receiver Pressure

A. Open the Generator Control Panel by pulling on the two Latches.

B. Slowly open the Manual Condensate Drain Valve and allow air to flow until the Air Receiver pressure reaches 0 PSIG.

C. Air Receiver pressure may be verified by inspecting the Air Receiver Pressure Gauge in the Generator Interior at the top of the Air Receiver.

D. Remove Air Inlet filter bowl and ensure the bowl is dry. Reinstall the filter bowl.



4.3 Feed Air Compressor Shutdown

A. Remove the Tethered Retaining Clip from the Feed Air Compressor Exterior Lid Support Base to release the Feed Air Compressor Exterior Lid Support.

B. Open the Exterior Feed Air Compressor Lid fully.

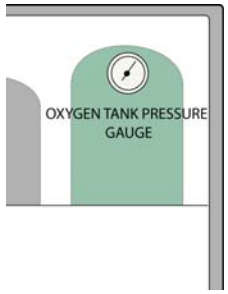
C. Turn the Compressor Power Switch on the Compressor Interior Cover OFF.

D. Disconnect the Compressor Power Cord from the power source.

4.4 Relieve Oxygen Receiver Pressure

A. Slowly open one or all of the Oxygen Outlet Ports on the front of the Generator panel.

B. Close the Outlet Ports when the Oxygen Outlet Pressure Gauge reads zero (0),



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5 Repair Procedures

5.1 Medical Air Filter

Tools: None
Parts Required: In Line HEPA Filter Element P/N 10H04-013

A. Shut down the Generator and Compressor

B. Locate the blue Medical Air Filter on the left side of the mid section of the interior of the generator. There are two blue filters in the Generator. The left side is the Medical Air HEPA filter and the right side is the O_2 HEPA filter.

C. Relieve the pressure from the filter by pressing the spring loaded pin valve at the bottom of the blue bowl until air/moisture stops escaping.

D. Unscrew the lower bowl from the housing.

E. Unscrew the black retainer and remove the filter element.

F. Visually inspect the bowl and housing to assure they are not clogged.

G. Replace the filter element if it is heavily discolored or clogged.

5.2 Auto Drain Restrictor .031”

Tools: 9/16” wrench, Teflon Tape
Parts Required: None

A. Shut down the Generator and Compressor

B. Relieve the air pressure by opening the ball valve at the base of the blue Air Tank.

C. Locate the auto drain valve in the center of the generator behind the lower panel. The .031” restrictor is located inside the left 1/4 X 1/4 straight fitting connected to the underside of the auto drain valve. (Note: Restrictor plugs are commonly inserted into the fitting on the left of the valve. If a plug with a .031” orifice is not found, the restrictor will be assembled into the right hand fitting.)

D. Release the ¼” tubing from the restricted fitting.

E. Unscrew the fitting from the auto drain valve housing using a 9/16” wrench.

F. Visually look for an obstruction then blow through the orifice to assure it is not clogged.

G. If the orifice is blocked, remove the foreign object and blow through to make sure the restrictor passage is open.

H. Apply Teflon tape to the fitting and reassemble it into the auto drain valve housing.

I. Reconnect the ¼” tube.

5.3 Sieve Bed Restrictors .055”

Tools: 9/16” wrench, Teflon Tape
Parts Required: None

A. Shut down the Generator and Compressor.

B. Locate the mac valve on the upper left section of the interior of the generator. Follow the two ¼” tubes attached to the mac valve upwards until they join two ¼ X ¼ elbows. The .059” restrictors are inside the elbows.

C. Release the ¼” tubing from the upper ¼” restricted fittings.

D. Unscrew the fittings from the mac valve housing using a 9/16” wrench.

E. Visually look for an obstruction in each restrictor then blow through the orifice to assure it is not clogged.

F. If the orifice is blocked, remove the foreign object and blow through to make sure the restrictor passage is open.

G. Apply Teflon tape to the fitting and reassemble it into the mac valve.

H. Reconnect the ¼” tube.

5.4 Pure flow Restrictor .059”

Tools: 7/16” wrench, Teflon Tape
Parts Required: None

A. Shut down the Generator and Compressor

B. Relieve the air pressure by opening the O_2 outlet port valves on the front panel of the generator. The O_2 tank pressure gage will drop to zero.

C. Locate the mac valve on the upper right section of the interior of the generator. The .059” restrictor is located inside the 1/8 X 1/4 elbow connected to the right hand side of the mac valve.

D. Release the ¼” tubing from the restricted fitting.

E. Unscrew the fitting from the mac valve housing using a 7/16” wrench.

F. Visually look for an obstruction then blow through the orifice to assure it is not clogged.

G. If the orifice is blocked, remove the foreign object and blow through to make sure the restrictor passage is open.

H. Apply Teflon tape to the fitting and reassemble it into the mac valve.

I. Reconnect the ¼” tube.

5.5 Medical Air Restrictor .073”

Tools: 9/16” wrench, Teflon Tape
Parts Required: None

A. Shut down the Generator and Compressor

B. Locate the blue Medical Air Filter on the left side of the mid section of the interior of the generator. There are two blue filters in the Generator. The left side is the Medical Air HEPA filter and the right side is the O_2 HEPA filter.

C. Relieve the pressure from the filter by pressing the spring loaded pin valve at the bottom of the blue bowl until air/moisture stops escaping.

D. The ¼ X ¼ elbow fitting connected to the right side of the Medical air regulator houses the .073” restrictor.

E. Unscrew the fitting from the regulator using a 9/16” wrench.

F. Visually look for an obstruction then blow through the orifice to assure it is not clogged.

G. If the orifice is blocked, remove the foreign object and blow through to make sure the restrictor passage is open.

H. Apply Teflon tape to the fitting and reassemble it into the regulator.

I. Reconnect the ¼” tubes.

5.6 Hose Leaking

Tools: Leak detection fluid, assorted wrench sizes, Teflon Tape
Parts Required: ¾” 300 PSIG Hose, 3/8”, ¼”, 5/32” Nylon Tube

A. System pressure is required to perform leak checks. Assure the system is running or has reached standby pressure.

B. Begin at one end of the hose and work towards the opposite end. Large leaks may be detected by sound and feel however it is best to use a leak detection fluid such as Snoop to verify the presence of a leak.

C. Pour or spray a small amount of the leak detection fluid over the joint and look for bubbles.

D. Test every joint and fitting along the entire length of the hose.

E. Tighten clamps and fittings if a leak is detected.

5.7 Heat Exchanger

Tools: Phillips Head Screw Driver.
Parts Required: 5W967 Cooling Air Filter Element, 3VU63 Fan

A. Dust, dirt, particles and moisture will restrict cooling airflow and may cause overheating conditions.

B. Open the Rain Guard by sliding the four (4) bolt locks away from the Guards and lifting upward.

C. Remove and inspect the cooling air filter.

D. Install a new cooling airflow filter assuring the arrow on the side of the element points downward.

E. Replace and secure the Rain Guard by sliding the four (4) bolt locks toward the Guard.

F. Open the Compressor Interior Cover by removing the four (4) securing knobs and lifting the cover.

G. Locate the side cooling air filter element in the Side Cooling Air Inlet Louver on the left side of the compressor case.

H. Remove the filter by grasping and pulling straight up.

I. Clean the filter with compressed air.

J. Reinstall the filter.

K. Locate the fan directly on top of the heat exchanger.

L. Verify the electrical plug from the power box is attached to the fan. The fan should operate whenever the compressor motor is running. If the electrical plug is connected and the fan does not operate, replace the fan.

M. To replace the fan, disconnect the electrical plug. Remove the four 6-32 X ½" screws with a Phillips head screw driver. Hold the nut on the underside of the bracket when removing the screws.

N. Inspect the fan and the heat exchanger cooling fins, remove dirt and dust.

O. Replace and locktite the four 6-32 X ½" screws and nuts

P. Visually inspect copper tubing for cracks or splits. Check the compression fittings to assure they are secure.

Q. Close the Compressor Interior Cover and secure the (4) knobs.

5.8 O_2 Tank Pressure Gage

Tools: 9/16" Wrench, Teflon Tape
Parts Required: ONS200-1 Pressure Gage

A. Locate the pressure gage on top of the green Oxygen tank.

B. Observe the pressure cycle (54 to 62 psig) while the generator and compressor are running.

C. If the gage is stuck at zero or "pegged" fully open at 100 or cracked it should be replaced.

D. Before removing the gage, relieve pressure from the O_2 tank by opening the Oxygen outlet ports on the front of the generator.

E. Unscrew the gage with a 9/16" wrench and discard the gage.

F. Replace with a 100-psig oxygen rated gage.

G. Teflon tape the threads before installing the new gage into the fitting.

5.9 O_2 Tank Pressure Relief Valve

Tools: 9/16” Wrench, Teflon Tape
Parts Required: KSV10-1/4-100 Relief Valve

A. Locate the pressure relief valve at the bottom of the green Oxygen Tank.

B. Inspect the valve to determine if it is leaking. It is rated at 100 psig.

C. Visually verify that each valve has not been damaged and that it is free of contamination such as dirt and debris.

D. Grasp the ring on the top of the valve and pull to open. The valve should pull smoothly and close fully when released.

E. Use a 9/16” wrench to remove the valve if it does not function properly.

F. Replace with a similar PSIG and flow rated valve.

G. Teflon tape the threads before installing the valve onto the tank.

5.10 O_2 Tank HEPA Filter

Tools: None
Parts Required: 10H04-013 Filter Element

A. Shut down the Generator and Compressor

B. Locate the blue O_2 Air Filter on the right side of the mid section of the interior of the generator. There are two blue filters in the Generator. The left side is the Medical Air HEPA filter and the right side is the O_2 HEPA filter.

C. Relieve the pressure from the filter by pressing the spring loaded pin valve at the bottom of the blue bowl until oxygen stops escaping.

D. Unscrew the lower bowl from the housing.

E. Unscrew the black retainer and remove the filter element.

F. Visually inspect the bowl and housing to assure they are not clogged.

G. Replace the filter element if it is heavily discolored or clogged.

5.11 O_2 Tank Regulator

Tools: 9/16” Wrench, Teflon Tape
Parts Required: R374-02CP/N Outlet Pressure Regulator

A. The O_2 Regulator is connected to the left side of the blue O_2 Tank HEPA Filter in the mid section of the generator.
B. Set the regulator to 50 PSIG (Read the O_2 pressure gage located on the front of the generator) while the generator and compressor are operating and the system is flowing 30 LPM Medical Air and 33 LPM Oxygen.
C. Verify the regulator is not leaking.
D. To replace the faulty or leaking regulator depressurize the system then unscrew the round plastic locking nut beneath the mounting bracket.
E. Release the ¼” tubes connecting the regulator and HEPA filter assembly to the tubes attached to the generator frame.
F. Unthread the regulator from the HEPA filter.
G. Unthread the ¼ X ¼ elbow from the regulator using a 9/16” wrench.
H. Clean and Teflon tape the elbow and straight fittings.
I. Assemble the new regulator to the HEPA filter and ¼ X ¼ elbow.
J. Mount the regulator into the bracket and reconnect the tubes.

5.12 Medical Air Regulator

Tools: 9/16” Wrench, Teflon Tape
Parts Required: R374-02CP/N

A. The Medical Air Regulator is connected to the right side of the blue Medical Air HEPA Filter in the mid section of the generator.
B. Set the regulator to 50 PSIG while the generator and compressor are operating and the system is flowing 30 LPM Medical Air and 33 LPM Oxygen.
C. Verify the regulator is not leaking.
D. To replace the faulty or leaking regulator depressurize the system then unscrew the round plastic locking nut beneath the mounting bracket.
E. Release the ¼” tubes connecting the regulator and HEPA filter assembly to the tubes attached to the generator frame.
F. Unthread the regulator from the HEPA filter.
G. Unthread the ¼ X ¼ elbow from the regulator using a 9/16” wrench.
H. Clean and Teflon tape the elbow and straight fittings.
I. Assemble the new regulator to the HEPA filter and ¼ X ¼ elbow.
J. Mount the regulator into the bracket and reconnect the tubes.

5.13 Dryer

Tools: 5/16" nut driver or flat head screwdriver
Parts Required: DMO8N23RA Dryer

A. Locate the drier at the bottom right side of the Generator.
B. Visually inspect the drier for clogs.
C. Inspect for excessive bleed out with low air tank pressure.
D. Relieve pressure before replacing the drier.
E. Disconnect the tubing from the ¼ X ¼ elbows at the top and bottom of the drier.
F. Loosen the two hose clamps and remove the drier from the generator frame.
G. Unthread the ¼ X ¼ elbows. Clean the threads and reapply Teflon tape.
H. Thread the elbows into a new drier.
I. Install the new drier into the open hose clamps being certain to have the airflow arrow pointing up.
J. Reconnect the tubes into the ¼ X ¼ elbows.

5.14 Microboost

5.14.1 Power

Tools: 5/16" nut driver or flat head screwdriver
Parts Required: DMO8N23RA Drier

A. Follow the cord from the microboost to the power source and assure it is connected.
B. Verify the source is providing electrical power.
C. Check the circuit breaker to assure it has tripped

5.14.2 Reset Button

Tools: None
Parts Required: 165-7586 Lighted Pushbutton 115V, 76-5655 Lighted Pushbutton 230V.
A. Actuate the reset button and assure it has free movement and the mechanical spring is working.

5.14.3 O2 Supply

Tools: None
Parts Required: None
A. Verify the valve is open and the green hose is connected directly to the O2 outlet port. The system requires a minimum of 50 PSIG to operate and must be receiving 8 LPM of O2

5.14.4 Regulator

Tools: 11/16” or Adjustable Wrench, Teflon Tape
Parts Required: R374-02CP/N Regulator

A. The generator must be operational to perform this service. With the green hose connected between the microboost and the generator and flowing 8LPM of oxygen, verify the input regulator is set to 24 psig.
B. To increase the pressure, turn the regulator clockwise. Turning the regulator counterclockwise will decrease the pressure.
C. If the pressure gage does not change and the generator is flowing oxygen, the regulator must be replaced.
D. Shutdown the system and depressurize before disconnecting and reinstalling a new regulator.
E. Remove the oxygen gage with a 7/16” wrench before removing the regulator.
F. The regulator can be disconnected from the microboost with an 11/16” wrench.
G. Apply Teflon tape to the threads of the new regulator before installation.

5.14.5 Pressure Gage

Tools: 7/16” wrench, Teflon Tape
Parts Required: ONS200-2

A. Locate the pressure gage attached to the Regulator.
B. Observe the pressure cycle (22 to 26 psig) while the generator and compressor are running.
C. If the gage is stuck at zero or “pegged” fully open at 100 psig or cracked it should be replaced.
D. Before removing the gage, relieve pressure from the Microboost by opening the outlet port on the top of the manifold.
E. Unscrew the gage with a 7/16” wrench and discard the gage.
F. Replace with a 100-psig oxygen rated gage.
G. Apply Teflon tape to the threads before installing the new gage into the fitting.

5.14.6 Check Valve

Tools: 9/16", ¾" Wrench, Teflon Tape
Parts Required: X615-8137

A. The check valve prevents oxygen pressure from escaping back into the compressor and maintains pressure at the manifold.
B. If the pressure gage on the manifold shows a drop in pressure and there are no leaks in the manifold system the check valve will need to be changed.
C. Locate the check valve on the lower side of the microboost attached to the discharge connection.
D. Before changing the check valve, relieve pressure from the Microboost by opening the outlet port on the top of the manifold.
E. Detach the braided cable connecting the manifold to the outlet port of the microboost with a 9/16" wrench.
F. Disconnect the check valve with a ¾" wrench.
G. Apply Teflon tape to the threads before attaching a new check valve.
H. Assure the direction of flow is correct. (Towards Manifold).

5.14.7 Back Flow Regulator

Tools: Adjustable Wrench, Teflon Tape
Parts Required: M1-870-PG

A. Locate the 100-PSIG back flow regulator on the top of the manifold.
B. Verify the regulator is set so the gage is reading 50-PSIG while flowing back through the POGS unit. (The manifold must be pressurized with the bottle attached and must be flowing O_2 through the regulator to adjust the regulator.)
C. If the regulator cannot be adjusted it must be replaced.
D. Relieve pressure before disconnecting the regulator from the manifold.
E. Use an adjustable wrench to remove the ball valve at the end of the assembly.
F. Rotate the center fitting connecting the two braided hoses to the manifold to provide clearance to turn and remove the regulator assembly.
G. Unscrew the regulator assembly from the manifold and discard.
H. Apply Teflon tape to all threads and reattach the regulator assembly. Be sure to return the center fitting to its original position and reattach the ball valve.
I. Verify the new regulator can be adjusted to 50 PSIG back pressure and leak test all fittings.

5.14.8 Pressure Switch

Tools: Flat-bladed Screwdriver
Parts Required: None

A. A pressure switch is located inside the base of the compressor and is factory set to 2200 psig. It is important that the set point never exceeds this pressure.

B. If it becomes necessary to reset this switch, it is accessible through a square shaped cut out in the plate covering the underside of the base.

C. Push the sleeve on the body of the pressure switch back to expose the pressure adjustment mechanism.

D. Insert a flat bladed tool such as a screwdriver in the slot and rotate the adjustment mechanism clockwise to increase pressure and counterclockwise to decrease pressure.

5.14.9 Relief Valve

Tools: ½ " Wrench, Adjustable wrench, Phillips Head Screwdriver
Parts Required: X515-A8448, 1st Stage, XA515-8449, 2nd Stage, X515-61 3rd Stage.

The manufacturer must service relief valves. If necessary they may be replaced with new valves. Care must be taken so that surfaces in contact with oxygen do not become contaminated.

A. During operation, check for leakage at the valves. Leakage can cause low flow.

B. Depressurize the system before replacing any relief valve.

C. Locate the first and second stage relief valves on the side of the compressor.

D. Remove first and second stage relief valves with a ½" wrench.

E. Locate the third stage or final relief valve inside the base of the compressor adjacent to the pressure switch.

F. Remove the third stage relief valve with a 1" wrench.

G. Install the new valve and retest the unit.

5.15 Operate Calibrate

Tools: 9/16” Wrench, Teflon Tape, .004” pin, compressed air.
Parts Required: None

Check that the arrow coincides with O_2 and Air settings. When set to Operate, the reading on the analyzer should be between 90 to 96%. When set to Calibrate the reading on the analyzer should be 20.9% O_2 in Air.

If the analyzer does not provide the proper reading, verify there is approximately1SCFH flow through when the system is on. If no flow is observed, the orifice may be clogged.

A. Remove the fitting housing the orifice from the left side of the base of the sensor with a 9/16” wrench.
B. Inspect the .004” diameter orifice by holding the housing up to light. There should be a clear path through the center of the orifice.
C. If it is clogged, clean out the opening with a .004” pin or compressed air.
D. Teflon Tape the threads and reassemble the housing into the base.
   If the analyzer still does not provide proper readings, verify the following:

E. The cable to the sensor is connected.
F. Fault codes are not displayed on the analyzer. (Refer to Neutronics Manual supplied with each POGS 33C Generator, pages 4-14 & 4-15.)
G. The sensor has not expired.
H. The o-ring between the sensor and the base has not been damaged and the sensor is securely threaded to the base.

5.16 Microboost Output Manifold Leak Check

Tools: Adjustable Wrenches, 9/16” wrench, O2 Bottles, Teflon Tape, Leak Detection Fluid, Oxygen Generator
Parts Required: None

A. Steps 1 through 13 define leak testing from the compressor to the high-pressure valves.

1. Connect the manifold to the microboost compressor. If the compressor is already assembled into the case, verify the stainless steel braided hose is connected between the manifold and the microboost compressor.
2. If the manifold and microboost compressor are not assembled into the case, secure the manifold in the vise with the valves up and the braided outlet hoses facing the O_2 bottle holder.
3. Place the microboost compressor within close proximity of the manifold and connect the O_2 hose female ends between the inlet port of the microboost compressor and the outlet port of the Oxygen Generator.
4. Close all valves.
5. Turn on the generator and adjust the input pressure regulator gauge to read between 28 and 24 PSIG.
6. Switch the Microboost power switch to ON then press and release the Microboost start button.
7. Set the backflow regulator gauge to read 50 PSIG.
8. Monitor the pressure rise on the High Pressure manifold pressure gauge.
9. The microboost will automatically shut off when the pressure reaches approximately 2200 PSIG.
10. Spray leak detection fluid on all joints and fittings on the compressor and manifold up to the valves.
11. If no leaks are observed, release the pressure.
12. Repair leaks by tightening, applying new Teflon tape and or changing the fitting.
13. Retest the repair by repeating steps 4 through 11.

B. Steps 14 through 23 define leak testing from the high-pressure valve to the O_2 bottle.

14. Connect the D/E cylinder couplings from the high-pressure lines closest to the manifold regulator onto the two O_2 receiving tanks. Assure that the two index pins are properly aligned before tightening.
15. Assure the O_2 bottle is closed.
16. Close all of the valves except the one for the two lines connected to the bottles.
17. Switch the microboost power switch to ON then press and release the microboost start button.
18. Monitor the pressure rise on the High Pressure manifold pressure gauge.
19. The microboost will automatically shut off when the pressure reaches approximately 2200 PSIG.
20. Spray leak detection fluid on the joints and fittings between the receiving bottles and the high-pressure manifold valve.
21. If no leaks are observed, release the pressure.
22. Repair leaks by tightening, applying new Teflon Tape and or changing the fitting.
23. Repeat steps 14 through 22 for the two high-pressure hoses on the opposite end of the manifold and the single high-pressure hose in the middle of the manifold.

C. Steps 24 through 29 determine bottle fill capability of the microboost. Only the center valve and single high-pressure hose are used for this test.

24. Connect the center high-pressure D/E cylinder coupling to one O_2 bottle. Assure that the two index pins are properly aligned before tightening.
25. Close all other valves.
26. Open the O_2 bottle.
27. Press power switch to ON then press and release the microboost start button.
28. Monitor the pressure rise on the High Pressure manifold pressure gauge. It will take approximately 30 minutes to fill an empty D cylinder to 1500psi and 1 hour to fill a cylinder to 2200psi.
29. Close the bottle and remove the coupling.

5.17 Heat Exchanger, Cracks in the Tubing

Tools: Phillips head screwdriver, Adjustable wrench, 13/16” wrench
Parts Required: M10-080SB1 Heat Exchanger

A. Clean dirt and debris from tubes.
B. Visually inspect copper tubing for cracks and pin holes.
C. Assure unrestricted flow through the exchanger.
D. Verify that the compression fittings are tight.

To replace a faulty heat exchanger,

A. Disconnect the plug from the fan.
B. Unscrew the four Phillips head screws securing the fan to the heat exchanger and lift the fan off of the heat exchanger.
C. Loosen the compression fittings with an adjustable and 13/16” wrench being careful not to damage the tubes.
D. Unscrew the four Phillips head screws securing the heat exchanger from the frame.
E. Replace with a new heat exchanger and reassemble the fan.

5.18 Inlet Filter Auto Drain Valve

Tools: None
Parts Required: None

A. Locate the manual drain valve at the bottom of the blue Air Receiver Tank inside the Generator.
B. Open the valve to observe air flow. If there is no air flow, trace backwards from the valve to look for blockage.

5.19 Air Tank 150 PSIG Pressure Relief Valve

Tools: 9/16” Wrench, Teflon Tape
Parts Required: KSV10-1/4-150 Relief Valve

A. Locate the pressure relief valve at the bottom of the blue Air Tank.

B. Inspect the valve to determine if it is leaking. It is rated at 150 PSIG.

C. Visually verify that each valve has not been damaged and that it is free of contamination such as dirt and debris.

D. Grasp the ring on the top of the valve and pull to open. The valve should pull smoothly and close fully when released.

E. Use a 9/16” wrench to remove the valve if it does not function properly.

F. Replace with a similar PSIG and flow rated valve.

G. Apply Teflon tape to the threads before installing the valve onto the tank.

5.20 160-PSIG Pressure Gage

Tools: 9/16” wrench, Teflon Tape
Parts Required: 102D204F 160-PSIG Pressure Gage

A. Locate the gage at the top of the Blue Oxygen Receiving tank inside the Generator.

B. Observe that the gage cycles between 80 PSIG to 50 PSIG while the generator and compressor are running.

C. If the gage is not moving or is pegged or leaking it should be replaced.

D. Before removing the gage, relieve pressure from the Generator by opening the outlet port on the top of the manifold.

E. Unscrew the gage with a 9/16” wrench and discard the gage.

F. Replace with a 160-psig gage.

G. Apply Teflon tape to the threads before installing the new gage into the fitting.

5.21 Oxygen Check Valve Leakage

Tools: adjustable wrench, 5/8” wrench, Teflon tape.
Parts Required: ICV250B-V-1 Check Valve

A. The Check Valve is located on the top of the Oxygen Tank on the right side of the pressure switch assembly.
B. Make sure the O_2 Tank is pressurized.
C. Open the “Oxygen Input from Booster” valve located on the front lower right of the Generator.
D. Note the pressure of the O_2 Gage and check that it is not dropping and that no gas is escaping from the input valve.
E. If leakage is detected, relieve pressure and disconnect the ¼” tubing from the Female elbow fitting.
F. Use a 5/8” wrench to remove the check valve and elbow from the pressure switch assembly. Note the direction of flow.
G. Disconnect the female elbow from the check valve.
H. Apply Teflon tape to the threads and assemble the elbow and new check valve back onto the pressure switch assembly assuring proper

5.22 Sieve Bed Check Valves

Tools: adjustable wrench, 5/8” wrench, Teflon tape.
Parts: ICV250B-V-1

A. Locate the two check valves at the upper right of each sieve bed connected by tubing “T”to a 111b Mac Valve.
B. Faulty check valves can cause Low Oxygen purity, or low oxygen tank pressure.
C. Determine if there is any vibration while the generator is operating during the air saver cycle. To do this, place your hand on each check valve and determine if there is any vibration.
D. No vibration indicates the check valve is functioning properly.
E. If one or both valves vibrate, they must be changed.
F. Relieve pressure from the generator.
G. Disconnect the ¼” tube connecting the check valve to the 111b mac valve.
H. Using a 5/8” wrench remove the check valve from the in line filter. Note the direction of flow.
I. Disconnect the tubing elbow fitting from the check valve.
J. Apply Teflon tape to the threads and assemble the check valve back in to the in line filter assuring proper orientation.

5.23 Auto Drain Regulator, Compressor

Tools: Philips Head Screwdriver, Large adjustable wrench
Parts Required: NAP100-N02

A. Air should be escaping from the head relieve drain between approximately 90 and 110 PSIG when the compressor is running.
B. If the air drains constantly while the compressor is running, locate the blue regulator in the back left area in the inside of the compressor.
C. Loosen the screw and turn the cap clockwise to increase the pressure at which air drains from the compressor. Air should escape from the compressor drain at approximatley 90 psig.
D. If no air escapes from the relief drain when the compressor is running, turn the cap counter clockwise to allow drainage at a lower pressure.
E. If the relief drain is constantly draing or will not drain it must be changed.
F. Loosen the locking latch on the top of the solenoid and remove the solenoid from the base.
G. Remove the locking nut securing the blue cap regulator to the bracket.
H. Disconnect the ¼" tubes and remove the regulator through the bottom of the bracket.
I. Assemble a new regulator onto the assembly using Teflon tape to seal the threads.
J. Install the regulator assembly back onto the bracket, reconnect the solenoid and the tubes.

5.24 Pure Flow Valve

Tools: Philips head screwdriver, 7/16" wrench, ½" wrench, timer or watch with a second hand, splice and crimp tool, Teflon tape
Parts Required: MAC 111B-111BA, Valve
The pure flow valve allows O_2 to flow from the sieve beds to the Oxygen storage tank. The pure flow valve is closed for 10 seconds and open for 20seconds. During the 20-second cycle, O_2 is transferred from one sieve bed to the storage tank. The 30-second cycle repeats for the other sieve bed.   A bad MAC valve may be the cause for low purity. To check and change the Pure Flow MAC valve, perform the following steps.

A. Open the front door and locate the valve mounted on the upper right section on the frame of the Generator.
B. While the generator is operating feel if the MAC valve is warm. A warm MAC valve indicates proper function.
C. Check that the O_2 tank is filling, if not, it may be an indication of a faulty MAC valve
D. Time the cycle to assure 20 second fill and 10 second off twice per minute
E. Trace and verify the MAC valve wires are connected to the timer and terminal block.
F. If the MAC valve is not functioning properly, it can be changed.
G. Shut down the generator, disconnect the power and depressurize the system.
H. Disconnect the ¼ tubes and remove the fittings with a 7/16" and ½" wrench.
I. Remove tie wraps from the wire harness about 6 to 12 inches from the MAC valve to allow a suitable location to splice in the new valve.
J. Unscrew the two Philips head screws securing the valve to the frame.
K. Install a new MAC 111B valve.
L. Apply Teflon tape to the fittings and install the restricted fitting into the right side and the unrestricted fitting into the left side of the valve.
M. Splice the wires into the harness.
N. Start the generator and monitor the purity.

5.25 Cross Over Valve

Tools: Philips head screwdriver, 7/16” wrench, splices and crimp tool, Teflon tape
Parts Required: MAC 111B-111BA, Valve

The cross over valve is constantly open when the generator is powered. The cross over valve allows air to pass between the beds. When the system is off the cross over valve closes and maintains pressure in the beds. A bad MAC valve may be the cause of low purity. To check and change the cross over MAC valve, perform the following steps.

A. Open the front door panel and locate the valve mounted to the upper frame between the sieve beds in the generator.
B. While the generator is operating feel if the MAC valve is warm. A warm MAC valve indicates proper function.
C. Trace and verify the MAC valve wires are connected to the terminal block.
D. If the MAC valve is not functioning properly, it can be change.
E. Shut down the generator, disconnect the power and depressurize the system.
F. Disconnect the ¼ tubes and remove the fittings with a 7/16” wrench.
G. Remove tie wraps from the wire harness about 6 to 12 inches from the MAC valve to allow a suitable location to splice in the new valve.
H. Unscrew the two Philips head screws securing the valve to the frame.
I. Install a new MAC 111B valve.
J. Apply Teflon tape to the fittings and install the restricted fitting into the left side and the unrestricted fitting into the right side of the valve.
K. Splice the wires into the harness.
L. Start the generator and monitor the purity.

5.26 Medical Air Valve

Tools: Philips head screwdriver, 7/16” wrench, 9/16” wrench, splices and crimp tool, Teflon tape
Parts Required: MAC 111B-111BA, Valve

The Medical Air MAC valve allows medical air to flow from the Air Receiving tank through a drier out to Medical Air outlet ports. The Medical Air valve remains open during system operation. A bad MAC valve may cause no pressure reading in the in the Medical Air Gage and lack of flow to the Medical Air Outlet ports. To check and change the Medical Air MAC valve, perform the following steps.

A. Open the front door and locate the valve mounted on the mid left section on the frame of the Generator. It is connected to the Blue HEPA filter and regulator assembly.
B. While the generator is operating, feel if the MAC valve is warm. A warm MAC valve indicates proper function.
C. Check that the regulator is set so the gage reads 50psi. If not, it may be an indication of a faulty MAC valve.
D. Trace and verify the MAC valve wires are connected to the terminal block.
E. If the MAC valve is not functioning properly, it can be changed.
F. Shut down the generator, disconnect the power and depressurize the system.
G. Disconnect the ¼ tube on the left side of the valve and remove the fitting with a 7/16” wrench.
H. Remove the fitting between the blue HEPA filter and the MAC valve with a 9/16” wrench.
I. Remove tie wraps from the wire harness about 4 to 8 inches from the MAC valve to allow a suitable location to splice in the new valve.
J. Unscrew the two Philips head screws securing the valve to the frame.
K. Install a new MAC 111B valve.
L. Apply Teflon tape to the fittings and install back into the valve.
M. Reconnect the ¼ tube on the left side of the MAC valve.
N. Splice the wires into the harness.
O. Start the generator and regulate 50 psig at the gage. Air should also flow from the Medical Air ports when opened.

5.27 Air Saver Valve

Tools: 3mm Allen wrench, 10 mm wrench, Teflon Tape
Parts Required: VNB203A-15A

There are two air saver valves in the generator. The lower valve is in the center of a cluster of 5 valves located at the bottom of the generator. The upper valve is located in the upper central section of the generator. 5/32 tubing connects the valves. A bad air saver valve may be the cause of low purity. To check and change the air saver valves, perform the following steps.

A. While the system is operating, disconnect the 5/32 tube from the “B” side of the upper valve.
B. B. Air should be flowing out of the tube for 28 seconds and shut off for two seconds.
C. If purity is low and the air saver is not functioning it may be changed. Both air saver valves can be changed with the same tools and process.
D. Shutdown the generator, disconnect the power and depressurize the system.
E. Disconnect the 5/32 tubes from both sides of the air saver valve with a 10 mm wrench.
F. Unthread the four (3) mm-hex head screws holding the top of the air saver valve to the base.
G. Remove the valve head and replace with a new valve head.
H. Screw the four (3) mm hex head screws into the base.
I. Apply Teflon tape to the threaded fittings and reconnect to the 5/32 tubes.

5.28 Inlet Valve

Tools: 3 mm Allen wrench, 10 mm wrench, Teflon tape
Parts Required: VNB201A-15A

There are two inlet valves in the generator. They are the two upper valves in the cluster of 5 valves located at the bottom of the generator. A bad inlet valve may be the cause of low purity and the beds not filling. To check and change the inlet valves, perform the following steps.

A. While the system is operating, grasp one of the lower black inlet hoses connecting the valve to the sieve bed.
B. One hose will be pressurized while the other will be without pressure for 30 seconds. The cycle will reverse every 30 seconds.
C. If a hose remains pressurized or does not pressurize for 30 seconds of every minute of operation the Inlet valve is not functioning it may be changed. Both inlet valves can be changed with the same tools and process.
D. Shutdown the generator, disconnect the power and depressurize the system.
E. Disconnect the 5/32 tubes from both sides of the inlet valves with a 10 mm wrench.
F. Unthread the four (3) mm-hex head screws holding the top of the air saver valve to the base.
G. Remove the valve head and replace with a new valve head.
H. Screw the four (3) mm-hex head screws into the base.
I. Apply Teflon tape to the threaded fittings and reconnect to the 5/32 tubes.

5.29 Exhaust Valve

Tools: 3mm Allen wrench, 10 mm wrench, Teflon Tape
Parts Required: VNB203A-15A

There are two exhaust valves in the generator. They are the outside valves in the bottom row of the cluster of 5 valves located at the bottom of the generator. 5/32 tubing connects the valves. A bad exhaust valve will prevent waste gas from exhausting out of the bed. To check and change the exhaust valves, perform the following steps.

A. While the system is operating, a blast of air should exhaust form the muffler every 30 seconds.
B. Air should be flowing out of the tube for 28 seconds and shut off for two seconds.
C. If air exhaust is constant or not actuating every 30 seconds, the exhaust valve may be changed. Both exhaust valves can be changed with the same tools and process.
D. Shutdown the generator, disconnect the power and depressurize the system.
E. Disconnect the 5/32 tubes from both sides of the exhaust valves a 10 mm wrench.
F. Unthread the four (3) mm-hex head screws holding the top of the exhaust valve to the base.
G. Remove the valve head and replace with a new valve head.
H. Screw the four (3) mm-hex head screws into the base.
I. Apply Teflon tape to the threaded fittings and reconnect to the 5/32 tubes.

5.30 General Leak Check Procedure for Generators and Compressors

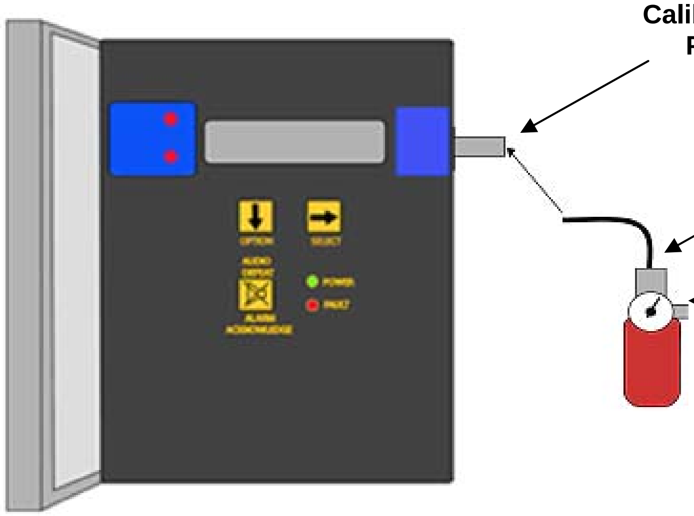
Tools: Leak Detection Fluid, Assorted Wrenches and screw drivers, Teflon tape
Parts Required: None
Perform a COMPLETE leak check of every connection/ fitting utilizing leak detector spray solution while compressor and generator are operating.

A. Starting from where the air starts at compressor, operator will check for leaks using spray solution on every connection working their way to the generator where inlet hose attaches to generator following the flow of air through generator.
B. Once operator establishes that there are no leaks at air compressor through inlet hose and up to generator air inlet, operator will continue leak-checking system by starting at air tank and moving through system as it operates. Sequence of testing will follow these steps:
    1) Check all connections with spray solution between air tank (blue) following tubing to inlet valves for beds.
    2) Continue following flow through valves checking valve connections into beds, then checking all fittings and connections to beds at bottom and working to the top where the AIR FLOW now CHANGES to OXYGEN.
    3) Starting at top of beds continue checking all connections/fittings and valves following the flow of oxygen to top of (green) tank using spray solution, while always looking for bubbles to solution which would indicate a leak.
    4) Continue to bottom of (green) tank, again checking all connections/fittings and valves for leaks. Follow tubing into filter and regulator assemblies while continuing to use spray solution to verify for leaks.
    5) Follow tubing to control panel where oxygen exits the generator and check for leaks at bulkhead fittings on control panel.
    6) Once the operator establishes that there are no leaks at any connections from compressor to generator and then out to flow a final “pressure hold” test will be performed.
C. Pressure Hold Test:
    1) Power up compressor and run generator with oxygen and medical air valves closed.
    2) Continue to run generator until unit goes into “standby”.
    3) Power OFF compressor and generator.

4) Record AIR pressure and O2 pressure gage readings and let the system stand with pressure for two hours.
5) Check the pressures on the air and O_2 gages have not dropped more than 2 lbs per in two hours.
6) If there is a pressure drop, repeat steps C and D.

5.31 CO Sensor- Calibrate

Tools: None
Parts Required: None



A. Calibration of the Carbon Monoxide Sensor requires the following items:

- Calibration Adapter
- A cylinder of 20.9% oxygen (zero gas)
- A cylinder of 20 PPM Carbon Monoxide (span gas)

B. Air Monitor maintenance menu is accessed with the OPTION and SELECT switches. From the operational display, press the OPTION switch until, “Enter Maintenance Menu” is displayed.

C. Entrance to the maintenance menu is guarded with a four-digit Password The factory default setting of the password is 1270. When a valid numerical password is inserted, the user is allowed to enter the maintenance menu.

D. In the “Enter Maintenance Menu” position:

- Press the SELECT switch; “ Enter Password = 0000 is displayed.
- In the 0000 position, the underline curser is under the left digit.
- Press the OPTION switch to change the left digit; select the correct digit.
- Press the SELECT switch, which locks the correct digit in place and moves the curser one digit to the right.

E. Continue this procedure until the four-digit password is complete. When a valid password is inserted in this manner, the display is transferred to the Calibration portion of the menu. If an invalid password is inserted, you are returned to the Enter Maintenance Menu display.

F. After entering a valid password to the maintenance menu, the calibration section is the first menu section; enter by pressing the SELECT switch.

Supply sensor with clean air for LowCaL/ZeroCal setting and apply calibration gas for HiCal/SpanGas setting.

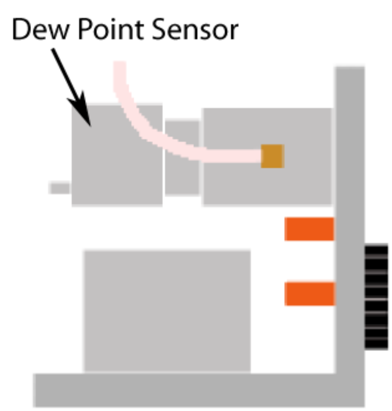
- Press the SELECT switch ”Calibration Select XX is displayed. XX= the gas to be calibrated.
- Press the OPTION switch if needed to change to the gas to be calibrated.
- Press the SELECT switch; the gas & current reading are displayed in the upper portion of the display. The mV reading & “LowCal 0 is displayed in the lower portion of the display. This reading needs to be at or near zero.
- If it is not, attach a cylinder of 20.9 zero gas to the Calibration/Sample Port using the Calibration Adapter.
- Open the cylinder valve set the regulator at 55 PSIG.
- Let the gas flow for up to 4 minutes.
- Press the SELECT switch that moves the cursor one digit to the right , when the last digit is accepted the display will move to “HiCal XX” gas calibration. XX = the level of gas to be used for calibration. The mV reading is shown in the upper right hand corner of the display.
- Apply calibration gas (20ppm CO in air) to the sensor for about I minute and the mV reading has stabilized.
- Press SELECT switch, that moves the cursor one digit to the right, when the last digit is accepted and the calibration is successful the display will momentarily show Cal OK then slope and off set readings before returning to the Calibration Menu.

G. Press OPTION switch until “Exit maint menu” appears and then press SELECT switch to return the instrument to the Operational Display

5.32 Generator: Dew Point Sensor

Tools: None
Parts Required: 03009-001

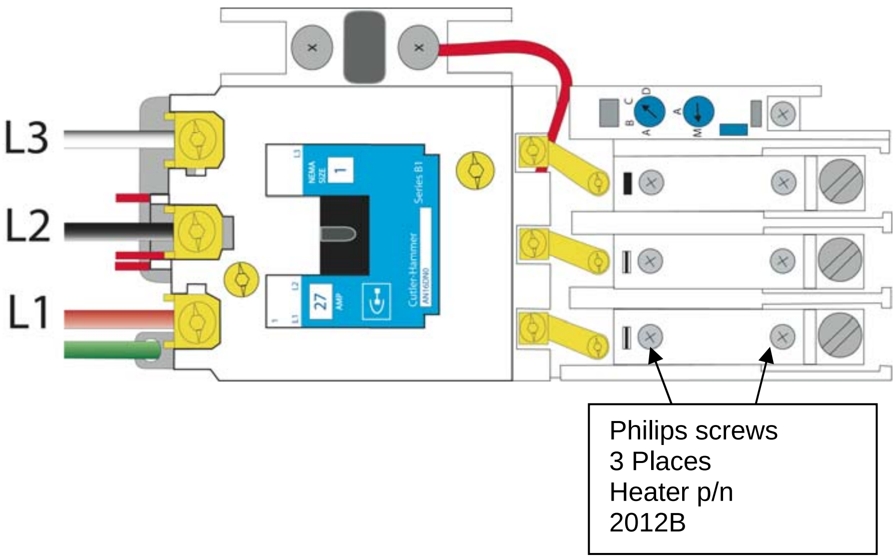
A. Unlike the CO and O2 sensors, the dew point sensor cannot be field calibrated, and must be calibrated at the factory. To minimize instrument downtime, contact On Site Gas Systems for the dew point sensor exchange program, in which the old dew point sensor can be exchanged for a newly calibrated sensor.



5.33 Pogs33C Compressor Heater Pack- Replacement

Tools: Phillips Head and Flat Head screwdriver
Parts Required: H2012B-3

A. Remove power from compressor use lockout tag out procedure.
B. Remove 4 Securing screws from top of compressor.
C. Remove Cover of Starter on Left side of unit. 1 spring loaded screw.
D. Remove heaters by loosening 2 captive Philips head screws.
E. Install new heater taking care to tightly secure Philips screws.
F. Repeat procedure if changing all 3 Heaters.
G. Verify the switch settings are M & C.
H. Reinstall Starter Cover.
I. Reinstall Compressor Top using the 4 Securing Screw.
J. Test the compressor for operation.

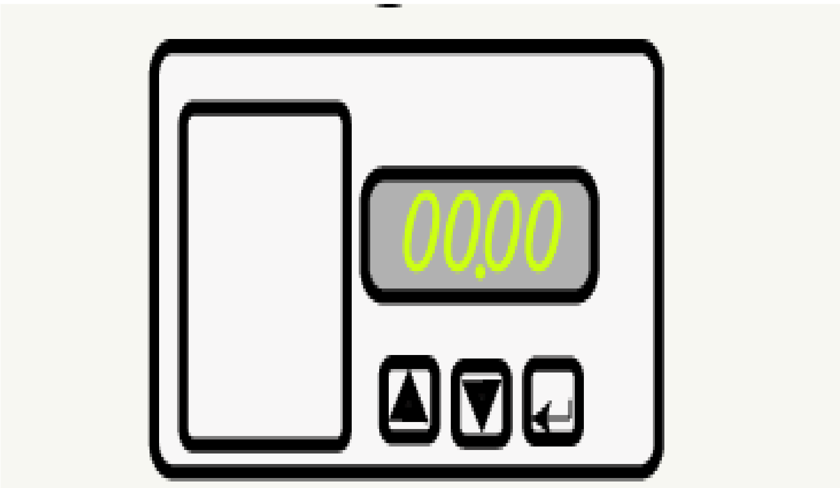


5.34 1100 Analyzer Reset Factory Settings.

Tools: None
Parts Required: None

A. Press and hold “Mode” switch on front panel for Aprox. 6 Seconds.
B. “----“ will display.
C. Release the Mode switch at this time.
D. Momentarily press the “Mode” switch 11 times till 8_ _ _ is in the left hand side of the
E. Display.
F. Use the ^ arrow key till 8 _ 88 is displayed.
G. Press the “Mode” switch one time and the 1100 will go into the run mode with the factory
H. settings installed.
I. Recalibrate the O2 sensor at this time.

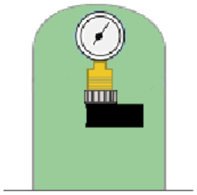
1100 Oxygen Analyzer.



Mode Sw

5.35 Standby Mode Pressure Switch Generator

Tools: 9/16" wrench, flat blade screwdriver, Teflon tape, electrical tape
Parts Required: HC26A214 pressure switch

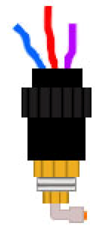


The Pressure Switch adjusts at what psig the Generator goes into Standby Mode. When there is no demand for O2 and Medical Air, the Generator will run until the green O2 tank reaches 70 psig.

A. Turning the metal barrel on the Pressure Switch clockwise increases the psig reading. Turning it counter clockwise decreases the reading.
B. If the switch cannot be adjusted to 70 psig it can be changed.
C. Turn off power and relieve system pressure.
D. Remove the electrical tape and unscrew the terminal screws at the bottom of the switch.
E. Remove the wires making sure to identify correct orientation for reassembly.
F. Unscrew the Pressure Switch from the O2 tank with a 9/16" wrench.
G. Apply Teflon Tape to the new Switch and install it into the O2 fitting.
H. Reassemble the wires to the terminals in the proper orientation and cover them with electrical tape.
I. Start the system and adjust the pressure switch.

5.36 PRESSURE SWITCH COMPRESSOR

Tools: 11/16" wrench, Wire Cutters, Crimp Tool, butt splices, Teflon Tape
Parts Required: 96211-BB5 Pressure Switch
The Pressure Switch adjusts at what psig the compressor goes into Standby Mode. When there is no demand for air, the compressor will run until the blue air tank reaches 110 psig.

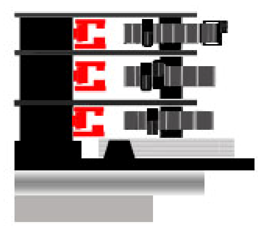


A. Turning the plastic barrel on the Pressure Switch clockwise increases the psig reading. Turning it counter clockwise decreases the reading.
B. If the switch cannot be adjusted to 110 psig it can be changed.
C. Turn off power and relieve system pressure.
D. Remove the ¼ tube from the fitting at the underside of the switch.
E. Unscrew the female elbow connected to the bottom of the switch with an 11/16" wrench and remove it from the bracket. Be careful not to misplace the two washers that fit between the elbow and the bracket holding the pressure switch.
F. Remove 4" to 6 " of the sheath from the wire harness and cut the wires connecting the old switch.
G. Splice the new switch with butt connectors into the wire harness and cover with the sheath.
H. Install the new switch into the bracket and attach the female elbow and two washers below the bracket and tighten.
I. Start the system and adjust the pressure switch.

5.37 Timing Assembly Adjustment and Replacement

Tools: Phillips Head Screw Driver, Stop Watch,
Parts Required: TM3A605

The timing assembly consists of 3 cams and 10 timing fingers. The timing sequence is symmetrical based on a 60 second full rotation. On each cam gear, the fingers are installed in an alternating direction, down and up or up and down, to actuate the micro switches on and off. There are two versions of the timer assembly. Version 1 has a 1- RPM motor and rotates to the left in the install position. Version 2 is a 10-RPM motor with a reducing gear to 1-RPM and rotates to the right in the install position. Check to verify if you have a version 1 or 2 replacement timer. Regardless of the timer, the first finger to actuate the switch will be in the down position. Timing cycles are adjusted at On Site Gas Systems but can be adjusted in the field.



A. The top gear has four sets of fingers spaced at approximately 10 second closed and 20-second open intervals to actuate the pure flow valve.
B. The middle gear has two sets of fingers spaced 180 degrees apart on the cam gear. Each set consists of two fingers next to one another to give a 2.5 second air saver valve actuation interval.
C. The bottom gear has two sets of fingers spaced at 30-second intervals to actuate the main valves.
D. It is best to begin setting the fingers of the lowest gear first, then aligning the middle and top fingers with the low gear fingers.
E. On the lowest gear set the two fingers 180 degrees apart, one in the up position and one in the down position.
F. Install two middle gear fingers together and align them so the lower cam finger is centered between the two. If the motor rotates left, the lower finger of the middle gear is on the left. If the motor rotates right, the lower finger of the middle gear is on the right.
G. Repeat step F aligning the second set of fingers 180 degrees on the opposite side of the middle gear.
H. Install the first finger in the top gear in a down position aligned with the lower finger in the middle gear.
I. Install the second finger in the up direction approximately 60 degrees behind the first finger.
J. Repeat step I aligning the second set of fingers 180 degrees on the opposite side of the middle gear.
K. Verify proper finger locations with a stop watch.

5.38 Feed Air Compressor – Tip Seal – Replace

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Tools: T type wrench set, Torque wrenches, Grease Gun, Gear Puller
Parts Required: IP604500AV
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H. Remove six (6) nuts with T-type wrench and then Fixed Scroll (FS) set from air end.

I. Remove Low Pressure (LP) and High Pressure (HP) tip seals from FS set and Orbit set. Using the tip of a ball-point pen at the start will make it much easier.

J. Remove dust from Scroll with clean cloth or air.

NOTE

Tips seals for Fixed Scroll and Orbit Scroll have opposing seal cut angels.

Insert tip seal so that the lip of the tip seal is on the bottom of seal groove and inner side of involute and the direction of lip faces the center of involute (curing spiral). This is to be done for both FS and OS sets.

Use caution not to tear or distort lip.

K. Insert new HP tip seal from the center section for Orbit Scroll (OS) so there will be no clearance at the tip (start) section.

L. Insert so that new LP tip seal will contact closely with HP tip seal inside Scroll Grove.

CAUTION

Insert approximately half of the LP tip seal and remove the tip seal to confirm that a notch in the tip seal has been achieved. This will prevent movement during installation.

M. Repeat the same procedure for FS tip seal set, remove both the dust seal and backup tube located on outermost side FS set.

N. Insert new backup tube in the FS in the 6 o'clock position.

O. Insert new dust seal on the backup tube. Face seamed section of the dust seal in the 3 o'clock position.

P. After replacing tip seal set, reassemble FS set to the OS. Tighten 6 nuts temporarily and confirm if crankshaft rotates smoothly by hand and tighten them firmly. Tightening torques are: First – 15 in. lb. / Second – 175 in. lb.

5.39 Feed Air Compressor - Scroll Compressor – Lubricate

In order to access the Main Bearing and Pin Crank Bearings, the Scroll Compressor must be removed from the Feed Air Compressor Frame.

A. Main Bearings

B. Remove the plastic dust cap. Use only one of the two locations found on the air end.

1. Rotate the compressor pulley until the grease fitting is visible through the dust cap hole.
2. Use a grease gun extension adapter to engage the grease fitting and supply approximately 3 grams of grease (3 to 5 pumps of the grease gun).

C. Pin Crank Bearings

1. Remove the V belts and the fan cover.
2. Remove the air end pulley and cooling fan with a gear puller.
3. Remove the fan duct shroud.
4. Remove the three (3) grease caps. Do not attempt to loosen or tighten the bolt.
5. Grease all three pin crank bearings with approximately 3 grams of grease, (3 to 5 pumps of the grease gun).
6. Replace the grease caps, fan shroud, pulley, etc.

5.40 Generator - O_2 Sensor – Calibrate

Tools: Calibration Gas
Parts Required: None

A. After 30 minute warm-up apply stream of calibration Gas 90% to 95% O2 to Sensor Assembly. Close the operate calibrate switch on panel.

B. Connect 5/32" tube from Cal Bottle. Open bottle and adjust regulator to 50 PSIG max. Allow Gas to flow 2 minutes before continuing.

C. Press and release the "MODE" key once.

D. The Display will Show "CAL" then an oxygen concentration value. ie 95%.

E. Use the up and down arrows to adjust display to value of O2 in Calibration Gas. ex. 95%. (Value should be written on Cal gas bottle Tag. Only Certified Gas should be used. Cert Gas is available from the Gas Supplier).

F. Press and release the "MODE" key four times to return to "Run" mode.

G. Keep Cal gas on for 5 more minutes to ensure there is no change in the O2 Value.

H. Turn Operate Calibrate switch to Calibrate. Air 20.9. Display will go from 95% to 20.9 in approx. 1-1/2 minutes.

I. Press and release the "MODE" key once.

J. The Display will Show "CAL" then an oxygen concentration value. 20.9.

K. Use the up and down arrows to adjust display to 20.9.

L. Press and release the "MODE" key four (4) more times to return to "Run" Mode.

M. Repeat steps A thru K at least three (3) times. Ensure Response time is approx. 1-1/2 minutes from 20.9%to 95%. The accuracy of the 1100 is +- 2%.

5.41 Sensor Orifice Closed

Tools Required: 7/ 16" wrench, 9/16" wrench; Teflon Tape, Flow Meter, solvent, compressed air .
Parts Required: None

A. Check O2 flow by attaching flow meter to the 5/32 tube exiting the sensor.
B. Flow should be between 0.5 and 1.0 CFH. (Avg 0.76).
C. Low flow may be caused by blockage in the .004" orifice.
D. Disconnect the 5/32 tube at the right side of the sensor elbow.
E. Remove the black rubberized sheath off of the sensor by sliding it up the cable. Disconnect the sensor cable and unscrew the sensor from its base.
F. Unscrew the base from the brass orifice fitting.
G. Hold the brass 1/8" hex nipple with a 7/16" wrench and remove the brass orifice fitting from it with a 9/16" wrench.
H. There is a .004" diameter orifice in the end of the brass fitting. Visually check if the orifice is blocked.
I. Unblock the orifice with compressed air or a small pin being careful not to enlarge the .004" diameter orifice. A solvent may be used to assist in particle removal.
J. Apply Teflon tape to the fittings and reassemble.

5.42 HV Booster Output Manifold Leak Check

Tools: Adjustable Wrenches, 9/16" wrench, O2 Bottles, Teflon Tape, Leak Detection Fluid, Oxygen Generator, D/E Adapter

Parts Required: None

A. Steps 1 through 13 define leak testing from the compressor to the high-pressure valves.

1. Verify the stainless steel braided hose is connected between the manifold and the HV compressor.
2. O_2 hose female ends between the inlet port of the HV compressor and the outlet port of the Oxygen Generator.
3. Close all valves.
4. Turn on the generator and adjust the input pressure regulator gauge to 35 psig. (Unit should turn on at approx 28 psig and off at 25-20 psig.)
5. If the unit is in Auto Mode, it will automatically begin the flow of oxygen to the cylinders when the power switch is pushed.
6. If the unit is in the manual mode and the power switch is on, push the START button to begin the flow of O_2.
7. Set the backflow regulator gauge to read 50 PSIG.
8. Monitor the pressure rise on the High Pressure manifold pressure gauge.
9. The HV Booster will automatically shut off when the pressure reaches approximately 2200 PSIG.
10. Spray leak detection fluid on all joints and fittings on the compressor and manifold up to the valves.
11. If no leaks are observed, release the pressure.
12. Repair leaks by tightening, applying new Teflon tape and or changing the fitting.
13. Retest the repair by repeating steps 4 through 12.

B. Steps 14 through 23 define leak testing from the high-pressure valve to the O_2 bottle.

14. Connect the H/K cylinder couplings from the high-pressure lines closest to the manifold regulator onto the two O_2 receiving tanks. Assure that the two index pins are properly aligned before tightening.
15. Assure the O_2 bottle is closed.
16. Close all of the valves except the one for the two lines connected to the bottles.
17. Switch the power to ON.
18. Monitor the pressure rise on the High Pressure manifold pressure gauge.
19. The HV Booster will automatically shut off when the pressure reaches approximately 2200 PSIG.
20. Spray leak detection fluid on the joints and fittings between the receiving bottles and the high-pressure manifold valve.
21. If no leaks are observed, release the pressure.
22. Repair leaks by tightening, applying new Teflon tape and or changing the fitting and retest.
23. Repeat steps 14 through 22 for the two high-pressure hoses on the opposite end of the manifold and the single high-pressure hose in the middle of the manifold.

C. Steps 24 through 29 determine bottle fill capability of the HV Booster. Only the center valve and single high-pressure hose are used for this test. Use the D/E adapter and fill a D size bottle for this test.

24. Connect the center high-pressure D/E cylinder coupling to one O_2 bottle. Assure that the two index pins are properly aligned before tightening.
25. Close all other valves.
26. Open the O_2 bottle.
27. Switch the HV Booster power switch to ON..
28. Monitor the pressure rise on the High Pressure manifold pressure gauge. It will take approximately 10 minutes to fill an empty D/E cylinder to 1500psi and 20 minutes to fill a cylinder to 2200psi.
29. Close the bottle and remove the coupling.

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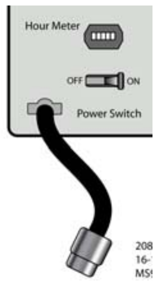
6 System Start-Up Procedure

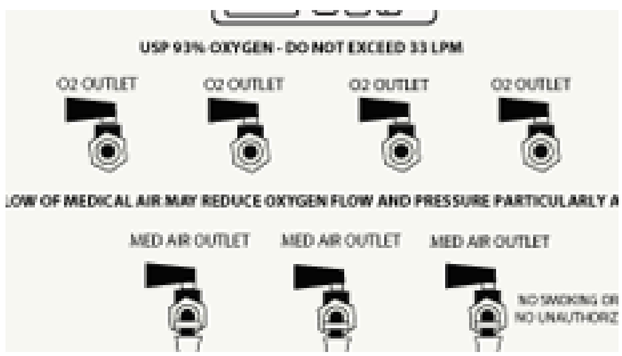
6.1 Power-Up

A. Connect the Feed Air Compressor Power Cord to the power source.
B. Move the Feed Air Compressor Power Switch to the ON position.
C. Allow the Feed Air Compressor to operate until it reaches standby mode (at approximately 110 PSIG on the air tank gauge the Feed Air Compressor will shut down).

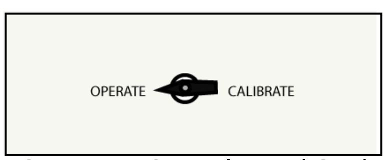


NOTE
The Feed Air Compressor may cycle between Standby and Operate Mode until the pressure is balanced between the Generator and the Feed Air Compressor. If more than 4 such cycles are observed however, check for leaks between the Feed Air Compressor and the Generator.

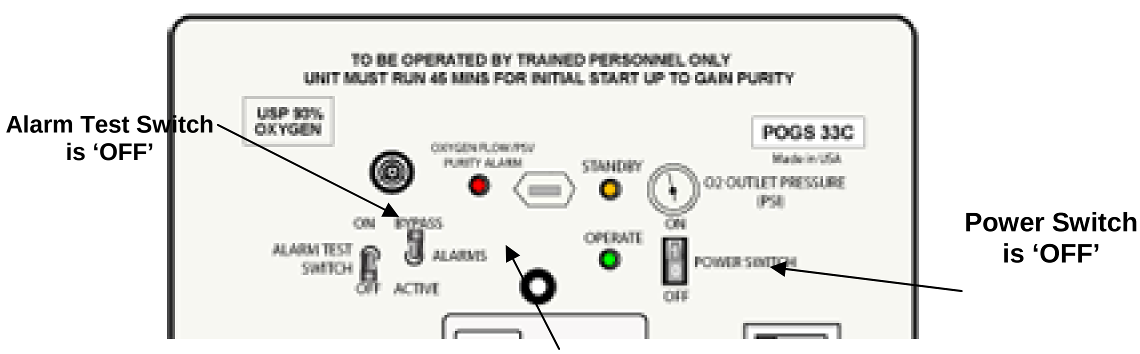
Verify that the (3) Medical Air Outlet Valves and all (4) Oxygen Outlet Valves on the Generator Control Panel (Fig 1-1) are in the closed position (9:00 position).



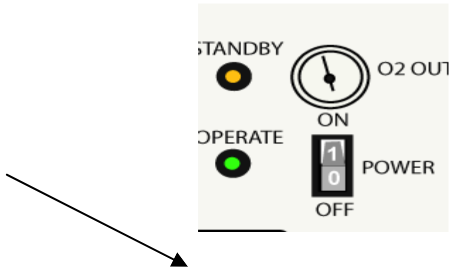
Verify the Operate/Calibrate Valve Handle is pointing to the (OPERATE) position.



Verify the following Generator Control Panel Settings:



Alarms Switch in 'BYPASS'



Connect the Generator Power Cord to the power source.

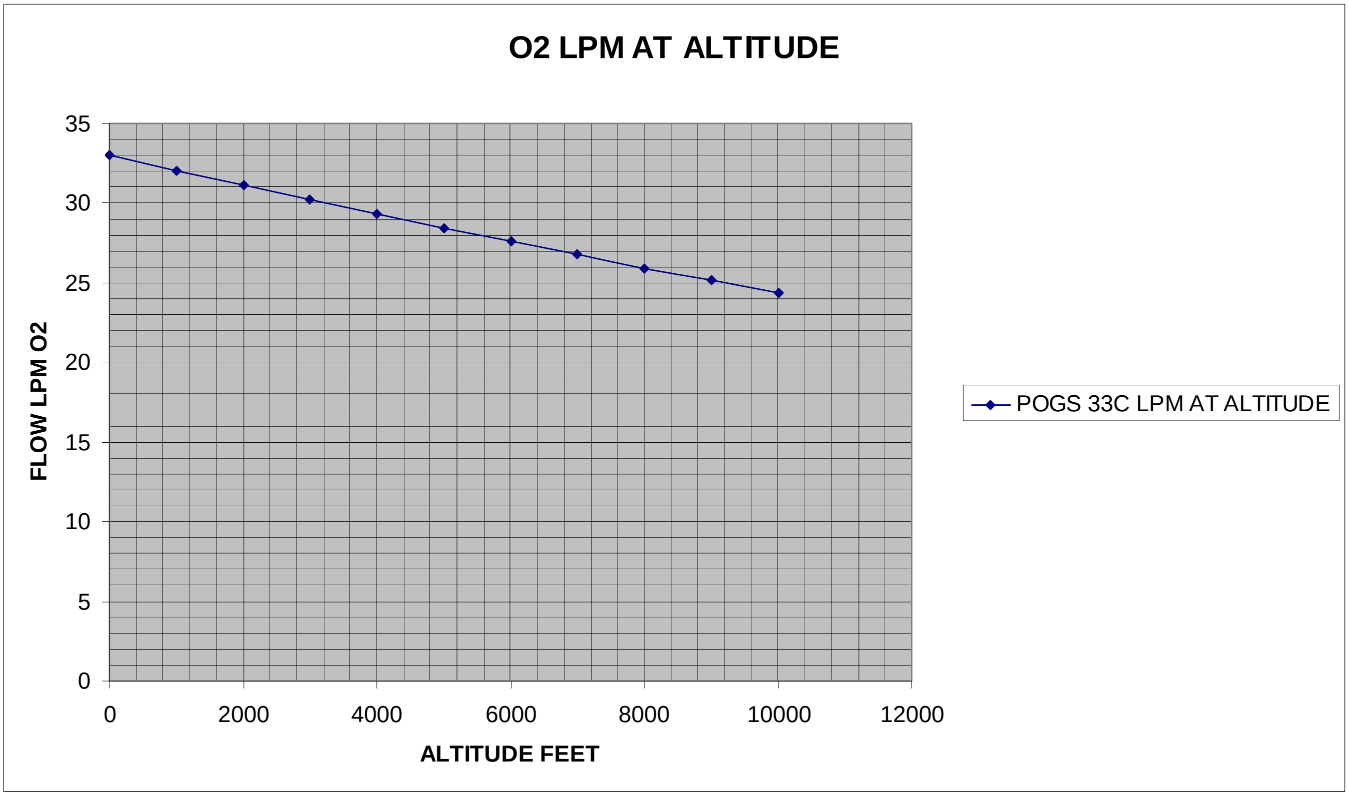
A. Apply power to the Generator pushing Power Switch to 'ON'.

B. If the Oxygen Receiver pressure is low, the Generator will run until Oxygen Receiver pressure reaches approximately 70 PSIG. Then, the Generator will switch to standby mode, which is indicated by the illumination of the Standby Indicator on the Generator Control Panel. The Generator should reach standby mode within 5 minutes.

C. Verify Oxygen Receiver pressure by inspecting the Oxygen Receiver Pressure Gauge in the Generator at the top of the Oxygen Receiver.

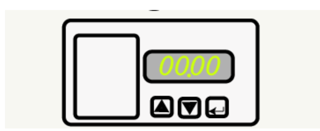
NOTE

At altitudes of 5,000 FT or above, the Generator (Fig 1-1) may not switch to standby mode. As altitude increases, the pressure, flow, and purity may decrease as the density of oxygen and air decreases. If the Generator does not switch to standby mode within 5 minutes, and no oxygen leaks are observed, continue with the procedure in Section 3.2. See Altitude Chart below.



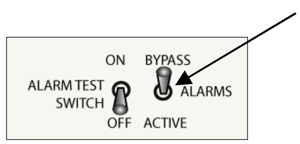
6.2 Purge Low Pressure Oxygen Receiver

A. Observe the oxygen concentration indicated by the Oxygen Analyzer.



B. If oxygen concentration is below 90%, remove any accessories from one or more Oxygen Flowmeters then open the corresponding Oxygen Outlet Valve(s); adjust the Oxygen Flowmeter(s) for a combined flow of 15-20 LPM. Continue flowing 15-20 LPM until oxygen concentration of 90% is achieved.

C. Once 90% oxygen concentration is achieved, the Alarm Bypass Switch should be switched to active:



D. Close the Oxygen Flowmeters and Oxygen Outlet Valves (9:00 position) until oxygen flow is needed.

E. Refer to Section 4 for oxygen output configurations.

6.3 Monitors and Alarms

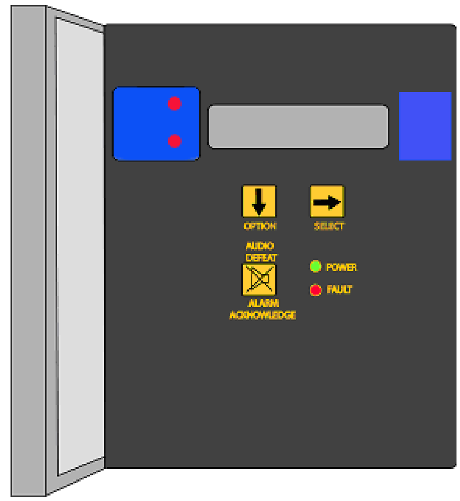
Carbon Monoxide (CO) and Dew Point Monitor

1) Carbon Monoxide and Dew Point Monitor is installed in the Generator interior.

2) The monitor is hard-wired to the electrical system of the Generator and is active whenever the Generator Power Switch is in the “ON” position.

3) Normal Operation

   - When the Generator Power Switch is changed to the “ON” position, the alarms may sound briefly. Pressing the ALARM ACKNOWLEDGE/AUDIO DEFEAT button on the monitor will silence the alarms.
   - The display of the monitor, visible when the Generator Control Panel (Fig 1-1) is opened, will display the current CO content of the feed air. The display also will indicate if there is proper flow through the sensor and indicate the dew point of the medical air.



CO & Dew Point Monitor

CAUTION
Acceptable levels for system operation are <10PPM CO, <39 degrees F dew point.

4) Calibration of the Carbon Monoxide (CO) and Dew Point Monitor

   - The carbon monoxide and dew point sensor come pre-calibrated from the factory.
   - The carbon monoxide sensor should be calibrated every 3 months, using calibration gases of 20.9% zero gas and 20 PPM CO.
   - The dew point sensor cannot be field calibrated, and should be replaced every 12 months to maintain accurate readings.

5) Restarting (machine turned off or power lost)

   - When power is restored to the Generator, the CO and Dew Point Monitor will resume operation.

7 APPENDIX

I. POGS MICRO BOOSTER AND 2P HIGH VOLUME BOOSTER

CYLINDER FILL TIME CHART

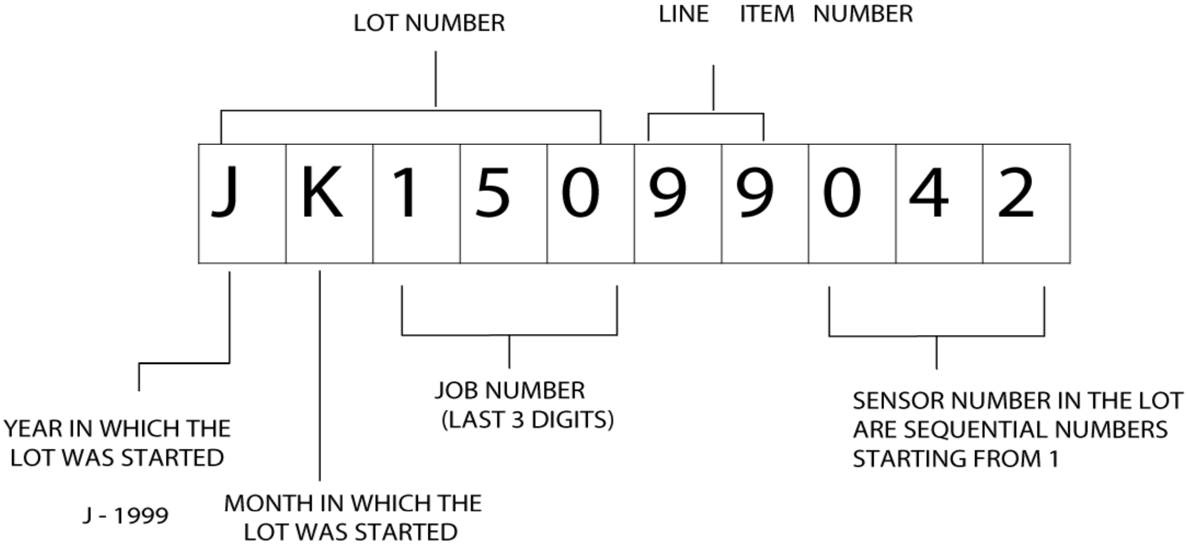
CYLINDER	CAPACITY @2000 PSIG	FILL RATE	TIME REQ'D	
MICRO BOOST				
D	**370 LITERS**	**7 LPM**	***52 MIN'S***	
E	**620 LITERS**	**7LPM**	***1.5 HOURS***	
2P 1POGS				
D	**370 LITERS**	**33 LPM**	***12 MIN'S***	
E	**620 LITERS**	**33 LPM**	***19 MINS***	
H	**6000 LITERS**	**33 LPM**	***3 HOURS***	
2P 2POGS				
D	**370 LITERS**	56 LPM	***7 MIN'S***	
E	**620 LITERS**	56 LPM	***11 MIN'S***	
H	6000 LITERS	56 LPM	***1.8 HOURS***	

NOTE: This is for reference only. Actual fill time may be longer due to environmental and altitude factors.

II. Date Code Table

NTRON OXYGEN SENSOR SERIAL NUMBER DEFINITION

NTRON™ Oxygen Sensor serial numbers are located on the oxygen sensor label. The Lot Number, Job Number, Line Item Number and Sequence Number all relate to the sequence of when the sensor was manufactured, during the month it was manufactured. The model number is listed separately on the label.



J - 1999
K - 2000
L - 2001
M - 2002
N - 2003
P - 2004
Q - 2005
R - 2006

A - JAN
B - FEB
C - MAR
D - APR
E - MAY
F - JUN
G - JUL
H - AUG
J - SEPT
K - OCT
L - NOV
M - DEC

III. Item I.D Table and Diagrams

POGS 33 Item Identification					
Section # in Manual	**Number in Manual**	**Part Names**	**Manufacturer**	**Manufacturing Part #**	**OSGS Part #**
		POGS 33			
	1	Generator			
	2	Feed Air Compressor		MOGS33COMP	
	3	Accessory Case		MOGS33ACC.KIT	
	4	Microbooster (Optional)		POGS MICROBOOST	
	5	HV Booster (Optional)		2P BOOSTER	
Apx. III. A		**Generator Control Panel**			
	6	Latches (x2)		64-21-10	SOUTHCO
	7	Audible Alarm		56965T26	
	8	Oxygen Purity Alarm	2150-1-12-20310		SOLICO
	9	Hour Meter	020035 N17		HOBBS
	10	Standby [Mode Indicator]	2150-1-12-20320		SOLICO
	11	Oxygen Outlet Pressure [Gauge]	ONS 200-4		P.I.C.
	12	Alarm Test Switch (ON/OFF)	683-0049		
	13	Alarm [Bypass Switch] (BYPASS/ACTIVE)	683-0049		
	14	Circuit Breaker	548-1053		
	15	Operate [Mode Indicator]	2150-1-12-20340		SOLICO
	16	Power Switch (ON/OFF)	676-5500		
	17	Oxygen Analyzer	1100	1100 (P)	NEUTRONICS
	18	Oxygen Outlet Valve	NB1		
	19	Oxygen Outlet Valve	NB1		
	20	Oxygen Outlet Valve	NB1		
	21	Oxygen Outlet Valve	NB1		
	22	Oxygen Outlet Port	M24-4		WESTERN MEDICA
	23	Oxygen Outlet Port	M24-4		WESTERN MEDICA
	24	Oxygen Outlet Port	M24-4		WESTERN MEDICA
	25	Oxygen Outlet Port	M24-4		WESTERN MEDICA
	26	Medical Air Outlet Port (a,b,c)	NB1		
	27	Medical Air Outlet Valve (a.b.c)	M16-4		WESTERN MEDICA
	28	Operate/Calibrate [Valve Handle]	UCI B3-F2		U.C.I.
	29	Generator Power Cord	809-543		
	30	Feed Air Inlet Port		P33-016S	
	31	Backup Oxygen Inlet Port	M24-4006		WESTERN MEDICA
	32	Backup Oxygen Inlet Port Valve	NB1		
	33	Particulate Filter Assembly	F26-04-FMO	P33043	WILKERSON
	34	Automatic Drain	04F20C2110ACF4C		PARKER
	35	Cover Wheels			HARDIGG
	36	Condensate Drain Port	KQH07-355		SMC

Apx. III. D		Generator Accessories			
	37	Memory Stick (1) & C D (2)	554530	Memory Stick	
	38	Oxygen Flowmeters (x6)	FM103		WESTERN MEDICA
	39	Cannulas (x6)	1600-2D		TRI-MED
	40	Humidifier Bottles (x6)	PX-1003		WESTERN MEDICA
	41	Oxygen Hoses (Green) (x6)		**SEE BELOW**	
	42	Medical Air Hoses (Yellow) (x6)		**SEE BELOW**	
			41-Oxygen Hose	**42-Medical Hose**	
			P33-040-003; 8' (2)	P33-041-003; 8' (1)	
			P33-040-005; 15' (2)	P33-042-003; 8' (1)	
			P33-040-007; 20' (2)	P33-041-005; 15' (1)	
				P33-042-005; 15' (1)	
				P33-041-007; 20' (1)	
				P33-042-007; 20' (1)	
	43	Oxygen Y-Fitting (x2)	MY-2S		WESTERN MEDICA
	44	Oxygen Y-Fitting (x2)	M16-75		WESTERN MEDICA
	45	Drain Water Bottle (x2)	PX-1003		WESTERN MEDICA
	46	Swivel Connector (Xmas tree) (x6)	M24-45P		WESTERN MEDICA
	47	Manual (2) Laminate Cards (3)			
	119	Adaptors			
	206	Booster Bottle Wrench (4)			
	207	D/E Yoke Gaskets			
Apx. III. B		**Generator Interior**			
	48	Air Receiver (Blue)		6X47AT-AL	
	49	Sieve Bed - Left (Black)		6X47-AL	
	50	Sieve Bed - Right (Black)		6X47-AL	
	51	Oxygen Receiver (Green)		6X47OT-AL	
	52	Air Receiver Pressure Gauge]	102D-204F		P.I.C.
	53	Air Saver Valve - Top	VNB203A-15A		SMC
	54	Inline Filters (x2)	PIF-2M		U.I.C.
	55	Check Valves (1/4") (x2)	ICV250B-V-1		GENERANT
	56	Crossover Valve	MAC111B-111BA		MAC VALVES
	57	Standby Mode Pressure Switch	HC26A214		ASCO
	58	Backup Oxygen Check Valve	ICV250B-V-1		GENERANT
	59	Oxygen Receiver Pressure Gauge	ONS 200-1		P.I.C.
	60	Purity Flow Valve	MAC111B-111BA		MAC VALVES
	61	Oxygen Sample Flow Valve	3121BBN1NV00N0M		PARKER
	62	Oxygen Sample Needle Valve	N10		DELTROL
	63	Oxygen Sensor Block	C2-02-4100-00-0		NEUTRONICS
	64	Oxygen Sensor Boot			NEUTRONICS
	65	Oxygen Sensor	C1-16-1000-01-0		NEUTRONICS
	66	Sensor Lead	C6-02-1000-442		NEUTRONICS

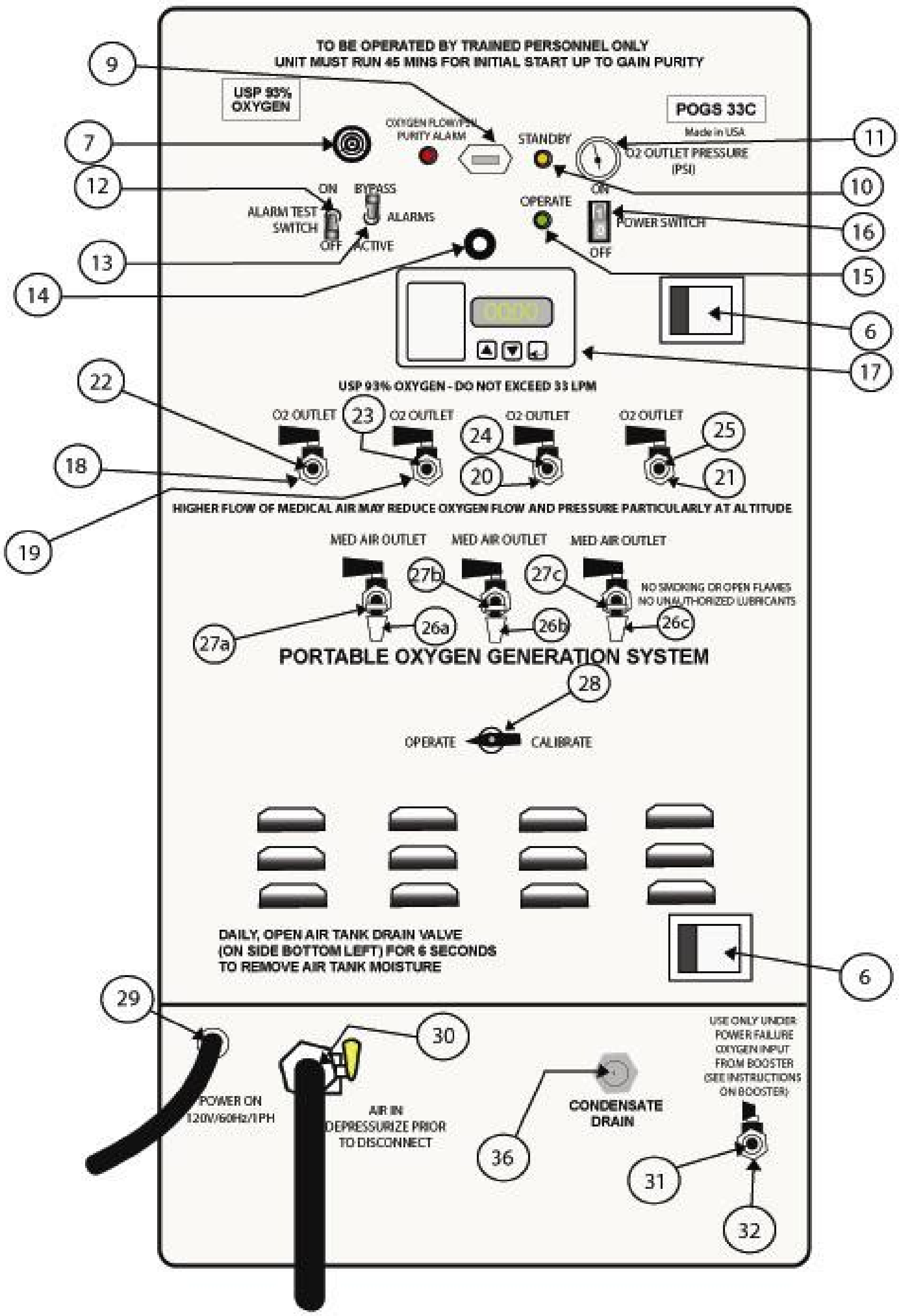
	67	Carbon Monoxide and Dew Point Monitor	MEDAIR-2200		ENMET
	68	Main Valve Assembly Pilot Valve/ Manifold	NVZ1120-3G M5 & NVV4Z1-20-03IT		SMC
	69	Terminal Block	14008		
	70	Timer Assembly	TM3A BASIC		EAGLE
	71	Timer Motor	PMH-79		EAGLE/DANAHER
	72	Medical Air MAC Valve	111B-111B		FINITE
	73	Inline HEPA Filter Element (x2)	10H04-013		FINITE
	74	Medical Air Pressure Gauge	ONS200-2		P.I.C.
	75	Medical Air Needle Valve	N/A		
	76	Exhaust Mufflers	9992K14		MCMASTER
	77	Main Valve Assembly	VNB201A-15A		SMC
	78	Condensate Drain Bottle	PX-1003		WESTERN MEDICA
	79	Manual Condensate Drain Valve	NB2		
	80	Velcro Strap	N/A		
	81	Oxygen Outlet Pressure Regulator	R374-02P/N		WATTS
	82	Alarm Pressure Switch	HB16A214		ASCO
	83	Inline HEPA Filter (Oxygen)	10H04-013		FINITE
	84	Air Saver Valve - Bottom (part of Main Valve Ass'y)	VNB203A-15A		SMC
	85	Air Receiver Relief Valve	KSV10-1/4-150		FC KINGSTON
	86	Oxygen Receiver Relief Valve	KSV10-1/4-100		FC KINGSTON
	87	Membrane Dryer	DM08N23RA		BEKO
	88	Medical Air Outlet Pressure Regulator	R374-02P/N		WATTS
Apx. III. C		**Compressor Interior Cover**			
	99	Feed Air Outlet Port		P33016S	
	100	Cover Hinge		N/A	
	101	Rain Guard		P33006-01	
	102	Supply Inlet Port		N/A	
	103	Serial Number Label		N/A	
	104	Compressor Power Cord - S012/ABR	AMC90556C32413P		AMERICAN CONNECTOR
	105	Securing Knobs (x4)	91185A811		MCMASTER
	106	Compressor Power Switch (ON/OFF)	683-0049		C&K
	107	Exterior Lid Support Base	321296-1		SEA DOG
	108	Tethered Retaining Clip	90995A130		MCMASTER
	109	Bolt Locks (x4)	4JG72		GRAINGER
	110	Hour Meter	020037N17		
Apx. III C		**Compressor Interior Cover**			
	113	Supply Air Filter Assembly	FS06038		SOLBERG
	114	Cooling Air Filter Element	5W967		GRAINGER
	115	Supply Air Filter Elements (x2)	O6		SOLBERG
	116	Feed Air Hose (Black)		FAH 015	
	117	Remote Supply Air Hose (Black) (may be used as Feed Air Extension Hose)		RAH 015	
	118	Air Hose Wrench		P33015A	ACE METAL

Apx. III. C		**Compressor Interior**			
	121	N/A			
	122	Power On Indicator Light			
	123	Check Valve (1/2")	CV500BV1		GENERANT
	124	Bracket			
	125	Pressure Switch	96211-BB5		BARKSDALE
	126	Auto Drain Valve	04F2001106ACF4C		PARKER
	127	Auto Drain Regulator	NAP 100-N02		SMC
	128	Side Cooling Filter	N/A		
	129	Surge Suppressor		N/A REV C	
	130	Starter Box	ECN 0511 EAA		CUTLER-HAMMER
	131	Starter Box Locking Screw		N/A	
	132	Circuit Breaker Reset Button		N/A	
	133	Interior Cooling Fan	3VU63		DAYTON
	134	Heat Exchanger	M10-080-SB1		LYTRON
	135	Heat Exchanger Cooling Fan	3VU63		DAYTON
	136	Cooling Air Exhaust	N/A		
	137	Compressor Motor	M3212T,		BALDOR
	138	Scroll Compressor	SLA 05		POWEREX
	139	Compressor Motor Pulley	2-3V4.50/SN#3650 & higher use 2-3V5.0		MASKA
	140	Compressor Drive Belts (x2)	3V375		DAYCO
	141	Scroll Compressor Pulley			N/A
	142				
	143				
	144	Heat Exchanger Brackets (x2)		P33012	
Apx. III. C		**Compressor Exterior (Supply Air Inlet Side)**			
	159	Side Cooling Air Inlet Louver		P33009	
	160	Rivets (x8)	N/A		
Apx. III. C		**Compressor Exterior (Air Outlet Side)**			
	162	Exterior Lid Support	321296-1		SEA DOG
	163	Lid Support Adjustment Knob	SEE ABOVE		SEA DOG
	164	Cooling Air Exhaust Louver		P33010	
	165	Rivets (x8)	N/A		
	166	Exterior Lid	N/A		
		Microbooster - Rear			
	167	Oxygen Inlet Port	M24-5		WESTERN MEDICA
	168	Oxygen Inlet Pressure Gauge	ONS200-2		P.I.C.
	169	Oxygen Inlet Pressure Regulator	R374-02P/N		WATTS
	170	Lid Stop	3043T53		
		Microbooster - Front			
	174	D/E Oxygen Cylinder Support Assembly		RB-002	

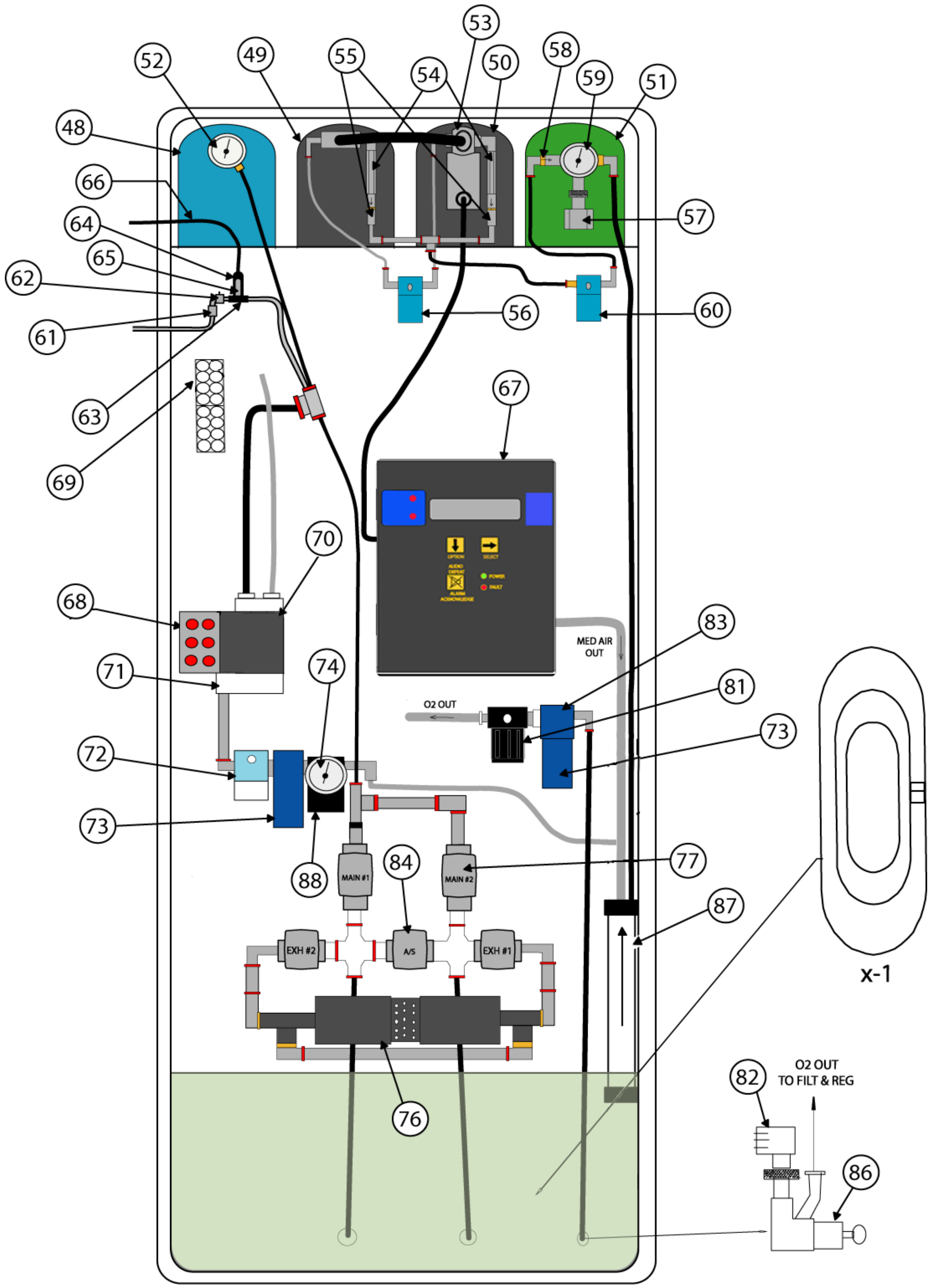
	175	Bolt Lock	3043T53		
		Microbooster - Right			
	179	Start Button	76-5657		RIX
	180	Power Switch	76-5470		RIX
		Microbooster - Left			
	184	Power Cord	809-543		RIX
	185	Circuit Breaker Reset [Button]	163-7586		RIX
Apx. III. E		**Microbooster - Top**			
	189	Backup Oxygen Outlet Port	M24-5		WESTERN MEDICA
	190	Backup Oxygen Outlet Valve	NB2		U.C.I.
	191	Backup Oxygen Outlet Pressure Gauge	M1-870-PG		WESTERN MEDICA
	192	Backup Oxygen Outlet Pressure Regulator	M1-870-PG		WESTERN MEDICA
	193	High Pressure Manifold Pressure Gauge	M1-870-PG		WESTERN MEDICA
	194	High Pressure Pigtails for D/E Cylinders	S204-18		
	195	High Pressure Pigtails for D/E Cylinders	S204-18		
	196	High Pressure Pigtails for D/E Cylinders	S204-18		
	197	High Pressure Pigtails for D/E Cylinders	S204-18		
	198	High Pressure Pigtails for D/E Cylinders	S204-18		
	199	Accessory High Pressure Pigtail for H/K Cylinders			
	200	Needle Valve	SS-110K		WESTERN MEDICA
	201	Needle Valve	SS-110K		WESTERN MEDICA
	202	Needle Valve	SS-110K		WESTERN MEDICA
	203	High Pressure Manifold		MANIFOLD-MB	
	204	Microbooster Lid	N/A		
	205	Lid Latch	64-21-10		SOUTHCO
Apx. III. F		**HV Booster Interior - Manifold Side**			
	209	High Pressure Manifold	VARIOUS PARTS	MANIFOLD-HV	
	210	Needle Valve	SS-110K		WESTERN MEDICA
	211	Needle Valve	SS-110K		WESTERN MEDICA
	212	Needle Valve	SS-110K		WESTERN MEDICA
	213	High Pressure Manifold Pressure Gauge	M1-870-PG		WESTERN MEDICA
	214	Backup Oxygen Outlet Pressure Regulator	M1-870-PG		WESTERN MEDICA
	215	Backup Oxygen Outlet Pressure Gauge	M1-870-PG		WESTERN MEDICA
	216	Backup Oxygen Outlet Valve	M1-870-PG		WESTERN MEDICA
	217	Backup Oxygen Outlet Port	M1-870-PG		WESTERN MEDICA
	218	High Pressure Pigtails for H/K Cylinders	S204-18		
	219	High Pressure Pigtails for H/K Cylinders	S204-42		
	220	High Pressure Pigtails for H/K Cylinders	S204-42		
	221	High Pressure Pigtails for H/K Cylinders	S204-42		
	222	High Pressure Pigtails for H/K Cylinders	S204-42		
	223	Accessory Storage Tray			
	224	Accessory High Pressure Pigtail for D/E Cylinders			

	225	Dual Oxygen Inlet Ports (x2)	M24-5		WESTERN MEDICA
	226	Dual Oxygen Inlet Pressure Regulator	R16-03-000		WILKERSON
	227	Dual Oxygen Inlet Pressure Gauge	ONS200-2		P.I.C.
	228	Dual/Single Oxygen Inlet (Valve Handle)	UCI B3-F2		U.C.I.
	229	Single Oxygen Inlet Pressure Regualtor	R374-02-P/N		WATTS
	230	Single Oxygen Inlet Pressure Gauge	ONS200-2		P.I.C.
	231	Single Oxygen Inlet Port	M24-5		WESTERN MEDICA
	232	Quick Reference Card (Specifications, Backup Oxygen, Cylinder Connectors)			
	233	High Pressure Cylinder Yoke			
Apx. III. F		**HV Booster Interior - Control Panel Side**			
	237	1st Stage Pressure Gauge	X60-824		RIX
	238	2nd Stage Pressure Gauge	X60-826		RIX
	239	3rd Stage Pressure Gauge	X60-828		RIX
	240	Control Panel	N/A		RIX
	241	Power Cord	N/A		RIX
	242	Power Switch	476-46		RIX
	243	Manual/Automatic Switch	476-47		RIX
	244	Circuit Breaker Reset [Button]	138-512		RIX
	245	Indicator Lamp	A160-321		RIX
	246	Hour Meter	61-1023		RIX

A. POGS 33C Control Panel

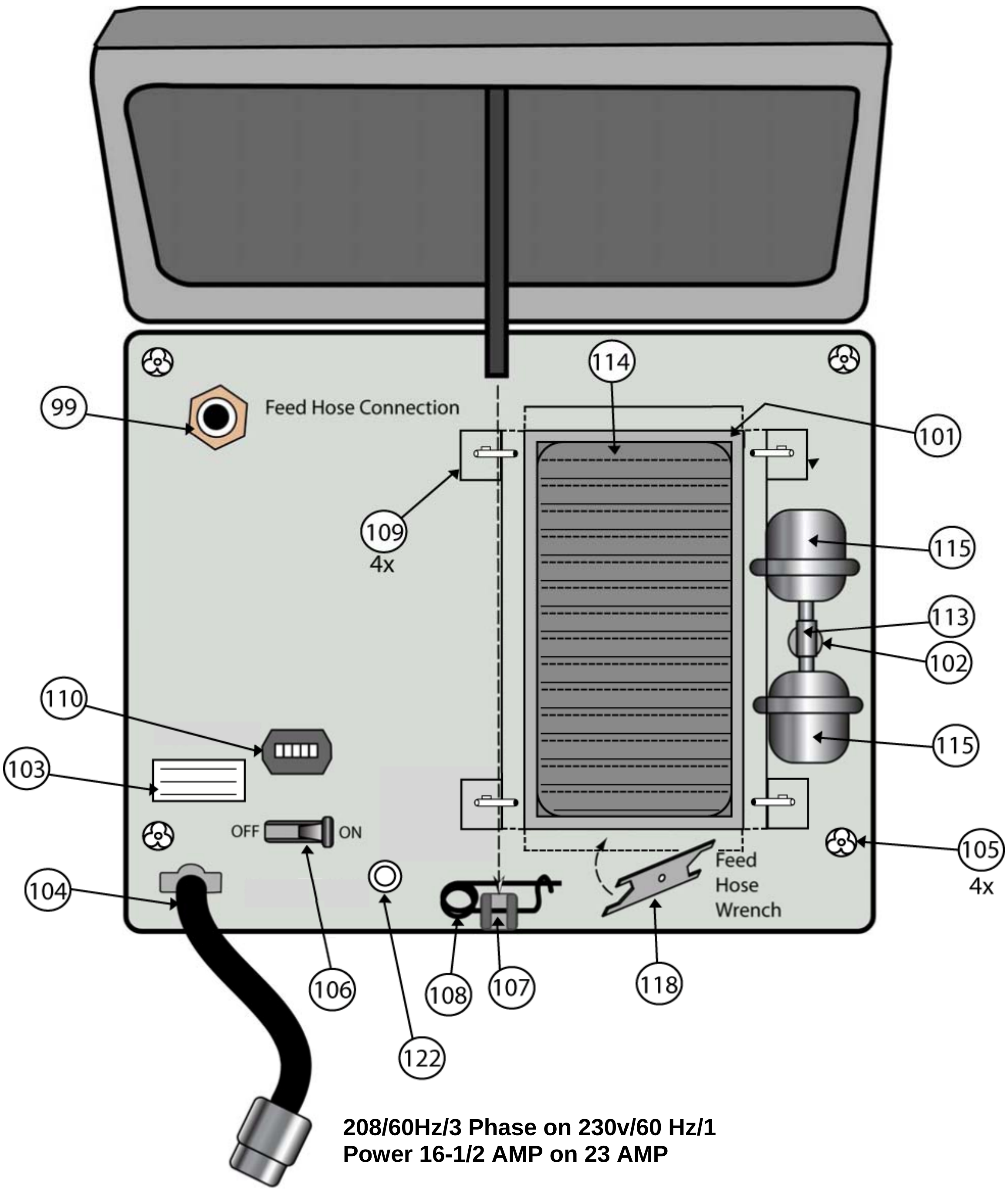


B. POGS 33C Generator Interior Diagram



C. Compressor Diagram

Compressor Top View

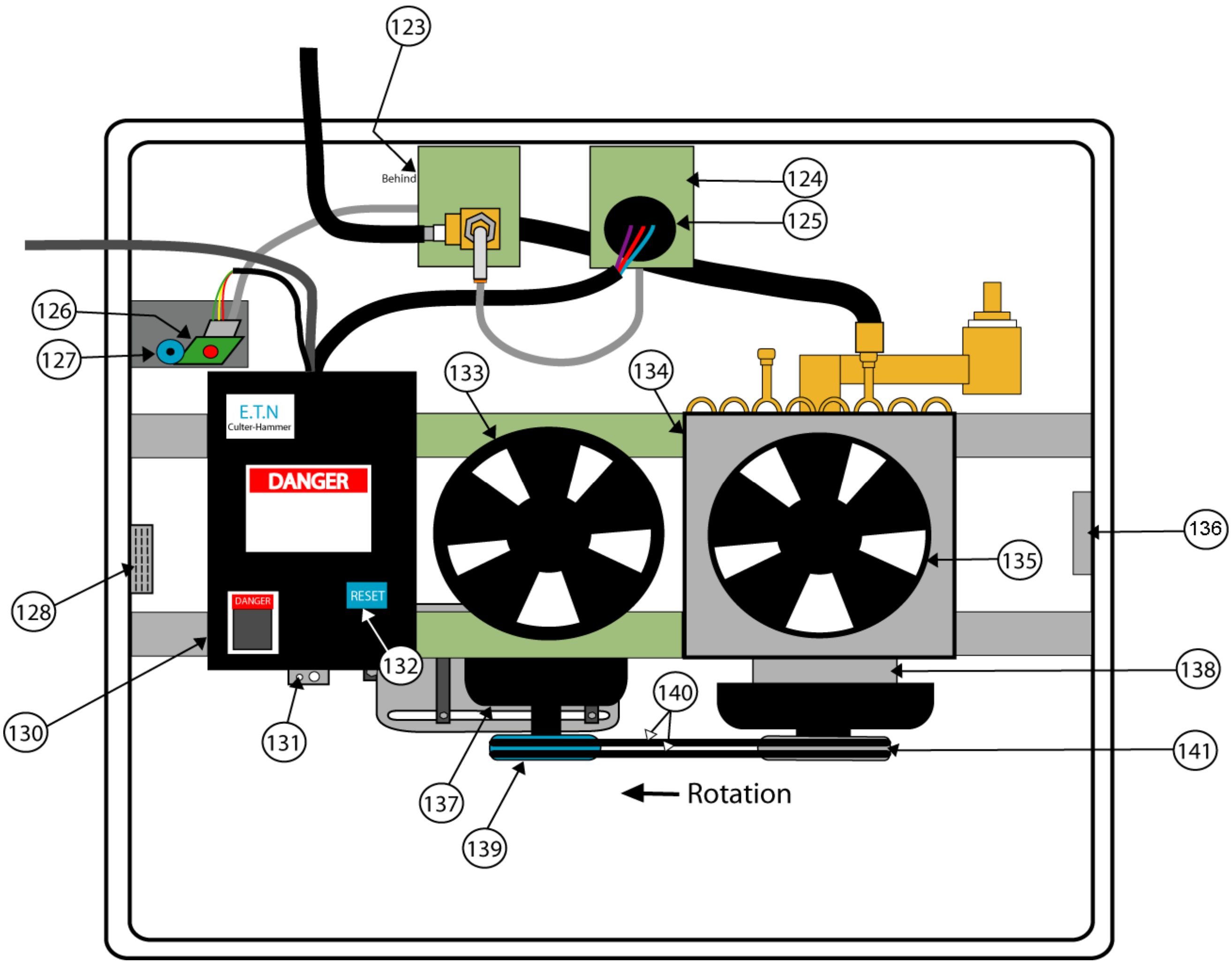


208/60Hz/3 Phase on 230v/60 Hz/1
Power 16-1/2 AMP on 23 AMP

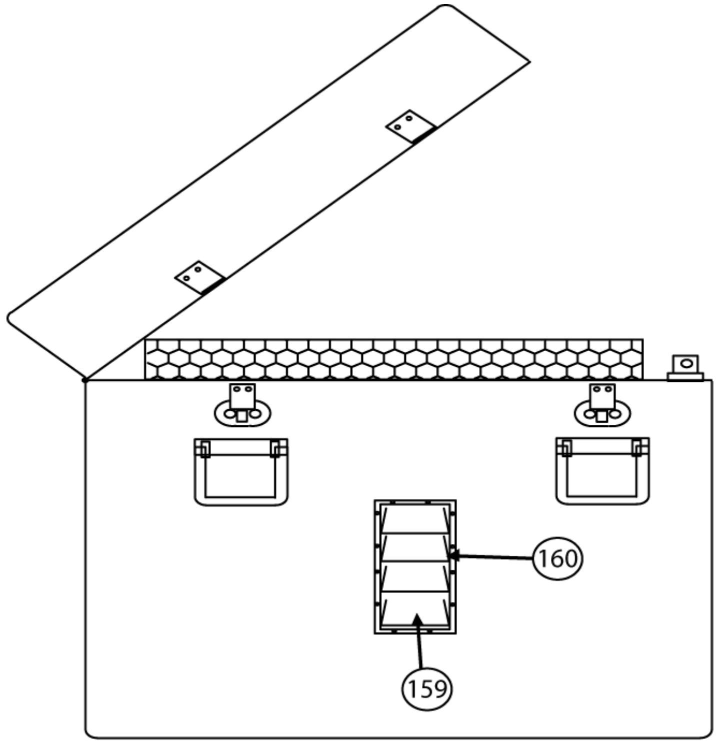
MS90556C32413P Connector

FEED AIR COMPRESSOR

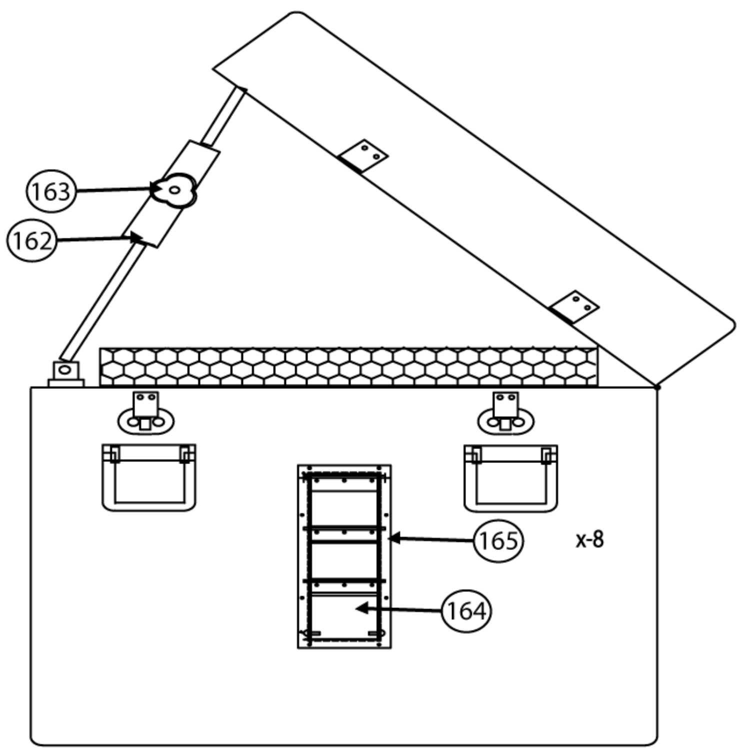
Compressor Inside View



Compressor Exterior View

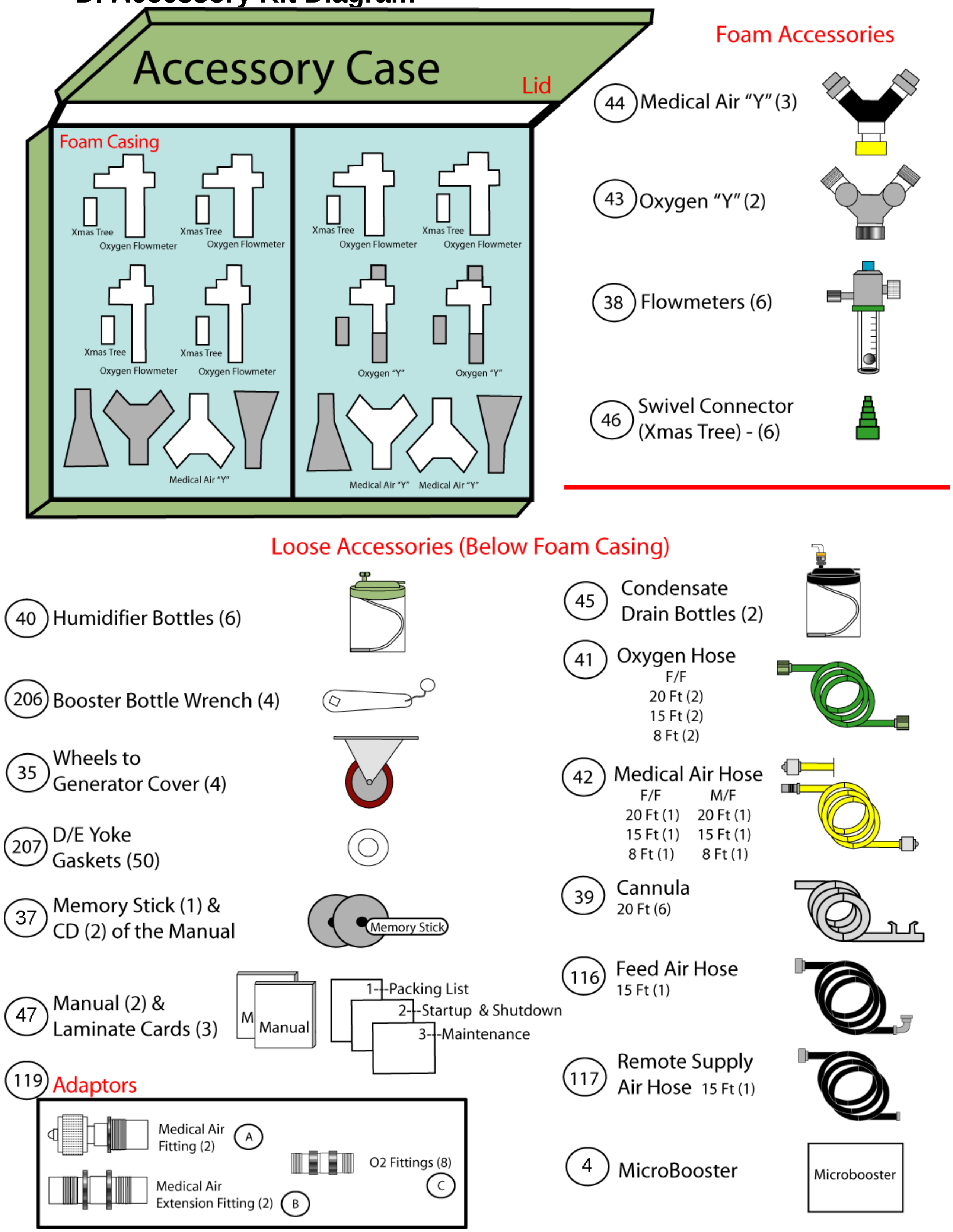


Air Inlet Side

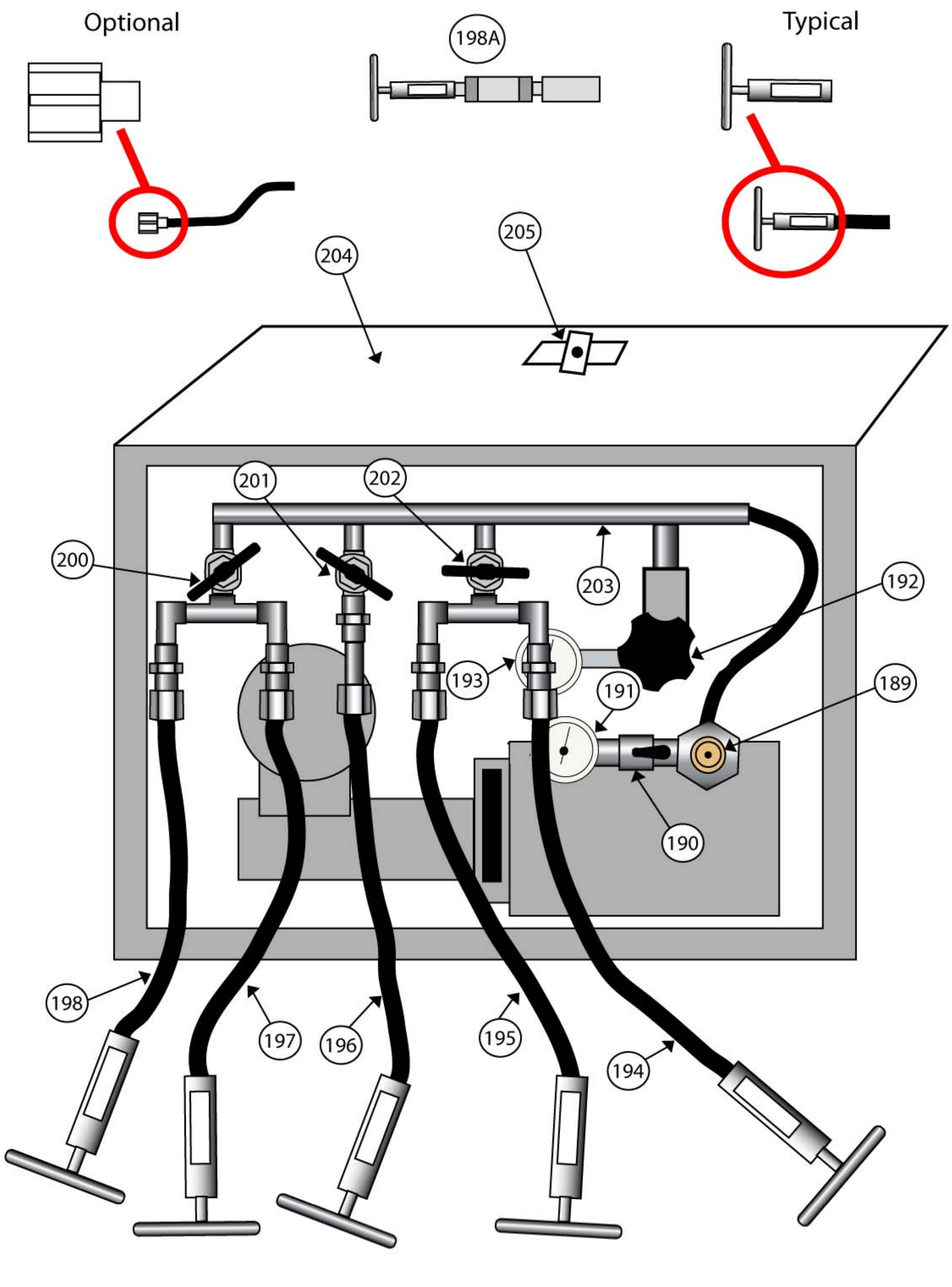


Air Outlet Side

D. Accessory Kit Diagram

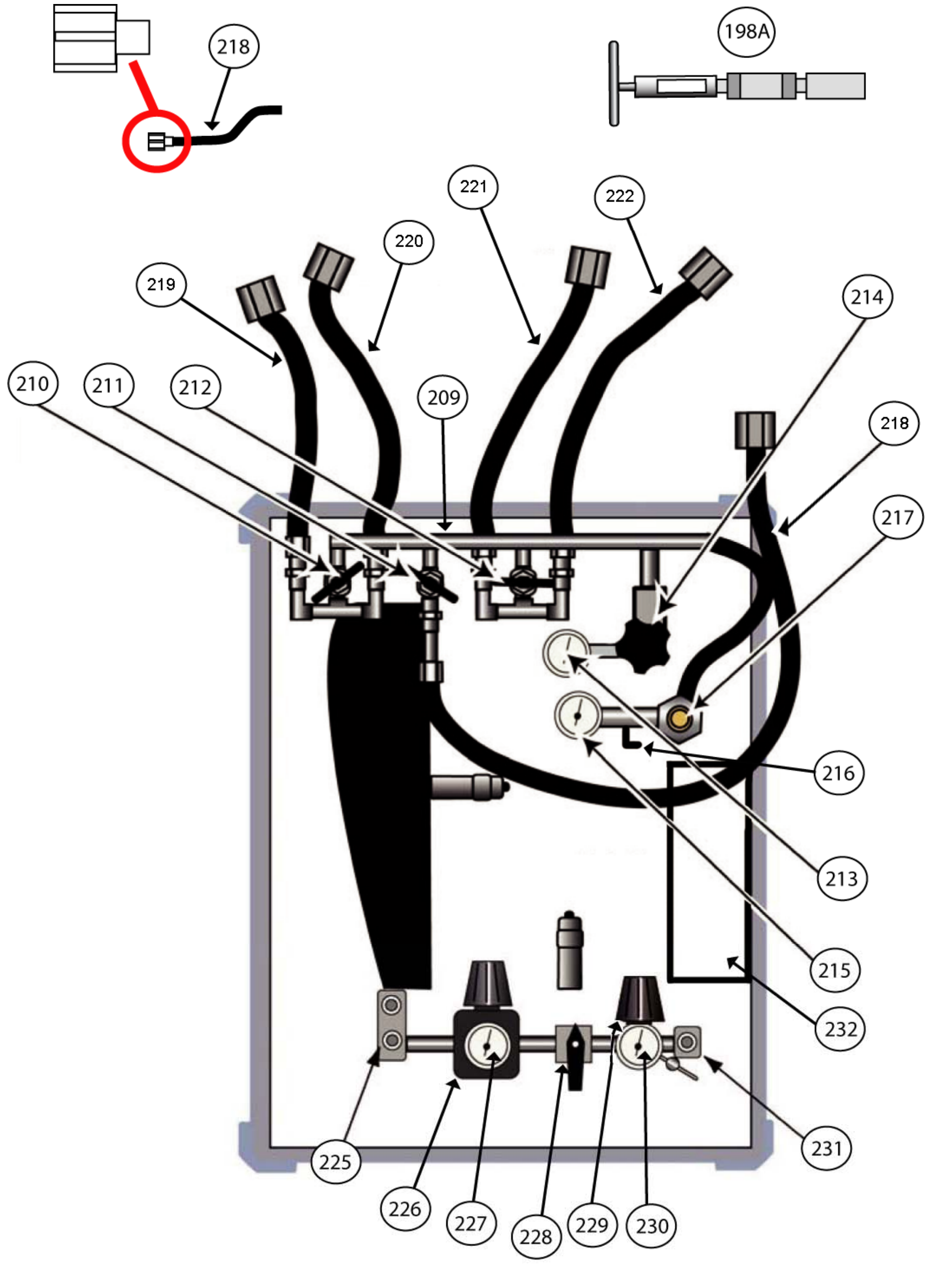


E. Microboost Diagram

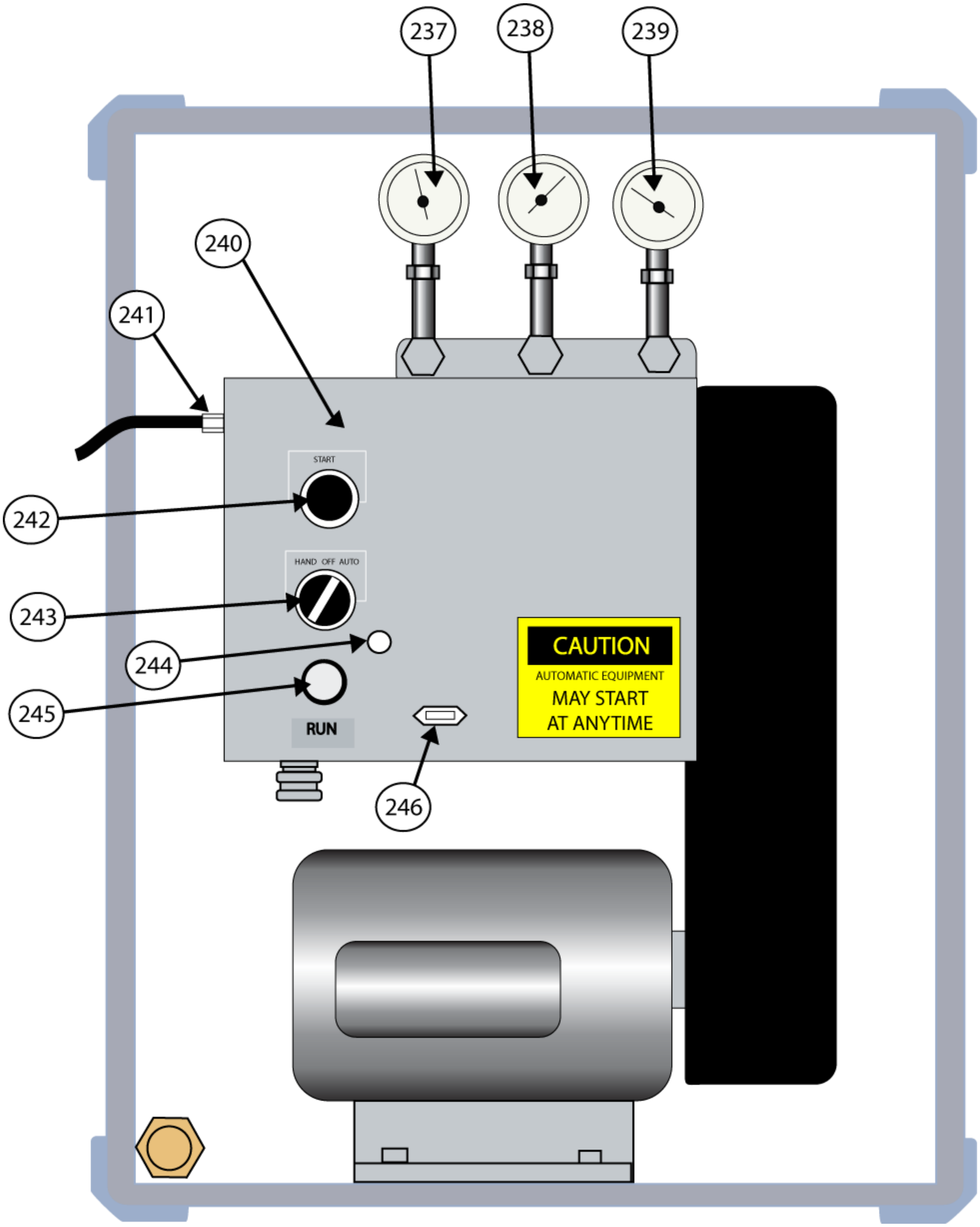


F. **HV Booster Diagram**

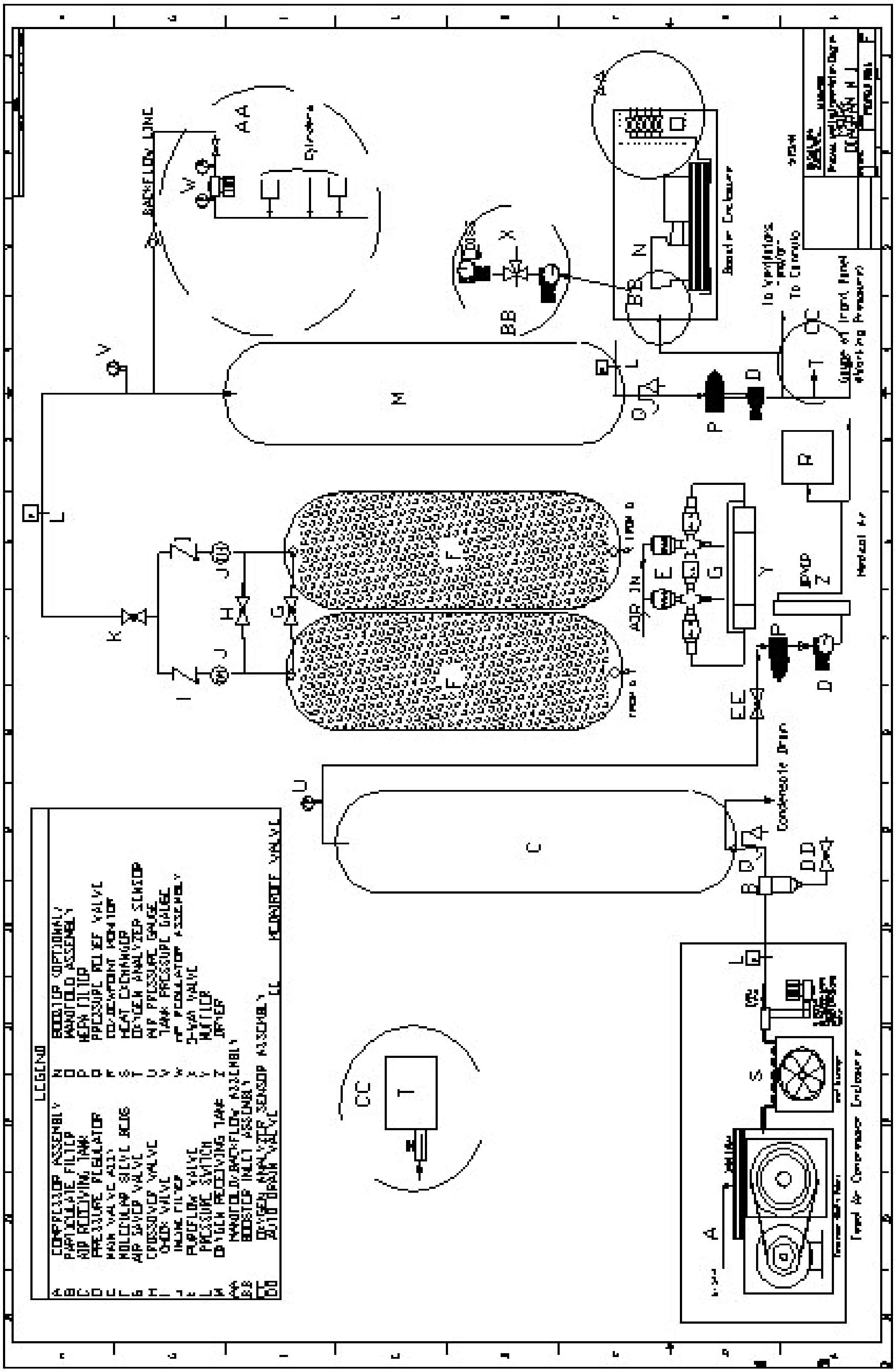
HV Booster Interior - Manifold Side



HV Booster Interior - Control Panel Side



G. Process and Instrumentation Diagram



IV. Wiring Diagrams

Diagram 2

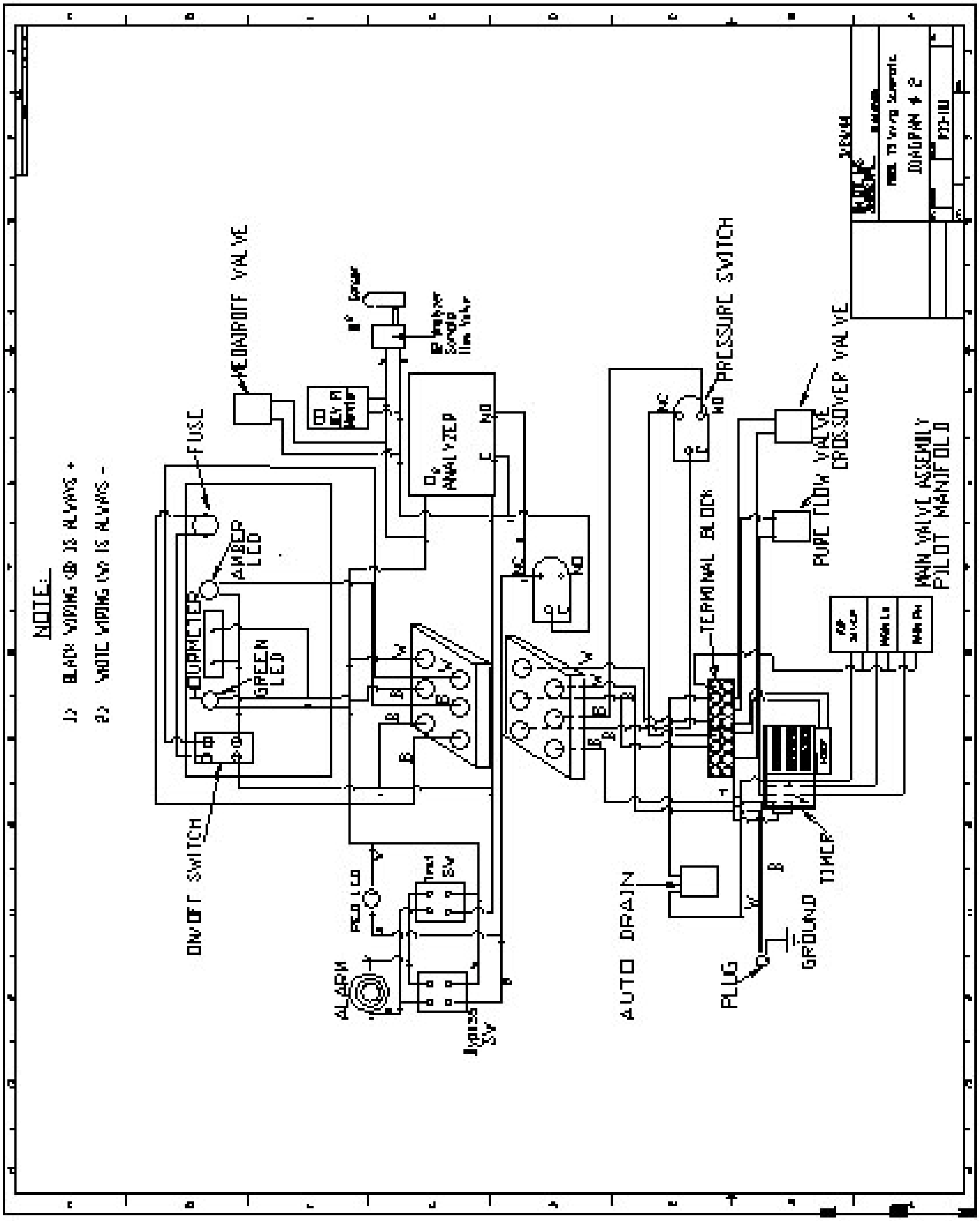


Diagram 2A

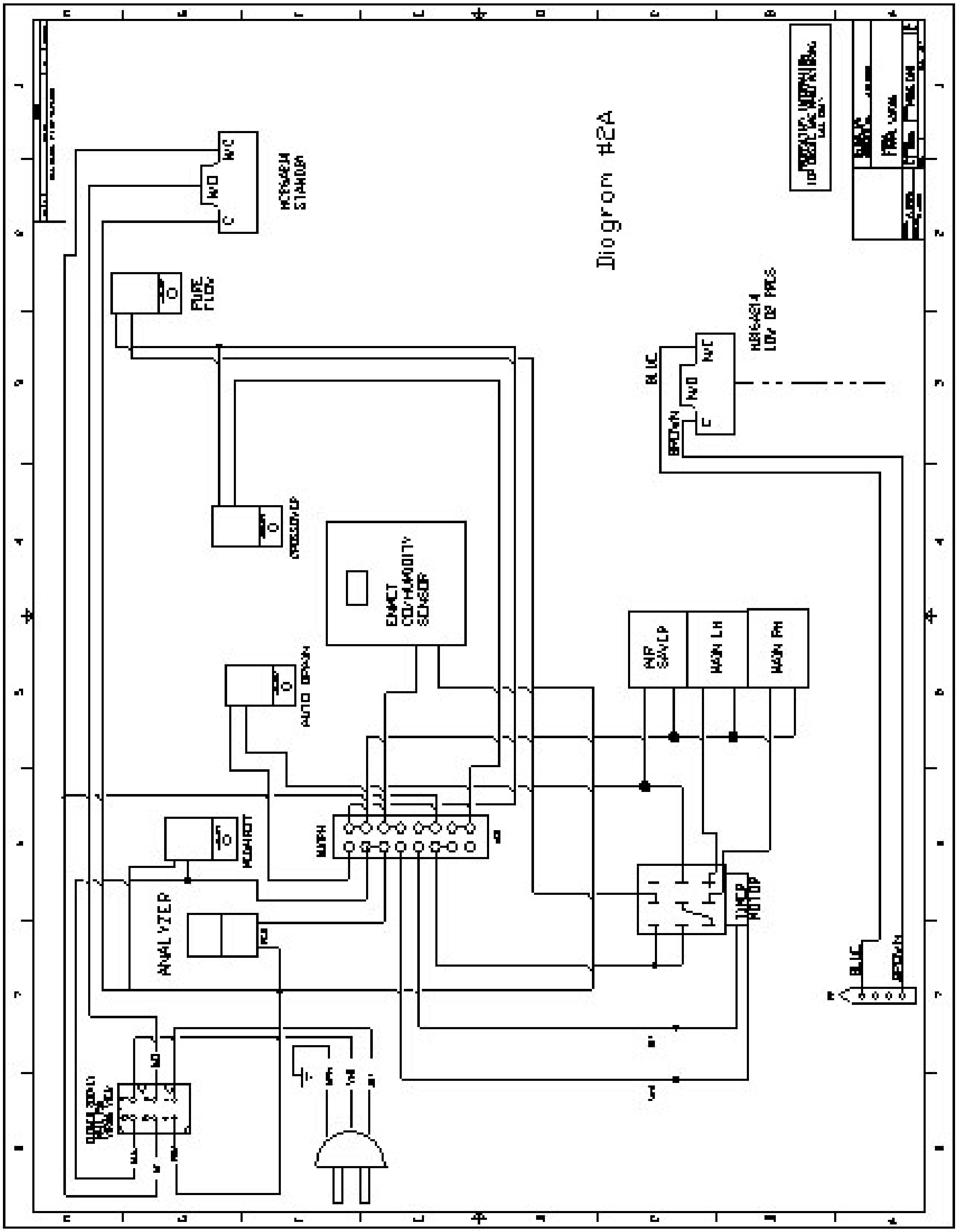


Diagram #2A
PURE FLOW
ANALYZER
AUTO DRAIN
MAIN LH
MAIN RH
BLUE
BROWN

Diagram 2B

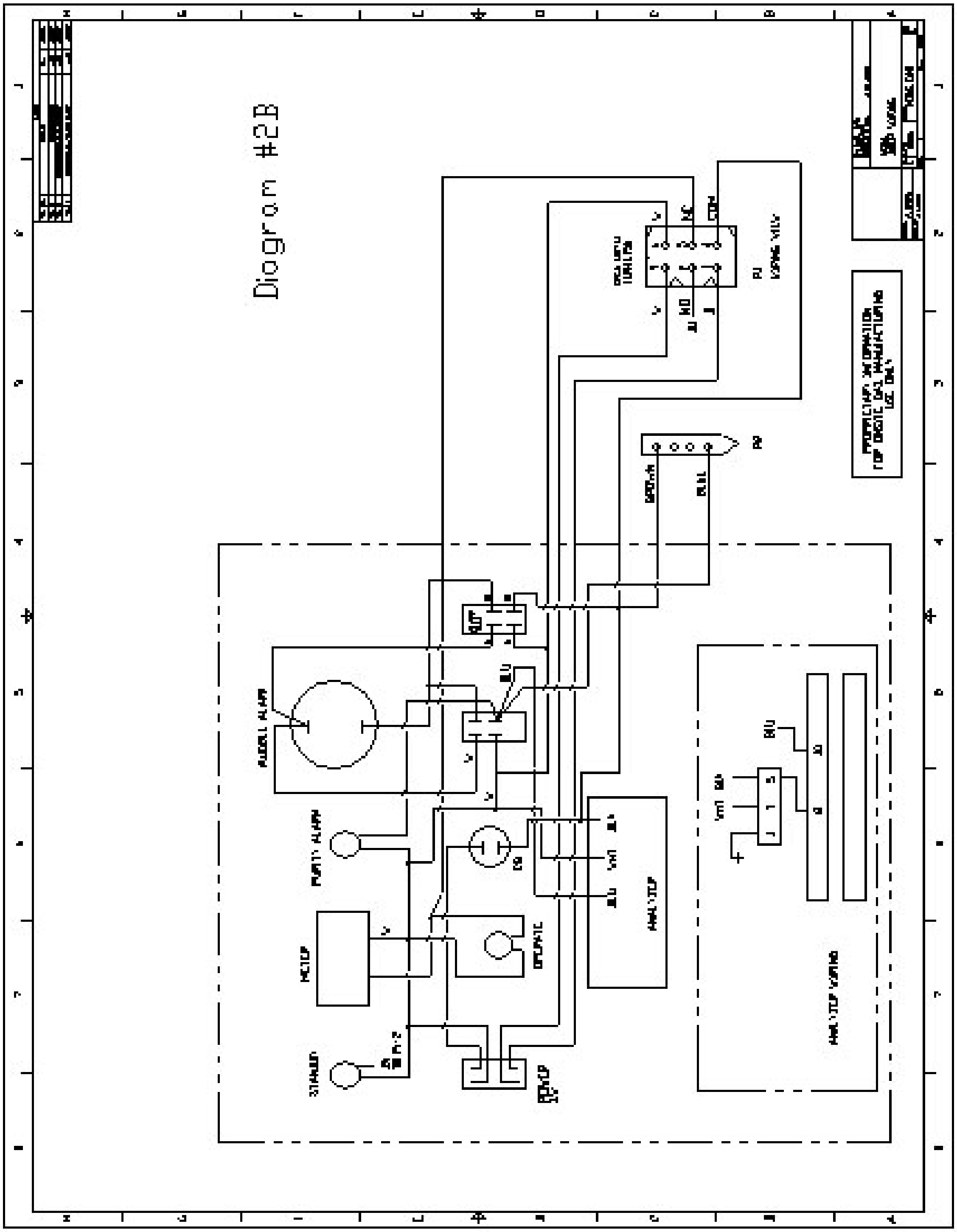


Diagram 3

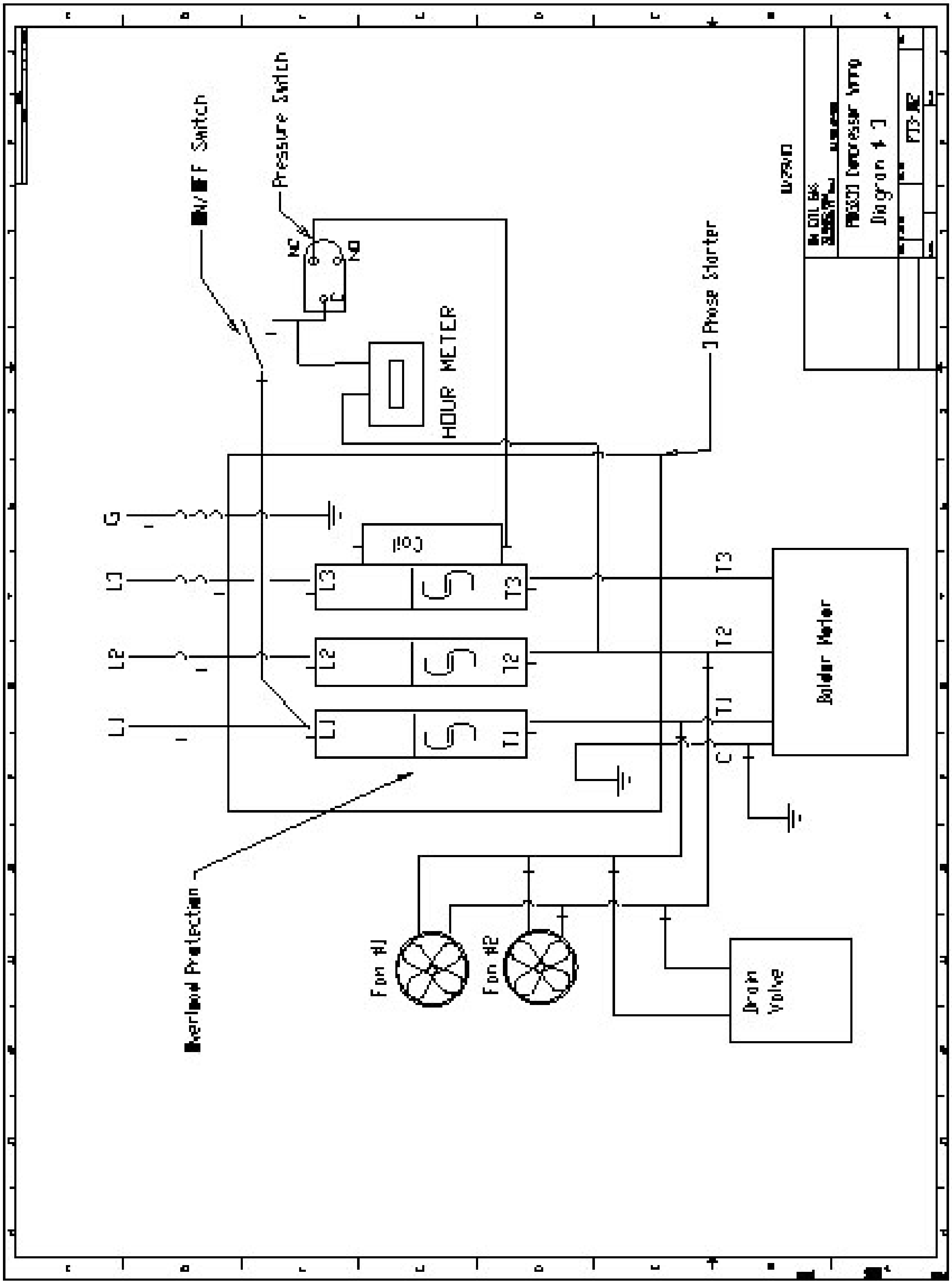
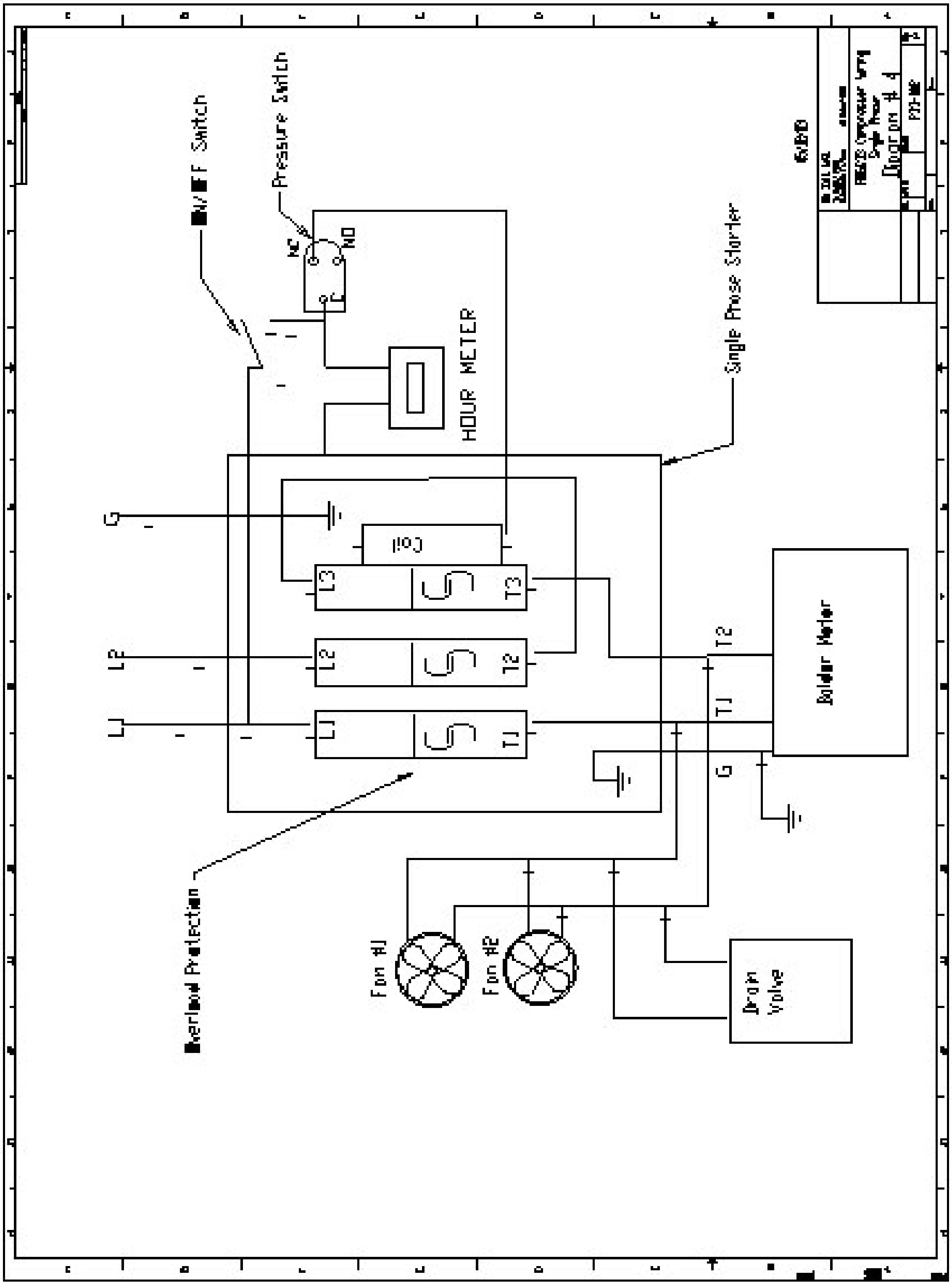

Pressure Switch
NC
NO
C
HOUR METER
Phase Starter
G
L3
L2
L1
Coil
T3
T2
T1
Overload Protection
Fan #1
Fan #2
Drain
Valve

Diagram 4


Pressure Switch
NC
NO
HOUR METER
Single Phase Starter
Coil
G
L1
L2
L3
T1
T2
T3
Fan #1
Fan #2
Drain
Valve
Diagram # 4

V. Quick Reference Card

A Quick Reference Card detailing connection and operating information for the POGS 33C is enclosed in the manual following this page.

POGS 33 STARTUP AND SHUTDOWN

WARNING: *When the Oxygen Generator is turned on for the first time after a prolonged shutdown period, the Oxygen receiver should be purged as described below.*

WARNING: *Feed Compressor may be in standby mode, not off. Make sure power is "off" before start-up.*

NORMAL ROUTINE START UP

Follow this procedure to start the Generator for normal operation. If this is the first time the unit has been started, has been moved to a new location, or has had a change to the power source, follow the Initial Start- Up Procedure (see below).

1) Connect compressed air line from the Compressor to the POGS 33 Generator
2) Turn the Compressor's power switch "ON".
3) Turn the POGS 33 Generator's Main Power switch "ON". Observe the oxygen purity. If the purity is below 90-96%, attach the oxygen flow meter(s) and set flow to 15-33 LPM until USP 93% oxygen content or higher is obtained. The POGS 33 is now ready for use: turn alarm switch to "Active".

INITIAL START-UP

1) Plug in power to the POGS Generator 110v/60Hz/1 ph and plug in power to POGS compressor 208/60/3ph. Then verify proper compressor rotation:
2) Connect compressed air line from the compressor to the POGS 33 Generator.
3) Turn on the Compressor
4) Turn POGS 33 Generator Main Power Switch "ON".
5) When Oxygen Tank Pressure reaches approximately 70 PSIG, the amber LED marked "Standby" should light up and oxygen production will cease. When oxygen is used the oxygen pressure falls to 55 PSIG, the amber light will go off and oxygen production will resume. This gauge is located at the upper right hand corner inside the Generator.
6) UPS 93% oxygen content will be obtained within 45 minutes. After the POGS 33 has gone into "Standby", connect one of the patient oxygen flow meters and set flow to 15-33 LPM to purge lower purity oxygen from the tank. Continue to flow until 90-96% oxygen content is obtained. The alarm switch should be in the "Bypass" position until the 90-96% oxygen level has been achieved.
7) As oxygen from the oxygen tank gets used, the oxygen purity continues to increase to the specified level. Accelerate the oxygen purity level by letting the generator go in and out of standby mode approximately six times with out going below 50 PSIG:

Purging Procedure:

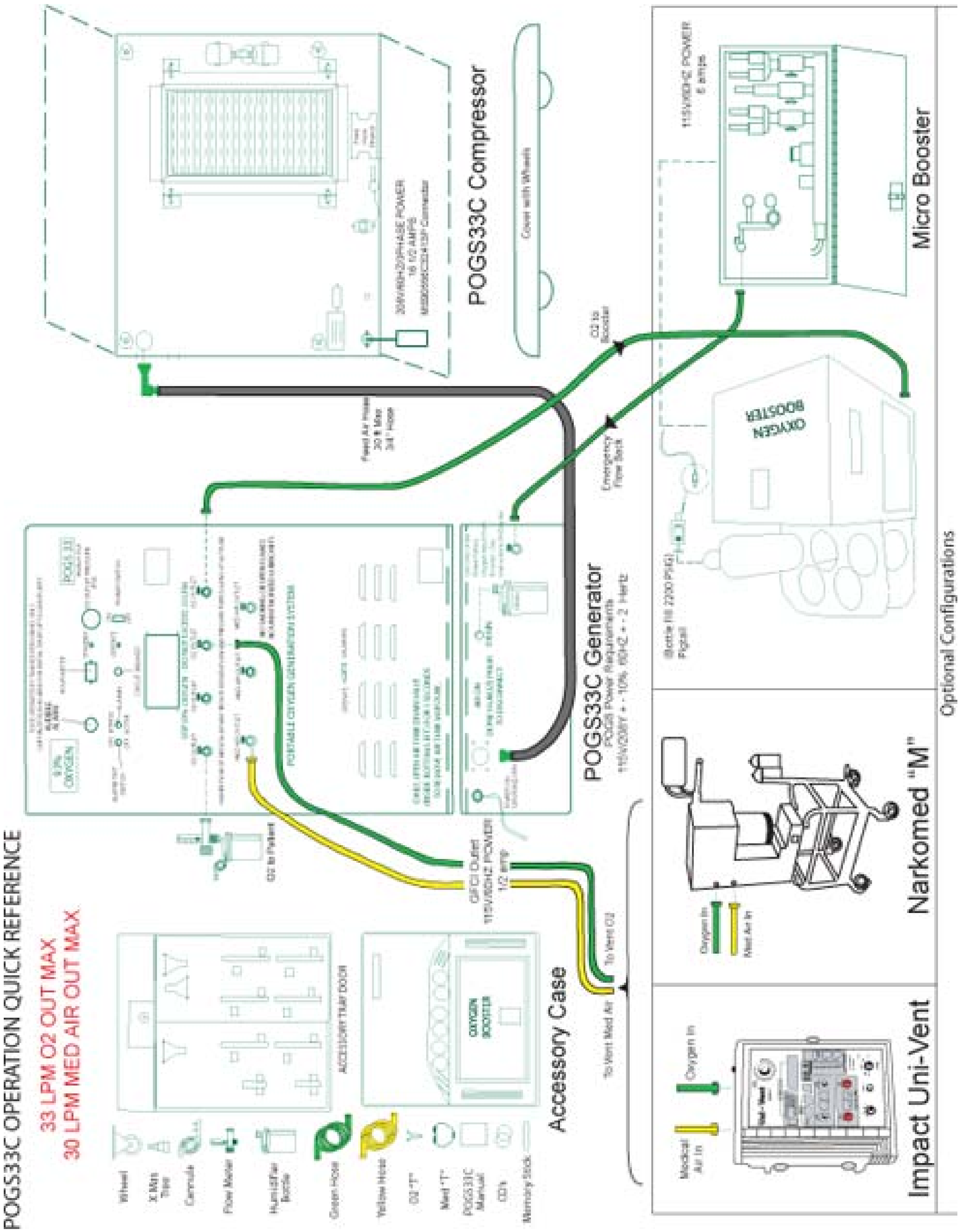
- Step 1-Let generator go into standby (amber LED on)
- Step 2-Bleed the oxygen out by allowing oxygen flow from flow meter until generator begins to run
- Step 3-Stop flowing the oxygen so it can go to "Standby" (amber LED on) again
- Step 4-Repeat six (6) times, or until purity is reached

WARNING: *If the generator or any part of the systems had been opened to the atmosphere, the system must be purged of any residual air to bring the product purity back to specifications. Do this by using the purging procedure (above).*

SHUTDOWN

1. Shut off all valve knobs for O2 (4) and Medical Air (3). Turn POGS 33 Generator Main Power switch "OFF"
2. Turn Generator Alarm Switch to "Bypass"
3. Turn Feed Compressor power switch "OFF"
4. Inside POGS generator cabinet at bottom left is a black valve knob. Use this to bleed any water out of air tank: with power off, open slowly and bleed-out water until only air bleeds out.
5. Near this same valve knob is the air tank water bottle. Empty the bottle and replace.

WARNING: *The generator will remain pressurized after shutdown. Before performing any maintenance or opening any piping systems, always depressurize the system; open the oxygen and air outlets to depressurize. Failure to do so may result in injuries.*


POGS33C OPERATION QUICK REFERENCE
33 LPM O2 OUT MAX
30 LPM MED AIR OUT MAX
Wheel
X Mas Tree
Cannula
Flow Meter
Humidifier Bottle
Green Hose
Yellow Hose
O2 "T"
Med "T"
POGS33C Manual
CDs
Memory Stick
ACCESSORY TRAY DOOR
OXYGEN BOOSTER
Accessory Case
To Vent Med Air
To Vent O2
GFCI Outlet
115V/60HZ POWER
1/2 amp
O2 to Patient
POGS33C Generator
Feed Air Hose
30 # Max
3/4" Hose
POGS33C Compressor
Cover with Wheels
O2 to Booster
Emergency Flow Back
Bottle fill 2200 PSIG
Pigtail
OXYGEN BOOSTER
115V/60HZ POWER
6 amps
Micro Booster
Oxygen In
Med Air In
Narkomed "M"
Medical Air In
Oxygen In
Impact Uni-Vent
Optional Configurations

POGS 33 C
Portable Oxygen Generation System
33 LPM

INSTALLATION MANUAL

PSA Oxygen Generator
On Site Gas Systems, Inc.

Manufactured by:

On Site Gas Systems, Inc.

35 Budney Road, Budney Industrial Park, Newington, CT 06111, USA

Telephone: +1-860-667-8888   Fax: +1-860-667-2222

E-mail: pogs@onsitegas.com - Web site: www.onsitegas.com

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Table of Contents

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1 INSTALLATION

Unpacking Instructions

A. The contents of each container should be inspected to assure that no damage has occurred during transit. If any components appear damaged, contact the manufacturer and the carrier immediately. Save the carton and packing materials to return a component in the event of shipping damage. The individual pieces should be checked against the packing list. If any discrepancy is found, contact your local distributor, or On Site Gas Systems, Inc. Please provide the model number and the serial number with all communications.

B. After any subsequent transit, each container should be inspected for damage. If any discrepancy is found, contact your local distributor, or On Site Gas Systems, Inc. Please provide the model number and serial number with all communications.

Items Supplied

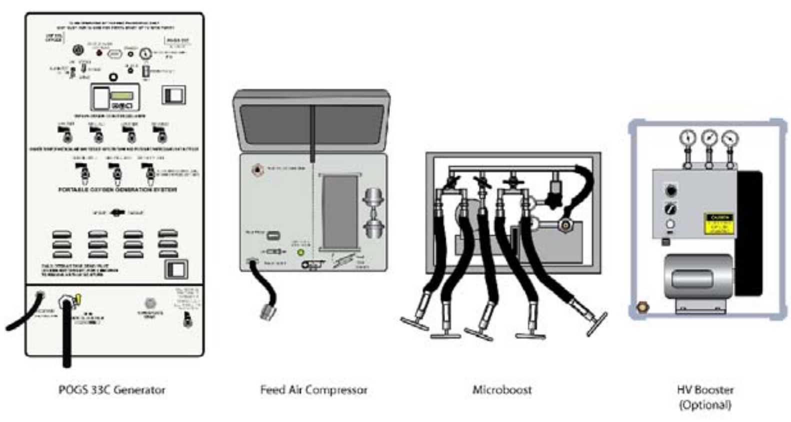


Figure 1-1: POGS 33C System Components

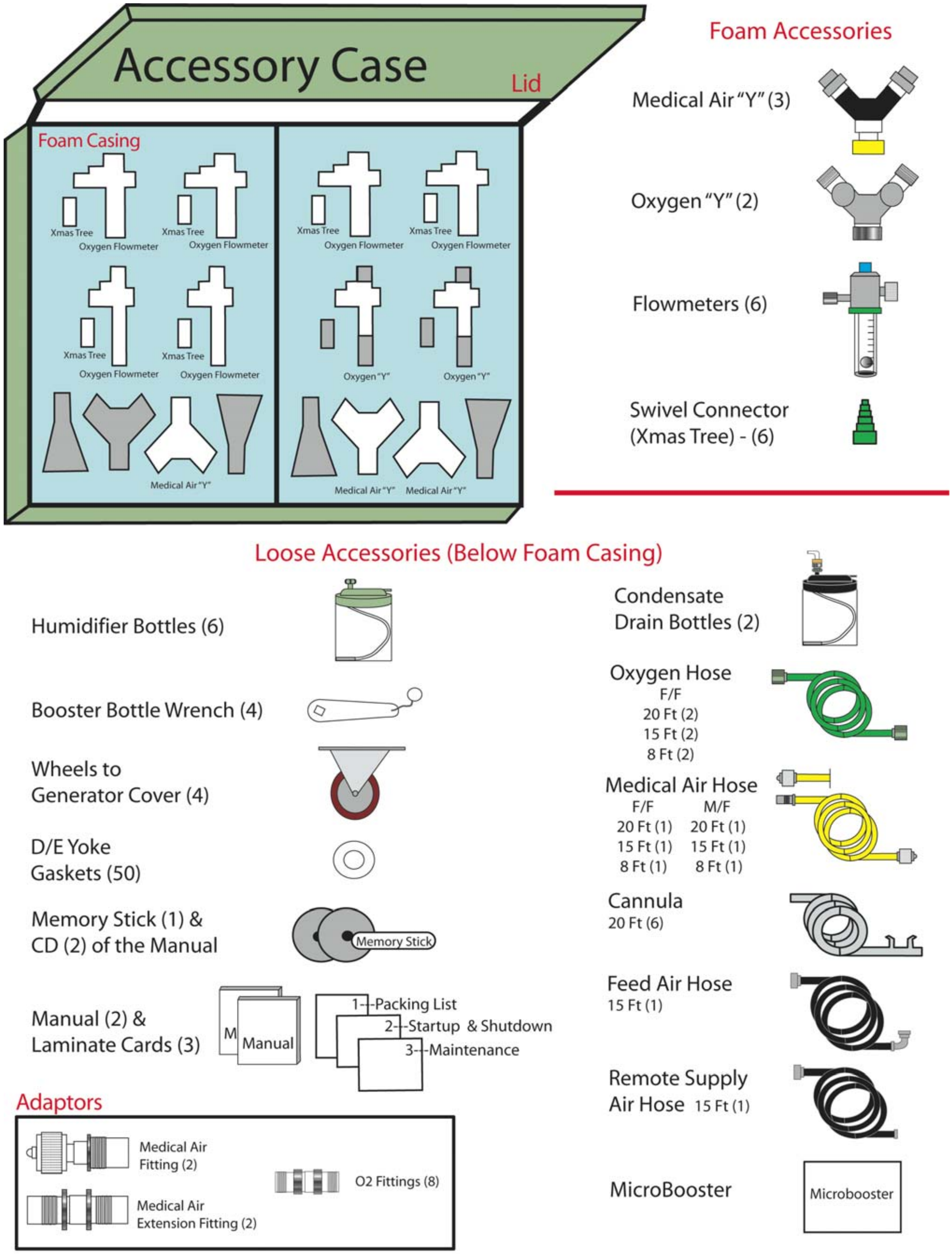


Figure 1-2: Accessories

System Power and Physical Specifications

	Generator	Feed Air Compressor	Accessory Case with Microboost	Microboost	High Volume Booster
Input Voltage	115 VAC	208-240 VAC	na	115 VAC	115 VAC
Input Frequency	60Hz	60Hz	na	60Hz	60Hz
Phase	1	3	na	1	1
Dimensions	52"L x 28"W x 24"H	29"L x 27"W x 27"H	29" L x 27."W x 27"H	18"L x 12"W x 24"H	34"L x 27"W x 23"H
Weight	265 lb	215 lb	220 lb	115 lb	275 lb

Equipment Location Guidelines

Generator Location Guidelines

The Generator is designed for inside installation on level ground. The generator is shipped in a horizontal position and must be placed upright prior to operation.

Feed Air Compressor Location Guidelines

When possible, locate the Feed Air Compressor in a protected area. Protection from direct sunlight must be provided to maintain ambient temperature under 120ºF/48ºC. The Feed Air Compressor Supply Air Inlet Assembly must be located at least 50 feet from any sources of Carbon Monoxide. Sources of Carbon Monoxide include any equipment containing an internal combustion engine or using fuel (vehicles, power generators, heaters, stoves). If the Feed Air Compressor is located in an area that may be exposed to Carbon Monoxide, use the Remote Supply Air Hose to position the Supply Air Filter Assembly in a clean air environment.

Microboost or HV Booster Location Guidelines

a.) The Microboost and/or HV Booster should be operated indoors.

Verification of Accessories

A. Locate and open the Accessory Case (Figure 1-2).

B. Check contents against the laminated packing list included in the Accessory Case.

Generator Installation

A. Unlock the fourteen (14) latches on the Generator Exterior Cover.

B. Lift the cover up and off the generator.

C. Stand the Generator upright (minimum of 4 people required) orienting it so the Feed Air Inlet Port and Backup Oxygen Inlet Port are at the bottom, as shown in Figure 1-1.

D. Pull open the two latches near the right edge of the front control panel.

E. Check for any foreign object or debris and inspect wiring to verify that no wires or connections have come loose and/or become damaged.

F. Close the Generator Control Panel, ensuring that the two latches engage.

Condensate Drain Bottle Attachment

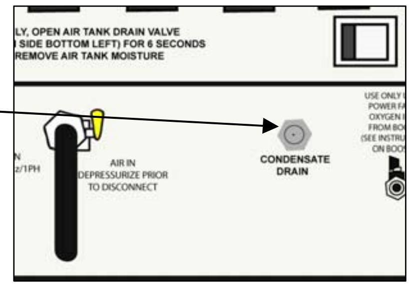
a.) Locate the Condensate Drain Bottle in the Acessories Case.

b.) The Condensate Drain Port fitting, located at the exterior bottom right of the Generator, secures the Condensate Drain Bottle, using the provided 1/4” tubing.

c.) Connect the Condensate Drain Bottle to the Manual Condensate Drain and Auto Drain.

d.) Keep the Manual Condensate Drain Valve closed (9:00 position). It is only opened for daily draining

Attach Condensate Drain Bottle Here



Generator Power Connection

a.) Verify that the Generator Power Switch on the front control panel is in the “OFF” position.

b.) Connect the Generator Power Cord to a suitable Power Source.

Feed Air Compressor Installation

Unpacking the Feed Air Compressor

a.) Unlock seven (7) latches on the exterior of the Feed Air Compressor case.

b.) Open the Exterior Lid fully.

c.) Open the Rain Guard by sliding the four (4) bolt locks away from the guard and lifting upward.

d.) Assure that the Cooling Air Filter inside the Rain Guard is pointing downward.

e.) Close the Rain Guard by lowering the guard and securing in place by sliding the four bolt locks toward the guard.

f.) Verify the Supply Air Filter Assembly is installed.

Inspecting Interior of Feed Air Compressor

a.) Open the Compressor Interior Cover by removing the four (4) securing knobs and lifting the cover.

b.) Verify the area is free and clear of debris and foreign material. Close the Compressor Interior Cover and fasten the securing knobs.

Feed Air Compressor Power Connection

a.) Verify that the Compressor Power Switch on the Compressor Interior Cover is in the “OFF” position.

b.) Connect the Compressor Power Cord to a suitable power source.

c.) If the Feed Air Compressor is supplied with a 2 foot pigtail (MS90556C32413P), then the facility must supply a power cord that mates with the Compressor.

d.) If supplied with a 30 foot power cord with no connector, then a qualified electrician will be required to hard-wire to a suitable power supply.

Compressor Motor Rotation Verification

a.) Verify the Compressor Power Switch on the Compressor Interior Cover is in the “OFF” position.

b.) Verify that no hoses are connected to the Feed Air Compressor.

c.) Momentarily apply power to the Feed Air Compressor with the Compressor Power Switch. A strong stream of air exiting the louvers on the right side of the Compressor case indicates proper rotation. Continue with Section 1.7.6.

Correcting Reversed Feed Air Compressor Rotation

WARNING

THE FEED AIR COMPRESSOR START BOX MAY REMAIN CHARGED EVEN WITH POWER DISCONNECTED. DISCHARGE THE STARTER BY SHORTING THE PLUG PINS TO EACH OTHER USING AN INSULATED SCREWDRIVER.

a.) If a strong stream of air exiting the louvers is not observed, rotation is incorrect. A qualified electrician should perform the following steps in this section to correct it.

b.) Your power source may have a phase switch located on the power source. Check that the phase switch is configured correctly before proceeding with the corrective steps below.

c.) Disconnect the Feed Air Compressor from the power source.

d.) Open the Compressor Interior Cover by removing the four (4) Securing Knobs and lifting the cover.

e.) Open the Starter Box by turning the Starter Box Locking Screw counter-clockwise.

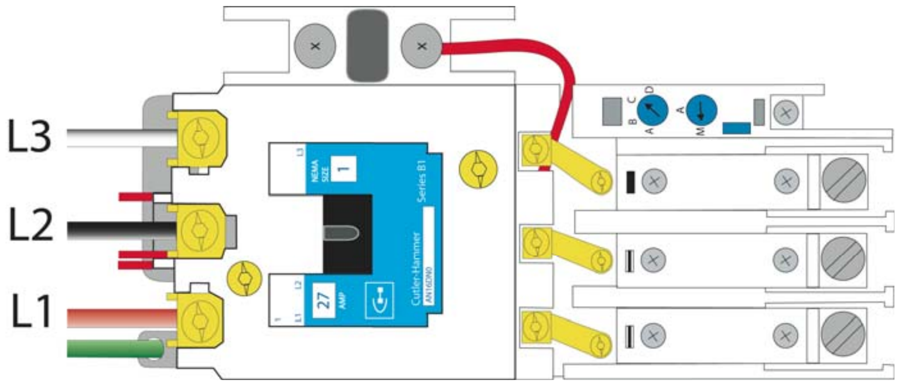
f.) Remove the cover of the Starter Box and set aside.

g.) Locate the large gauge red (L1) and black (L2) wires connected to the Power Input Terminal at the rear of the Starter Box. Loosen the securing screws that correspond to the red (L1) and black (L2) large gauge wires, and reverse the red (L1) and black (L2) large gauge wires, being careful not to disturb the smaller gauge wires. Tighten the securing screws.

h.) Replace the Starter Box cover, and secure by turning the Starter Box Locking Screw 1/2 turn clockwise.

i.) Close the Compressor Interior Cover and fasten the Securing Knobs.

j.) Repeat the steps in Section 1.7.4 to verify proper rotation.



Feed Air Hose Connection

The Feed Air Hose must be perpendicular to the Cover Hinge to allow proper positioning of the Exterior Lid.

A. Connect the Feed Air Hose with 90 degree connector to the Compressor Outlet Port and the other end to the Generator Feed Air Inlet Port.

B. If the distance between the Feed Air Compressor and Generator is more than 15 feet, the Remote Supply Air Hose may be used as an extension as described in the next step.

Remote Supply Air Hose

WARNING

The Supply Air Filter Assembly must be located at least 50 feet from any sources of Carbon Monoxide.

Use of the Remote Supply Air Hose is optional. It has two possible configurations: Remote Air Supply or Extended Distance.

Remote Air Supply

a.) Connect the Remote Supply Air Hose Female End to the Supply Air Inlet Port. Connect the Male end to the Supply Air Filter Assembly.

b.) Place the The Supply Air Filter Assembly in a clean air environment.

c.) Tighten all hose connections using the Air Hose Wrench located on the compressor rain guard.

Extended Distance between Feed Air Compressor and Generator

a.) Connect the Remote Supply Air Hose to the Feed Air Hose.

b.) Connect the Remote Air Supply Hose to the Feed Air Inlet Port. This configuration allows a distance of up to 30 feet between the Feed Air Compressor and the Generator.

c.) Tighten all hose connections using the Air Hose Wrench located on the compressor rain guard.

2 DISASSEMBLY PROCEDURES

IMPORTANT The Feed Air Compressor should not be shut down while the Generator is operating.

Storage and/or Shipping Shutdown

The Storage and/or Shipping Shutdown procedure is used when the POGS 33 will not be used for extended periods of time or in preparation for shipping.

Generator Shutdown

a.) Close all four (4) Oxygen Outlet Valves on the Generator Control Panel by turning them to the 9:00 position.

b.) Close all three (3) of the Medical Air Outlet Valves by turning them to the 9:00 position.

c.) Wait for the Generator to move into Standby Mode, as indicated by the Standby indicator on the Control Panel.

d.) Turn the Power Switch on the Generator Control Panel OFF.

e.) Disconnect the Generator Power Cord from the power source.

f.) Turn the Compressor Power Switch on the Compressor Interior OFF.

Feed Air Compressor Shutdown

a.) Remove the Tethered Retaining Clip from the Feed Air Compressor Exterior Lid Support Base to release the Feed Air Compressor Exterior Lid Support.

b.) Open the Exterior Feed Air Compressor Lid fully.

c.) Turn the Compressor Power Switch on the Compressor Interior Cover OFF.

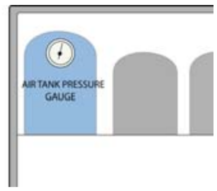
d.) Disconnect the Compressor Power Cord from the power source.

e.) Lower the Exterior Lid without engaging the Exterior Lid Support to prevent foreign object entry.

Relieve Air Receiver Pressure

a.) Open the Generator Control Panel by pulling on the two Latches.

b.) Slowly open the Manual Condensate Drain Valve and allow air to flow until the Air Receiver pressure reaches zero (0) PSIG.



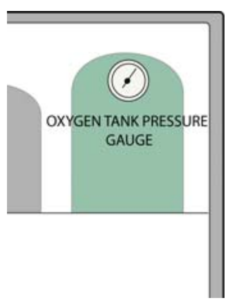
c.) Air Receiver pressure may be verified by inspecting the Air Receiver Pressure Gauge in the Generator Interior at the top of the Air Receiver.

d.) Remove Air Inlet Filter Bowl and ensure the bowl is dry. Reinstall the Filter Bowl.

Relieve Oxygen Receiver Pressure

a.) Slowly open one or all of the Oxygen Outlet Ports on the front of the Generator panel.

b.) Close the Outlet Ports when the Oxygen Outlet Pressure Gauge reads zero (0).



Prepare the Generator for Storage and/or Shipping

a.) Remove all Oxygen Flowmeters from the Oxygen Outlet Ports.

b.) Remove any accessories installed on the Medical Air Outlet Ports.

c.) Secure all of the Oxygen Flowmeters and Generator Accessories in the Accessory – Microboost Box.

d.) Disconnect the hose attached to the Generator Feed Air Inlet Port using the Air Hose Wrench.

e.) Lay the Generator on its rear side (minimum 4 people required).

f.) Install the Generator Exterior Lid on the Generator.

g.) Secure the cover by closing all fourteen (14) latches.

Prepare the Feed Air Compressor for Storage and/or Shipping

a.) Disconnect all Supply Air Hoses using the Air Hose Wrench and secure in the Accessory – Microboost Box.

b.) Be sure to reinstall the Air Inlet Filter to the Compressor Inlet Port if necessary.

c.) Securely tighten the Air Hose Wrench onto the Rain Guard.

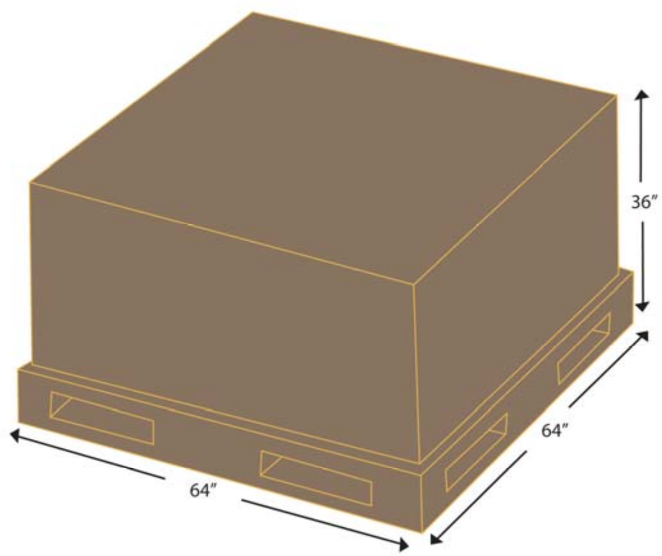
d.) If supplied with the pigtail connector, snap the pigtail and cord into the spring holders on the Compressor interior cover.

e.) If supplied with the 30 foot power cord, insert it on top of the Compressor Interior Lid.

f.) Close the Feed Air Compressor Exterior Lid and secure by using all seven (7) latches.

3 Shipping Guidelines

The component cases are intended for military transport. When shipping you may use the original crating with packaging materials, if they are available, or strap the component cases on standard pallets. The Generator should be placed in a horizontal position with the Control Panel facing upward. All other components should be shipped upright.



POGS 33 C
Portable Oxygen Generation System
33 LPM

OPERATION MANUAL

PSA Oxygen Generator
On Site Gas Systems, Inc.

Manufactured by:
On Site Gas Systems, Inc.
35 Budney Road, Budney Industrial Park, Newington, CT 06111, USA
Telephone: +1-860-667-8888 Fax: +1-860-667-2222
E-mail: info@onsitegas.com - Web site: www.onsitegas.com

CAUTION

RX ONLY

Oxygen has been determined by the FDA to be a drug. The POGS 33 is only to be operated by trained medical personnel. Oxygen is to be administered ONLY by properly trained medical personnel.

CAUTION

OXYGEN DRAMATICALLY INCREASES THE FLAMMABILITY OF OTHERWISE NONFLAMMABLE ITEMS, SUCH AS SYNTHETIC CLOTHING. CAUTION SHOULD BE USED SURROUNDING THIS SYSTEM. DO NOT SMOKE. DO NOT USE OIL TO CLEAN OR LUBRICATE ANY COMPONENT OF SYSTEM.

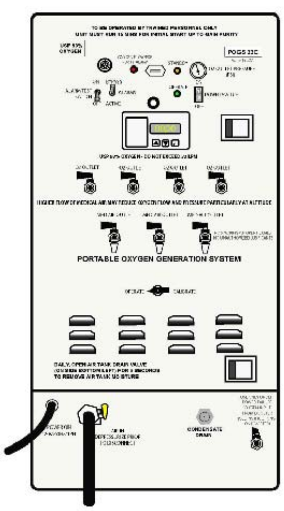
Table of Contents

The POGS 33C is intended to generate and deliver USP 93% supplemental oxygen and medical grade air. This device is intended to be used only by trained personnel in disaster relief and emergency preparedness situations or military settings where bottled oxygen is not readily available.

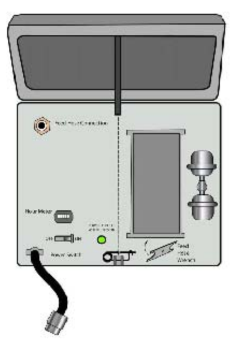
FDA 510(k) 063454

1. System Component Identification and Nomenclature

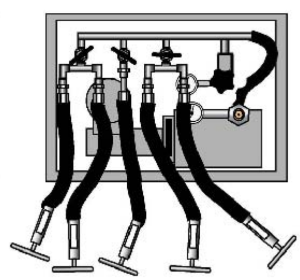
1.1 System Components



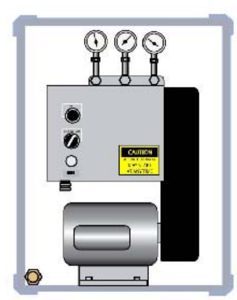
POGS 33C Generator



Feed Air Compressor

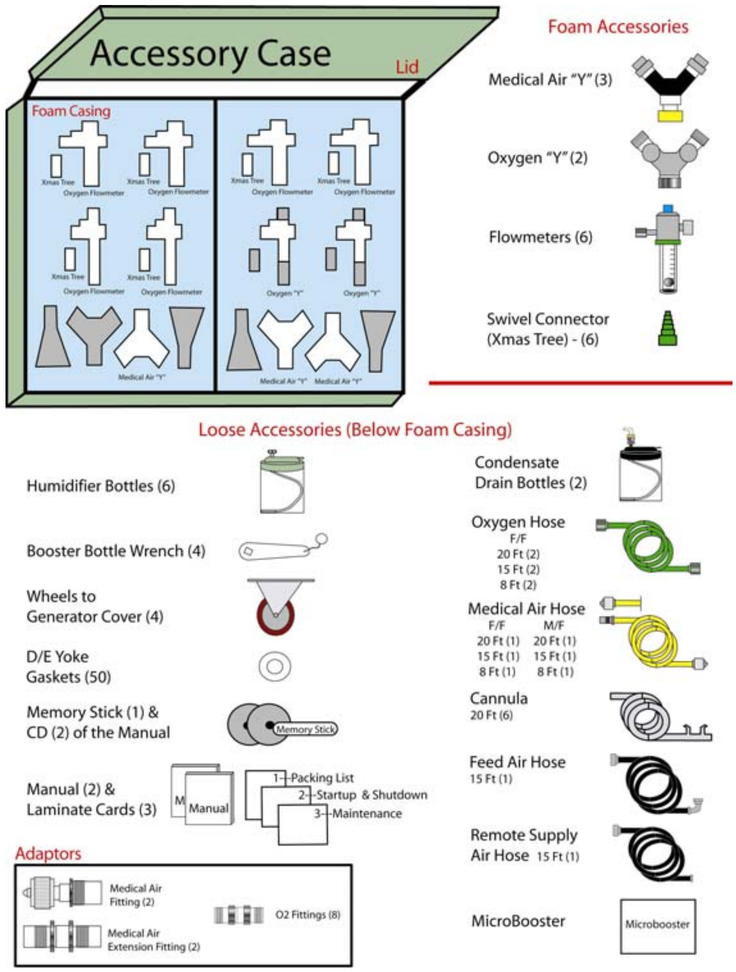


Microboost



HV Booster
(Optional)

1.2 Accessory/Microboost Hardigg Case Contents



1.3 Generator Controls

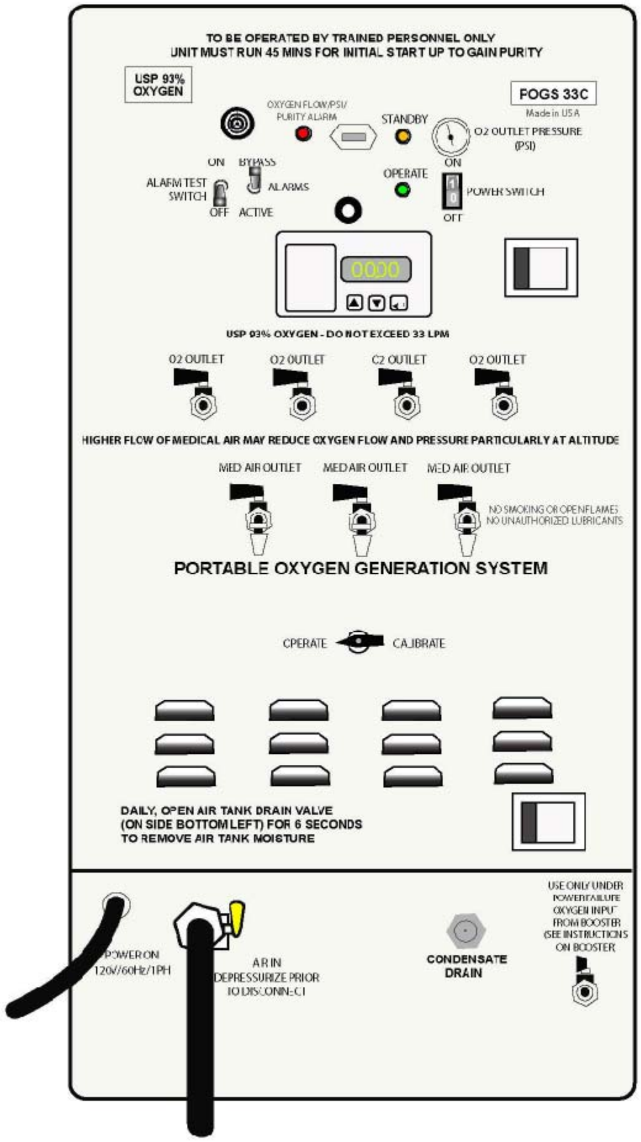


FIGURE 1-1: POGS 33C Generator Control Panel

1.4 Generator Interior

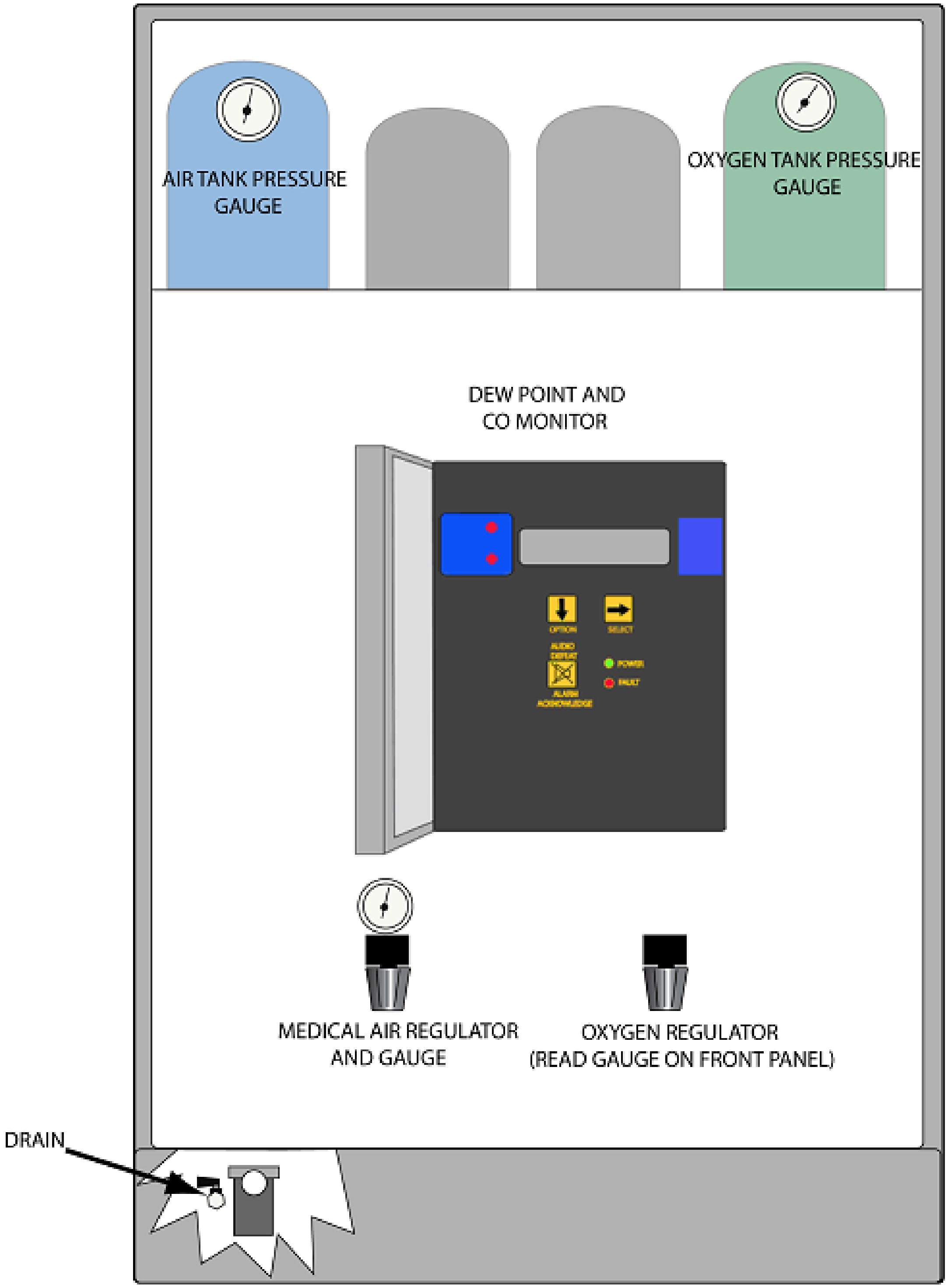


FIGURE 1-2: POGS33C Generator Interior Controls and Indicators

1.5 Feed Air Compressor Controls – top view

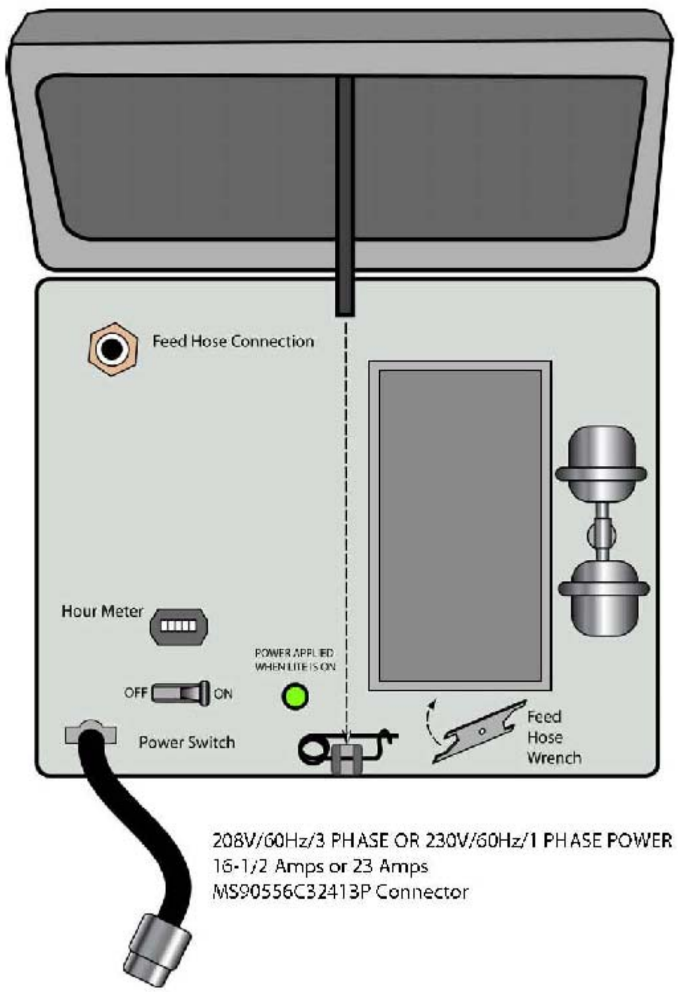


FIGURE 1-3 Feed Air Compressor

2. System Preparation

The POGS 33 is to be operated by trained medical personnel only.

2.1 Visual Inspection

A. Open the Exterior Compressor Lid fully.

B. Verify the Supply Air Filter Assembly and Top Cooling Air Inlet Filter are installed.

C. If necessary, empty the Condensate Drain Bottle at the bottom left of the Generator and re-secure.

D. Inspect the Feed Air Hose and Remote Supply Air Hose for any cuts or abrasions. Replace any damaged hoses.

NOTE:

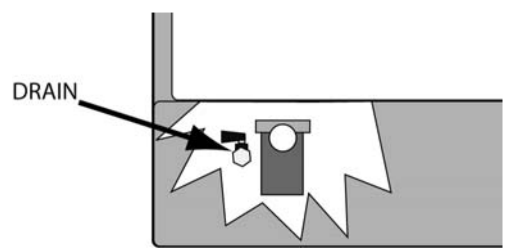
Before disconnecting any hoses between the Feed Air Compressor and the Generator, turn off the Feed Air Compressor and disconnect it from its power source, and depressurize the system by opening the Manual Condensate Drain Valve located in the Generator at the bottom of the Air Receiver.

2.2 Drain Water

Important:

At least once per day the Air Receiver should be drained of water that condenses during operation by performing the following steps:

A. Slowly open the Manual Condensate Drain Valve at the bottom of the Air Receiver in the Generator.



B. Leave the Valve open until water no longer drains from the Air Receiver.

C. More frequent draining may be necessary in hot and/or humid climates.

D. The Condensate Drain Bottle should be disconnected, emptied, and re-installed as necessary.

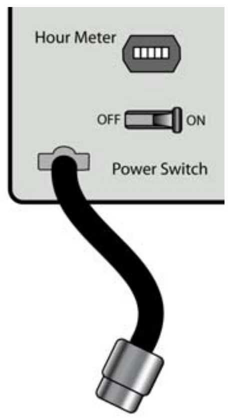
3. Operation

3.1 Power-Up

A. Connect the Feed Air Compressor Power Cord to the power source. The air intake should be located in a well-ventilated space to avoid airborne pollutants or fumes

B. Move the Feed Air Compressor Power Switch to the ON position.

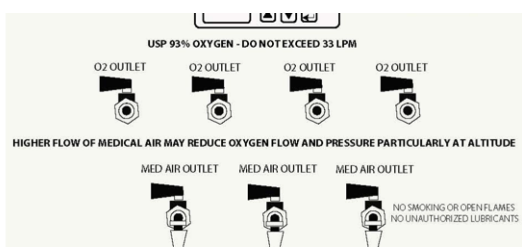
C. Allow the Feed Air Compressor to operate until it reaches standby mode (at approximately 110 PSI on the air tank gauge the Feed Air Compressor will shut down).



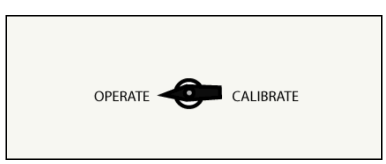
NOTE:

The Feed Air Compressor may cycle between Standby and Operate Mode until the pressure is balanced between the Generator and the Feed Air Compressor. If more than 4 such cycles are observed however, check for leaks between the Feed Air Compressor and the Generator.

D. Verify that the (3) Medical Air Outlet Valves and all (4) Oxygen Outlet Valves on the Generator Control Panel (Fig 1-1) are in the closed position (9:00 position).



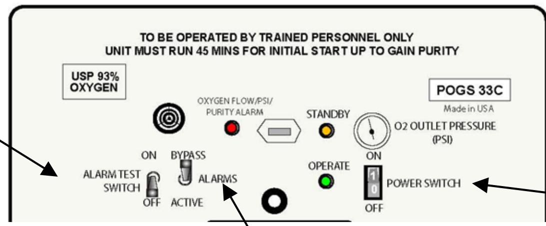
E. Verify the Operate/Calibrate Valve Handle is pointing to the (OPERATE) position.



F. Verify the following Generator Control Panel Settings:

.

Alarm Test Switch is 'OFF'

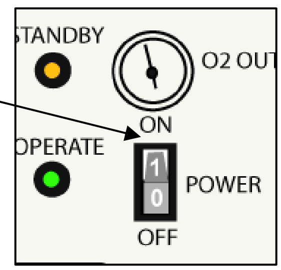


Power Switch is 'OFF'

Alarms Switch in 'BYPASS'

G. Connect the Generator Power Cord to the power source.

H. Apply power to the Generator pushing Power Switch to 'ON'.

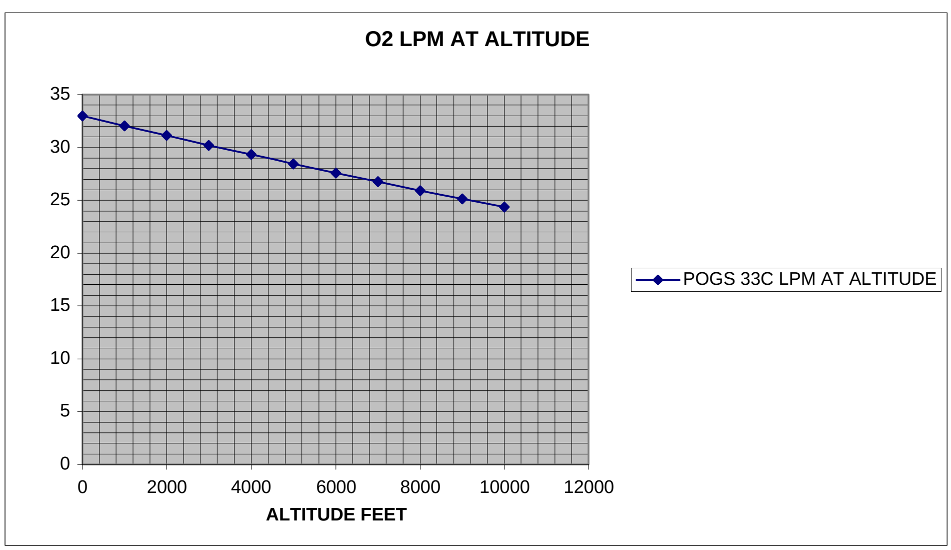


I. If the Oxygen Receiver pressure is low, the Generator will run until Oxygen Receiver pressure reaches approximately 70 PSIG. Then, the Generator will switch to standby mode, which is indicated by the illumination of the Standby Indicator on the Generator Control Panel. The Generator should reach standby mode within 5 minutes.

J. Verify Oxygen Receiver pressure by inspecting the Oxygen Receiver Pressure Gauge in the Generator at the top of the Oxygen Receiver.

NOTE:

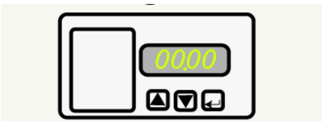
At altitudes of 5,000 FT or above, the Generator (Fig 1-1) may not switch to standby mode. As altitude increases, the pressure, flow, and purity may decrease as the density of oxygen and air decreases. If the Generator does not switch to standby mode within 5 minutes, and no oxygen leaks are observed, continue with the procedure in Section 3.2. See Altitude Chart below.



3.2 Purge Low Pressure Oxygen Receiver

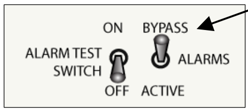
A. Attach flow meters to the oxygen outlet ports and adjust the flow to 33LPM.

B. Observe the oxygen concentration indicated by the Oxygen Analyzer.



C. If oxygen concentration is below 90%, remove any accessories from one or more Oxygen Flowmeters then open the corresponding Oxygen Outlet Valve(s); adjust the Oxygen Flowmeter(s) for a combined flow of 15-20 LPM. Continue flowing 15-20 LPM until oxygen concentration of 90% is achieved.

D. Once 90% oxygen concentration is achieved, the **Alarm Bypass Switch** should be switched to active:



E. Close the Oxygen Flowmeters and Oxygen Outlet Valves (9:00 position) until oxygen flow is needed.

F. Refer to Section 4 for oxygen output configurations.

3.3 Monitors and Alarms

3.3.1 Carbon Monoxide (CO) and Dew Point Monitor

a.) Carbon Monoxide and Dew Point Monitor is installed in the Generator interior.

b.) The monitor is hard-wired to the electrical system of the Generator and is active whenever the Generator Power Switch is in the “ON” position.

c.) Normal Operation

- When the Generator Power Switch is changed to the “ON” position, the alarms may sound briefly. Pressing the ALARM ACKNOWLEDGE/AUDIO DEFEAT button on the monitor will silence the alarms.
- The display of the monitor, visible when the Generator Control Panel (Fig 1-1) is opened, will display the current CO content of the feed air. The display also will indicate if there is proper flow through the sensor and indicate the dew point of the medical air.

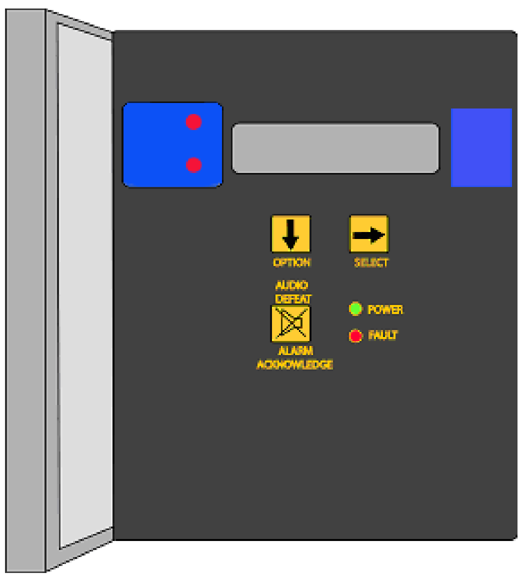


Figure 3-1: CO & Dew Point Monitor

CAUTION

Verify CO and Dew Point readings are at acceptable levels (<10PPM CO, <39 degrees F dew point) before using the POGS 33.

d.) Calibration of the Carbon Monoxide (CO) and Dew Point Monitor

- The carbon monoxide and dew point sensor come pre-calibrated from the factory.
- The carbon monoxide sensor should be calibrated every 3 months, using calibration gases of 20.9% oxygen in nitrogen and 20 PPM CO.
- The dew point sensor cannot be field calibrated, and should be replaced every 12 months to maintain accurate readings.

e.) Restarting (machine turned off or power lost)

- When power is restored to the Generator, the CO and Dew Point Monitor will resume operation.

3.3.2 Oxygen Analyzer

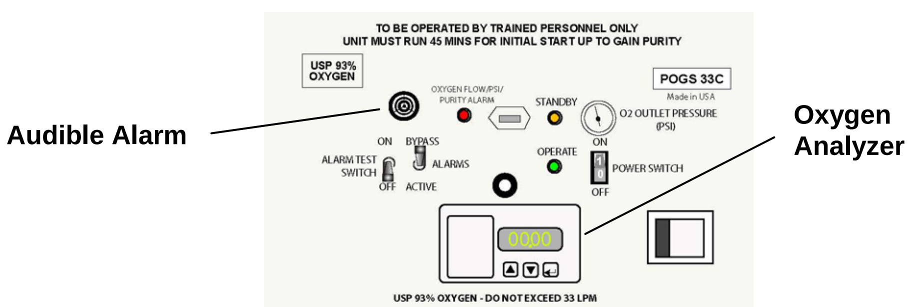
The Oxygen Analyzer display is located on the front of the Generator Control Panel. The Oxygen Sensor is mounted in the Generator interior.

a.) How It Operates

- The Oxygen Sensor receives a small sample flow from the Oxygen Receiver to continuously monitor the oxygen purity.
- The Oxygen Analyzer receives power from the Generator Electrical System (Diagram 2), and will be active whenever the Generator Power Switch is in the “ON” position.

b.) Oxygen Alarms

- The Oxygen Analyzer is equipped with alarms that will be activated if oxygen purity drops. If purity drops below a pre-set value (89% set at factory), an Audible Alarm on the Generator Control Panel will sound, and the “ALM1” indicator on the Oxygen Analyzer display will flash. The analyzer is configured to provide a backup alarm at 85%.



4. Output Configurations

The system can supply oxygen and medical air for various combinations of oxygen delivery devices and appliances such as anesthesia machines or ventilators. This section provides the details of connecting and powering these devices.

4.1 Calculating Oxygen and Medical Air Demand

When configuring devices to use the oxygen and medical air outputs of the POGS 33, the user must not exceed the maximum available flow ratings of the generator. Total demand must be calculated, and delivery devices and/or appliances selected appropriately. The table below lists flow capability and typical demand for devices and appliances.

GENERATOR OUTPUT	Oxygen	Medical Air
POGS 33	33 liters per minute (LPM)	30 LPM

DEMAND	Oxygen Demand	Medical Air Demand
Cannula	4-6 LPM(typical)	None
Anesthesia Unit (Narkomed-M)	10 LPM	10 LPM
2 Anesthesia Units	20 LPM	20 LPM
Ventilator (Impact Univent™ 750)	10 LPM	10 LPM
2 Ventilators	20 LPM	20 LPM
Microboost	9 LPM (continuous)	None
HV Booster *	33 LPM*	None

* Cannot be combined with any other output consuming devices.

4.2 Nasal Cannulas

To connect cannulas for supplying humidified oxygen follow the instructions below:

A. Connect one Oxygen Flowmeter to each Oxygen Outlet port on the POGS Generator Control Panel that is to be used to supply oxygen via nasal cannula. The Flowmeter must be positioned straight up and down (vertical) for reliable operation.

B. For each cannula, fill one Humidifier Bottle with distilled or highly filtered water, and connect it to the Flowmeter output.

C. Attach the female end of the cannula to the swivel connector (Christmas tree fitting) on each Humidifier Bottle.

D. Secure the humidifier bottles to prevent them from tipping.

E. Start the oxygen flow through a cannula by first opening the Oxygen Outlet Valve for the port to be used, and then adjust the Oxygen Flowmeter for the desired flow rate.

4.3 Anesthesia Unit

The Drager Narkomed-M Anesthesia unit is compatible with the POGS 33 Generator. The Generator can supply one Narkomed using medical air as the drive gas and 93% (nominal) oxygen for patient supply, or more Narkomed units if oxygen is also used for the drive gas. The total demand for medical air and oxygen for all connected appliances must not exceed 33 LPM oxygen and 30 LPM medical air in continuous use. Configuring the POGS unit with a Backup Oxygen supply can accommodate momentary demand in excess of the POGS ratings, for example, when the the Oxygen Flush control on the Narkomed is activated. Please refer to Section 9 for detailed instructions on connecting and using the POGS 33 to power the Narkomed-M.

4.4 Ventilator

Ventilators use the POGS 33 medical air output to power their breathing assist mechanism, and use oxygen to supply directly to the patient, although different configurations may be used depending on the ventilator operating instructions. The mixture of gases supplied to the ventilator can be controlled by an external customer-supplied Blender, which mixes the oxygen and medical air outputs of the POGS33 Generator to power multiple ventilators at less than maximum Oxygen purity levels.

Refer to Section 10 for detailed instructions on connecting and using the POGS 33 to power the Impact Univent™ 750 Ventilator.

4.5 Microboost

The Microboost unit provides a means for filling high pressure oxygen cylinders. To connect the Microboost unit to the POGS 33 Generator, follow the instructions below:

A. Connect an oxygen hose between the Oxygen Outlet Port on the Generator Control Panel and the Oxygen Inlet Port of the Microboost device.

B. Connect the hose directly; do not use a Flow meter or Humidifier bottle in the supply path.

C. Open the Oxygen Outlet Valve when ready to power the Microboost. (Refer to section 6 for Microboost Operating Instructions.)

4.6 High Volume (HV) Booster (Optional)

One or two POGS 33 Generators can be connected to a single HV Booster. Follow the instructions below for one or two generator connection. HV Boosters are connected directly. No Flow meters or Humidifier devices should be connected in the flow path.

WARNING

Do not use any other oxygen-consuming device in combination with the HV Booster because the HV Booster consumes the total oxygen output of the POGS 33.

4.6.1 One POGS 33 Generator with HV Booster

Connect an oxygen hose between an Oxygen Outlet Port on the Generator Control Panel and the Single Oxygen Inlet Port of the HV Booster.

4.6.2 Two POGS 33 Generators with HV Booster

a.) Connect an oxygen hose between an Oxygen Outlet Port on Generator A’s Control Panel and one of the Dual Oxygen Inlet ports of the HV Booster.

b.) Connect an oxygen hose between an Oxygen Outlet Port on Generator B’s Control Panel and the other Dual Oxygen Inlet port on the HV Booster.

5. Power Failure with Backup Oxygen Configuration

The system can be configured with an external Backup Oxygen supply that provides uninterrupted oxygen flow in the event of power failure to the Generator. The Backup Oxygen System also provides uninterrupted flow if the oxygen flow demand of devices connected to the generator exceeds the generator's output capabilities.

NOTE:

When the BACKUP SYSTEM is active during a power failure,
THERE IS NO MEDICAL AIR OUTPUT from the POGS 33.

5.1 Backup System Using High-Pressure (HP) Oxygen Cylinder

A. Use a high-pressure oxygen cylinder with a regulator capable of 45 PSIG.

B. Make sure that the Backup Oxygen Inlet Port Valve on the Generator Control Panel is closed (9:00 position).

C. Connect an oxygen hose between the Backup Oxygen Inlet Port on the Generator Control Panel and the output port of the regulator installed on the high-pressure cylinder.

D. Two modes of operation are available:

- For uninterrupted oxygen flow in power failure or over-demand conditions, open the high pressure oxygen cylinder valve and adjust the regulator for 45 PSIG, while the generator is operating.
- For backup only in power failure condition, keep the oxygen cylinder valve closed during normal operation, and open it in the case of a power failure.

5.2 Operating with the HP Cylinder Backup System Connected

A. Open the Backup Oxygen Inlet Port Valve (6:00 position).

B. Monitor the Oxygen Outlet Pressure gauge regularly. In this configuration, oxygen flows from the cylinder whenever its valve is open and the Oxygen Receiver pressure in the generator drops below 45 PSIG.

5.3 Shutting Down Backup Oxygen

When the conditions that cause the POGS 33 to shut down or be overdrawn are corrected, the Backup Oxygen can be disconnected as follows:

A. Close the High Pressure Cylinder Valve.

B. Close the backup Oxygen Inlet Port Valve on the Generator Control Panel.

C. To disconnect the Backup System completely, disconnect the hose between the regulator on the High Pressure Cylinder and the Backup Oxygen Inlet Port on the Generator Control Panel.

6. Microboost Operation

The Microboost Unit is used to fill high-pressure cylinders with oxygen at approximately 2200 PSIG.

WARNING
Do not use the Microboost unit to fill cylinders with medical air.

6.1 Setting Up the Microboost (Refer to Figure 6-1)

A. Connect an oxygen hose between the oxygen output of the generator and the oxygen inlet of the Microboost, as instructed in Section 4.5.

B. Open the Microboost lid and locate the High-Pressure Pigtails.

C. Verify that the High Pressure Pigtails match the high-pressure cylinders to be filled. The Microboost comes standard with “D” and “E” size cylinder fittings, but may also be fitted with an optional “H/K” fitting.

D. To prepare for filling D or E cylinders, secure the High Pressure Oxygen Cylinders to be filled in the D/E Cylinder Support Assembly.

E. For H cylinders, the Microboost should be positioned on the floor, with the cylinder lying on its side next to it and secured to the Microboost.

F. There are two configurations for cylinder filling:

- For filling one cylinder, the center High Pressure Pigtail should be used – the center valve controls it.
- The two left and two right High Pressure Pigtails are paired together. The left pair is controlled by the left valve and the right pair by the right valve. These pairs must be used together.

G. Select the High Pressure Cylinder Fittings to be used, and inspect each one for any dirt, oil, or other foreign material. Clean with a mild detergent as necessary and dry the fitting completely. Remove any particles of cloth from the drying process. Ensure that the gasket of the High Pressure Cylinder fitting is present and does not appear damaged.

H. Open the High Pressure Cylinder Fitting by turning the handle counterclockwise until opened enough to place over the valve of the high-pressure cylinder, then put it in place.

I. Align the two index pins of the High Pressure Cylinder fitting with the two holes in the high pressure cylinder valve and seat the pins in the holes. If the pins do not line up, remove and reverse the fitting.

J. Secure the High Pressure Cylinder fitting to the high-pressure oxygen cylinder valve by turning the handle on the fitting clockwise until tight, while making sure that the index pins remain seated.

K. Repeat process G-J for each cylinder.

L. Open the high-pressure manifold valves for each High Pressure Pigtail connected.

M. Make sure that high-pressure manifold valves where pigtails are not connected are fully closed.

N. Open the valve on each high-pressure cylinder to be filled.

6.2 Operating the Microboost

A. Connect the Microboost to the power source.

B. Make sure that the POGS 33 Generator is running.

C. Switch the Microboost power switch to ON.

D. Press and release the Microboost START button.

E. All connected cylinders will begin filling. Monitor progress on the High Pressure Manifold Pressure Gauge.

F. The Microboost will automatically shut off when cylinder pressure reaches approximately 2200 PSIG.

G. When ready to fill again, the Microboost will only start by manually pressing the START button.

6.3 Microboost – top view

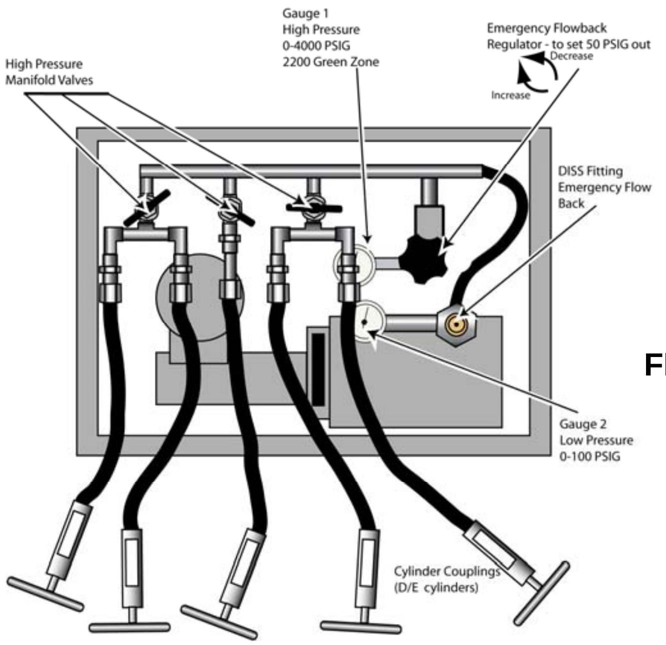


FIGURE 6-1: Microboost

6.4 Microboost – rear view

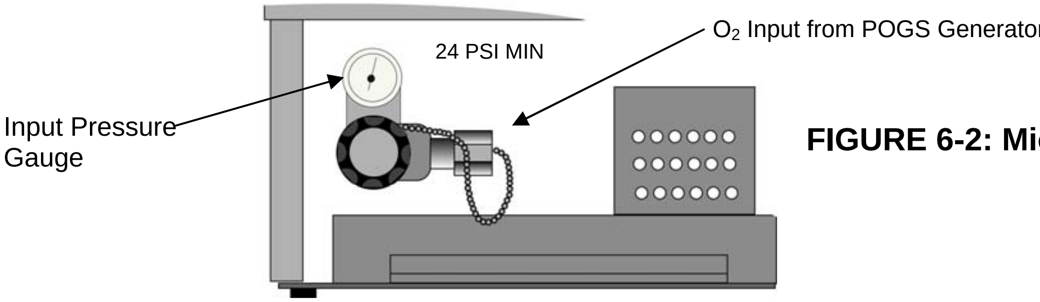


FIGURE 6-2: Microboost

7. High Volume (HV) Booster (Optional)

The High Volume Booster is designed to rapidly fill cylinders. The HV Booster consumes the total oxygen output of the POGS 33. Either one or two POGS 33 Generators can be used in combination with the HV Booster.

7.1 Setting Up the HV Booster (Refer to Figure 7-1)

A. Connect one or two POGS 33 Generators to the HV Booster as instructed in Section 4.6.

B. Open the HV Booster lid and locate the High-Pressure Pigtails.

C. Verify that the High Pressure Pigtails match the high-pressure cylinders to be filled. The HV Booster comes standard with “H/K“ cylinder fittings, but may also be fitted with optional ”D/E” size fittings.

D. To prepare for filling D or E cylinders, secure the High Pressure Oxygen Cylinders to be filled in the D/E Cylinder Support Assembly.

E. Make sure that the High Pressure Cylinders to be filled are secured and prevented from falling over.

F. There are two configurations for cylinder filling:

- For filling one cylinder, the center High Pressure Pigtail should be used – the center valve controls it.
- For filling two cylinders, the two left and two right High Pressure Pigtails are paired together. The left pair is controlled by the left valve and the right pair by the right valve. These pairs must be used together.

G. Select the High Pressure Cylinder Fittings to be used, and inspect each one for any dirt, oil, or other foreign material. Clean with a mild detergent as necessary and dry the fitting completely. Remove any particles of cloth from the drying process. Ensure that the gasket of the High Pressure Cylinder fitting is present and does not appear damaged.

H. Open the High Pressure Cylinder Fitting by turning the handle counterclockwise until opened enough to place over the valve of the high-pressure cylinder, then put it in place.

I. Align the two index pins of the High Pressure Cylinder fitting with the two holes in the high pressure cylinder valve and seat the pins in the holes. If the pins do not line up, remove and reverse the fitting.

J. Secure the High Pressure Cylinder fitting to the high-pressure oxygen cylinder valve by turning the handle on the fitting clockwise until tight, while making sure that the index pins remain seated.

K. Repeat process G-J for each cylinder.

L. Open the high-pressure manifold valves for each High Pressure Pigtail connected.

M. Make sure that high-pressure manifold valves where pigtails are not connected are fully closed.

N. Open the valve on each high-pressure cylinder to be filled.

7.2 Operating the HV Booster

7.2.1 Manual Mode

a.) Connect the HV Booster Power cord to the power source.

b.) Turn the Manual/Automatic switch on the Control Panel to ‘START’ mode position. (The HV Booster automatically stops when the cylinders being filled reach approximately 2200 PSIG).

c.) Make sure that the POGS 33 Generator(s) is/are operating.

d.) Position Selection Switch to indicate the number of POGS generators.

e.) Push the HV Booster Power Switch to the ON position.

f.) In “Manual’ mode push the START button on the HV Booster to begin flow of oxygen to the cylinders.

g.) Monitor progress of cylinder filling on the High Pressure Manifold Pressure Gauge.

7.2.2 Auto Mode

a.) Connect the HV Booster Power cord to the power source.

b.) Turn the Manual/Automatic switch on the Control Panel to ‘AUTO’ position. (The HV Booster automatically stops when the cylinders being filled reach approximately 2200 PSIG).

c.) Make sure that the POGS 33 Generator(s) is/are operating.

d.) Position Selection Switch to indicate the number of POGS generators.

e.) Push the HV Booster Power Switch to the ON position.

f.) In “AUTO’ mode the HV Booster will automatically begin flow of oxygen to the cylinders.

g.) Monitor progress of cylinder filling on the High Pressure Manifold Pressure Gauge.

NOTE:

HV Booster has a dynamic seal, so to prevent system leak down, put the Selection Switch to the 12:00 position.

7.3 Cylinder Removal

A. Close the High Pressure Oxygen Cylinder Valves on all of the connected cylinders.

B. Close the 3 High Pressure Manifold Needle Valves.

C. Slowly loosen the bottle connector to relieve the line pressure.

D. Repeat this process for each cylinder.

NOTE:

Unit will not start until 30 PSIG is available at input.
Unit will stop when input pressure drops below 25 PSIG.

7.4 HV Booster - front view

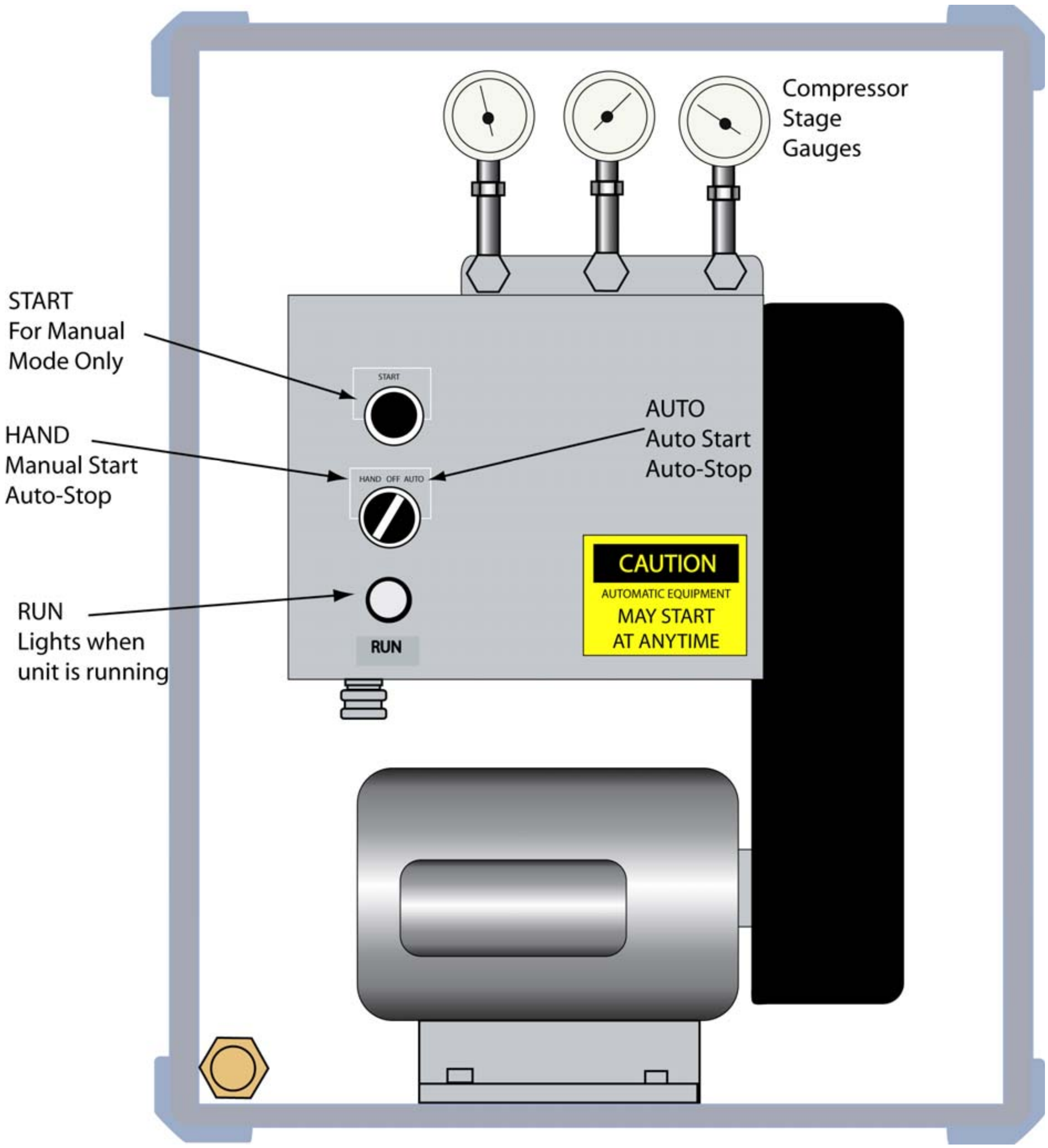


FIGURE 7-1: HV Booster

7.5 HV Booster - rear view

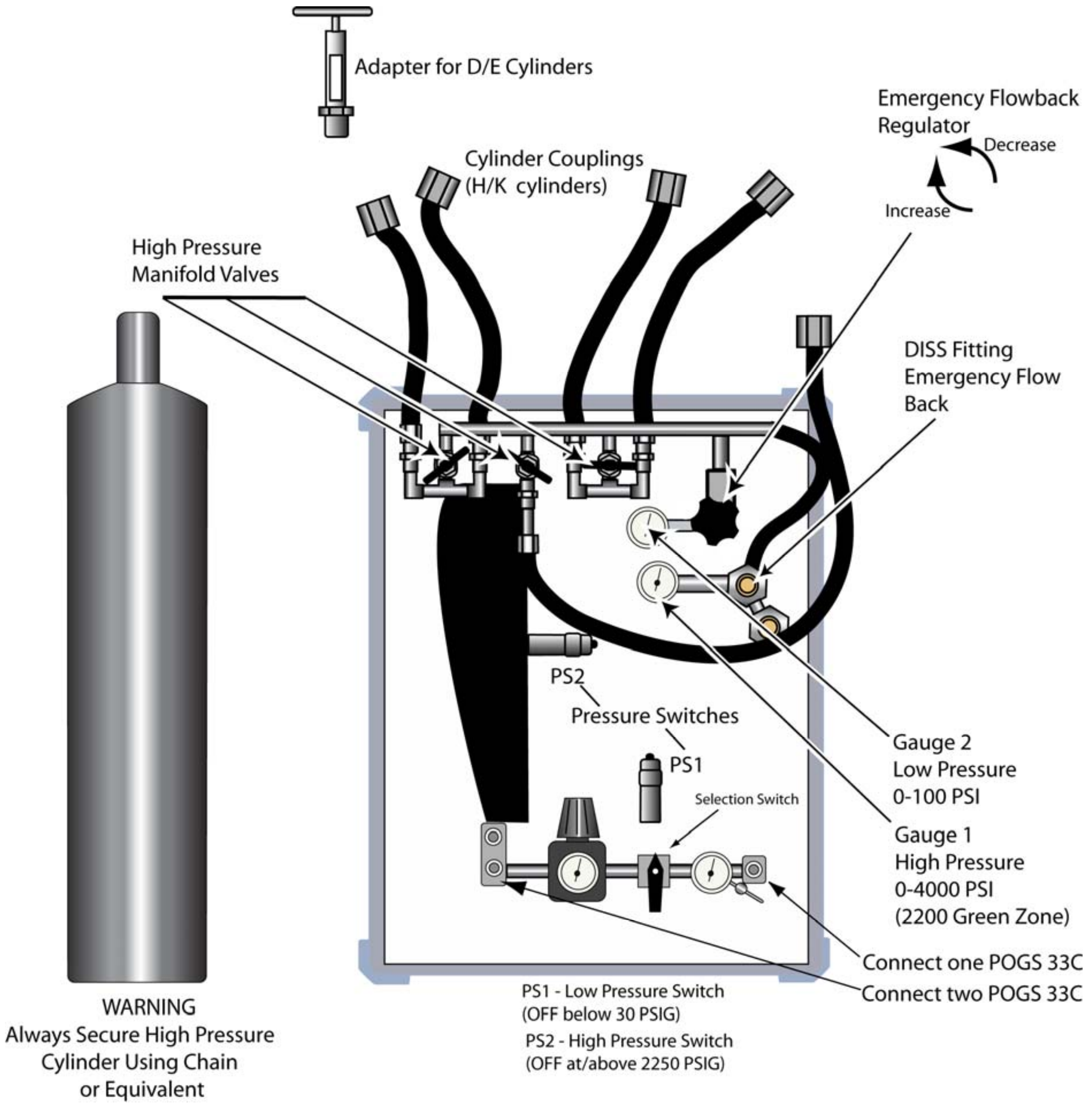


FIGURE 7-2: HV Booster

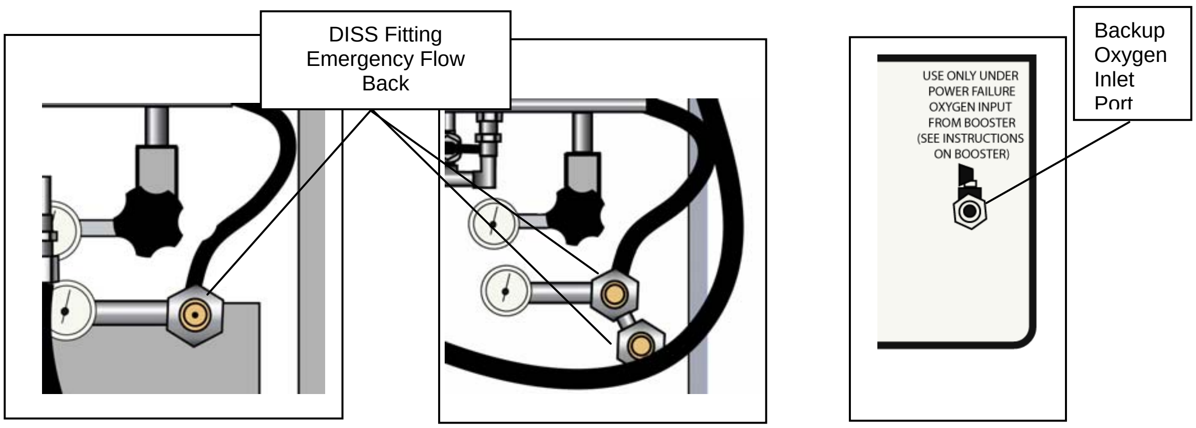
8. Using the Microboost or HV Booster for Power Failure Backup Oxygen Supply

The Microboost and HV Booster systems can be configured to supply oxygen from a backup cylinder in the case of a power failure or overdraw condition in the generator.

8.1 Setup

A. A filled or partially filled high-pressure cylinder must be installed as instructed in Section 6.1 (Microboost) or Section 7.1 (HV Booster) for the Backup System to function.

B. Connect an oxygen hose between the Backup Oxygen Outlet port on the Microboost/HV Booster and the Backup Oxygen Inlet port on the Generator Control Panel.



Section 6.1- Microboost Section 7.1 HV Booster Generator Control Panel

C. Open the Backup Oxygen Outlet Valve on the Microboost/HV Booster.

D. If the POGS 33 has experienced a power failure, or if the pressure in the generator's Oxygen Receiver falls below 45 PSIG, oxygen will now be supplied from the cylinder attached to the Microboost/HV Booster.

E. To maintain uninterrupted oxygen flow when the high-pressure oxygen cylinder starts to run low, one of the high pressure Manifold Needle Valves should be closed and corresponding cylinder replaced with a full one.

8.2 Shutdown

A. When the condition that caused the POGS 33 to shut down is corrected, first close the Backup Oxygen valve on the Microboost/HV Booster.

B. Close the Backup Oxygen Inlet Port Valve on the Generator Control Panel.

C. Disconnect the oxygen hose between the Microboost/Booster and the Generator if there is no further need for the backup system.

9. Operation with Narkomed-M Anesthesia Machine

The Draeger Narkomed-M has been validated as compatible equipment with the POGS 33 Oxygen Generator. This section of the Manual provides connection information and operating instructions specific to the use of the Narkomed-M unit with the POGS 33.

CAUTION
Fully read and acquaint yourself with the Narkomed-M instructions for Installation and Operation before attempting to configure or operate the unit.

9.1 POGS Setup for Narkomed-M Use

Use the instruction below to configure and connect the POGS 33 and the Narkomed unit.

9.1.1 POGS33/Narkomed Connections

a.) Connect a full "D/E" oxygen cylinder to the oxygen cylinder yoke per the Narkomed instructions (see Narkomed-M Manual).

b.) Configure the POGS33 Generator for Power Failure Backup Oxygen, using an oxygen cylinder as instructed in Sections 5, or the Microboost/HV Booster and a cylinder as instructed in Section 8 of this manual.

c.) Check that any unused Oxygen Outlet Valves and the Medical Air Outlet Valves on the POGS 33 Control Panel are closed.

d.) Attach one end of a Medical Air Hose to one of the three Medical Air Outlet Ports on the Generator Control Panel.

e.) Attach the other end of the Medical Air Hose to the Medical Air Inlet port in the back of the Narkomed-M.

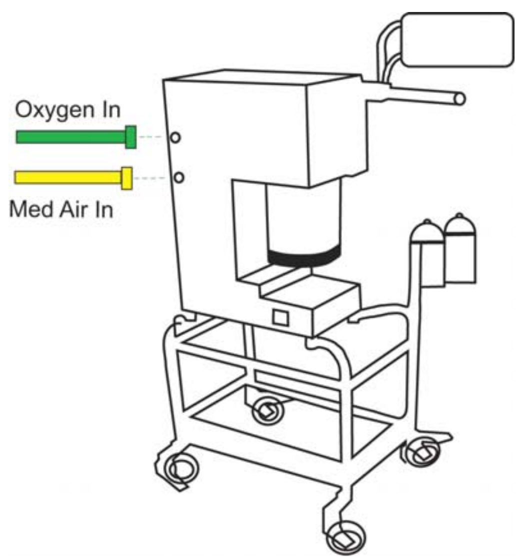


FIGURE 9-1: Narkomed M Anesthesia Machine

CAUTION

DO NOT use an Oxygen Flow meter or a humidifier bottle between the Oxygen Outlet Port and the Narkomed-M.

f.) Attach an Oxygen Hose between an unused Oxygen Outlet Port on the Generator Control Panel and the Oxygen Inlet port in the back of the Narkomed-M.

g.) Make certain that the flow meter control knobs on the front of the Narkomed-M are completely closed.

NOTE:

1.5 LPM of oxygen will flow through the system to the Narkomed even with its flow meter valves closed.

h.) Open the Oxygen Outlet Valve on the Generator Control Panel corresponding to the Oxygen Outlet Port to which the Narkomed-M is connected.

i.) Open the Medical Air Outlet Valve on the Generator Control Panel.

j.) Select Medical Air or Oxygen as the drive gas by using the Drive Gas selector switch on the Narkomed-M.

NOTE:

If power to the POGS 33 Generator is interrupted, no Medical Air is produced, and the Narkomed-M will not have a drive gas supply if Medical Air has been selected.

k.) A second Narkomed-M unit may be connected to the POGS 33 in the same manner, by connecting another Medical Air hose between the Medical Air Outlet Port and Air Inlet on the Narkomed-M, and another Oxygen Hose between the POGS 33 Oxygen Outlet Port and the Narkomed Oxygen Inlet.

l.) With two Narkomed-M units connected, set one Narkomed-M for Air as the Drive Gas, and the second for Oxygen as the Drive Gas.

m.) Select oxygen as the drive gas on the Narkomed that will require the lower inspiratory flow. This will maximize the oxygen available for supplying the Narkomed flow meters.

9.2 POGS 33 Characteristics Specific to the Narkomed Anesthesia Unit

9.2.1 Oxygen Purity

The Oxygen output from the POGS 33 is 90-96% pure. The remaining percentage is Argon and Nitrogen. Refer to the calibrated POGS Oxygen sensor reading for the current Oxygen content in the gas going to the patient.

NOTE:

When mixing N2O, the Clinician should be aware that there is 5-7% added volume of inert gas in the Generator output, and calculate N2O/Oxygen mix accordingly.

9.2.2 Medical Air and Oxygen Budgeting

The drive gas requirement for the Narkomed-M is a maximum of 11.25 LPM Oxygen or Medical Air, whichever is selected. If oxygen is used as the drive gas, the total demand of all connected oxygen appliances must be added and the total kept below the output capability of the Oxygen Generator: 33LPM Oxygen and 30LPM Medical Air. If Medical Air is being used as the drive gas, the Medical Air use and the Oxygen use must both be kept below their output capabilities. Typical demands for drive gas are:

Demand	Medical Air or Oxygen
Low	3 to 4 LPM
Medium	5 to 7 LPM
High	8 to 11.25 LPM

If Medical Air and/or Oxygen pressure readings on the POGS Control Panel start to drop, it is an indication that the Medical Air is being overdrawn and system should be readjusted if possible to diminish Medical Air/Oxygen demand.

9.2.3 Monitoring Consumption Rate

a.) Oxygen consumption through the Narkomed Oxygen Flow meter is monitored by observing the movable ball on the graduated scale of the Oxygen Flow meter. The Narkomed Oxygen Flow meter displays the flow of Oxygen into the system.

b.) If Medical Air is being used as the drive gas, add the Narkomed Oxygen Flowmeter reading to the other POGS Oxygen demands to feed other systems, such as Cannulas and other equipment.

NOTE:

Do not exceed 33 LPM Oxygen flow except during oxygen flush or in momentary conditions.

9.2.4 Supply Characteristics During Narkomed Oxygen Flush

When the "OXYGEN FLUSH" button on the Narkomed-M is pushed, the instantaneous oxygen demand goes to 55 LPM. This is a condition of oxygen overdraw for the POGS 33. This overdraw will run the POGS Oxygen Receiver (Fig 3-1) pressure down below 35 PSIG within approximately one (1) minute, assuming that there is no other Oxygen demand. Configuring the POGS 33 Generator in a Backup Oxygen configuration will compensate for this pressure drop.

a.) If oxygen is being used as a drive gas, drive gas should be shifted to Medical Air before oxygen flush procedure.

b.) After flush is complete, follow the Backup Oxygen shutdown procedures in the same sections.

c.) During and after an Oxygen flush, other systems demanding oxygen should be closed or monitored closely for failure or oxygen starvation.

9.3 Procedure for Power Failure While Powering Narkomed

CAUTION

If a power failure occurs to the Feed Air Compressor (Fig 1-3), even if the Backup Oxygen system is configured to supply oxygen, the MEDICAL AIR IS NO LONGER AVAILABLE through the POGS 33 Medical Air Outlet Port (Fig 1-1).

9.3.1 On Loss of Power

a.) Immediately open the Backup Oxygen Outlet Valve on the Microboost /HV Booster to start the flow of oxygen through the Oxygen Receiver.

b.) Insure that the POGS Generator is set up with a backup configuration.

c.) Immediately change the Narkomed-M's drive gas control switch to "OXYGEN".

d.) Monitor the pressure of Oxygen in the high-pressure cylinders feeding the Backup backflow regulator by monitoring the High-pressure Manifold Pressure Gauge in the booster.

CAUTION

The Backup Oxygen system supplies Oxygen for a LIMITED time only. Monitor high-pressure oxygen cylinder pressure to ensure uninterrupted oxygen flow.

9.3.2 On Restoration of Power

a.) When power is restored, restart the POGS 33 Generator as instructed in Section 3.1. When complete, change the drive gas switch back to "Medical Air".

b.) When the pressure in the POGS 33 Generator's Oxygen Receiver reaches 45 PSIG, the POGS 33 automatically stops drawing from the Backup Oxygen system.

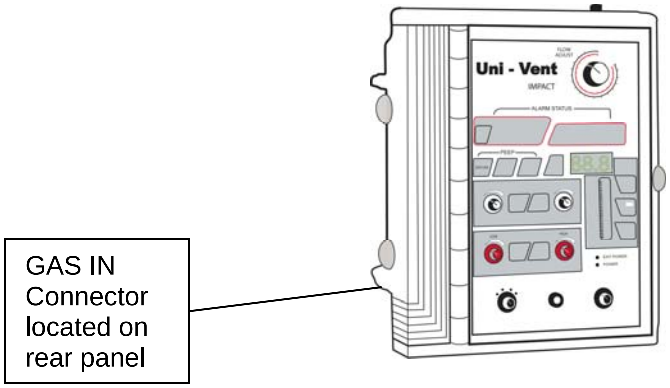
c.) Close the Backup Oxygen Outlet Valve in the Microboost/HV Booster.

d.) Close the Backup Oxygen Inlet Port Valve on the Generator Control Panel.

10. Operation with Impact Portable Ventilator (IPV) Uni-Vent^{TM} 750

10.1 General

The IPV is powered directly from an oxygen gas cylinder, piped gas, or the POGS 33. IPV flow adjust is based upon 50 psi input. The IPV oxygen source can be supplied through a Direct Connection or through an external Gas Blender.



10.1.1 Direct Connection

IPV is provided with a six (6) foot green oxygen hose. Attach one end to the IPV oxygen fitting marked “Gas In” and the other end of the hose to one of the four POGS 33 Oxygen Outlet Ports. Note: the connection to the POGS 33 should be direct with **no** flowmeter in line to impede the flow.

a.) Open the ball valve on the POGS oxygen Outlet connected to the IPV.

b.) The IPV is ready to operate per IPV instruction manual.

10.1.2 Connection via Air Gas Blender

a.) If less than USP 93% oxygen is desired, the IPV requires an Air-Oxygen Blender provided by impact.

b.) For Blender configuration, the IPV is provided with two (2) green oxygen hoses and one (1) air hose.

c.) Connect one end of the green hose to the IPV oxygen fitting marked “Gas In” and the opposite end to the Blender at bottom (Primary Outlet-High Flow Outlet).

d.) There are two gas inlets at rear of mixer. Connect a green oxygen hose between the Blender’s “Oxygen” inlet and one of the four Oxygen Outlets Ports on the POGS 33. Note: the connection to the POGS 33 should be direct with **no** flowmeter in line to impede the flow.

e.) Connect one end of the black air hose to the mixer at rear marked “medical air” and the opposite end to the POGS 33 front panel ”Medical Air” outlet. Note: a medical air flowmeter should **not** be used, as it will impede the flow.

f.) Open the ball valve at POGS Oxygen Outlet. Open the ball valve at the POGS “Medical Air” Outlet.

g.) The Blender is now ready for use per the Blender instructions manual.

10.2 Operation of Two (2) IPV's

10.2.1 Direct Connection

Connection of two (2) IPV's is identical to the connection of one IPV.

a.) Connect each of the two green oxygen hoses to the front panel of the POGS 33 marked "oxygen outlet".

b.) Open ball valves at two "oxygen outlets".

c.) Review IPV operation manual.

10.2.2 Connection via Air Oxygen Mixer.

The connection of two IPV's via the Air Oxygen Mixer is identical to the connection of one IPV.

10.3 Procedure for Power Failure while Powering Impact Univent 750

a.) Connect the two (2) black medical air hoses from the two (2) Air Oxygen Mixers to two (2) of the Medical Air Outlet fittings.

b.) Open the ball valve of the Medical Air Outlet Fitting.

c.) Review the IPV Air Oxygen Mixer Instruction Manual and IPV Operation Manual.

CAUTION

If a power failure occurs to the Feed Air Compressor (Fig 1-3), even if the Backup Oxygen system is configured to supply oxygen, the MEDICAL AIR IS NO LONGER AVAILABLE through the POGS 33 Medical Air Outlet Port (Fig 1-1).

CAUTION

If the Air-Oxygen Blender is being used and there is a power failure to the POGS Feed Air Compressor, the blended gas will revert to 90-96% oxygen. The Blender will audible alarm for the duration of the power failure due to low gas pressure.

CAUTION

The Backup Oxygen system supplies Oxygen for a LIMITED time only. Monitor high-pressure oxygen cylinder pressure to ensure uninterrupted oxygen flow.

a.) Immediately open the Backup Oxygen Outlet Valve on the Microboost or HV Booster to start the flow of oxygen back through the Oxygen Receiver.

b.) Insure that the POGS Generator is set up with a backup configuration.

c.) Monitor the pressure of Oxygen in the high-pressure cylinders feeding the Backup Backflow Regulator by monitoring the high-pressure manifold pressure Gauge in the booster.

10.3.1 On Restoration of Power

a.) When power is restored, restart the POGS 33 Generator as instructed in Section 3.1.

b.) When the pressure in the POGS 33 Generator's Oxygen Receiver reaches 45 PSIG, the POGS 33 automatically stops drawing from the Backup Oxygen system.

c.) Close the Backup Oxygen Outlet Valve in the Microboost/HV Booster.

d.) Close the Backup Oxygen Inlet Port Valve on the Generator Control Panel.

11. System Shutdown Procedures

IMPORTANT

The Feed Air Compressor should not be shut down while the Generator is operating.

11.1 Normal Shutdown

11.1.1 Definition

The Normal Shutdown procedure is used to shutdown the POGS 33 for short periods when oxygen production is not needed and the POGS 33 is to remain ready for quick startup. This procedure is also used when the power to either the Generator or the Feed Air Compressor, has been interrupted, or another event occurs that prevents normal operation while the POGS 33 is in operation.

a.) Close all four (4) Oxygen Outlet Valves on the Generator Control Panel by turning them to the 9:00 position.

b.) Close all three (3) of the Medical Air Outlet Valves by turning them to the 9:00 position.

c.) Wait for the Generator to move into Standby Mode, as indicated by the STANDBY Indicator on the Control Panel.

d.) Turn the Power Switch on the Generator Control Panel OFF.

e.) Turn the Compressor Power Switch on the Compressor Interior Cover OFF.

NOTE:

If the System is being shut down as the result of a power failure or system problem, insure that the system is set up with a backup configuration.

11.2 Shutdown for Configuration Changes

This procedure is used when the POGS 33 needs configuration changes made after the Initial Startup procedure has been performed.

This includes:

- Any changes that require the hoses between the Feed Air Compressor and Generator to be disconnected and/or changes to the power source.

This does not include:

- Any changes to accessories connected to the Oxygen Outlet Ports on the Generator Control Panel: the Normal Shutdown procedure should be used if necessary.

11.2.1 POGS 33 Shutdown

a.) Close all four (4) Oxygen Outlet Valves on the Generator Control Panel by turning them to the 9:00 position.

b.) Close all three (3) of the Medical Air Outlet Valves by turning them to the 9:00 position.

c.) Wait for the Generator to move into Standby Mode, as indicated by the STANDBY Indicator on the Control Panel.

d.) Turn the Power Switch on the Generator Control Panel OFF.

e.) Turn the Compressor Power Switch on the Compressor Interior Cover OFF.

11.2.2 Relieve Air Receiver Pressure

a.) Open the Generator Control Panel by pulling on the two Latches.

b.) Press the center orange button on the pilot valve to relieve pressure from the beds.

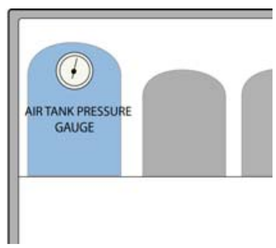
c.) Press the bottom orange button on the pilot valve to relieve pressure from the other sieve bed.

d.) Repeat this process of pressing the pilot valve alternating pressure to the pilot valve buttons until the air tank pressure reads approximately 20 PSIG.

e.) Slowly open the Manual Condensate Drain Valve and allow the remaining air to flow until the Air Receiver pressure reaches 0 PSIG.

f.) Air Receiver pressure may be verified by inspecting the Air Receiver Pressure Gauge in the Generator Interior at the top of the Air Receiver.

g.) Remove Air Inlet filter bowl and ensure the bowl is dry. Reinstall the filter bowl.



11.3 Storage and/or Shipping Shutdown

The Storage and/or Shipping Shutdown procedure is used when the POGS 33 will not be used for extended periods of time or will be shipped.

11.3.1 Generator Shutdown

a.) Close all four (4) Oxygen Outlet Valves on the Generator Control Panel by turning them to the 9:00 position.

b.) Close all three (3) of the Medical Air Outlet Valves by turning them to the 9:00 position.

c.) Turn the Power Switch on the Generator Control Panel OFF.

d.) Disconnect the Generator Power Cord from the power source.

11.3.2 Feed Air Compressor Shutdown

a.) Remove the Tethered Retaining Clip from the Feed Air Compressor Exterior Lid Support Base to release the Feed Air Compressor Exterior Lid Support.

b.) Open the Exterior Feed Air Compressor Lid fully.

c.) Turn the Compressor Power Switch on the Compressor Interior Cover OFF.

d.) Disconnect the Compressor Power Cord from the power source.

e.) Lower the Exterior Lid without engaging the Exterior Lid Support to prevent foreign object entry.

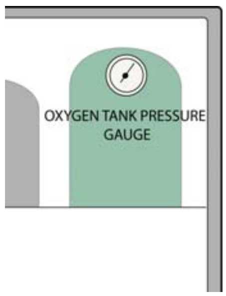
11.3.3 Relieve Air Receiver Pressure

Follow 11.2.2 to relieve Air Receiver Pressure

11.3.4 Relieve Oxygen Receiver Pressure

a.) Slowly open one or all of the Oxygen Outlet Ports on the front of the Generator panel.

b.) Close the Outlet Ports when the Oxygen Outlet Pressure Gauge reads zero (0),



11.3.5 Prepare the Generator for Storage and/or Shipping

a.) Remove all Oxygen Flowmeters from the Oxygen Outlet Ports.

b.) Remove any accessories installed on the Medical Air Outlet Ports.

c.) Secure all of the Oxygen Flowmeters and Generator Accessories in the Accessory – Microboost Box.

d.) Disconnect the hose attached to the Generator Feed Air Inlet Port using Air Hose Wrench.

e.) Lay the Generator on its rear side (minimum 4 people required).

f.) Install the Generator Exterior Lid on the Generator.

g.) Secure the cover by closing all fourteen (14) latches.

11.3.6 Prepare the Feed Air Compressor for Storage and/or Shipping

a.) Disconnect the Remote Supply Air Hose using the Air Hose Wrench and secure in the Accessory – Microboost Box.

b.) Be sure to reinstall the Air Inlet Filter to the Compressor Inlet Port if necessary.

c.) Securely tighten the Air Hose Wrench onto the Rain Guard.

d.) If supplied with the pigtail connector, snap the pigtail and cord into the spring holders on the Compressor interior cover.

e.) If supplied with the 30 foot power cord, insert it on top of the Compressor Interior Lid.

f.) Close the Feed Air Compressor Exterior Lid and secure by using all seven (7) latches.

APPENDIX 1 – Quick Reference Card

A Quick Reference Card detailing connection and operating information for the POGS 33C is enclosed in the manual following this page.

POGS 33 STARTUP AND SHUTDOWN

WARNING: *When the Oxygen Generator is turned on for the first time after a prolonged shutdown period, the Oxygen receiver should be purged as described below.*
WARNING: *Feed Compressor may be in standby mode, not off. Make sure power is "off" before start-up.*

NORMAL ROUTINE START UP

Follow this procedure to start the Generator for normal operation. If this is the first time the unit has been started, has been moved to a new location, or has had a change to the power source, follow the Initial Start- Up Procedure (see below).

1) Connect compressed air line from the Compressor to the POGS 33 Generator
2) Turn the Compressor's power switch "ON".
3) Turn the POGS 33 Generator's Main Power switch "ON". Observe the oxygen purity. If the purity is below 90-96%, attach the oxygen flow meter(s) and set flow to 15-33 LPM until USP 93% oxygen content or higher is obtained. The POGS 33 is now ready for use; turn alarm switch to "Active".

INITIAL START-UP

1) Plug in power to the POGS Generator 110v/60Hz/1 ph and plug in power to POGS compressor 208/60/3ph. Then verify proper compressor rotation:
2) Connect compressed air line from the compressor to the POGS 33 Generator.
3) Turn on the Compressor
4) Turn POGS 33 Generator Main Power Switch "ON".
5) When Oxygen Tank Pressure reaches approximately 70 PSIG, the amber LED marked "Standby" should light up and oxygen production will cease. When oxygen is used the oxygen pressure falls to 55 PSIG, the amber light will go off and oxygen production will resume. This gauge is located at the upper right hand corner inside the Generator.
6) UPS 93% oxygen content will be obtained within 45 minutes. After the POGS 33 has gone into "Standby", connect one of the patient oxygen flow meters and set flow to 15-33 LPM to purge lower purity oxygen from the tank. Continue to flow until 90-96% oxygen content is obtained. The alarm switch should be in the "Bypass" position until the 90-96% oxygen level has been achieved.
7) As oxygen from the oxygen tank gets used, the oxygen purity continues to increase to the specified level. Accelerate the oxygen purity level by letting the generator go in and out of standby mode approximately six times with out going below 50 PSIG:

Purging Procedure:

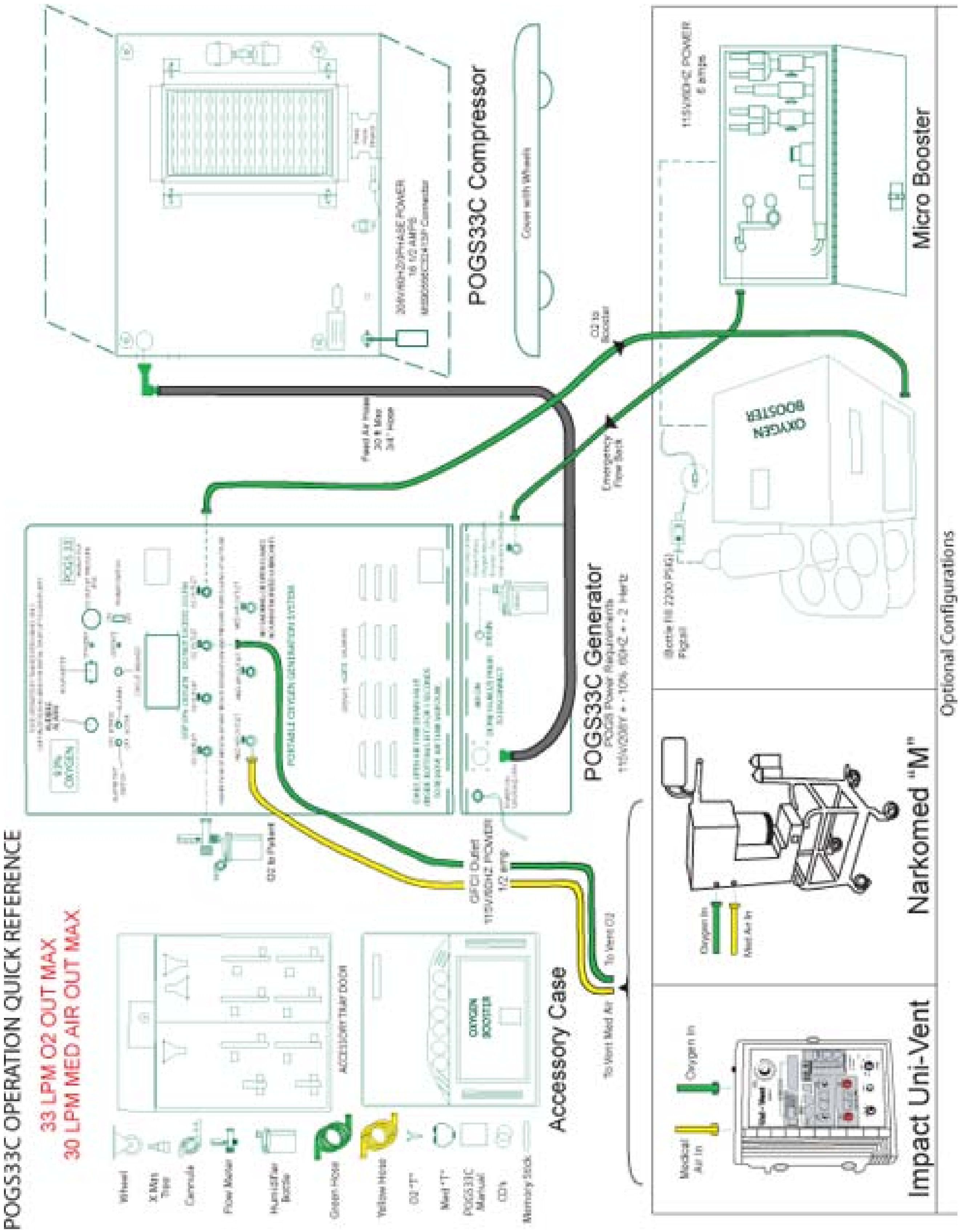
- Step 1-Let generator go into standby (amber LED on)
- Step 2-Bleed the oxygen out by allowing oxygen flow from flow meter until generator begins to run
- Step 3-Stop flowing the oxygen so it can go to "Standby" (amber LED on) again
- Step 4-Repeat six (6) times, or until purity is reached

WARNING: *If the generator or any part of the systems had been opened to the atmosphere, the system must be purged of any residual air to bring the product purity back to specifications. Do this by using the purging procedure (above).*

SHUTDOWN

1. Shut off all valve knobs for O2 (4) and Medical Air (3). Turn POGS 33 Generator Main Power switch "OFF"
2. Turn Generator Alarm Switch to "Bypass"
3. Turn Feed Compressor power switch "OFF"
4. Inside POGS generator cabinet at bottom left is a black valve knob. Use this to bleed any water out of air tank; with power off, open slowly and bleed-out water until only air bleeds out.
5. Near this same valve knob is the air tank water bottle. Empty the bottle and replace.

WARNING: *The generator will remain pressurized after shutdown. Before performing any maintenance or opening any piping systems, always depressurize the system; open the oxygen and air outlets to depressurize. Failure to do so may result in injuries.*


POGS33C OPERATION QUICK REFERENCE
33 LPM O2 OUT MAX
30 LPM MED AIR OUT MAX
Wheel
X-Mas Tree
Cannula
Flow Meter
Humidifier Bottle
Green Hose
Yellow Hose
O2 "T"
Med "T"
POGS33C Manual
CD's
Memory Stick
ACCESSORY TRAP DOOR
OXYGEN BOOSTER
Accessory Case
To Vent Med Air
To Vent O2
GFCI Outlet
115V/60HZ POWER
1/2 amp
O2 to Patient
POGS33C Compressor
Cover with Wheels
Feed Air Hose
20 ft Max
3/4" Hose
POGS33C Generator
POGS Power Requirements
115V/208V +- 10% 60HZ +- 2 Hertz
O2 to Booster
Emergency Flow Back
Bottle fill 2200 PSIG Pigtail
115V/60HZ POWER
6 amps
Micro Booster
Medical Air In
Oxygen In
Med Air In
Impact Uni-Vent
Narkomed "M"
Optional Configurations

POGS 33 C
Portable Oxygen Generation System
33 LPM

MAINTENANCE MANUAL

PSA Oxygen Generator
On Site Gas Systems, Inc.

Manufactured by:

On Site Gas Systems, Inc.

35 Budney Road, Budney Industrial Park, Newington, CT 06111, USA

Telephone: +1-860-667-8888   Fax: +1-860-667-2222

E-mail: pogs@onsitegas.com - Web site: www.onsitegas.com

Maintenance Manual V1.9

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Table of Contents

CAUTION

Oxygen dramatically increases the flammability of otherwise nonflammable items, such as synthetic clothing. Caution should be used surrounding this system. Do not smoke. DO NOT USE oil to clean or lubricate any component of system.

WARNING

Before attempting any maintenance or service procedures that may expose the sieve beds to the atmosphere, ensure that the service or maintenance is completed and the sieve beds do not remain exposed for an extended period of time.

WARNING

Before attempting to perform any maintenance procedures, make certain that the air supply is turned off, the electrical source is locked-out, and the POGS 33 system is depressurized!

WARNING

The interior of the control cabinet contains electrical parts that will produce an electrical hazard if not properly handled. Use extra caution when servicing this equipment to prevent electrical shock. Be sure to unplug the power cord before working inside the cabinet.

WARNING

Ensure the power has been disconnected prior to touching any electrical connections.
Electrical shock can cause serious or fatal injury.
Only Qualified personnel should attempt the installation, operation and maintenance of this equipment.

1 MAINTENANCE OVERVIEW

1.1 How to Purchase Spare Parts

1.1.1 Ordering from On Site Gas Systems

Mailing Address: 35 Budney Rd., Newington, CT 06111 USA
Telephone: 860.667.8888
Fax: 860.667.2222
Email: pogs@onsitegas.com
Website: www.onsitegas.com (through "Contact Us")

1.1.2 Methods of Payment Accepted

Cash, check, money order, or wired monies
Credit card
Letter of credit
Approved credit with deposit

1.2 Tools and Equipment Required for Maintenance

Tool	Detailed Types
Adjustable Wrench	6" 8" 12"
Screwdrivers	Phillips Slotted
Electrical Kit:	Multi Tool Wire Cutters Meter
Channel Lock Pliers	Wire Cutters
Allen Wrench Set	Ameri. Standard
Utility Knife	
Teflon Tape	
Leak Check Fluid	Snoop
Grease	Baldor Polyrex
Hand Held Oxygen Sensor	
Flow Meter	1 SCFH
SMC Fittings	
Auto Drain Restrictor	

1.3 Spare Parts List

(Key: B = Bottom Tray   T = Top Tray)

Conf. ID	Figure Drawing	Item ID	Item Description	Part Number	Location	Recomm. Quantity
Filters, Regulators						
Gen.	2	33	Particulate Filter Assembly	F26-04-FMO	B 1	1
Gen.	3	72,83	Inline HEPA Filter (Medical Air, Oxygen)	615A-1/4A1-10H	B 1	1
FAC	6	127	Auto Drain Regulator	NAP-100 N02	B 1	1
Gen.	3	81,88	Outlet Pressure Regulator	R374-02CP/N	B 1	1
Filter Accessories						
Gen.	3	73	Inline HEPA Filter Element	10H04-013	T 2	12
FAC	6	122	Particulate Filter Bowl (F26)	P33-043	T 2	1
FAC	N/A	33	Filter Element Retainer	FRP-96-944	T 2	1
FAC	N/A	33	O-Ring, Filter Bowl	GRP-96-768	T 2	10
FAC	5	115	Supply Air Filter Element	O6	T 2	12
FAC	5	114	Cooling Air Filter Element	5W967	T 8	12
FAC	2	33	Particulate Filter Element	FRP-95-115	T 2	8
Gen.	N/A	54	Inline Filter Element	EKP2	T 2	4
Gen.	3	54	Inline Filter	PIF-2M	T 2	4
Electrical Parts						
Gen.	3	57	Standby Mode Pressure Switch	HC26A214	T 3	2
FAC	6	125	Pressure Switch	96211-BB5	T 3	1
Gen.	3	82	Pressure Switch	HB16A214	T 3	1
Gen.	2	14	Circuit Breaker	548-1053	T 3	1
Gen.	2	16	Power Switch (On/Off) - Rocker	676-5500	T 3	1
FAC	6	106	Power Switch (On/Off) - Toggle	2GK5173	T 3	1
Valves						
Gen.	3	61	Oxygen Sample Flow Valve, 1/8"	3121BBN1NV00N0M3	T 4	1
Gen.	3	60	Purity Flow Valve, 1/8"	MAC111B-111BA	T 4	1
Gen.	2	34	Drain Valve, 1/4"	04F20C211ACF4C05	T 4	1
FAC	6	126	Automatic Drain Valve, 1/4"	04F20O1106ACF4C15	T 4	1
Gen.	N/A	77	Kit, Valve Repair (For VNB201)	VN2-4BA	T 4	2
Gen.	3	53,77,84	Air Saver Valve, 1/2"	VNB201A-15A	T 4	1
Gen.	3	68	Air Saver Pilot Valve	NVZ1120-3G M5	T 4	2
Gen.	3	70	Timer Assembly with motor	TM3A 605	T 4	1
Gen.	6	123	Check Valve, 1/2"	CV500B-V-1	T 4	1
Gen.	3	55	Check Valve, 1/4"	ICV250B-V-1	T 4	4
Gen.	3	86	Oxygen Receiver Relief Valve, 100psi	KSV10-1/4-100	T 4	1
MB	10	200	Cartridge Valve, Soft Seat	SS-110K	T 4	2

MB	N/A	200	Cartridge Valve Insert, Soft Seat	SS-CK	T 4	2
Gen.	3	85	Air Receiver Relief Valve, 150psi	KSV10-1/4-150	T 4	1
Miscellaneous / Other						
Gen.	3	59	Oxygen Receiver Pressure Gauge, 0-100 psi	ONS200-1	B 5	1
Gen.	3	52	Air Receiver Pressure Gauge, 0-160 psi	102D-204F	B 5	1
Gen.	3	67	Dew Point Sensor (Exchange Program)	03009-001	B 5	1
Gen.	3	74	Medical Air Pressure Gauge, 0-100 psi	ONS200-2	B 5	1
Gen.	2	11	Oxygen Outlet Pressure Gauge, 0-100 psi	ONS200-4	B 5	1
FAC	6	133, 135	Interior Cooling Fan, 6"	3VU63	B 5	1
FAC	6	140	Compressor Drive Belts	3V375	B 7	4
MB	N/A	N/A	Valve Kit, Microbooster	X204-MB-2	T 4	1
FAC	5	116	Feed Air Hose, 15 ft	FAH-15	B 7	1
FAC	5	117	Remote Supply Air Hose, 15 ft	RSAH-15	B 5	1
FAC	6	149	Heater	H2012B-3	B 5	2
N/A	N/A	N/A	USB Drive, 64MB	554530	B 5	1
FAC	7	162	Hatch Support	321296-1	B 7	1
N/A	N/A	N/A	Teflon Tape	63134	B 5	4
N/A	N/A	N/A	Elbow, Tubing 1/4" x 1/4"	KQL07-35S	B 5	10
N/A	N/A	N/A	Elbow, Tubing 1/8" x 1/4"	KQL07-34S	B 5	10
Gen.	3	65	Oxygen Sensor	C1-16-1000-01-0	B 5	1
Accessories						
Gen.	2, 4	38	Oxygen Flowmeters	FM103	T 6	2

All Level 1, packaged in MIL-Spec Hardigg Case (p/n AL2624-1205)

REV 2 APRIL 19, 2006

2 MAINTENANCE AND CALIBRATION CHART

Component: UNIT POGS33C Maintenance and Calibration Chart Rev Date: 1/9/06 Updated 5/4/06

			Frequency							
Item	**Maintenance Item**	**ID#**	**Daily**	**Monthly**	**3 mnths**	**6 mnths**	**Annual**	**2 Year**	**Remarks**	**P/N**
Logbook	Enter Data		◆	◆	◆	◆	◆	◆		
1) POGS Gen	Manual H2O Drain	79	⇨	⇨	⇨	⇨	⇨	⇨		
2) O2 Sensor	Sample Flow	65	⇨	⇨	⇨	⇨	⇨	⇨	1 scfh	
3) CO Monitor	Sample Flow	67	⇨	⇨	⇨	⇨	⇨	⇨	1 scfh	
1) POGS Gen	Leak Check		●	●	●	●	⇨	⇨		
4) FAC	Inspect Fans	133	●	●	●	●	●	●		3VU63
5) Rix MB	Leak Check		●	●	●	●	⇨	⇨		
5) Rix MB	Piping Inspctn		●	●	●	●	●	●		
4) FAC	Supply Air Filters	113	●	●	●	●	●	●	User Determined AR	C-61352
2) O2 Sensor	Calibration	65		△	△	△	△	■	Cal at initial setup & AR	
4) FAC	Belt Adjustment	140		●	●	●	⇨	■	Also at initial startup	3V375
4) FAC	Top Cooling Filter	114		■	■	■	■	■	User Determined AR	5w967
3) CO Monitor	Co Sensor Cal	67			△	△	△	■	Replace when can't Cal	67016-1204
4) FAC	Inspect Motor	137			●	●	●	●		M3218T
4) FAC	Inspect Magnetic starter	150				●	●	●	Replace if points worn	CN0511EAA
1) POGS Gen	Med Air Hepa Filter	72				■	■	■	User Determined AR	1506A
1) POGS Gen	O2 Hepa Filter	93				■	■	■	User Determined AR	1506A
1) POGS Gen	Particulate F26	33				■	■	■	User Determined AR	FRP-95-115
3) CO Monitor	Dew Point Sensor	67					△ ■	△ ■	Exchange Program	03009-001
4) FAC	Lube Motor	137					⇨	⇨	SPD-3600 -- 5500 HOURS	Exxon EM
4) FAC	Clean Compressor Fins	138					⇨	⇨	2,500 Hours ⇨■	
4) FAC	Blower Fan, Fan Duct						⇨	⇨	5,000 Hours clean	
1) POGS Gen	Inspect safety valves	86,86					●	●		
4) FAC	Inspect Pressure Switch	125					●	●		96211-BB5
5) Rix MB	1st Stage Relief valve						●	●	RIX ID (25)	X54P-4P50NSS
5) Rix MB	2nd Stage Relief valve						●	●	RIX ID (42)	XA515-A8449
5) Rix MB	Pressure Switch						●	●	RIX ID (17)	X76-5659
5) Rix MB	Discharge valve 3rd						●	●	RIX ID (19)	XAD15-A8576
5) Rix MB	Suction valve 3rd						●	●	RIX ID (20)	XAS15-A8594
3) CO Monitor	Particulate filter	67					■	■		73089-002
2) O2 Sensor	Replace Sensor	65						■		P/N C1-16-1000-01-0
3) CO Monitor	Humidifier Tube	67						■	Replace when chg CO	73108-002
4) FAC	Replace Tip Seal	138							10,000 Hours ⇨■	IP604600AV
4) FAC	Replace Dust seal	138							10,000 Hours ⇨■	IP601900AV
4) FAC	Lube Scroll Compressor	138							10,000 Hours ⇨■	IP00000AV

Check user manual for latest Maintenance requirements. Severity of environment may require more frequent. Maintenance/Filter changes.

POGS Gen	POGS 33 Generator
O2 Sensor	Oxygen Sensor
CO Monitor	Carbon dioxide Monitor
FAC	Feed Air Compressor
Rix MB	Rix Microbooster

◆	Entry
⇨	Action
△	Calibrate (Cal)
●	Inspect
■	Replace
AR	As Required

Updated 5/4/06

Item	Maintenance Item	Daily	Monthly	3 mnths	6 mnths	Annual	2 Year	Remarks	P/N
		Frequency							
Logbook	Enter Data	◆	◆	◆	◆	◆	◆		
1) 2P Booster	Belt Adjustment				●➪	●➪	●➪	2000 hours belt adjust	41-520J6
1) 2P Booster	Gas Piping				●➪	●➪	●➪	2000 hours leak check	ALL PIPES
1) 2P Booster	Bearing Inspection				●➪	●➪	●➪	2000 hours bearing	181-7
1) 2P Booster	Piston Ring Replacement 2nd Stage				●➪	●➪	●➪	2000 hours ring rpl	X18-A2750-3G
1) 2P Booster	Filter Cleaning				➪	➪	➪	2000 hours Clean	XA77-505
1) 2P Booster	Piston Ring Replacement 1st Stage					●➪	●➪	3000 hours leak check	X18-C1147-14-1G
1) 2P Booster	Compressor Valves Inspection and Reconditioning						●➪	4000 hours	XAO15-A5565
1) 2P Booster	Pressure Relief Valve						●➪	4000 hours	X515-852,855
								O2 GREASE	45-1006

Check user manual for latest Maintenance requirements.
Severity of environment may require more frequent.
Maintenance/Filter changes.

◆	Entry
➪	Action
△	Calibrate (Cal)
●	Inspect
■	Replace
AR	As Required

3 MAINTENANCE SHUTDOWN (When Required)

IMPORTANT

The Feed Air Compressor should not be shut down while the Generator is operating.

3.1 Maintenance Requiring System Operational vs, Shutdown

Some maintenance procedures require the system to be operational and pressurized, while others require system shutdown. The maintenance procedures are organized as follows:

A. System Operational and Pressurized

a.) Feed Compressor
b.) Generator
c.) Microboost
d.) HV Booster

B. System Operational and Pressurized Followed by Shutdown

C. System Shutdown

3.2 System Shutdown Procedures

a.) Close all four (4) Oxygen Outlet Valves on the Generator Control Panel by turning them to the 9:00 position.
b.) Close all three (3) of the Medical Air Outlet Valves by turning them to the 9:00 position.
c.) Wait for the Generator to move into Standby Mode, as indicated by the STANDBY Indicator on the Control Panel.
d.) Turn the Power Switch on the Generator Control Panel OFF.
e.) Turn the Compressor Power Switch on the Compressor Interior Cover OFF.
f.) Unplug all components.

A. Relieve Air Receiver Pressure

a.) Open the Generator Control Panel by pulling on the two (2) latches.
b.) Slowly open the Manual Condensate Drain Valve and allow air to flow until the Air Receiver pressure reaches zero (0) PSIG.
c.) Air Receiver pressure may be verified by inspecting the Air Receiver Pressure Gauge in the Generator Interior at the top of the Air Receiver.

B. Relieve Oxygen Receiver Pressure

a.) Slowly open one or all of the Oxygen Outlet Ports on the front of the Generator panel.
b.) Close the Outlet Ports when the Oxygen Outlet Pressure Gauge reads zero (0).

IMPORTANT

The Sensor Exhaust must not be blocked in any way.
Any blockage that creates backpressure will damage the Analyzer Sensor.
If using a flow meter with a flow control, ensure the flow control is fully open before connecting to the sensor exhaust.

4 DAILY MAINTENANCE

4.1 Maintenance Logbook

It is strongly recommended that all maintenance work be recorded in a Maintenance Logbook. This will assure that good maintenance policy is employed and will provide valuable information should troubleshooting become necessary.

4.2 Maintenance Requiring System Operational and Pressurized

A. Generator - Manual H_2O Drain – Drain

a.) Unlatch the Control Panel to access the Generator interior.
b.) Slowly open the Manual Condensate Drain Valve at the bottom of the Air Receiver.
c.) Leave the Valve open until water no longer drains from the Air Receiver.
d.) More frequent draining may be necessary in hot and/or humid climates.
e.) The Condensate Drain Bottle should be disconnected, emptied, and re-installed as necessary.

B. Generator - O_2 Sensor - Sample Flow – Test

a.) The Analyzer Sensor receives a sample flow of either oxygen or ambient air, depending on the position of the Operate/Calibrate Valve Handle. The sample flow is turned on or off by the Analyzer Sample Flow Valve, and is regulated to 1 SCFH by the Analyzer Sample Needle Valve.
b.) The Analyzer Sensor Block has a fitting with a length of 5/32" tubing attached. This is the sensor exhaust.
c.) The flow through the Oxygen Sensor assembly can be verified by attaching a flow meter to the sensor exhaust tube (1 SCFH observed). The Generator Power Switch must be in the "ON" position for the Sample Flow Valve to allow flow through the Analyzer Sensor.
d.) If a flow meter is not available, flow through the Analyzer Sensor should still be verified. Holding a wet finger or lips close to the end of the sensor exhaust tube, with the Generator Power Switch in the "ON" position, a small flow should be felt.
e.) The Sample Flow Valve should allow flow through the Analyzer Sensor whenever the Generator Power Switch is in the "ON" position. This includes both Operate and Standby modes.
f.) If proper operation of the Analyzer Sample Flow Valve is not observed, a qualified electrician should verify that the valve is receiving power, and the valve replaced if necessary.

C. Generator - CO/Dewpoint Monitor - Sample Flow – Test

a.) 1.5 to 2.4 SCFH of Medical Air sample flow should be observed on the CO/Dewpoint Monitor front panel.
b.) The pressure of Medical Air Gauge should be greater than 48 PSIG.

D. Microboost - Leak Check – Inspect

a.) To perform a leak check, the Microboost must be operational and attached to an oxygen source such as a POGS 33C or a fully pressurized Oxygen bottle. A minimum of two oxygen-receiving bottles will be required to complete a leak check of the system.

b.) A complete system check will require that all connections including five of the manifold hoses be tested. Each pair of outside hoses must be tested together as they are controlled by one valve. All five manifold hoses can be tested at the same time if five oxygen-receiving bottles are available.

c.) Attach the D/E connection from the manifold hose to a closed oxygen-receiving bottle.

d.) Close all valves including any hose or pair of hoses not connected to an oxygen-receiving bottle. Do not close the valve to the hose or hoses being tested.

e.) Connect the oxygen source to the Microboost inlet port. If a POGS Generator is the source, assure it is running.

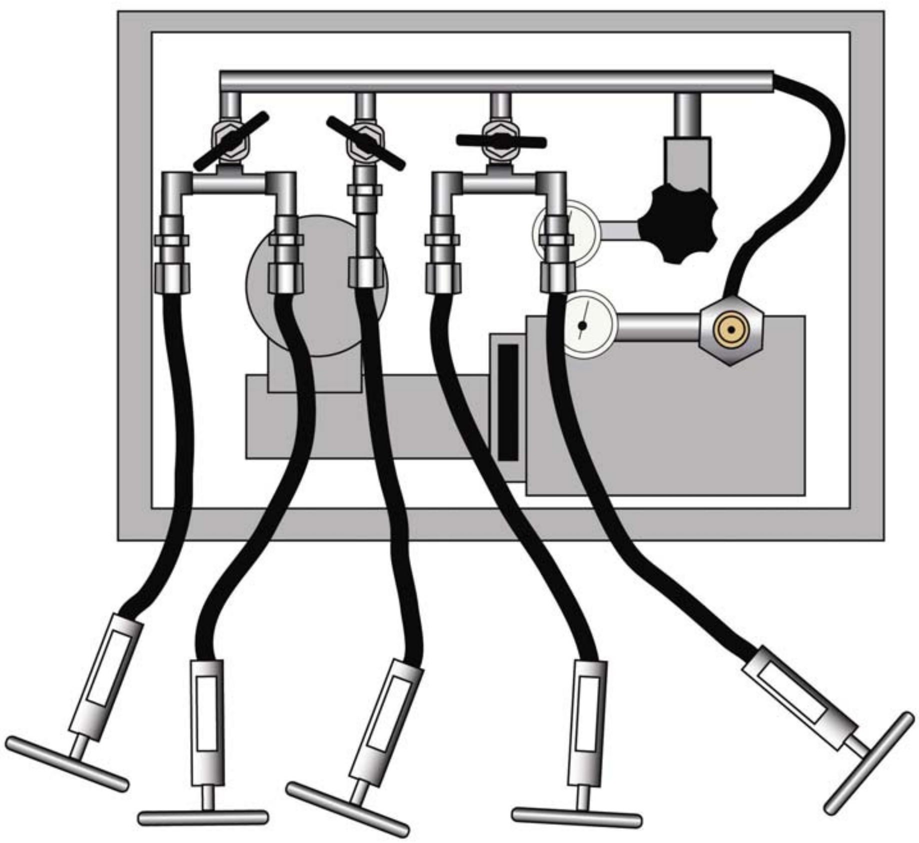
f.) Start the Microboost by putting the On/Off Rocker switch to the ON position then pushing the start button.

g.) Allow the Microboost to build pressure until it reaches approximately 2200 PSIG and automatically shuts off.

h.) Monitor the pressure drop on the Gauge. There should be zero change in pressure in ten minutes.

i.) Repeat for every hose or pair of hoses until all five have been checked.

Microboost



4.3 Maintenance Requiring System Operational and Pressurized Followed by Shutdown

A. Feed Air Compressor - Fans – Inspect

a.) Visually inspect that the cooling fans operate when the compressor is running.
b.) Assure electrical plugs are securely installed.
c.) Shutdown power to remove dust and debris from the fan blades.

B. Generator - Leak Check – Inspect

a.) Allow system to reach standby mode. Standby mode is in effect when the amber-colored Generator Standby indicator on the front panel becomes illuminated and the Compressor motor shuts off automatically.
b.) The Generator may cycle a few minutes until the pressure equalizes in all the tubing and valves.
c.) When The Compressor and Genator reach standby mode turn off the power switches on both the Generator and Compressor.
d.) Note the pressure readings on the Air tank and the Oxygen Tank located inside the front panel at the top of the Generator.
e.) Monitor the pressure drop on the two gauges. There should be zero change in pressure in ten minutes.

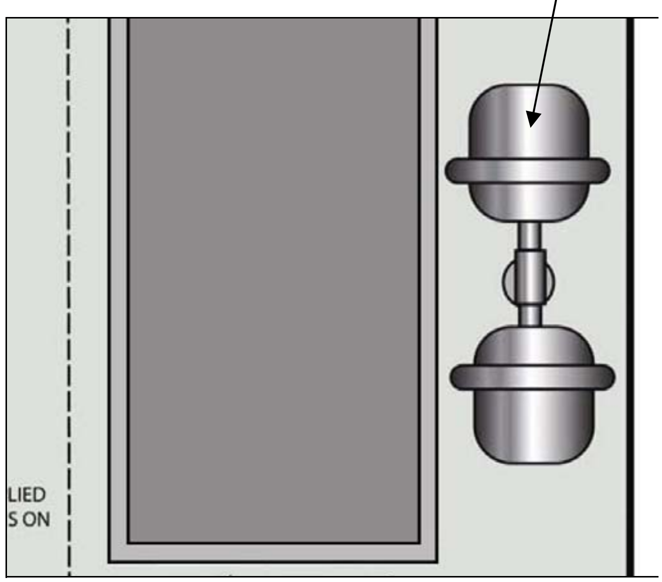
4.4 Maintenance Requiring System Shutdown

A. Microboost - Piping – Inspect

a.) Visually inspect all joints, hoses and tubes for cracks, damage and secured connections.
b.) Verify the ends of the D/E connectors contain a filter plug and a blue die yoke gasket.

B. Feed Air Compressor - Supply Air Inlet Filters - Replace

a.) Remove the Supply Air Filter Elements from the **Supply Air Inlet Assembly** and inspect.
b.) Replace the element if dirty.



5 MONTHLY MAINTENANCE

5.1 Maintenance Requiring System Operational and Pressurized

A. Generator - O_2 Sensor – Calibrate

a.) After 30 minute warm-up apply stream of calibration Gas 90% to 95% O2 to Sensor Assembly. Close the operate calibrate switch on panel (place in vertical position).
b.) Connect 5/32" tube from Cal Bottle. Open bottle and adjust regulator to 50 PSIG max. Allow Gas to flow 2 minutes before continuing.
c.) Press and release the "MODE" key once.
d.) The Display will Show "CAL" then an oxygen concentration value. ie 95%.
e.) Use the up and down arrows to adjust display to value of O2 in Calibration Gas. ex. 95%. (Value should be written on Cal gas bottle Tag. Only Certified Gas should be used. Cert Gas is available from the Gas Supplier).
f.) Press and release the "MODE" key four times to return to "Run" mode.
g.) Keep Cal gas on for 5 more minutes to ensure there is no change in the O2 Value.
h.) Turn Operate Calibrate switch to Calibrate. Air 20.9. Display will go from 95% to 20.9 in approx. 1-1/2 minutes.
i.) Press and release the "MODE" key once.
j.) The Display will Show "CAL" then an oxygen concentration value. 20.9.
k.) Use the up and down arrows to adjust display to 20.9.
l.) Press and release the "MODE" key four (4) more times to return to "Run" Mode.
m.) Repeat steps A thru K at least three (3) times. Ensure Response time is approx. 1-1/2 minutes from 20.9%to 95%. The accuracy of the 1100 is +- 2%.

5.2 Maintenance Requiring System Shutdown

A. Feed Air Compressor - Top Cooling Filter – Replace

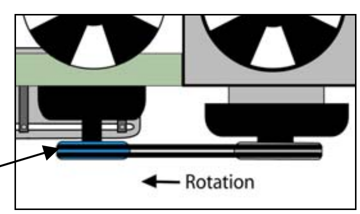
(Part #: 5W967)

a.) The cooling air filter element prevents dust, dirt, and other particles from entering the Compressor Interior during operation. A dirty filter element will restrict cooling airflow and may cause overheating conditions.
b.) Open the Rain Guard by sliding the four (4) bolt locks away from the Guard and lifting upward.
c.) Remove the cooling air filter element and discard.
d.) Install a new cooling air filter element, ensuring that the arrow on the side of the element points downward.
e.) Close the Rain Guard by lowering the Guard and securing in place by sliding the four (4) bolt locks toward the Guard.

B. Feed Air Compressor - Belt Tension – Inspect and Adjust

a.) Inspect

- Before performing any inspections or adjustments: shutdown the Feed Air Compressor and Generator and disconnect power.
- Open the Compressor Interior Cover.
- Apply approximately 10 pounds of force at the mid-span of the belt between the pulleys.
- The belt should deflect ½" to ¾".
- Visually verify the belt is not frayed, worn or damaged.



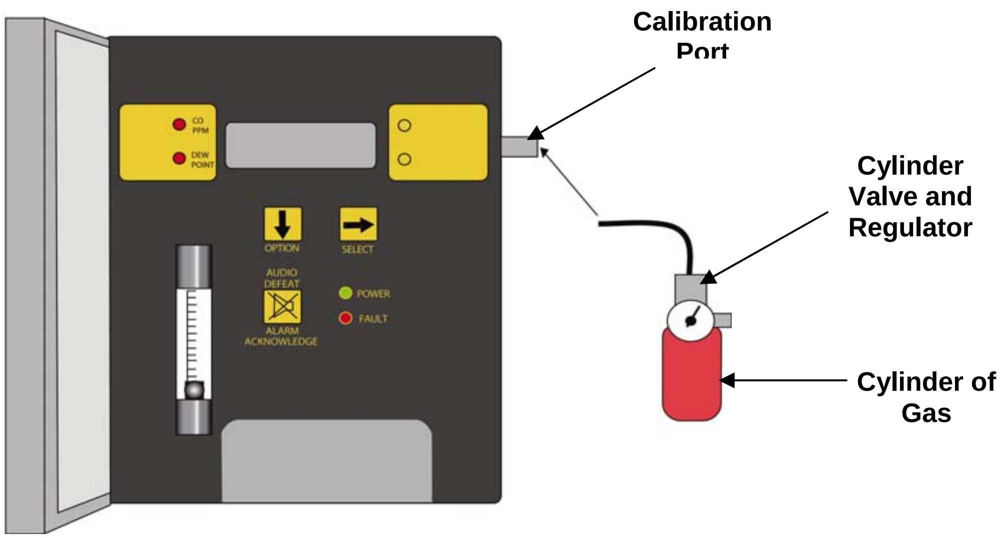
b.) Adjust

- Using a $^{9}/_{16}$" wrench, loosen the four mounting nuts securing the Compressor Motor mounted to the frame.
- Using a ¾" wrench, turn the bolt on the lower left of the frame clockwise to tighten and counterclockwise to loosen the belts.
- Adjust belt tension to ½" to ¾" deflection and tighten the four mounting nuts.

6 THREE-MONTH MAINTENANCE

6.1 Maintenance Requiring System Operational and Pressurized

A. Generator: CO Sensor – Calibrate



a.) Calibration of the Carbon Monoxide Sensor requires the following items:
- Calibration Adapter
- A cylinder of 20.9% oxygen (zero gas)
- A cylinder of 20 PPM Carbon Monoxide (span gas)

b.) Air Monitor maintenance menu is accessed with the OPTION and SELECT switches. From the operational display, press the OPTION switch twice, "run MAINTENANCE MODE" is displayed.

c.) Entrance to the maintenance menu is guarded with a four-digit key. The factory default setting of the key is 1270. When a valid numerical key is inserted, the user is allowed to enter the maintenance menu.

d.) In the "run MAINTENANCE MODE" position:
- Press the SELECT switch; " KEY = 0000 is displayed.
- In the "KEY =0000" position, the underline curser is under the left digit.
- Press the OPTION switch to change the left digit; select the correct digit.
- Press the SELECT switch, which locks the correct digit in place and moves the curser one digit to the right.

e.) Continue this procedure until the four-digit key is complete. When a valid key is inserted in this manner, the display is transferred to the "run AUTOMATIC ZEROING" portion of the menu. If an invalid key is inserted, "INVALID" is displayed briefly; then the Medical Air Monitor returns to the operational display.

f.) Automatic Zeroing:
- Insert a valid Key, (1270) is preset at the Factory, in order to display "run AUTOMATIC ZEROING".
- Press the OPTION switch once to display "FULL CALIBRATION".
- Press the OPTION switch once to display "ATTACH ZERO GAS".
- Attach a cylinder of zero gas to the Calibration Port using the Calibration Adapter.
- Open the cylinder valve, set the regulator at 55 PSIG and turn the red handle of the sample calibrate valve up toward the calibration port.
- Let the gas flow for about a minute.

- Press the SELECT switch.
- "ZERO = 30   .00V" is displayed. This is a timer that counts down from 30 seconds.
- At the end of that time the procedure is finished and the Display will read "ATTACH SPAN GAS – SPAN = 20".
- Return the Sample-Calibrate valve to the down position pointing toward the Sample Port.
- Remove the zero gas canister from the Calibration Port and proceed with the Calibration procedure listed below.
- If a failure occurs, "Fault-01" is displayed in place of a PPM reading in the operational display. Verify the proper zero gas is attached to the calibration port and the sample calibrate valve is up toward the calibration port. Repeat the "AUTOMATIC ZEROING" procedure.
- If "Fault 01" still occurs, replace the sensor.

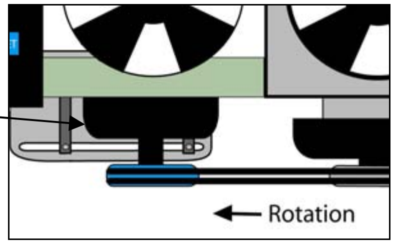
g.) Calibration:

- Attach the 20 PPM span gas to the Calibration Port.
- Open the cylinder valve set the regulator at 55 PSIG.
- Allow the span gas to flow for at least one minute then press the SELECT switch.
- "SPAN = 120 .00V" is displayed. This is a timer that counts down 120 seconds.
- At the end of that time the procedure is completed.
- The ".00V" portion of the display reflects the sensor signal, as it responds to the CO gas. This value should increase.
- After a valid zero and calibration the instrument reverts to the operational display.
- After an invalid zero or calibration, one of the following will be displayed in place of the PPM reading in the operational display.

Display	Cause	Possible Remedy
Fault 01	An invalid zero	Verify proper <u>zero gas</u> is attached to calibration port and sample-calibration valve handle is up Perform automatic zero Change Sensor.
Fault 02	An Invalid Calibration	Verify proper <u>span gas</u> is attached to calibration port and sample-calibration valve handle is up. Perform calibration. Change Sensor.
Fault 03	An Invalid Zero and Calibration	(Same as Fault 02)

- After this procedure is complete, return the red handle of the Sample Calibrate valve to the down position.

6.2 Maintenance Requiring System Shutdown



A. Feed Air Compressor - Motor – Inspect

a.) Ensure the Compressor Power Switch is in the “OFF” position.
b.) Disconnect the Compressor Power Cord from the power source.
c.) Keep the motor ventilation openings clear.
d.) Check that the interior and exterior of the motor is free of dirt, oil, grease, water, etc. Oily vapor, paper pulp, textile lint, etc can accumulate and block motor ventilation. If the motor is not properly ventilated, overheating can occur and cause early motor failure.
e.) Use an insulation breakdown measuring device periodically to ensure that the integrity of the winding insulation has been maintained. Record the readings in the maintenance logbook. Immediately investigate any significant drop in insulation resistance.
f.) Check all electrical connectors to be sure that they are tight.

7 SIX-MONTH MAINTENANCE

7.1 Maintenance Requiring System Operational and Pressurized

A. High-Volume (HV) Booster (Optional) - Gas Piping – Leak Check

a.) To perform a leak check, the HV Booster must be operational and attached to an oxygen source such as a POGS 33C or a fully pressurized Oxygen bottle. A minimum of two oxygen-receiving bottles will be required to complete a leak check of the system.

b.) All connections including five (5) of the manifold hoses should be tested. Each pair of outside hoses must be tested together as they are controlled by one valve. All five manifold hoses can be tested at the same time if five oxygen-receiving bottles are available.

c.) Attach the H/K connection from the manifold hose to a closed oxygen-receiving bottle.

d.) Close all valves including any hose or pair of hoses not connected to an oxygen-receiving bottle. Do not close the valve to the hose or hoses being tested.

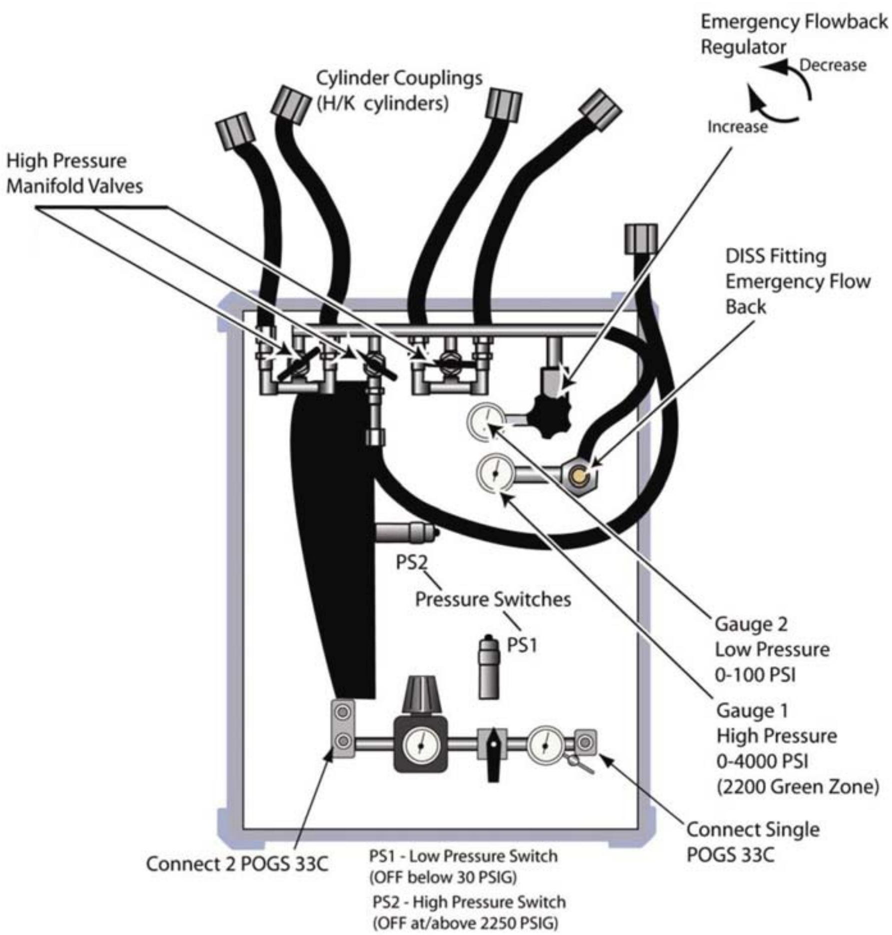
e.) Connect the oxygen source to one of the (HV) inlet ports. If a POGS Generator is the source, assure it is running.

f.) Start the HV Booster and allow it to build pressure to approximatley 2200 PSIG at which point it will reach Stand by and automatically turn off.

g.) Turn the black selector switch straight up to close the flow of Oxygen to the piston.

h.) Monitor the pressure drop on the 4000 psi gauge. There should be no change in pressure in ten minutes.

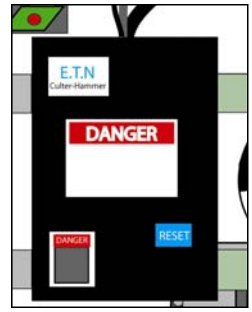
i.) Repeat for every hose or pair of hoses until all five (5) have been checked.



WARNING
Hot discharge lines can produce painful burns. Be careful to avoid making contact with hot pipes while performing tests and repairs.

7.2 Maintenance Requiring System Shutdown

A. Feed Air Compressor - Side Cooling Air Filter Element – Clean



a.) The Side Cooling Air Filter Element prevents dust, dirt, and other particles from entering the Compressor Interior during operation. A dirty filter element will restrict cooling airflow and may cause overheating conditions.
b.) Open the Compressor Interior Cover by removing the four (4) securing knobs and lifting the cover.
c.) The filter is housed in the Side Cooling Air Inlet Louver on the left side of the compressor case.
d.) Remove the filter by grasping and pulling straight up.
e.) Clean filter with compressed air.
f.) Reinstall the filter.
g.) Close the Compressor Interior Cover and secure the four (4) knobs.

B. Feed Air Compressor - Magnetic Starter – Inspect

a.) Open the electrical box located beneath the interior compressor cover.
b.) Verify the wires have remained tightly secured to the terminals.
c.) Verify the heater setting arrows are set to M and C.
d.) Close the Compressor Interior Cover and secure the four (4) knobs.

C. Generator - Medical Air and Oxygen HEPA Filters – Replace

(Part #: 10H04-013)

a.) HEPA filter elements are located in blue housings in the mid section of the Generator interior below the Medical Air Analyzer.
b.) Unscrew the lower bowl from the housing.
c.) Unscrew the black retainer and remove the filter elements and replace.
d.) Reinstall the retainer and bowl.

D. Generator - Particulate Filter – Replace

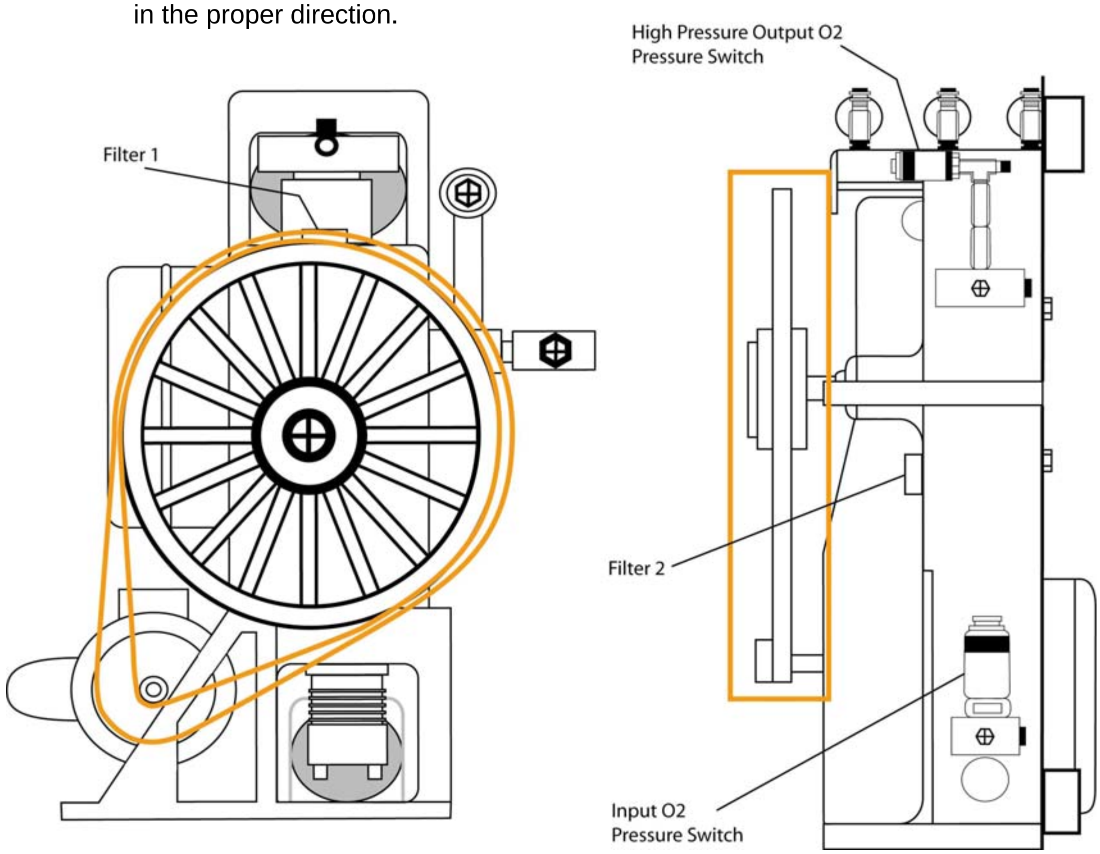
(Part #: FRP95-115)

a.) Push the tab on the filter bowl assembly while rotating the lower section of the filter housing.
b.) Lower and remove the filter bowl assembly.
c.) Unscrew the black retainer holding the filter element in place.
d.) Remove the filter and replace.
e.) Reinstall the retainer securely into the threaded housing.
f.) Reinstall the bowl assembly over the filter and black retainer taking care not to disengage the retainer from the housing.
g.) Engage the locking tab to assure the bowl is securely attached to the housing.

E. High-Volume (HV) Booster (Optional) - Filters – Clean

The external interstage filters should be cleaned. Failing to clean the filters as scheduled may result in improper operation of the compressor valves.

- Remove external filters.
- Clean and thoroughly dry filters.
- Reinstall the filters with the flow in the proper direction.



F. High-Volume (HV) Booster (Optional) - Belt Tension - Inspect and Adjust

a.) Inspect

- Before performing any inspections or adjustments: de-energize the machine by pushing the STOP button, disconnecting the power to the system, venting pressure by opening the output valves and allow the discharge piping time to cool down.
- Remove the belt guard.
- Apply approximately 10 lbs. of force at the mid span of the belt between the pulleys.
- The belts should deflect ½” to ¾”.

b.) Adjust

- Loosen the motor tie down bolts at least two (2) turns.
- Push down on the motor sheave and tighten the motor bolts to adjust belt tension to ½” to ¾” deflection.
- Tighten motor tie down bolts and replace belt guard.

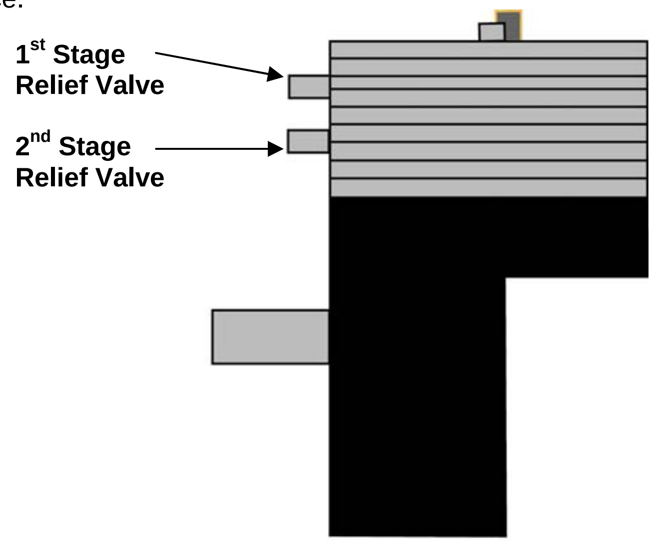
8 ONE-YEAR MAINTENANCE

8.1 Maintenance Requiring System Operational and Pressurized

A. Microboost - 1st & 2nd Stage Relief Valve – Inspect

Relief valves are provided for all compression stages. The first stage (set to 350 PSIG) and second stage (set to 1200 PSIG) relief valves are located on the outside of the compressor as shown. The third stage relief valve (set at 2400 PSIG) is located inside the compressor base. These prevent pressures from rising to levels that might cause damage.

Pressurize the manifold until the booster automatically shuts down at approximately 2200 PSIG. A pop noise occurring during pressurizing indicates a valve will require service.



8.2 Maintenance Requiring System Shutdown

A. Feed Air Compressor - Compressor Fins – Clean

a.) Open the Exhaust Louvers on the exterior Case and visually inspect the Compressor Fins, which are directly behind the Louvers.
b.) Assure that the foam insulation is not covering any of the fins.
c.) Using a vacuum, remove any dust, dirt or debris which may have become attached to the fins.
d.) Remove any oil, grease or moisture with a clean cloth being careful not to clog the fins.

B. Feed Air Compressor - Fan Duct and Blower Fan - Clean

a.) Loosen the four (4) 9/16"mounting nuts securing the Compressor Motor to the frame.
b.) Using a ¾" wrench, turn the bolt on the lower left of the frame counter clockwise to loosen the belts.
c.) Remove the belts from the sheave.
d.) Unscrew five (5) screws and remove the fan cover from the compressor shroud.
e.) Vacuum the Fan Duct and the Centrifugal Fan vanes to remove dust and debris.
f.) Use a clean cloth to wipe away any remaining oil or moisture from the Fan Duct and the vanes of the Centrifugal Fan.
g.) Wipe out any dust, debris and moisture from the Fan Cover and secure it onto the compressor shroud with the five (5) screws.

h.) Install the belts and adjust tension to ½” to ¾” tension by turning the ¾” bolt clockwise.
i.) Tighten the four (4) mounting nuts using a 9/16” wrench.

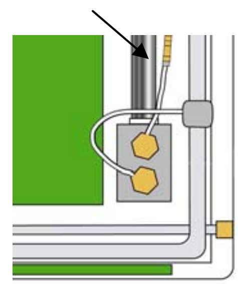
C. Feed Air Compressor - Pressure Switch – Inspect

a.) The pressure switch is leak tested and adjusted at the factory. It should be periodically checked to assure that it is securely attached to the mounting plate and that the setting has not drifted.
b.) With the system powered off, grasp the brass nut at the base of the pressure switch and try to turn it to assure that the nut is securely tightened to the green mounting bracket.
c.) Do not turn the plastic switch housing, as this will change the pressure setting.
d.) Assure the nylon tube is secure in the fitting at the bottom of the switch.
e.) Inspect the pressure setting with the system running. Allow the system to reach stand-by.
f.) Check that the pressure reading on the gage on the top of the blue Air Tank is at approximately 110 PSI while the system is in Stand-by mode.

D. Generator - Dew Point Sensor – Replace

(Part #: 03009-001)

a.) Unlike the CO and O2 sensors, the dew point sensor cannot be field calibrated, and must be calibrated at the factory. To minimize instrument downtime, contact On Site Gas Systems for the dew point sensor exchange program, in which the old dew point sensor can be exchanged for a newly calibrated sensor.
b.) The Spare Parts Kit is equipped with a replacement sensor.



E. Feed Air Compressor - Motor – Lubricate

The two grease fittings are on opposite ends on top of the motor. The grease fitting closest to the V belts can be easily accessed with a grease gun. The motor must be removed from the frame in order to access the fitting opposite the V belts.

a.) A High Grade ball or roller bearing Grease should be used. Recommended grease for standard service conditions is Polyrex EM (Exxon Mobil). Equivalent and compatible greases include Texeco Polystar, Rykon Premium #2, Pennzoil Penn 2 Lube and Chevron SRI.
b.) Special High temperature grease is recommended (DOW Corning DC44) for extreme operating conditions and ambient temperatures above 50 degrees C. Note that DC44 does not mix with other grease types. If used, thoroughly clean bearing and cavity before adding grease.
c.) Clean the grease fitting.
d.) Add 2.0 teaspoons of grease to the bearings

CAUTION

To avoid damage to motor bearings, grease must be kept free of dirt.

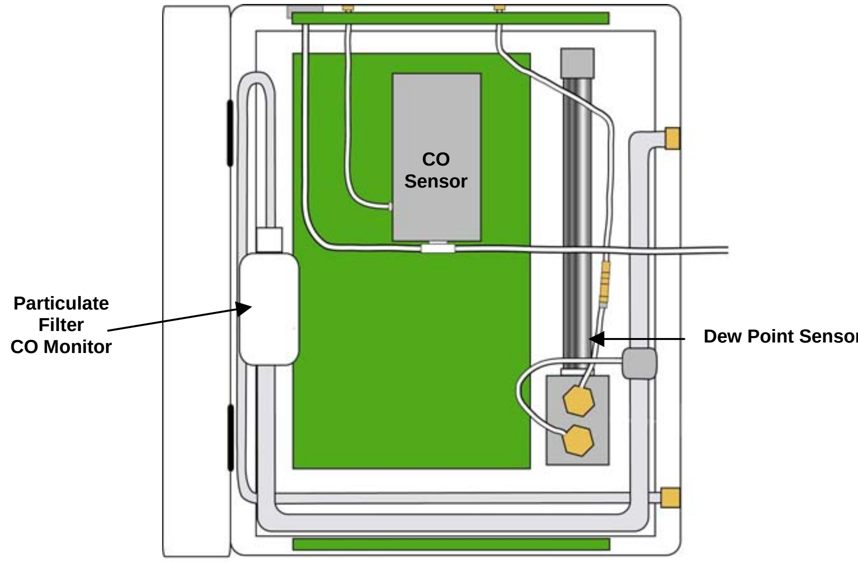
F. Generator - CO/Dewpoint Monitor - Particulate Filter – Replace

(Part #: 73089-002)

a.) On instruments with serial numbers 332 and above, a filter is installed inside the enclosure.

b.) To replace this filter:

- Obtain a new filter
- Note the correct direction of flow, as denoted by the arrow on the filter body.
- Remove the old filter.
- Replace with the new filter.



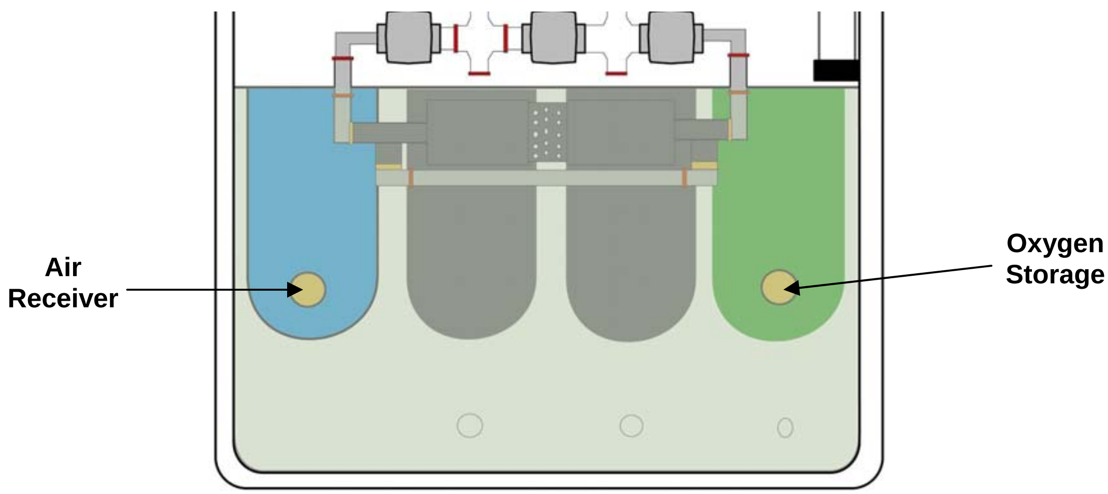
G. Generator - Pressure Relief Valves – Inspect

a.) Relief Valves are located at the bottom of the Generator's Air Receiver Tank and Oxygen Storage Tank.

b.) Visually verify that each valve has not been damaged and that it is free of contamination such as dirt and debris.

c.) Grasp the ring on the top of the valve and pull to open. The valve should pull smoothly and close fully when released.

d.) Replace with a similar PSI and flow-rated valve if the spring mechanism does not provide a smooth actuation.



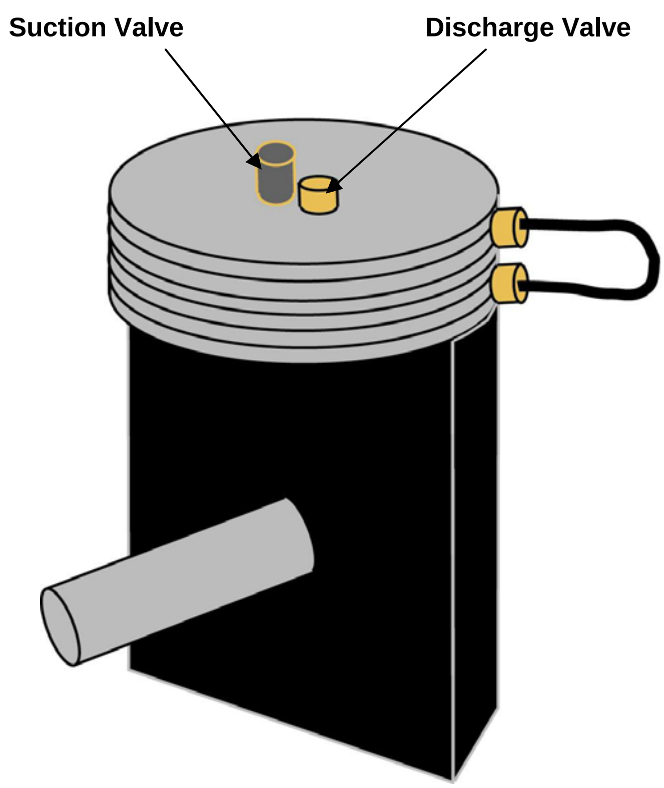
H. Microboost: Pressure Switch – Inspect

A pressure switch is located inside the base of the compressor and is factory set at 2200 PSIG. The gauge on the regulator assembly can be used to check that the pressure switch is functioning properly.

a.) To perform a pressure switch inspection, the Microboost must be operational and attached to an operating POGS 33C or a POGS 10.
b.) Shut the 3 Manifold valves and the outlet valve attached to the regulator assembly.
c.) Turn on the Generator and Microboost.
d.) Monitor the pressure rise on the gauge attached to the regulator assembly inside the Microboost.
e.) When the needle on the gauge reaches approximately 2200 PSIG, the Microboost will shut down.
f.) Slowly relieve the pressure through the outlet valve on the regulator assembly.
g.) If the Microboost shuts off when the needle is not in the green band on the face of the gauge, the Pressure Switch will need to be reset. Pressure Switch setting instructions can be found in the Service Manual.

I. Microboost - 3rd Discharge Valve and 3rd Suction Valve – Inspect

Valves are marked with and 'S' for Suction and a 'D' for Discharge. Make sure the proper valve is installed as shown in the diagram. Suction and Discharge Valves should not be interchanged. The valves should be secure into the compressor head. Do not over tighten as this may damage sealing surfaces.



9 TWO-YEAR MAINTENANCE

9.1 Maintenance Requiring System Shutdown

A. Generator - CO/Dewpoint Monitor - Humidifier Tube – Replace

(Part #: 73108-002)

NOTE

The humidifier tube needs to be purchased through On Site Gas Systems.

a.) The humidifier tube is used to assure that the CO and Oxygen sensors are not subjected to extremely dry air for a long period of time, which would decrease their useful life. Change the humidifier tube when changing a CO sensor at the completion of its useful life.

b.) To change the humidifier tube:
- Remove the sheet metal cover from the top of the enclosure, exposing the humidifier tube.
- Note the coiled arrangement of the tube. Remove the old tube and replace with the new one.
- Replace sheet metal cover.

B. Generator - O_2 Sensor – Replace

(Part #: C1-16-1000-01-0)

a.) The Oxygen Analyzer is supplied with an oxygen sensor, and sensor flow-through head for connection to a sampled process gas stream, and a sensor interface cable with a rubberized sheath to protect the sensor and the sensor electrical connector from dust and liquid spray.
b.) Cut the tie-wrap that secures the cable to the inside of the Generator Case.
c.) Remove the black rubberized sheath off of the sensor by sliding it up the cable.
d.) Unscrew the knurled locking nut at the top of the sensor to remove the cable.
e.) Unscrew old sensor from the threaded retaining base.
f.) Unscrew the protective plastic cap from the new sensor.
g.) Verify the O-ring is in place to seal the sensor to the base.
h.) Remove the plastic seal from the sensor to activate the electrolyte.
i.) Thread the new sensor securely into the base.
j.) Attach and thread the knurled locking nut onto the top of the sensor.
k.) Slide the rubberized sheath back over the sensor and re tie the cable to the case.
l.) Sensor needs to be recalibrated.

10 FIVE-YEAR MAINTENANCE

10.1 Maintenance Requiring System Shutdown

A. Feed Air Compressor - Tip Seal – Replace

(Part #: IP604500AV)

a.) Remove six (6) nuts with T-type wrench and then Fixed Scroll (FS) set from air end.
b.) Remove Low Pressure (LP) and High Pressure (HP) tip seals from FS set and Orbit set. Using the tip of a ball-point pen at the start will make it much easier.
c.) Remove dust from Scroll with clean cloth or air.

NOTE

Tips seals for Fixed Scroll and Orbit Scroll have opposing seal cut angels.

Insert tip seal so that the lip of tip seal is on the bottom of seal groove and inner side of involute and the direction of lip faces the center of involute (curing spiral). This is to be done for both FS and OS sets.

Use caution not to tear or distort lip.

d.) Insert new HP tip seal from the center section for Orbit Scroll (OS) so there will be no clearance at the tip (start) section.
e.) Insert so that new LP tip seal will contact closely with HP tip seal inside Scroll Grove.

CAUTION

Insert approximately half of the LP tip seal and remove the tip seal to confirm that a notch in the tip seal has been achieved. This will prevent movement during installation.

f.) Repeat the same procedure for FS tip seal set, remove both the dust seal and backup tube located on outermost side FS set.
g.) Insert new backup tube in the FS in the 6 o'clock position.
h.) Insert new dust seal on the backup tube. Face seamed section of the dust seal in the 3 o'clock position.
i.) After replacing tip seal set, reassemble FS set to the OS. Tighten 6 nuts temporarily and confirm if crankshaft rotates smoothly by hand and tighten them firmly. Tightening torques are: First – 15 in. lb. / Second – 175 in. lb.

B. Feed Air Compressor - Scroll Compressor – Lubricate

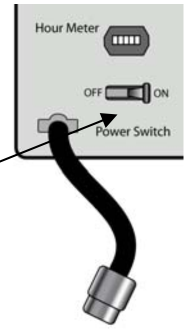
In order to access the Main Bearing and Pin Crank Bearings, the Scroll Compressor must be removed from the Feed Air Compressor Frame.

a.) Main Bearings
- Remove the plastic dust cap. Use only one of the two locations found on the air end.
- Rotate the compressor pulley until the grease fitting is visible through the dust cap hole.
- Use a grease gun extension adapter to engage the grease fitting and supply approximately 3 grams of grease (3 to 5 pumps of the grease gun).

b.) Pin Crank Bearings

- Remove the V belts and the fan cover.
- Remove the air end pulley and cooling fan with a gear puller.
- Remove the fan duct shroud.
- Remove the three (3) grease caps. Do not attempt to loosen or tighten the bolt.
- Grease all three pin crank bearings with approximately 3 grams of grease, (3 to 5 pumps of the grease gun).
- Replace the grease caps, fan shroud, pulley, etc.

11 STARTUP PROCEDURES FOLLOWING MAINTENANCE

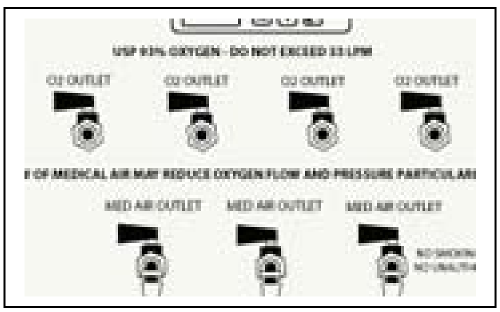


11.1 Power-Up Procedure

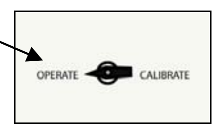
a.) Connect the Feed Air Compressor Power Cord to the power source.
b.) Move the Feed Air Compressor Power Switch to the ON position.
c.) Allow the Feed Air Compressor to operate until it reaches standby mode (at approximately 110 PSI on the air tank gauge the Feed Air Compressor will shut down).

> **NOTE**
> **The Feed Air Compressor may cycle between Standby and Operate Mode until the pressure is balanced between the Generator and the Feed Air Compressor.**
> **If more than 4 such cycles are observed however, check for leaks between the Feed Air Compressor and the Generator.**

d.) Verify that the (3) Medical Air Outlet Valves and all four (4) Oxygen Outlet Valves on the Generator Control Panel are in the closed position (9:00 position).



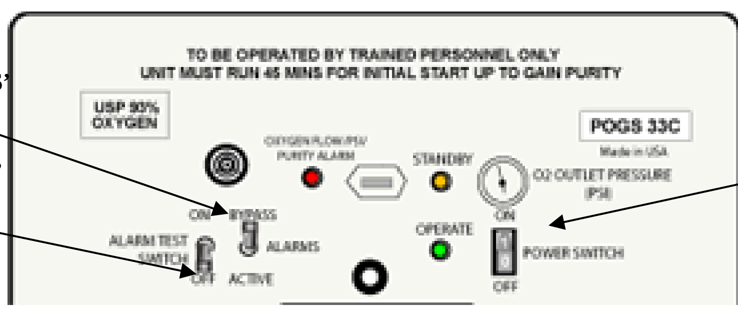
Verify the Operate/Calibrate Valve Handle is pointing to the (OPERATE) position.



Verify the following Generator Control Panel Settings:

Alarms Switch in 'BYPASS'

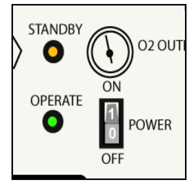
Alarm Test Switch is 'OFF'



Power Switch is "ON"

e.) Connect the Generator Power Cord to the power source.
f.) Apply power to the Generator pushing Power Switch to 'ON'.

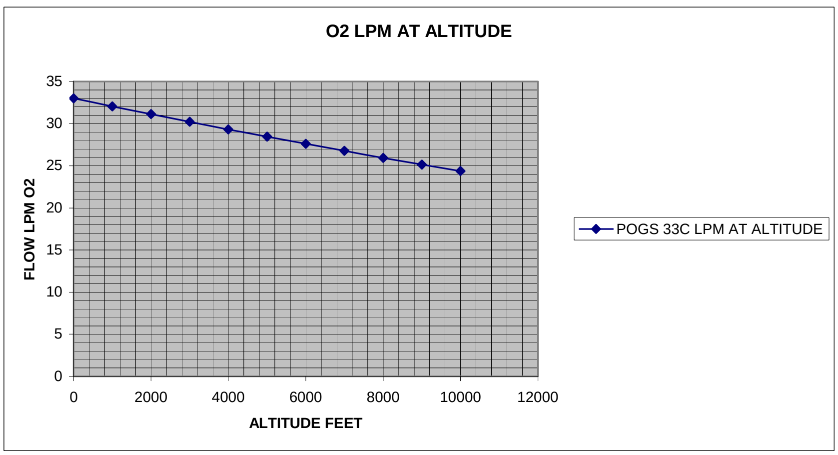
If the Oxygen Receiver pressure is low, the Generator will run until Oxygen Receiver pressure reaches approximately 70 PSIG. Then, the Generator will switch to standby mode, which is indicated by the illumination of the Standby Indicator on the Generator Control Panel. The Generator should reach standby mode within 5 minutes.



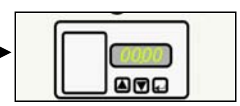
Verify Oxygen Receiver pressure by inspecting the Oxygen Receiver Pressure Gauge in the Generator at the top of the Oxygen Receiver.

NOTE

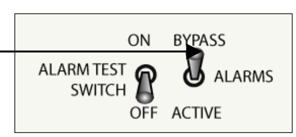
At altitudes of 5,000 FT or above, the Generator may not switch to standby mode. As altitude increases, the pressure, flow, and purity may decrease as the density of oxygen and air decreases.



11.2 Purge Low Pressure Oxygen Receiver



a.) Observe the oxygen concentration indicated by the Oxygen Analyzer.
b.) If oxygen concentration is below 90%, remove any accessories from one or more Oxygen Flowmeters then open the corresponding Oxygen Outlet Valve(s); adjust the Oxygen Flowmeter(s) for a combined flow of 15-20 LPM. Continue flowing 15-20 LPM until oxygen concentration of 90% is achieved.
c.) Once 90% oxygen concentration is achieved, the Alarm Bypass Switch should be switched to **Active**.
d.) Close the Oxygen Flowmeters and Oxygen Outlet Valves (9:00 position) until oxygen flow is needed.



11.3 Compressor Motor Rotation Verification

a.) Verify the Compressor Power Switch on the Compressor Interior Cover is in the “OFF” position.
b.) Verify that no hoses are connected to the Feed Air Compressor.
c.) Momentarily apply power to the Feed Air Compressor with the Compressor Power Switch. A strong stream of air exiting the louvers on the right side of the Compressor case indicates proper rotation. If the rotation is not appropriate, correct before continuing (Refer to Installation Manual).

12 SYSTEM VERIFICATION

12.1 Component Acceptance Verification Procedure

If you find a deficiency or contradiction performing the checklist, reference the appropriate procedure in the Service Manual to correct the possible fault.

A. Feed Air Compressor Checklist

a.) Verify inlet filter is installed
b.) Verify air inlet guard installed
c.) Verify green power indicator is lit
d.) Verify correct compressor rotation (louvers are being pushed out)
e.) Verify feed air hose connected
f.) Verify hose fittings do not leak.
g.) Verify pressure switch adjust to shut off at 110 PSI on inlet tank PSIG

B. Generator Checklist

a.) Record hour meter ______________
b.) At power on-green power indicator lit
c.) At power on- O2 analyzer functions
d.) At power on- CO analyzer functions
e.) At power on- mechanical timer functions
f.) Verify med air 2000. < 10 ppm CO
g.) Verify med air 2000. < 39 deg F dew point
h.) Verify auto drain operation
i.) Verify O2 flow through sensor and assure flow stops at power off.
j.) Leak check system after pressurized, look for pressure loss at power off
k.) Alarm 1 set to 89, alarm 2 set to 85
l.) Verify standby pressure switch – 70 PSI *dead band* ________

C. Microboost Checklist

a.) Verify bottle wrenches included p/n mcw-3pc
b.) Verify green inlet hose connected
c.) O2 input regulator set to 24 PSI.
d.) Back flow regulator set to 50 PSI.
e.) Insure manifolds valves closed
f.) Verify Microboost shuts off at 2200 PSIG (+/- 50 PSI)

D. HV Booster Checklist

a.) Verify 1 bottle wrench included p/n mcw-3pc
b.) Verify 1 h/k to d/e adapter is included with unit.
c.) R26 (large) regulator set to 50 PSI + ¼ turn
d.) Back flow regulator set to 50 PSI .
e.) R00 (small) regulator set to 35 PSI.
f.) Unit should turn on at approx 28 PSIG and off at 25-20 PSIG.
g.) Verify Microboost shuts off at 2200 PSIG (+/- 50 psi)
h.) Record hour meter ______________
i.) Verify function of auto and manual mode.

MASTER TABLE OF CONTENTS

(Refer to Each Manual's Table of Contents)
Revision B: July 14, 2004

MASTER LIST OF ILLUSTRATIONS
(Refer to Each Manual's Table of Contents)
Revision 1: May 2004

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Oxygen Analyzer

Operations and Maintenance Manual and Parts List

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Carbon Monoxide & Dewpoint Monitors

Operations and Maintenance Manual

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Feed Air Compressor

Installation and Maintenance Manual

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GLOSSARY

Adsorber Bed or Adsorber Vessel	A vessel, or tank used to hold molecular sieve in the oxygen generator
Adsorption	Physical adsorption of a substance, as in a sponge with water, incorrectly referred to as "absorption", which is more accurately a chemical process.
Ambient Air	Air surrounding the component, including its inherent temperature and dew point.
Argon	A colorless, odorless inert gaseous element found in the air.
ASME	American Society of Mechanical Engineers
Backup Oxygen	A method of redirecting contained oxygen to flow back to patients or equipment in the event of a power failure, or oxygen flow demand exceeds the capabilities of POGS 33.
Bed	A vessel or tank used to hold molecular sieve in the oxygen generator
Calibration	The act of calibrating; to standardize an instrument by determining the deviation from a standard so as to ascertain the proper correction factors.
Cannula	A small flexible tube inserted into a body cavity (such as nostrils) for draining off fluid or introducing medication (such as oxygen)
CE	Conformite Europeene: CE Marking (European Standard)
CO	Carbon Monoxide
Coalescing Filter	Filters oil.
Condensate	A product of condensation.
Configuration	A particular arrangement of parts or components.
Dew point	The temperature at which a vapor begins to condense.
DISS Fitting	Diameter Index Safety System Fitting
FDA	Food and Drug Administration
HEPA	High Efficiency Particulate Air Filter, commonly used in medical oxygen and medical air
High-Volume Booster	High-Volume Oxygen Cylinder Filling Pressure Booster: boosts up to 66LPM
HP	Horse power
HV Booster	High Volume Booster
Humidifier Bottle	A container to which water is added and medical gas passes through to add moisture to the gas.
Knurled Knob	A knob with a series of small ridges or beads on a surface to aid in gripping
lbs	Pounds
Leak Check	A procedure to check for leaks in a system’s lines
Leak Solution	The solution used in the leak check procedure.
LPM	Liters per Minute (flow rate)
Microboost	Small Volume Oxygen Cylinder-Filling Pressure Booster: boosts up to 19 SCFH
MIL Spec	Military Specification [Standard]

GLOSSARY

Molecular Sieve	A crystalline substance (as a zeolite) characterized by uniformly sized pores of molecular dimension that can adsorb small molecules and is used especially in molecule separations
N2	Nitrogen
NFPA	National Fire Protection Agency (standard)
O2	Oxygen
P&ID	Process and Instrumentation Diagram
Particulate Filter	Filters particles and water.
Power Surge	A spike in electrical current, or power
PPM	Parts Per Million, (a method of defining purity levels)
Product Receiver	A vessel or tank that receives, or holds, or stores the final product of oxygen.
PSA	Pressure Swing Adsorption – A method of gas separation
PSIG	Pounds per square inch gauge
POGS	Portable Oxygen Generation System built by On Site Gas Systems
RIX	Brand name of Microboost and High-Volume O2 Booster
SCFH	Standard cubic feet per hour (flow rate)
SCFM	Standard cubic feet per minute (flow rate)
Sieve Bed	A cylinder filled with Zeolite Molecular Sieve material
Tethered	To fasten or restrain by a tether.
USP	United States Pharmacopoeia [Manufacturing Standard]
Y-Fitting	A device used to split the flow of gas (such as oxygen) from one hose to two hoses.
Zeolite	A crystalline substance (as a zeolite) characterized by uniformly sized pores of molecular dimension that can adsorb small molecules and is used especially in separations
ZMS	Zeolite Molecular Sieve

7 POGS 33 Item Identification and Drawings

7.1 Part Names

7.1.1 POGS 33 (Fig. 1)

2. Generator
3. Feed Air Compressor
4. Accessory Case
5. Microboost (Optional)
6. HV Booster (Optional)

7.1.2 Generator Control Panel (Fig 2)

6. Latches (x2)
7. Audible Alarm
8. Oxygen Purity Alarm
9. Hour Meter
10. Standby [Mode Indicator]
11. Oxygen Outlet Pressure [Gauge]
12. Alarm Test Switch (ON/OFF)
13. Alarm [Bypass Switch] (BYPASS/ACTIVE)
14. Circuit Breaker
15. Operate [Mode Indicator]
16. Power Switch (ON/OFF)
17. Oxygen Analyzer
18. Oxygen Outlet Valve
19. Oxygen Outlet Valve
20. Oxygen Outlet Valve
21. Oxygen Outlet Valve
22. Oxygen Outlet Port
23. Oxygen Outlet Port
24. Oxygen Outlet Port
25. Oxygen Outlet Port
26. Medical Air Outlet Valve(3)
27. Medical Air Outlet Port(3)
28. Operate/Calibrate [Valve Handle]
29. Generator Power Cord
30. Feed Air Inlet Port
31. Backup Oxygen Inlet Port
32. Backup Oxygen Inlet Port Valve
33. Particulate Filter Assembly
34. Automatic Drain
35. Cover Wheels
36. Condensate Drain port

7.1.3 Generator Accessories (Fig. 2/Fig.4)

38. Oxygen Flowmeters (x6)
39. Cannulas (x6)
40. Humidifier Bottles (x6)
41. Oxygen Hoses (Green) (x6)
42. Medical Air Hoses (Yellow) (x6)
43. Oxygen Y-Fitting (x2)

44. Medical Air Y-Fitting (x3)
45. Drain Water Bottle (x2)
46. Swivel Conn (XMas tree) (x6)

7.1.4 Generator Interior (Fig. 3)

48. Air Receiver (Blue)
49. Sieve Bed - Left (Black)
50. Sieve Bed - Right (Black)
51. Oxygen Receiver (Green)
52. Air Receiver Pressure Gauge
53. Air Saver Valve - Top
54. Inline Filters (x2)
55. Check Valves (1/4”) (x2)
56. Crossover Valve
57. Standby Mode Pressure Switch
58. Backup Oxygen Check Valve
59. Oxygen Receiver Pressure Gauge
60. Purity Flow Valve
61. Oxygen Sample Flow Valve
62. Oxygen Sample Needle Valve
63. Oxygen Sensor Block
64. Oxygen Sensor Boot
65. Oxygen Sensor
66. Sensor Lead
67. Carbon Monoxide and Dew Point Monitor
68. Main Valve Assy Pilot Valve/ Manifold
69. Terminal Block
70. Timer Assembly
71. Timer Motor
72. Inline HEPA Filter (Medical Air)
73. Inline HEPA Filter Element (x2)
74. Medical Air Pressure Gauge
75. Medical Air Needle Valve
76. Exhaust Mufflers (4)
77. Main Valve Assembly
78. Condensate Drain Bottle
79. Manual Condensate Drain Valve
80. Velcro Strap
81. Oxygen Outlet Pressure Regulator
82. Alarm Pressure Switch
83. Inline HEPA Filter (Oxygen)
84. Air Saver Valve – Bottom (part of Main Valve Ass’y)
85. Air Receiver Relief Valve
86. Oxygen Receiver Relief Valve
87. Membrane Dryer
88. Medical Air Outlet Pressure Regulator

7.1.5 Generator Accessory Storage within Exterior Cover (Fig. 4)

95. Accessory Storage Door
96. Accessory Storage Netting or Canvas (x2)

7.1.6 Compressor Interior Cover (Fig. 5)

99. Feed Air Outlet Port
100. Cover Hinge
101. Rain Guard
102. Supply Air Inlet Port
103. Serial Number Label
104. Compressor Power Cord
105. Securing Knobs (x4)
106. Compressor Power Switch (ON/OFF)
107. Exterior Lid Support Base
108. Tethered Retaining Clip
109. Bolt Locks (x4)

7.1.7 Compressor Accessories (Fig. 5)

107. Supply Air Filter Assembly
108. Cooling Air Filter Element
109. Supply Air Filter Elements (x2)
110. Feed Air Hose (Black)
    a. Compressor End
    b. Generator End
111. Remote Supply Air Hose (Black) (may be used as Feed Air Extension Hose)
    a) Male End
    b) Female End
112. Air Hose Wrench

7.1.8 Compressor Interior (Fig. 6)

121.
122.
123. Check Valve (1/2”)
124.
125. Pressure Switch
126. Auto Drain Valve
127. Auto Drain Regulator
128. Side Cooling Air Filter Element
129. Surge Suppressor
130. Starter Box
131. Starter Box Locking Screw
132. Circuit Breaker Reset Button
133. Interior Cooling Fan
134. Heat Exchanger
135. Heat Exchanger Cooling Fan
136. Cooling Air Exhaust Foam Gasket
137. Compressor Motor
138. Scroll Compressor
139. Compressor Motor Pulley
140. Compressor Drive Belts (x2)
141. Scroll Compressor Pulley
142.
143.
144. Heat Exchanger Brackets (x2)

7.1.9 Starter Box Interior (Fig. 6)

148. Power Input Terminals (x3)
149. Heaters (x3)
150. Circuit Breaker
151. Trip Point Adjustment
152. Manual/Auto Reset Selector
153. Circuit Breaker Reset Button
154. Power Output Terminals (x3)

7.1.10 Compressor Exterior (Air Outlet Side) (Fig. 7)

159. Side Cooling Air Inlet Louver
160. Rivets (x8)

7.1.11 Compressor Exterior (Supply Air Inlet Side) (Fig. 7)

162. Exterior Lid Support
163. Lid Support Adjustment Knob
164. Cooling Air Exhaust Louver
165. Rivets (x8)
166. Exterior Lid

7.1.12 Microboost – Rear (Fig. 8)

167. Oxygen Inlet Port
168. Oxygen Inlet Pressure Gauge
169. Oxygen Inlet Pressure Regulator
170. Lid stop

7.1.13 Microboost – Front (Fig. 8)

174. D/E Oxygen Cylinder Support Assembly
175. Bolt Lock

7.1.14 Microboost – Right (Fig. 9)

179. Start Button
180. Power Switch

7.1.15 Microboost – Left (Fig. 9)

184. Power Cord
185. Circuit Breaker Reset [Button]

7.1.16 Microboost Top (Fig. 10)

189. Backup Oxygen Outlet Port
190. Backup Oxygen Outlet Valve
191. Backup Oxygen Outlet Pressure Gauge
192. Backup Oxygen Outlet Pressure Regulator
193. High Pressure Manifold Pressure Gauge
194. High Pressure Pigtails for D/E Cylinders
195. High Pressure Pigtails for D/E Cylinders
196. High Pressure Pigtails for D/E Cylinders
197. High Pressure Pigtails for D/E Cylinders
198. High Pressure Pigtails for D/E Cylinders
199. Accessory High Pressure Pigtail for H/K Cylinders
200. Needle Valve
201. Needle Valve
202. Needle Valve
203. High Pressure Manifold
204. Microboost Lid
205. Lid Latch

7.1.17 HV Booster Interior – Manifold Side (Fig. 11)

209. High Pressure Manifold
210. Needle Valve
211. Needle Valve
212. Needle Valve
213. High Pressure Manifold Pressure Gauge
214. Backup Oxygen Outlet Pressure Regulator
215. Backup Oxygen Outlet Pressure Gauge
216. Backup Oxygen Outlet Valve
217. Backup Oxygen Outlet Port
218. High Pressure Pigtails for H/K Cylinders
219. High Pressure Pigtails for H/K Cylinders
220. High Pressure Pigtails for H/K Cylinders
221. High Pressure Pigtails for H/K Cylinders
222. High Pressure Pigtails for H/K Cylinders
223. Accessory Storage Tray
224. Accessory High Pressure Pigtail For D/E Cylinders
225. Dual Oxygen Inlet Ports (x2)
226. Dual Oxygen Inlet Pressure Regulator
227. Dual Oxygen Inlet Pressure Gauge
228. Dual/Single Oxygen Inlet (Valve Handle)
229. Single Oxygen Inlet Pressure Regulator
230. Single Oxygen Inlet Pressure Gauge
231. Single Oxygen Inlet Port
232. Quick Reference Card (Specifications, Backup Oxygen, Cylinder Connectors)
233. High Pressure Cylinder Yoke

7.1.18 HV Booster Interior – Control Panel Side (Fig. 12)

237. 1st Stage Pressure Gauge
238. 2nd Stage Pressure Gauge
239. 3rd Stage Pressure Gauge
240. Control Panel
241. Power Cord
242. Power Switch
243. Manual/Automatic Switch
244. Circuit Breaker Reset [Button]
245. Indicator Lamp
246. Hour Meter

POGS33-C

Spare Parts Kit Level 1

Current as of March 24, 2004

Conf. ID	Figure Drawing	Item ID	Item Description	Our Order Number	Manufacturer
Filters, Regulators					
Gen.	2	33	Particulate Filter Assembly	F26-04-FMO	Wilkerson
Gen.	3	72	Inline HEPA Filter (Medical Air)	10H	On Site Gas
Gen.	3	83	Inline HEPA Filter (Oxygen)	10H	On Site Gas
Gen.	3	81	Oxygen Outlet Pressure Regulator	R00-02-000	Wilkerson
Gen.	3	88	Medical Air Outlet Pressure Regulator	R00-02-000	Wilkerson
Filter Accessories					
Gen.	3	73	Inline HEPA Filter Element	1506A	Parker
FAC	6	122	Particulate Filter Bowl (F26)	GRP-95-960	On Site Gas
FAC	N/A	33	Filter Element Retainer	FRP-96-944	Wilkerson
FAC	N/A	33	O-Ring, Filter Bowl	GRP-96-768	Wilkerson
FAC	5	115	Supply Air Filter Element	C-61352	Thomas
FAC	5	114	Cooling Air Filter Element	5W967	AirHandler
FAC	6	143	Particulate Filter Element	FRP-95-115	Wilkerson
Gen.	3	54	Inline Filter	PIF-2M	UCI
Electrical Parts					
Gen.	3	57	Standby Mode Pressure Switch	HC26A214L	ASCO
FAC	6	125	Pressure Switch	96211-BB5	Barksdale
Gen.	3	82	Pressure Switch	HB16A214	ASCO
Gen.	2	14	Circuit Breaker	548-1043	Eaton
Gen.	2	16	Power Switch (On/Off) - Rocker	676-5501	Carling
FAC	6	106	Power Switch (On/Off) - Toggle	2GK5173	Carling
Valves					
Gen.	3	61	Oxygen Sample Flow Valve, 1/8"	U8225B004V	ASCO
Gen.	3	60	Purity Flow Valve, 1/8"	MAC111B-111BA	MAC
Gen.	2	34	Drain Valve, 1/8"	MAC111B-111BA	MAC
Gen.	6	126	Automatic Drain Valve, 1/4"	MAC225B-121BA	MAC
Gen.	3	53	Purity Flow Valve, 1/4"	MAC225B-111BA	MAC
Gen.	N/A	77	Kit, Valve Repair (For VNB201)	VN2-4BA	SMC
Gen.	3	77	Main Valve, 1/2"	VNB201A-15A	SMC
Gen.	3	84	Air Saver Valve, 1/2"	VNB201A-15A	SMC
Gen.	3	68	Air Saver Pilot Valve	NVZ1120-3GM5	SMC
Gen.	3	70	Timer Assembly with motor	TM3A 605	Eagle
Gen.	6	123	Check Valve, 1/2"	CV500B-V-1	Generant
Gen.	3	55	Check Valve, 1/4"	ICV250B-V-1	Generant
Gen.	3	86	Oxygen Receiver Relief Valve, 100psi	KSV10-1/4-100	Kingston
M/B	10	200	Cartridge Valve, Soft Seat	SS-110K	Western
Gen.	3	85	Air Receiver Relief Valve, 150psi	KSV10-1/4-150	Kingston
Gen.	3	62	Oxygen Sample Needle Valve, 1/8"	4995K11	Deltrol
Miscellaneous / Other					
Gen.	3	76	Exhaust Muffler (1/2")	9992K14	McMaster-Carr
Gen.	3	59	Oxygen Receiver Pressure Gauge, 0-100 psi	102D-204E	P.I.C.
Gen.	3	52	Air Receiver Pressure Gauge, 0-160 psi	102D-204F	P.I.C.
Gen.	3	67	Dew Point Sensor (Exchange Program)	03009-001	ENMET
Gen.	3	74	Medical Air Pressure Gauge, 0-100 psi	102D-158E	P.I.C.
Gen.	2	11	Oxygen Outlet Pressure Gauge, 0-100 psi	103D-158E	P.I.C.
FAC	6	133	Interior Cooling Fan, 6"	3VU63	Dayton
FAC	6	135	Heat Exchanger Cooling Fan, 6"	3VU63	Dayton
FAC	6	140	Compressor Drive Belts	3V375	Dayco
FAC	5	116	Feed Air Hose, 15 ft	FAH-15	On Site Gas
FAC	5	117	Remote Supply Air Hose, 15 ft	RSAH-15	On Site Gas
FAC	6	149	Heater	H2012B-3	Cutler-Hammer
N/A	N/A	N/A	USB Drive, 64MB	554530	EDGE
FAC	7	162	Hatch Support	321296-1	SeaDog
N/A	N/A	N/A	Teflon Tape	63134	Fastenal
N/A	N/A	N/A	Elbow, Tubing 1/4" x 1/4"	KQL07-35S	SMC
N/A	N/A	N/A	Elbow, Tubing 1/8" x 1/4"	KQL07-34S	SMC
Gen.	3	65	Oxygen Sensor	C1-16-1000-01-0	Neutronics
Accessories					
Gen.	2, 4	38	Oxygen Flowmeters	FM103	Western
Optional					
FAC	6	138	Scroll Compressor (itself)	SLA05	POWEREX
FAC	6	137	Compressor Motor	M3218T	Baldor
FAC	1	2	Feed Air Compressor (system)	CMP33	On Site Gas
Gen.	2	17	Oxygen Analyzer	Model 1100	Neutronics
M/B	1	3	Microboost (system; cylinder filling)	Microboost	On Site Gas
HV	1	4	HV Booster (system; cylinder filling)	2-PS	On Site Gas

All Level 1, <u>without Optional Items,</u> packaged in MIL-Spec Hardigg Case

POGS 33 STARTUP AND SHUTDOWN

WARNING: When the Oxygen Generator is turned on for the first time after a prolonged shutdown period, the Oxygen receiver should be purged as described below.

NORMAL ROUTINE START-UP

Follow this procedure to start the Generator for normal operation. If this is the first time the unit has been started, has been moved to a new location, or has had a change to the power source, follow the Initial Start- Up Procedure (see below).

WARNING: Feed Compressor may be in standby mode, not off. Make sure power is "off" before setup.

1) Connect compressed air line from the Compressor to the POGS 33 Generator
2) Turn the Compressor's power switch "ON".
3) Turn the POGS 33 Generator's Main Power switch "ON". Observe the oxygen purity. If the purity is below 90-96%, attach the oxygen flow meter(s) and set flow to 15-33 LPM until 90-96% oxygen content or higher is obtained. The POGS 33 is now ready for use: turn alarm switch to "Active".

INITIAL START-UP

1) Verify proper compressor rotation:
2) Connect compressed air line from the compressor to the POGS 33 Generator.
3) Turn on the Compressor
4) Turn POGS 33 Generator Main Power Switch "ON".
5) When Oxygen Tank Pressure reaches approximately 70 PSIG, the amber light marked "Standby" should light up and oxygen production will cease. When oxygen is used the oxygen pressure falls to 55 PSIG, the amber light will go off and oxygen production will resume. This gauge is located at the upper right hand corner inside the Generator.
6) 90-96% and higher oxygen content will be obtained within 45 minutes. After the POGS 33 has gone into "Standby", connect one of the patient oxygen flow meters and set flow to 15-33 LPM to purge lower purity oxygen from the tank. Continue to flow until 90-96% oxygen content is obtained. The alarm switch should be in the "Bypass" position until the 90-96% oxygen level has been achieved.
7) As oxygen from the oxygen tank gets used, the oxygen purity continues to increase to the specified level. Accelerate the oxygen purity level by letting the generator go in and out of standby mode approximately six times with out going below 50 PSIG:

Purging Procedure:

- Step 1-Let generator go into standby
- Step 2-Bleed the oxygen out by allowing oxygen flow from flow meter until generator begins to run
- Step 3-Stop flowing the oxygen so it can go to "Standby" again
- Step 4-Repeat six (6) times, or until purity is reached

WARNING: If the generator or any part of the systems had been opened to the atmosphere, the system must be purged of any residual air to bring the product purity back to specifications. Do this by using the purging procedure (above).

SHUTDOWN

1. Turn POGS 33 Generator Main Power switch "OFF"
2. Turn Generator Alarm Switch to "Bypass"
3. Turn Feed Compressor power switch "OFF"
4. Inside POGS generator cabinet at bottom left is a black valve knob. Use this to bleed any water out of air tank: with power off, open slowly and bleed-out water until only air bleeds out.
5. Near this same valve knob is the air tank water bottle. Empty the bottle and replace.

WARNING: The generator will remain pressurized after shutdown. Before performing any maintenance or opening any piping systems, always depressurize the system; open the oxygen and air outlets to depressurize. Failure to do so may result in injuries.

POGS 33 Maintenance

WARNING: Air Compressor: Before doing any maintenance, the electric power must be unplugged. Depressurize by slowly disconnecting the air hose to the POGS.

WARNING: POGS Oxygen Generator: Before doing any maintenance, the electric power cord must be unplugged. Depressurize the air and oxygen tanks by leaking out the oxygen supply and compressed air supply. This is done by opening one of the oxygen outlet valves and one of the compressed air valves labeled on the front of the generator.

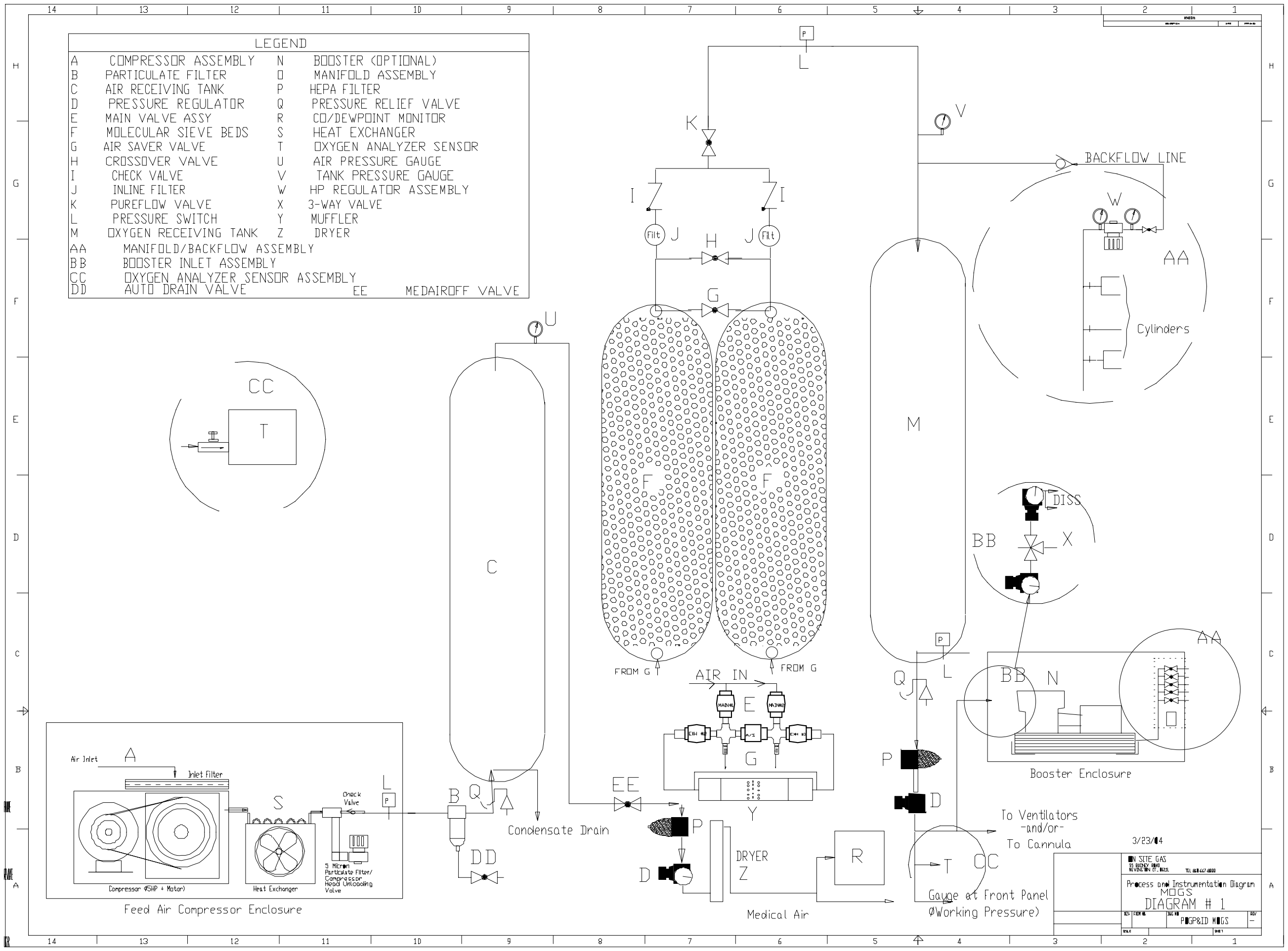
WARNING: Sieve Beds: If they are removed for any reason, block both ends so room air does not enter the beds.

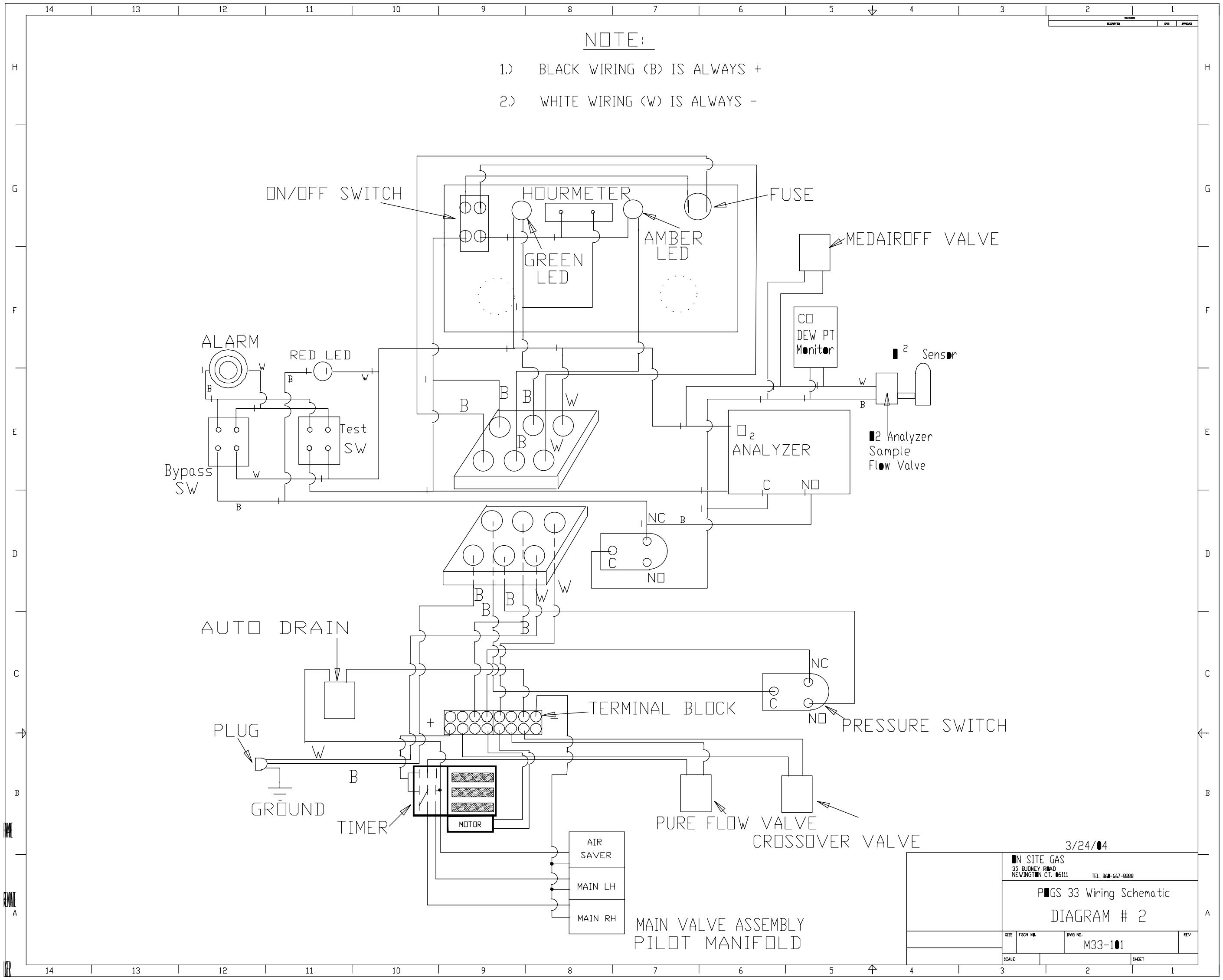
AIR COMPRESSOR (Refer to Owners' Manual)

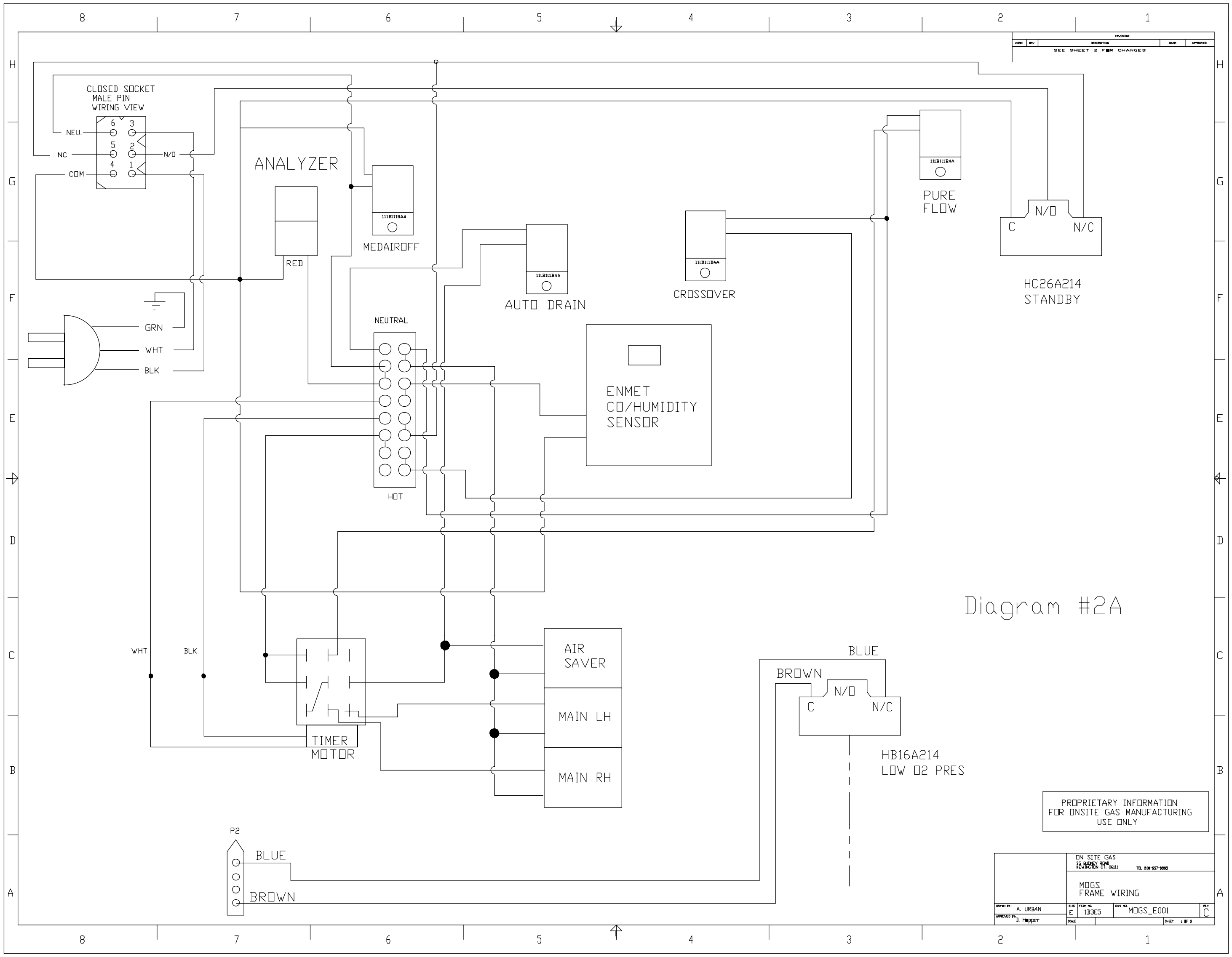
1. The two (2) air inlet filters should be inspected daily or weekly (depending on environmental conditions). The black filter housings can be twisted open to remove filter elements.
2. The cabinet filter (located in center of compressor cabinet) should be inspected daily or weekly (depending on environmental conditions). To replace, pull back on four latches, lift cover and replace with new one.

POGS- Oxygen Generator

1. **DAILY-** Inside POGS cabinet at bottom left is a black valve knob. Use this to bleed any water out of air tank: with power off, open slowly and bleed out water until only air bleeds out.
2. **DAILY-** Outside the cabinet is the air tank water bottle. Empty the bottle and replace.
3. HEPA Filters- Change at three (3) months. Depressurize the air and oxygen by opening the oxygen outlet valve and compressed air valve. Open POGS cabinet door. Locate the two (2) blue HEPA filter housings. Unscrew the filter housing. Remove the filters and replace elements.
4. Air Line Filter- Change at three (3) months. Located in bottom of cabinet behind lower panel. Marked F26-04-FM0. Be sure air line is depressurized; depressurize using black valve knob Bottom Left of Cabinet. Push down on the filter-housing latch. Twist filter housing and drop down. Unscrew filter element support located in upper center of filter housing. Remove filter and replace. Clean filter bowl.


LEGEND
A COMPRESSOR ASSEMBLY
B PARTICULATE FILTER
C AIR RECEIVING TANK
D PRESSURE REGULATOR
E MAIN VALVE ASSY
F MOLECULAR SIEVE BEDS
G AIR SAVER VALVE
H CROSSOVER VALVE
I CHECK VALVE
J INLINE FILTER
K PUREFLOW VALVE
L PRESSURE SWITCH
M OXYGEN RECEIVING TANK
N BOOSTER (OPTIONAL)
O MANIFOLD ASSEMBLY
P HEPA FILTER
Q PRESSURE RELIEF VALVE
R CO/DEWPOINT MONITOR
S HEAT EXCHANGER
T OXYGEN ANALYZER SENSOR
U AIR PRESSURE GAUGE
V TANK PRESSURE GAUGE
W HP REGULATOR ASSEMBLY
X 3-WAY VALVE
Y MUFFLER
Z DRYER
AA MANIFOLD/BACKFLOW ASSEMBLY
BB BOOSTER INLET ASSEMBLY
CC OXYGEN ANALYZER SENSOR ASSEMBLY
DD AUTO DRAIN VALVE
EE MEDAIROFF VALVE
BACKFLOW LINE
Cylinders
AIR IN
FROM G
Booster Enclosure
To Ventilators
-and/or-
To Cannula
Condensate Drain
DRYER
Medical Air
Gauge at Front Panel
(Working Pressure)
Air Inlet
Inlet Filter
Check Valve
Compressor (5HP + Motor)
Heat Exchanger
Feed Air Compressor Enclosure
DISS
3/23/04
ON SITE GAS
Process and Instrumentation Diagram
MOGS
DIAGRAM # 1
POGP&ID MOGS


NOTE:
1.) BLACK WIRING (B) IS ALWAYS +
2.) WHITE WIRING (W) IS ALWAYS -
ON/OFF SWITCH
HOURMETER
FUSE
GREEN LED
AMBER LED
MEDAIROFF VALVE
CO DEW PT Monitor
Sensor
Analyzer Sample Flow Valve
ALARM
RED LED
Test SW
Bypass SW
O_2 ANALYZER
C NO
NC
AUTO DRAIN
TERMINAL BLOCK
PRESSURE SWITCH
PLUG
GROUND
TIMER
MOTOR
PURE FLOW VALVE
CROSSOVER VALVE
AIR SAVER
MAIN LH
MAIN RH
MAIN VALVE ASSEMBLY
PILOT MANIFOLD
SITE GAS
33 Wiring Schematic
DIAGRAM # 2
M33-1



CLOSED SOCKET
MALE PIN
WIRING VIEW
NEU.
NC
COM
N/O
ANALYZER
RED
MEDAIROFF
GRN
WHT
BLK
NEUTRAL
HOT
AUTO DRAIN
CROSSOVER
PURE
FLOW
HC26A214
STANDBY
ENMET
CO/HUMIDITY
SENSOR
Diagram #2A
AIR
SAVER
MAIN LH
MAIN RH
TIMER
MOTOR
BLUE
BROWN
HB16A214
LOW O2 PRES
P2
PROPRIETARY INFORMATION
FOR ONSITE GAS MANUFACTURING
USE ONLY
SEE SHEET 2 FOR CHANGES
ON SITE GAS
MOGS
FRAME WIRING
A. URBAN
MOGS_E001
C

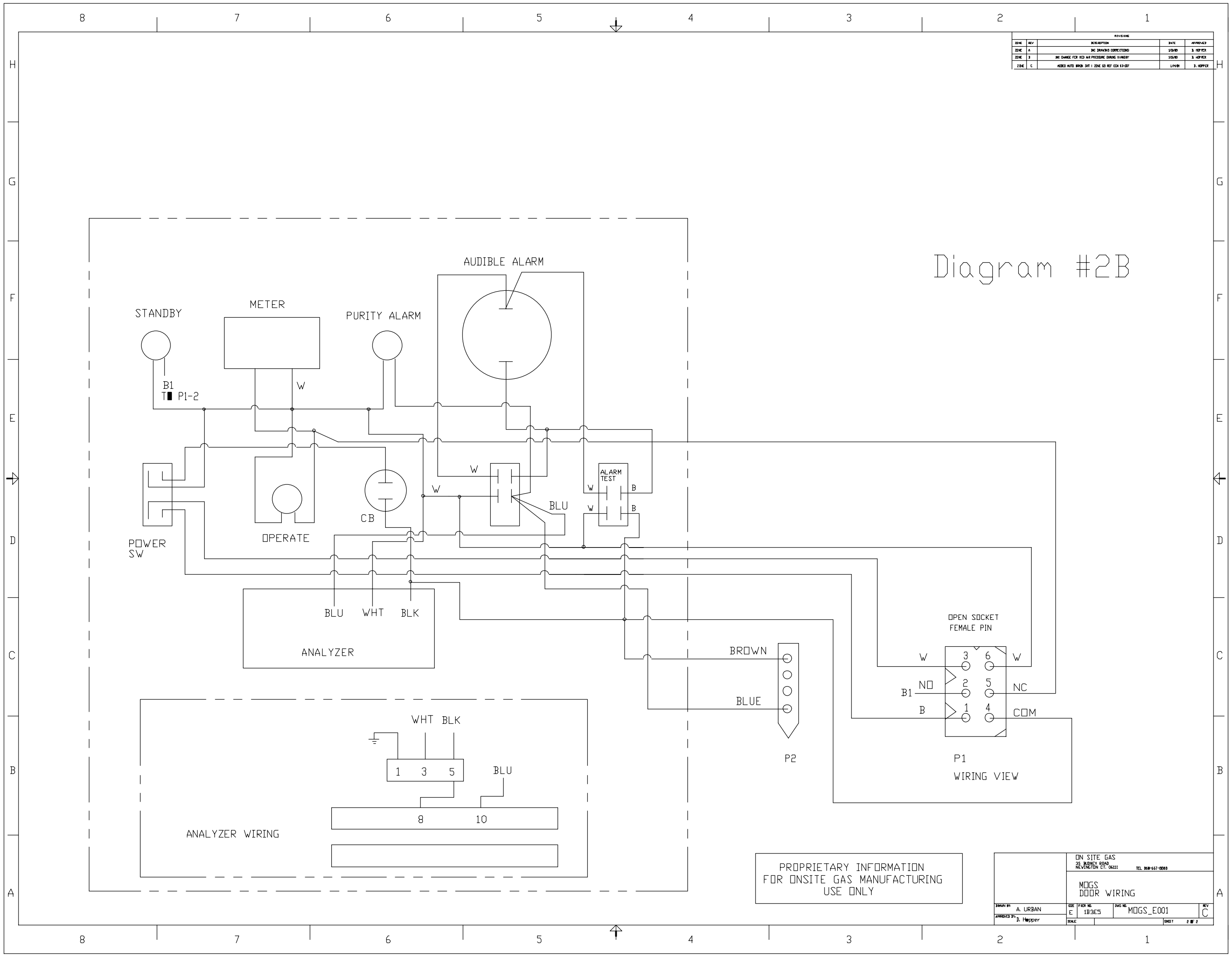
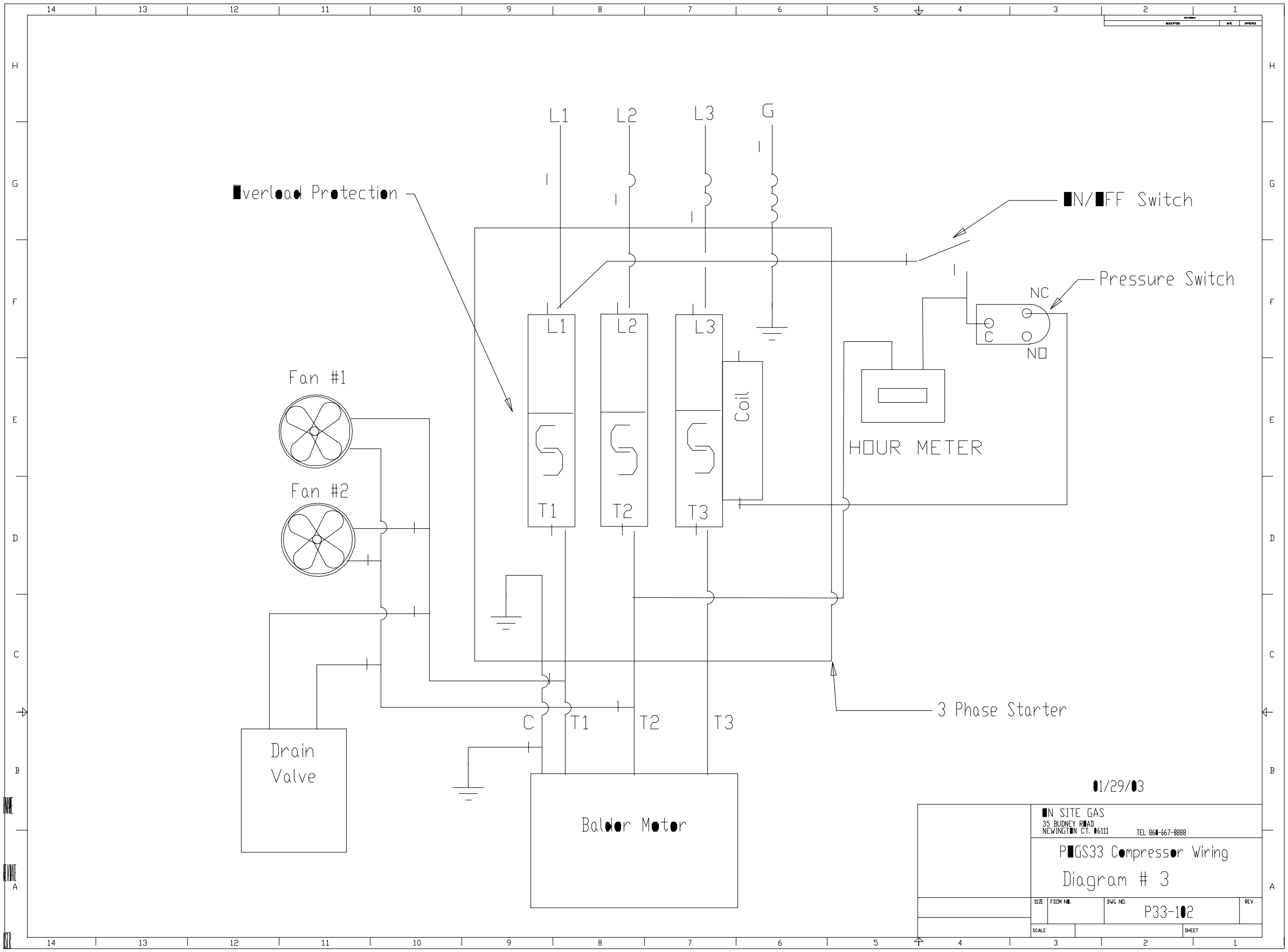
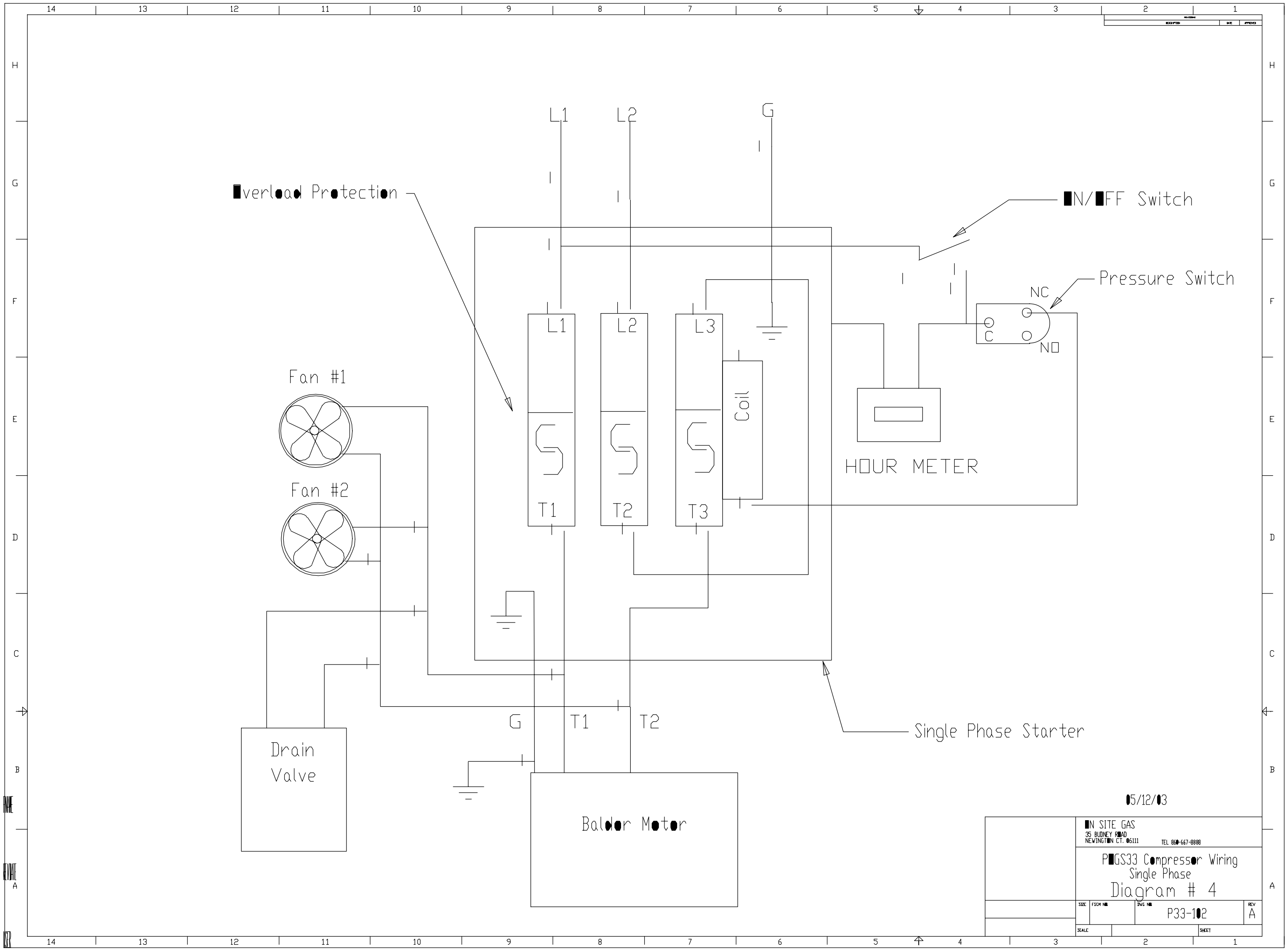


Diagram #2B
STANDBY
METER
PURITY ALARM
AUDIBLE ALARM
B1
T P1-2
W
ALARM TEST
B
BLU
CB
OPERATE
POWER SW
BLU WHT BLK
ANALYZER
WHT BLK
1 3 5
BLU
8 10
ANALYZER WIRING
OPEN SOCKET FEMALE PIN
BROWN
BLUE
P2
W
NO
B1
B
NC
COM
P1
WIRING VIEW
PROPRIETARY INFORMATION FOR ONSITE GAS MANUFACTURING USE ONLY
ON SITE GAS
MOGS
DOOR WIRING
A. URBAN
1B3E5
MOGS_E001
C



L1
L2
L3
G
Overload Protection
ON/OFF Switch
Pressure Switch
NC
C
NO
HOUR METER
L1
L2
L3
Coil
T1
T2
T3
Fan #1
Fan #2
C
T1
T2
T3
3 Phase Starter
Drain Valve
Baldor Motor
01/29/03
ON SITE GAS
35 BUDNEY ROAD
NEWINGTON CT. 06111
TEL 860-667-8888
POGS33 Compressor Wiring
Diagram # 3
SIZE
FSCM NO.
DWG NO.
P33-102
REV
SCALE
SHEET


L1
L2
G
Overload Protection
ON/OFF Switch
Pressure Switch
NC
C
NO
L1
L2
L3
Coil
T1
T2
T3
HOUR METER
Fan #1
Fan #2
G
T1
T2
Single Phase Starter
Drain Valve
Baldor Motor
05/12/03
ON SITE GAS
35 BUDNEY ROAD
NEWINGTON CT. 06111
TEL 860-667-8888
POGS33 Compressor Wiring
Single Phase
Diagram # 4
P33-102
A

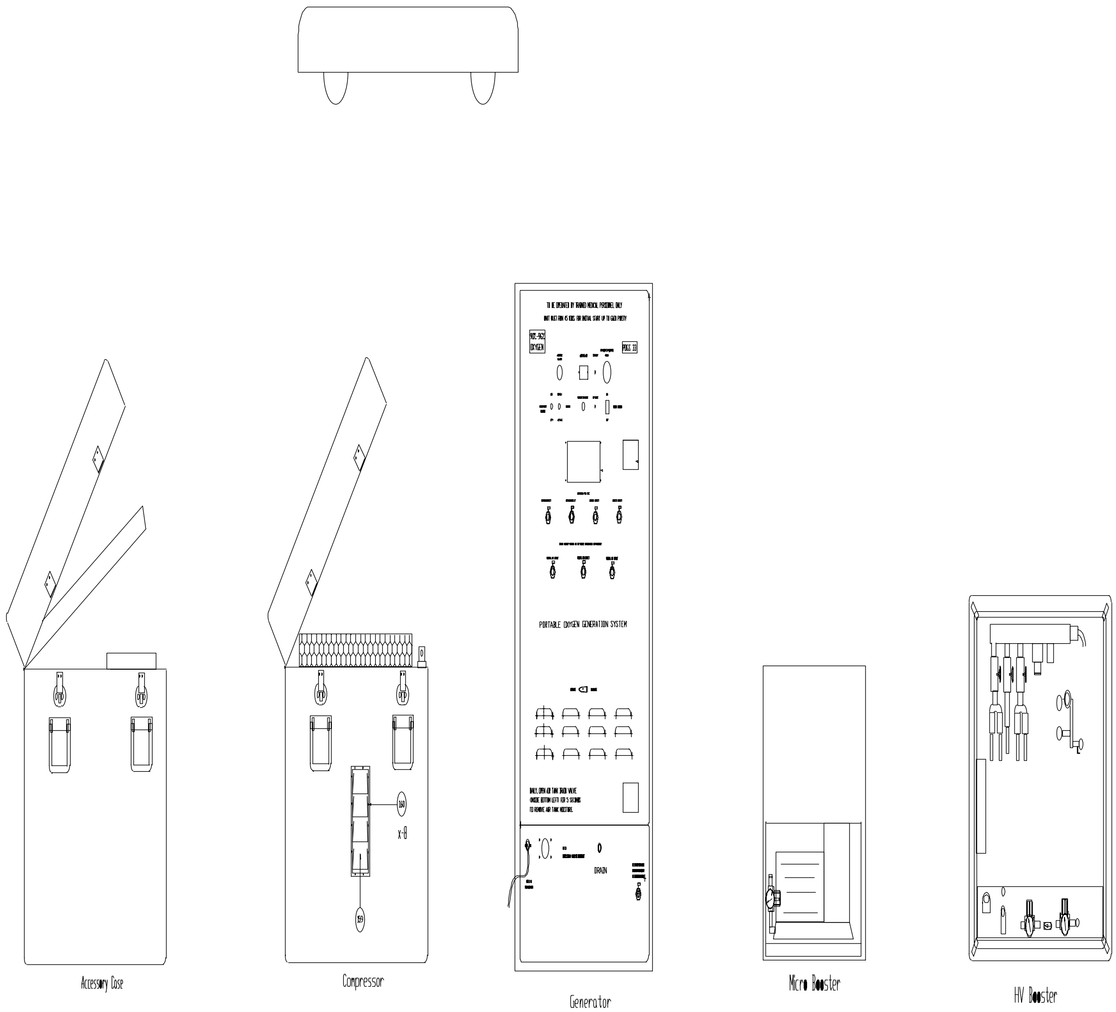


Figure 1
Pogs33 Components

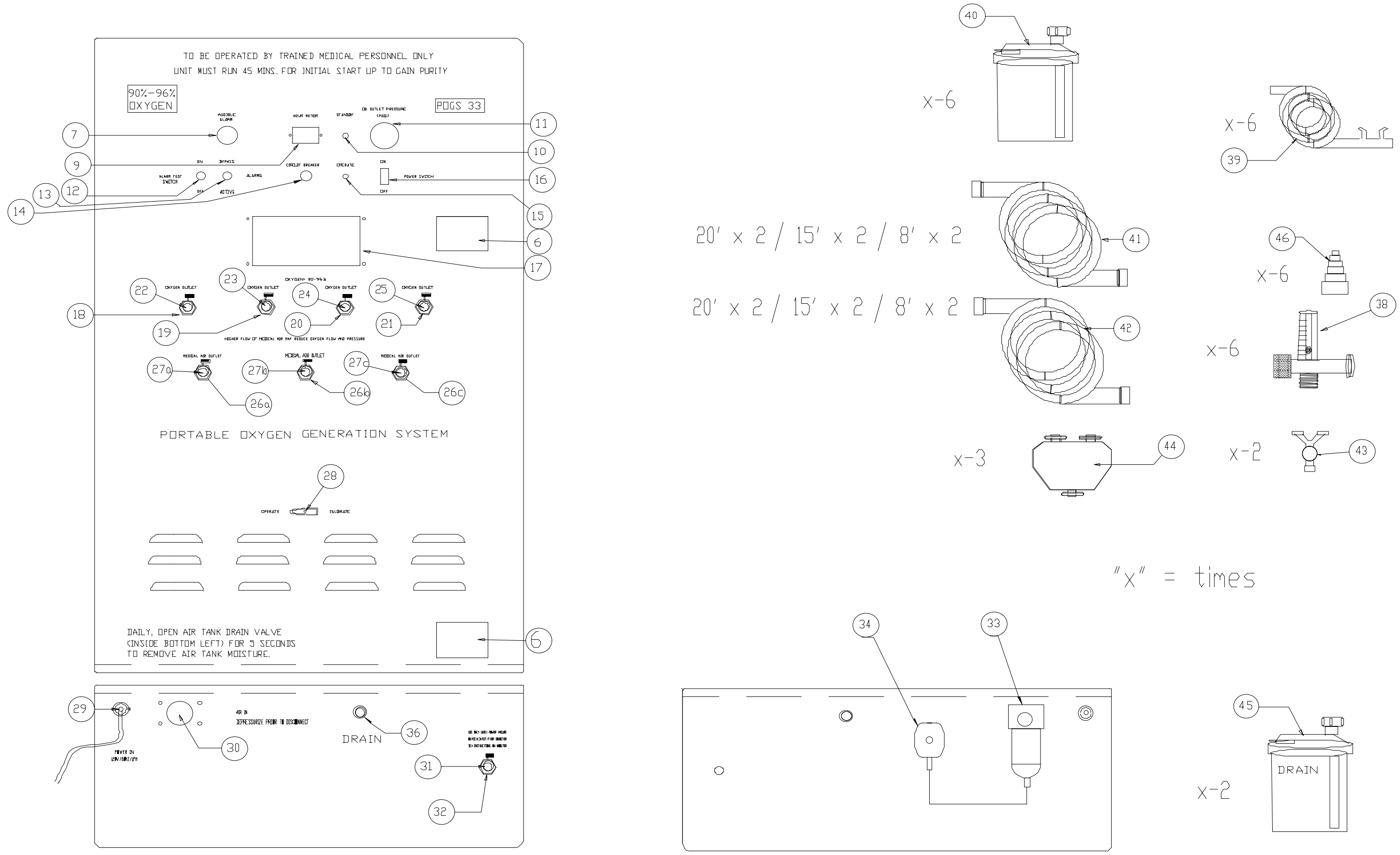


Figure 2
Generator Control Panel

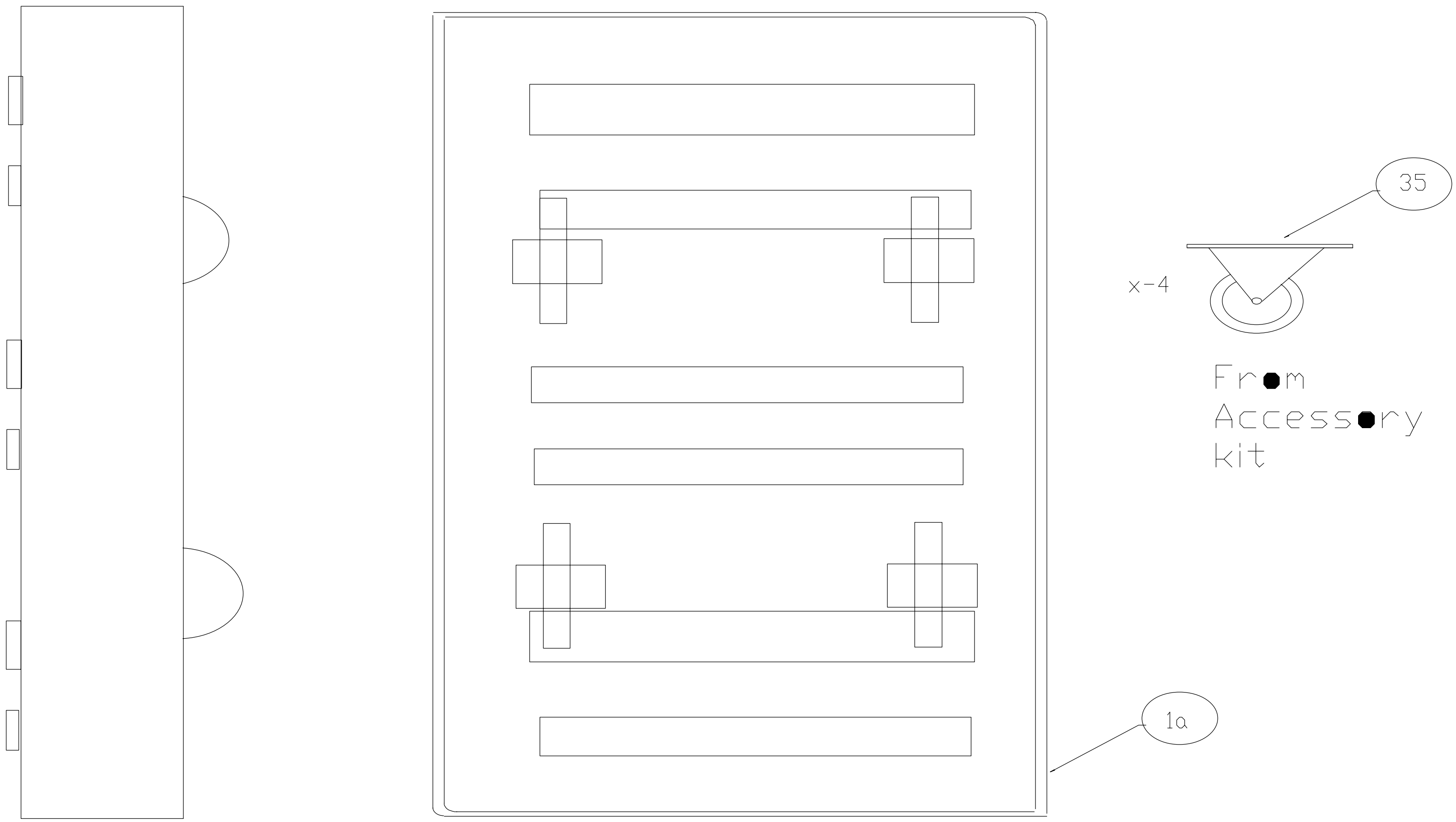


Figure 2a
Generator Dolly

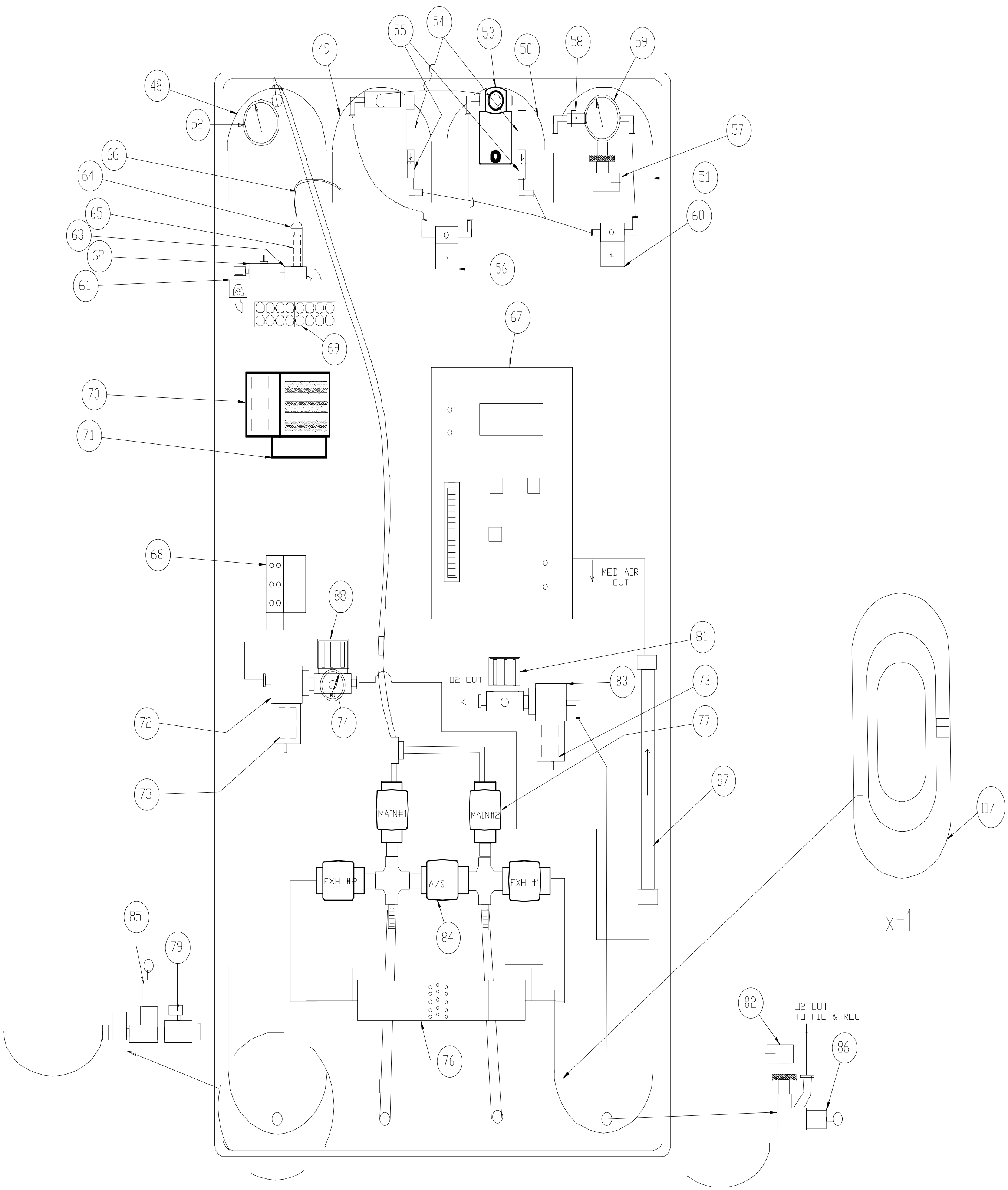


Figure 3
Generator Interior

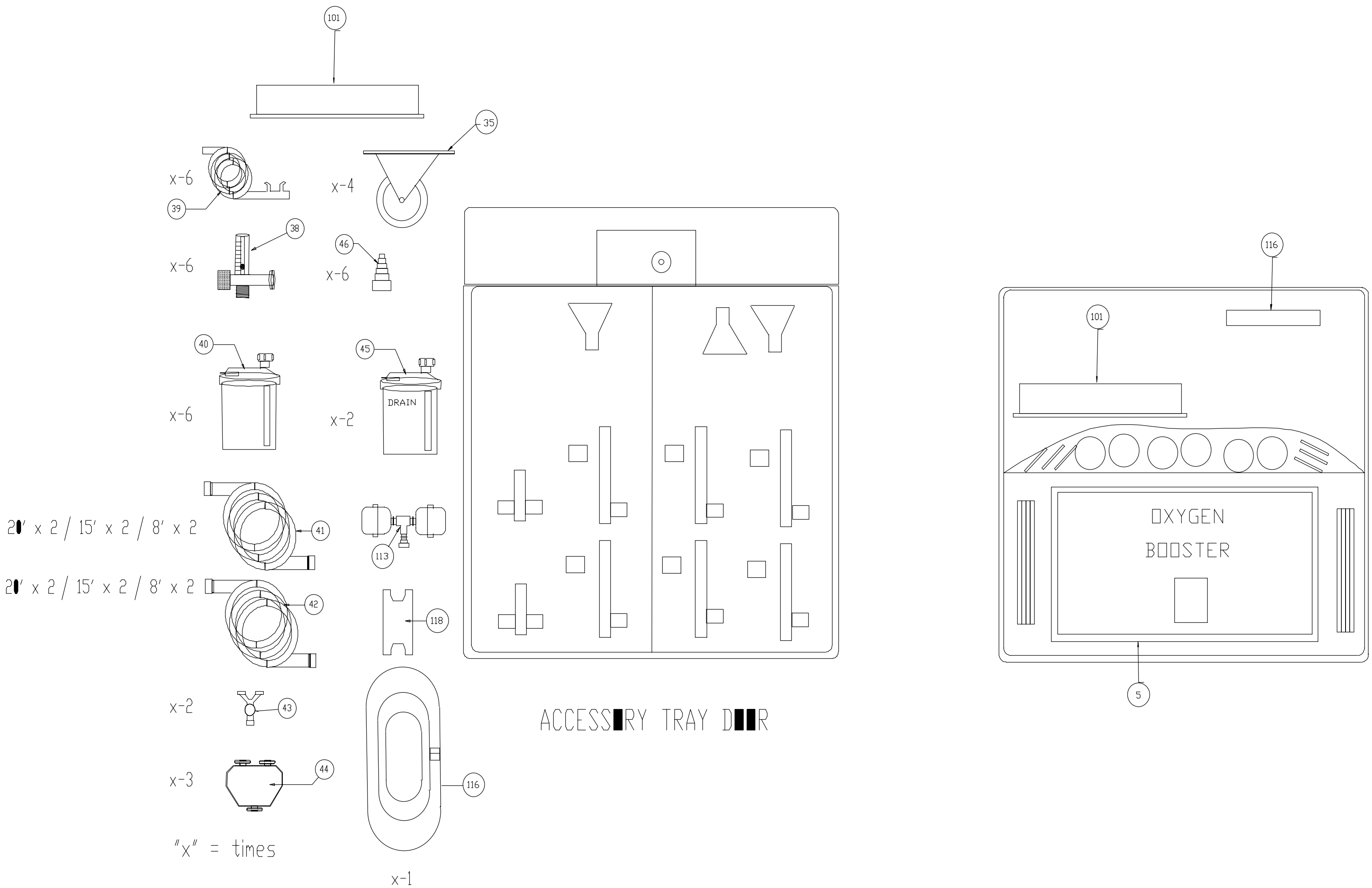


Figure 4
ACCESSORY KIT

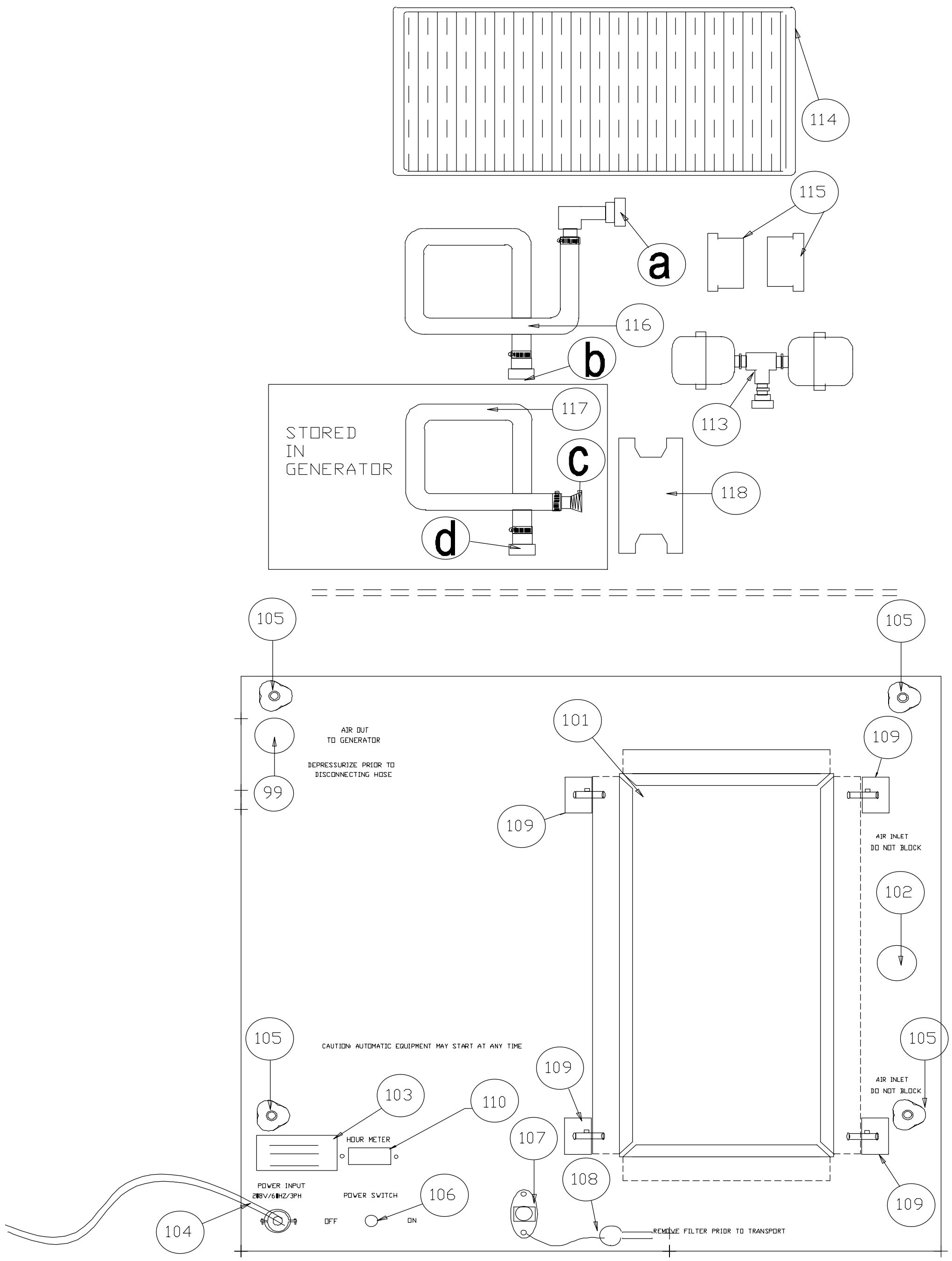
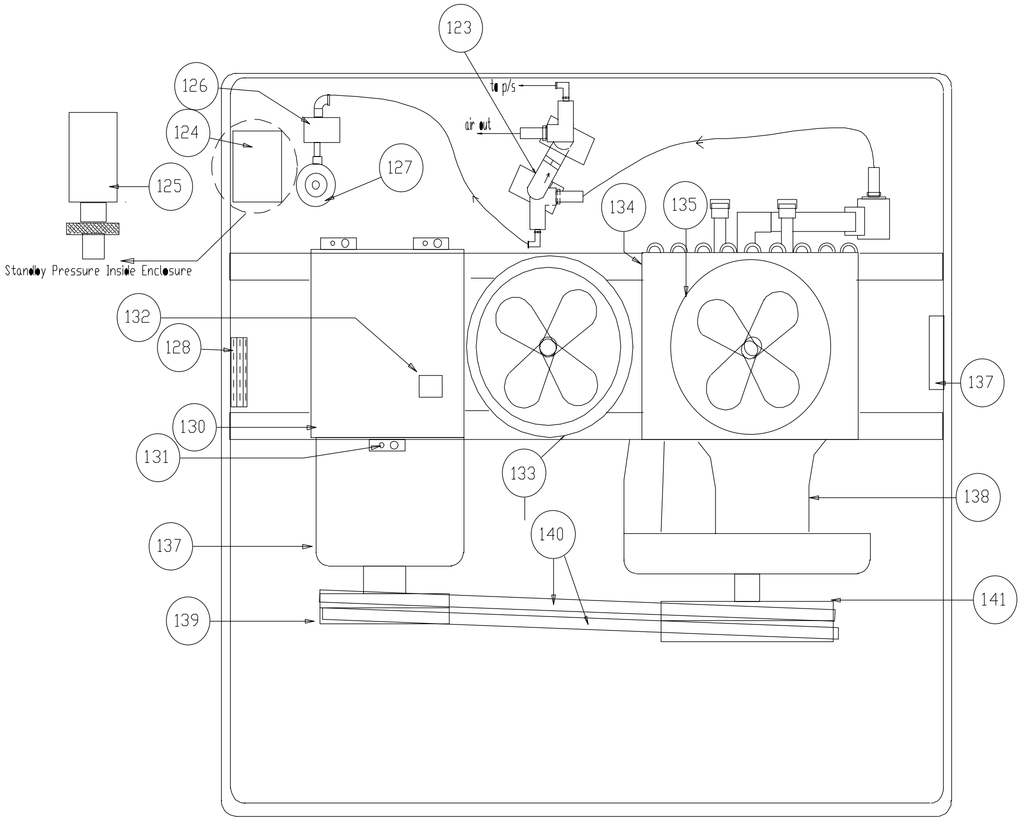


Figure 5
Compressor Interior Cover
with
Compressor Accessories
Located in Accessory Case



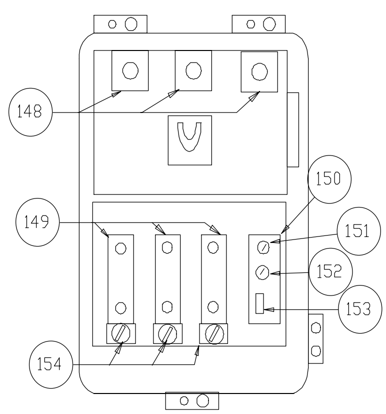
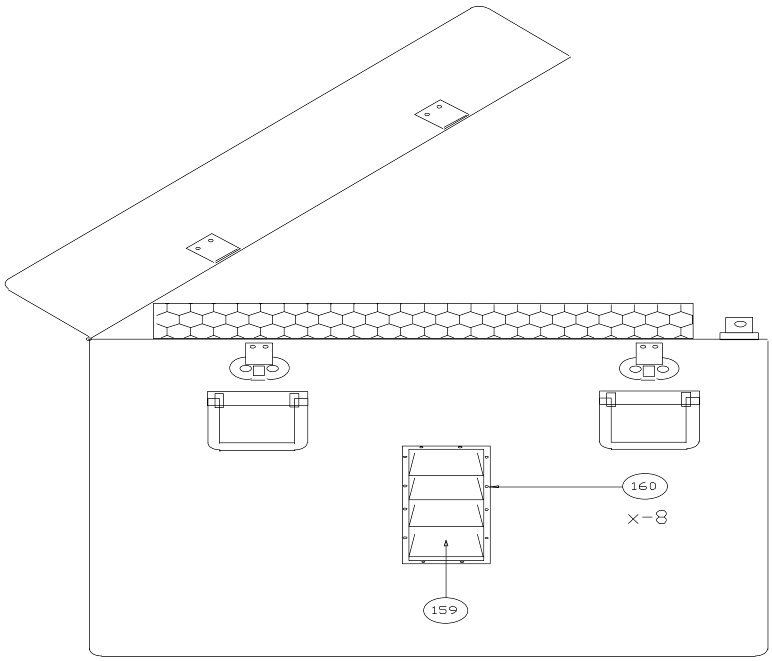
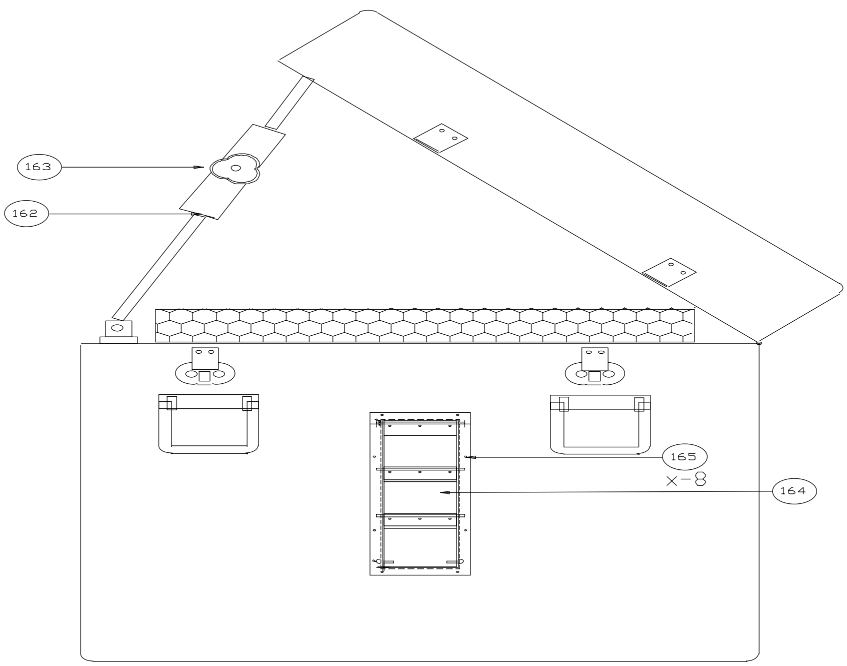


Figure 6
Compressor Interior
with
Compressor Starter Box Interior



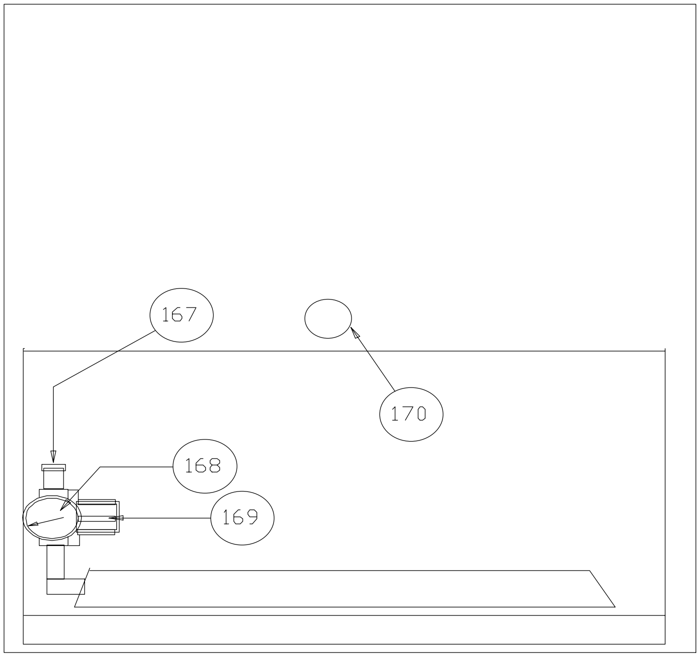
Air Outlet Side



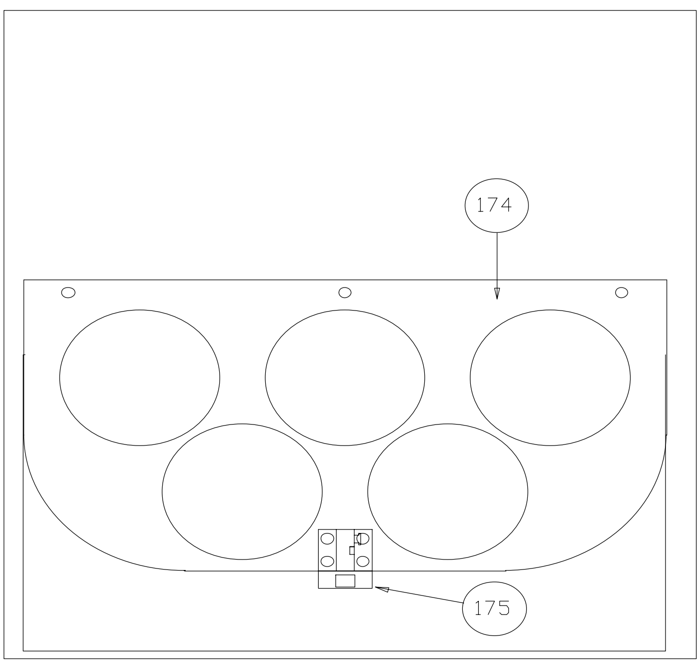
Air Inlet Side

Figure 7

Compressor Exterior (Air Outlet Side)
with
Compressor Exterior (Air Inlet Side)



Rear



FRONT

FIGURE 8
MICROBOOST – REAR
WITH
MICROBOOST - FRONT

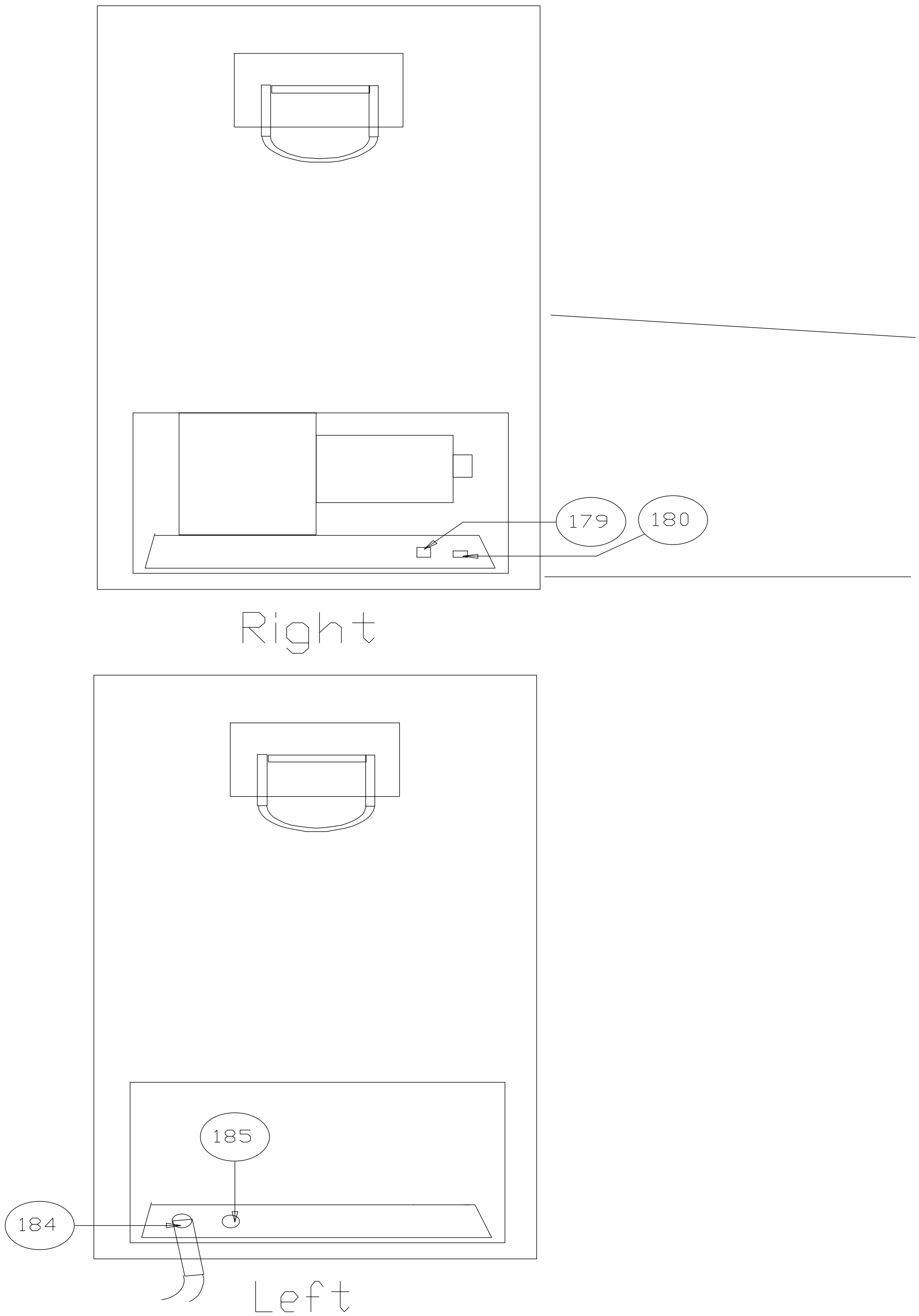


Figure 9

MICROBOOST – RIGHT
WITH
MICROBOOST - LEFT

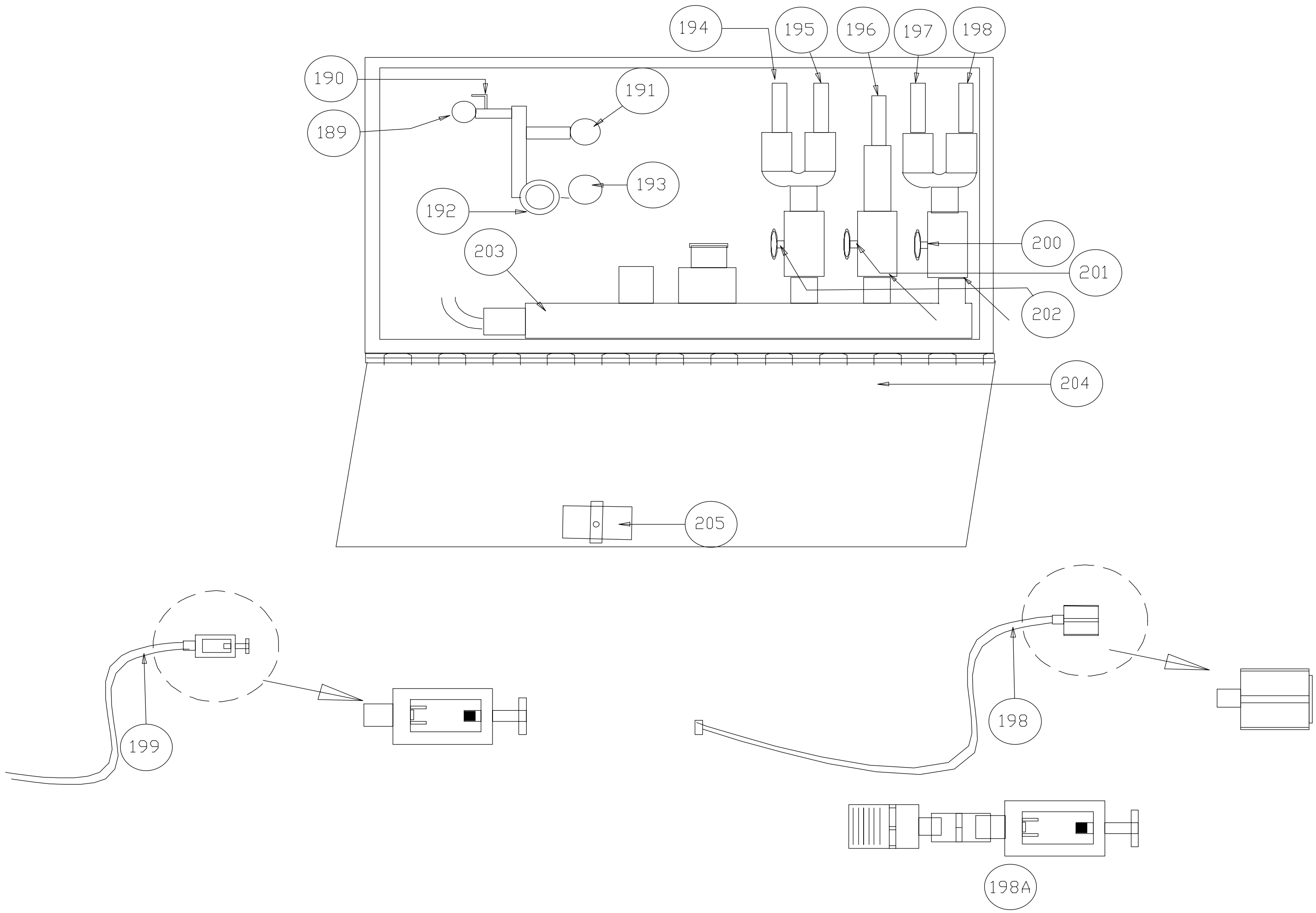


FIGURE 10 MICROBOOST - TOP

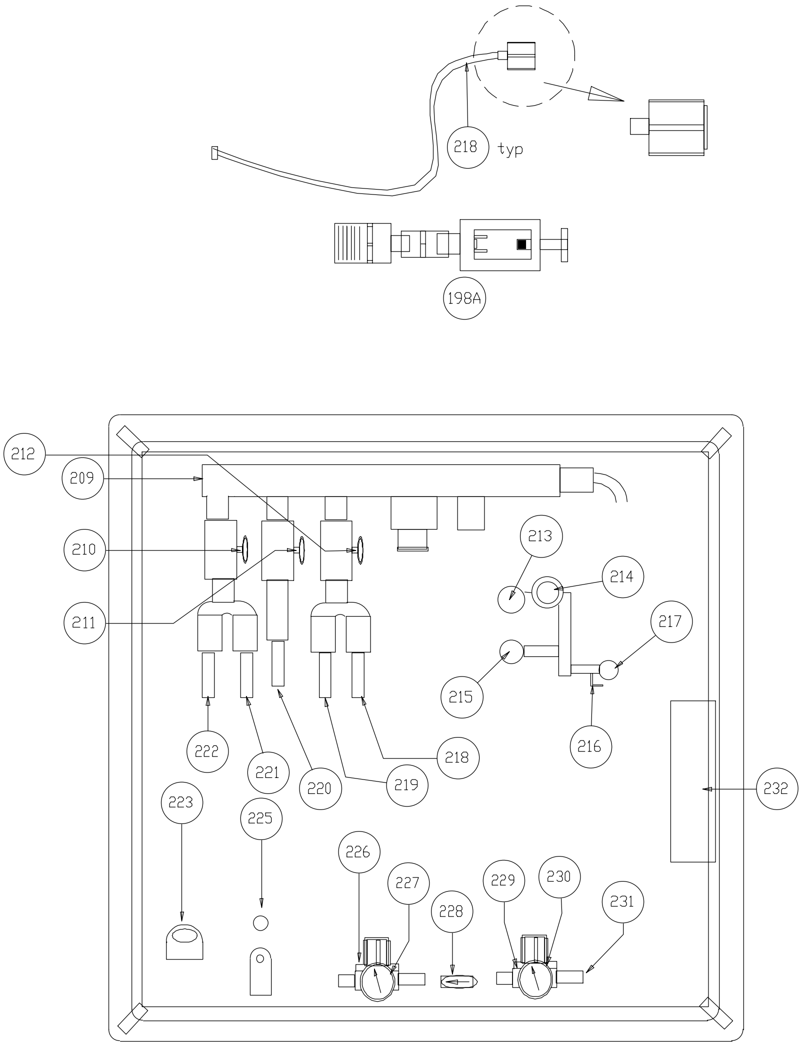


Figure 11

HV BOOSTER INTERIOR MANIFOLD SIDE

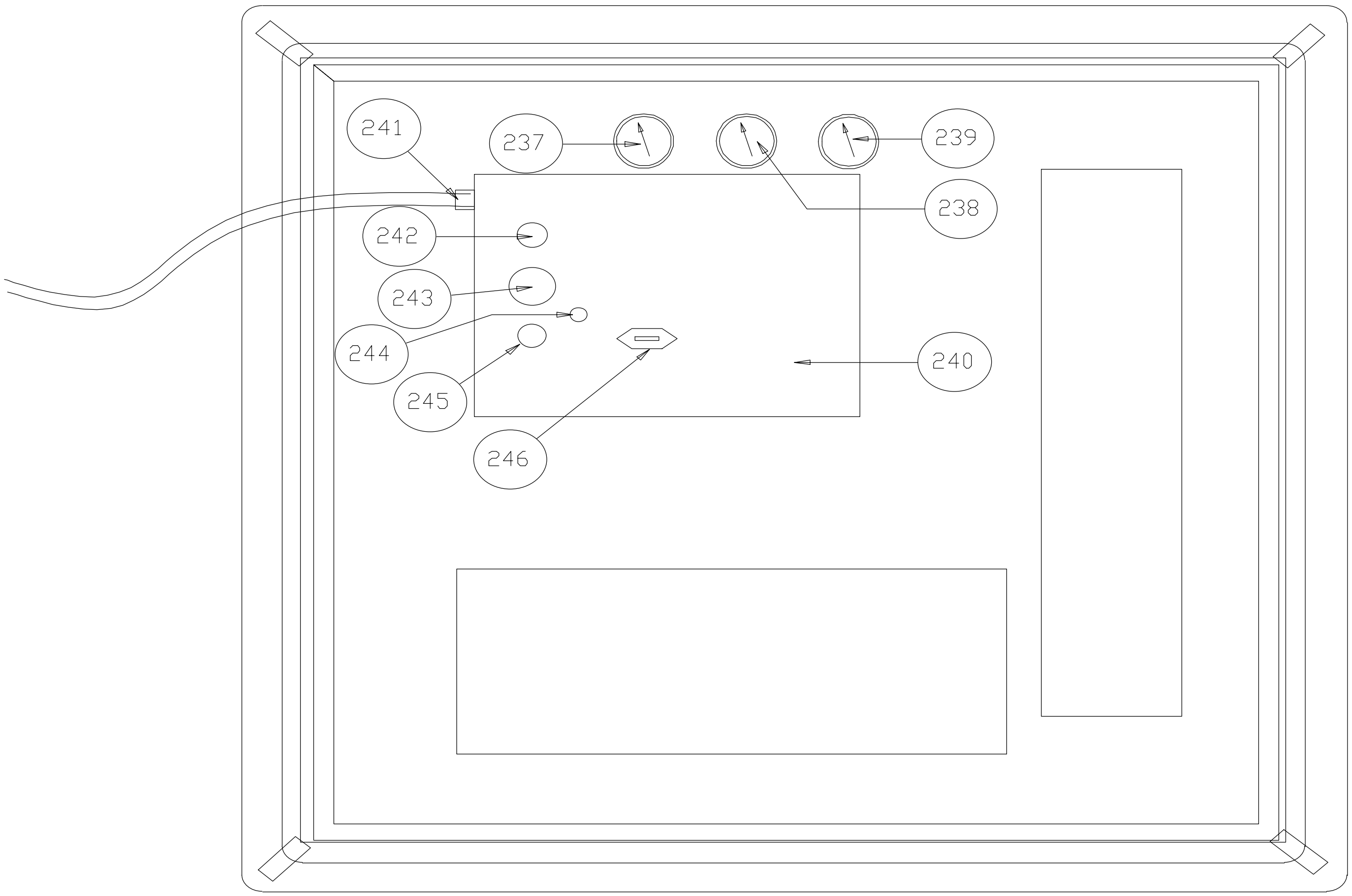


Figure 12

HV BOOSTER INTERIOR CONTROL PANEL SIDE

POGS 33 Maintenance

WARNING: Air Compressor: Before doing any maintenance, the electric power must be unplugged. Depressurize by slowly disconnecting the air hose to the POGS.

WARNING: POGS Oxygen Generator: Before doing any maintenance, the electric power cord must be unplugged. Depressurize the air and oxygen tanks by leaking out the oxygen supply and compressed air supply. This is done by opening one of the oxygen outlet valves and one of the compressed air valves labeled on the front of the generator.

WARNING: Sieve Beds: If they are removed for any reason, block both ends so room air does not enter the beds.

AIR COMPRESSOR (Refer to Owners' Manual)

1. The two (2) air inlet filters should be inspected daily or weekly (depending on environmental conditions). The black filter housings can be twisted open to remove filter elements.
2. The cabinet filter (located in center of compressor cabinet) should be inspected daily or weekly (depending on environmental conditions). To replace, pull back on four latches, lift cover and replace with new one.

POGS- Oxygen Generator

1. **DAILY-** Inside POGS cabinet at bottom left is a black valve knob. Use this to bleed any water out of air tank: with power off, open slowly and bleed out water until only air bleeds out.
2. **DAILY-** Outside the cabinet is the air tank water bottle. Empty the bottle and replace.
3. HEPA Filters- Change at three (3) months. Depressurize the air and oxygen by opening the oxygen outlet valve and compressed air valve. Open POGS cabinet door. Locate the two (2) blue HEPA filter housings. Unscrew the filter housing. Remove the filters and replace elements.
4. Air Line Filter- Change at three (3) months. Located in bottom of cabinet behind lower panel. Marked F26-04-FM0. Be sure air line is depressurized; depressurize using black valve knob Bottom Left of Cabinet. Push down on the filter-housing latch. Twist filter housing and drop down. Unscrew filter element support located in upper center of filter housing. Remove filter and replace. Clean filter bowl.

POGS 33 STARTUP AND SHUTDOWN

WARNING: When the Oxygen Generator is turned on for the first time after a prolonged shutdown period, the Oxygen receiver should be purged as described below.

NORMAL ROUTINE START-UP

Follow this procedure to start the Generator for normal operation. If this is the first time the unit has been started, has been moved to a new location, or has had a change to the power source, follow the Initial Start- Up Procedure (see below).

WARNING: Feed Compressor may be in standby mode, not off. Make sure power is "off" before setup.

1) Connect compressed air line from the Compressor to the POGS 33 Generator
2) Turn the Compressor's power switch "ON".
3) Turn the POGS 33 Generator's Main Power switch "ON". Observe the oxygen purity. If the purity is below 90-96%, attach the oxygen flow meter(s) and set flow to 15-33 LPM until 90-96% oxygen content or higher is obtained. The POGS 33 is now ready for use: turn alarm switch to "Active".

INITIAL START-UP

1) Verify proper compressor rotation:
2) Connect compressed air line from the compressor to the POGS 33 Generator.
3) Turn on the Compressor
4) Turn POGS 33 Generator Main Power Switch "ON".
5) When Oxygen Tank Pressure reaches approximately 70 PSIG, the amber light marked "Standby" should light up and oxygen production will cease. When oxygen is used the oxygen pressure falls to 55 PSIG, the amber light will go off and oxygen production will resume. This gauge is located at the upper right hand corner inside the Generator.
6) 90-96% and higher oxygen content will be obtained within 45 minutes. After the POGS 33 has gone into "Standby", connect one of the patient oxygen flow meters and set flow to 15-33 LPM to purge lower purity oxygen from the tank. Continue to flow until 90-96% oxygen content is obtained. The alarm switch should be in the "Bypass" position until the 90-96% oxygen level has been achieved.
7) As oxygen from the oxygen tank gets used, the oxygen purity continues to increase to the specified level. Accelerate the oxygen purity level by letting the generator go in and out of standby mode approximately six times with out going below 50 PSIG:

Purging Procedure:

- Step 1-Let generator go into standby
- Step 2-Bleed the oxygen out by allowing oxygen flow from flow meter until generator begins to run
- Step 3-Stop flowing the oxygen so it can go to "Standby" again
- Step 4-Repeat six (6) times, or until purity is reached

WARNING: If the generator or any part of the systems had been opened to the atmosphere, the system must be purged of any residual air to bring the product purity back to specifications. Do this by using the purging procedure (above).

SHUTDOWN

1. Turn POGS 33 Generator Main Power switch "OFF"
2. Turn Generator Alarm Switch to "Bypass"
3. Turn Feed Compressor power switch "OFF"
4. Inside POGS generator cabinet at bottom left is a black valve knob. Use this to bleed any water out of air tank: with power off, open slowly and bleed-out water until only air bleeds out.
5. Near this same valve knob is the air tank water bottle. Empty the bottle and replace.

WARNING: The generator will remain pressurized after shutdown. Before performing any maintenance or opening any piping systems, always depressurize the system; open the oxygen and air outlets to depressurize. Failure to do so may result in injuries.

NEUTRONICS INC.

Engineered Solutions for Gas Detection and Analysis

High Purity Instruments

MODEL 1100

OXYGEN ANALYZER / CONTROLLER – PERCENT RANGE

OPERATIONS MANUAL

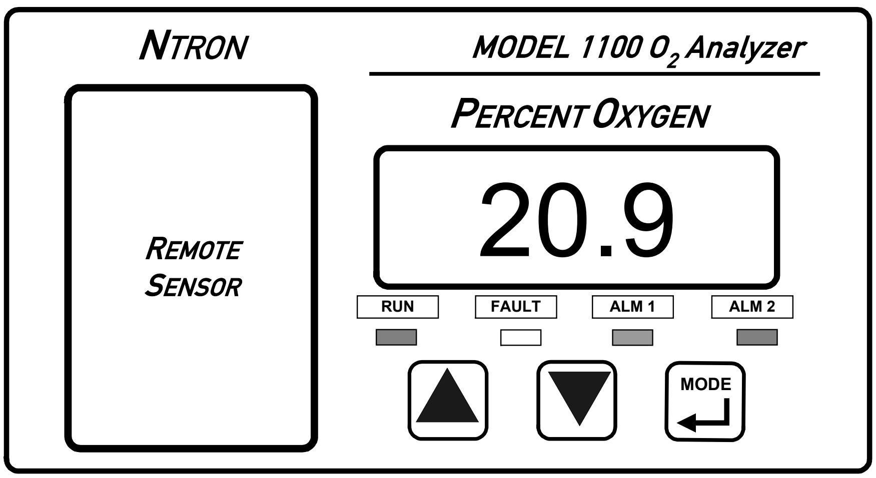


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Table of Contents

For Your Safety:

PLEASE READ THIS MANUAL IN ITS ENTIRETY BEFORE ATTEMPTING INSTALLATION OR OPERATION! Attempting to operate the Model 1100 without fully understanding its features and functions may result in unsafe conditions

- Always use protective eye wear and observe proper safety procedures when working with pressurized gases.
- Always remove the freshness seal from the CAG-250E sensor before using.
- Always assure the pressure of gas entering the model 1100 is 1-3 psig.
- Always calibrate the model 1100 at an equivalent pressure and flow rate to the measured gas.
- Always calibrate the model 1100 whenever the point of use elevation changes more than 500 feet.
- Properly dispose of the oxygen sensor when it has expired.
- Ensure the protective freshness seal has been removed from the sensor before use.
- Ensure the model 1100 has been properly calibrated before use.
- Never expose the model 1100 analyzer chassis or sensor to water, high humidity or moisture. The units are not watertight.
- Never expose the model 1100 to flame or high temperatures.
- Never expose the model 1100 analyzer to flammable gases or vapors. The unit is not rated Explosion Proof, or Intrinsically Safe.
- Never expose the model 1100 directly to unregulated gas lines, cylinder gas. High gas pressures may cause the oxygen sensor to rupture.
- Ensure the analyzer unit is mounted in an area of free airflow to prevent the chassis from exceeding the operating temperature specifications. Do not mount the analyzer or sensor against hot surfaces. Do not block the ventilation louver on the analyzer chassis.
- The Model CAG-250 Oxygen Sensor is housed in a PVC casing. Please consult appropriate material compatibility references to ensure the sensor is not damaged by background gases in process monitoring applications.

WELCOME

Thank you for purchasing the Model 1100 Analyzer for zero to 100 % range Oxygen measurement.

The Model 1100 Compact Analyzer is a user friendly, microprocessor controlled Oxygen measuring instrument. It has many features to offer the user, which will be described in this manual. We recommend that all personnel who use the instrument read this manual to become more familiar with its proper operation.

For further detail regarding the maintenance and in-field service of the Model 1100 analyzer, please contact the Neutronics Inc. Customer Service Department. If you have questions or comments, we would like to hear from you.

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Equipment Serial Number: ________________

(For faster service, please have this number ready if for any reason you need to contact us about your instrument)

1 CHAPTER 1 – INTRODUCTION AND OVERVIEW

1.1 General

The model 1100 *Compact Series* analyzer by Neutronics offers an efficient solution in a small package for oxygen measurement and control applications. The Model 1100 is a microprocessor-based instrument for measuring zero to 100 % oxygen. The system is supplied with a model CAG-250E oxygen sensor, a flow through head, and a 6-foot sensor interface cable.

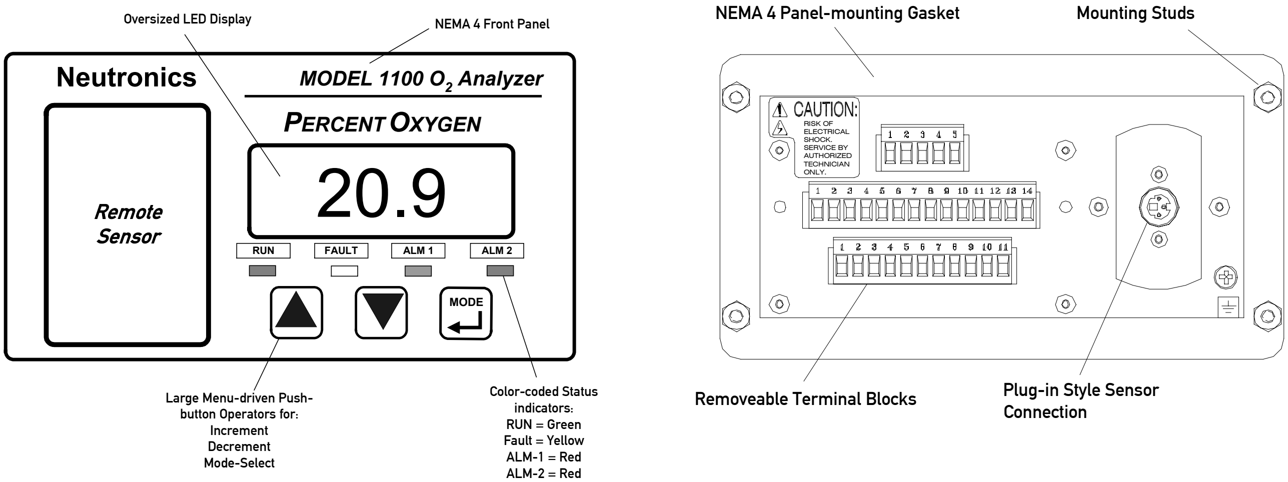
At the heart of the analyzer is the model CAG-250E oxygen sensor. This sensor assures reliability and fast response for critical measurements from zero to 100 %. It utilizes a unique weak acid electrolyte which offers long life and is unaffected by CO_2 and other acid gases. When used with the model 1100, the CAG-250E is remote mounted to allow the sensor to be installed close to a sampling point for the fastest response time possible for process monitoring and control applications. A flow-through mounting head is supplied for use with all Neutronics Inc. process gas sampling systems.

1.2 Features

The *Compact Series* analyzers are designed to be flush mounted to a panel or console. Because of the small size of the Model 1100 analyzer, it can be integrated into a variety of equipment or control panels. The Remote Sensor Module can be mounted close to the sampling point to assure the fastest response possible.

Other Features Include:

- Low-cost disposable Galvanic sensor
- Two User-adjustable Oxygen Alarms with configurable relay outputs for process control use
- Two Analog Outputs: 4-20 mA <u>AND</u> 0-1, 0-5, or 0-10 VDC
- Auto Ranging or Fixed Range Oxygen Measurement (VDC output provided for auto-range identification)
- Double Redundant Operating System, with automatic repair function
- Bi-directional RS-232 Serial Interface for connection to a PC, terminal, or printer



Front view **Rear view**

Figure 1 – Model 1100 oxygen analyzer front and rear view

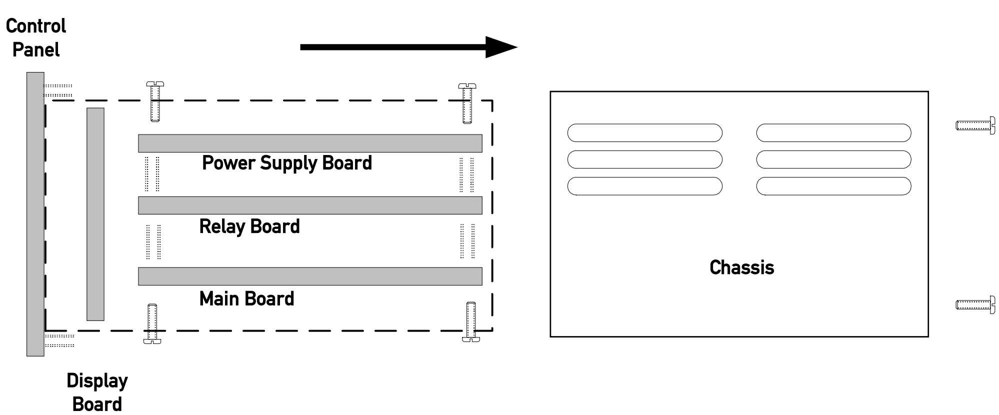


Figure 2 – Basic internal analyzer components

1.3 System Hardware Overview

1.3.1 Main Board

The main board houses the microprocessor, and supporting electronics for controlling the operation of the Model 1100 Analyzer. The main board receives the sensor input, and provides the control and display functions of the analyzer.

1.3.2 Relay Board

The Relay Board houses relay contacts for all of the Alarm and Control features of the 1100. The relays are mapped discretely to each alarm to provide electrical outputs for reporting, and process control use.

1.3.3 Power Supply

The power supply board is designed to take 110/220 VAC, 50/60 Hz mains power input. The supply is fused directly on the board. Optional 12 VDC and 24 VDC power supplies are available for installations where a DC voltage is required to power the Model 1100. A 12 VDC battery-backup power input (battery not provided) is also provided to act as an emergency back up in case of mains power failure.

1.3.4 Display Board

The Display board is designed to generate a digital indication of the concentration of oxygen (Appendix E – range / output chart), and fault codes (section 4.3.1). The display is a 7-segment, ¾" alphanumeric LED.

1.3.5 Control Panel

The Control Panel serves as the main user interface. The Control Panel features the keypad (ramp-UP, ramp-DOWN, and MODE keys) and the status LED's. The control panel is designed to be splash and water-resistant. There are #8-32 threaded mounting studs at each of the four corners for flush mounting of the model 1100 to a stationary control or equipment panel. The gasketed panel is suitable for NEMA type 4 / IP20 environments when properly installed.

1.3.6 Sensor

The sensor is an electrochemical cell, which measures partial pressure of oxygen. Sample gas is passed by the face of the sensor and an electrical output is generated, which is directly proportional and linear to the partial pressure of oxygen in the gas sample. It is similar in operation to a battery, except that one of the reactants, oxygen is supplied externally to the cell.

The CAG-250E Oxygen sensor consists of a lead anode, oxygen cathode, and weak acid electrolyte. Oxygen permeates a plastic membrane on the face of the sensor. The oxygen is electrochemically reduced at the cathode. The current generated is directly proportional to the partial pressure of oxygen at the sensing surface of the cell.

The CAG-250E sensor is a sealed disposable device with a serviceable life of 2 to 3 years. It does not require any periodic maintenance. When the sensor has expired, the entire device is disposed of and replaced easily and safely.

1.3.7 Sensor Flow-Through Head

The sensor mounting-base allows the model CAG-250 sensor to be used for process monitoring. It serves as both the receptacle for the sensor and the delivery system for a gas sample from a process vessel or stream. It includes a sample inlet, a flow-through chamber a sample exhaust, and a screw-in receptacle for the oxygen sensor.

1.3.7.1 Sample Gas Inlet

Gas must be directed from the measured process to the sample inlet port via positive pressure from the source, or an external pump. The model CAG-250E sensor and flow-through head combination can be installed in any Neutronics Inc. Process Sampling System.

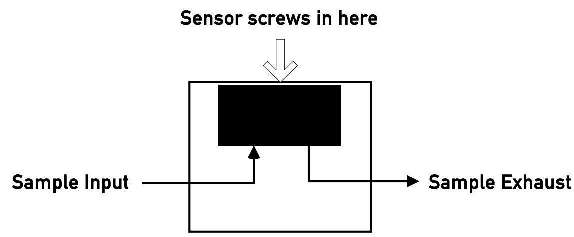
1.3.7.2 Sample Gas Exhaust

A sample gas exhaust port is provided for installation with a process oxygen sampling system. Gas must be directed from the sample exhaust port to a suitable vent source that does not apply significant backpressure on the sampling system. The unit can be installed in-line with any Neutronics Inc. Process Sampling System.

1.3.7.3 In-Situ Mounting

The model CAG-250 sensor may be mounted directly to a contained process gas stream via a user-installed threaded port. In-situ sampling is appropriate for clean dry applications, where there is not significant pressure / vacuum, or fluctuation in pressure / flow.

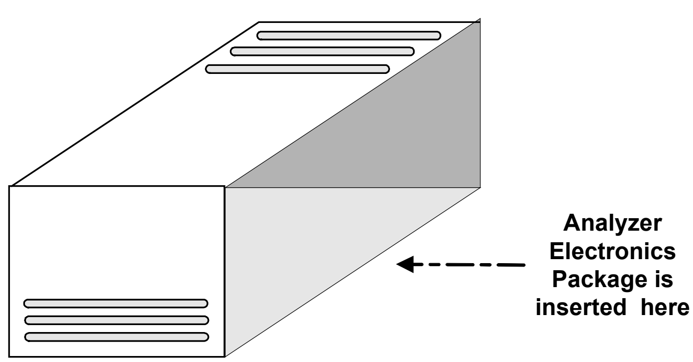
Figure 3 – Sensor flow-through head



1.3.8 Chassis

The chassis is manufactured of specially coated steel. It is designed to provide a general level of protection against mechanical damage from the local environment. It is also an important component of the electrostatic discharge (ESD) shielding design. Since the model 1100 is a flush mounted system, the portion of the instrument housed in the chassis will be located behind the control panel or embedded within the customer equipment enclosure. The enclosure is general purpose and is not watertight.

Figure 4 – Analyzer chassis



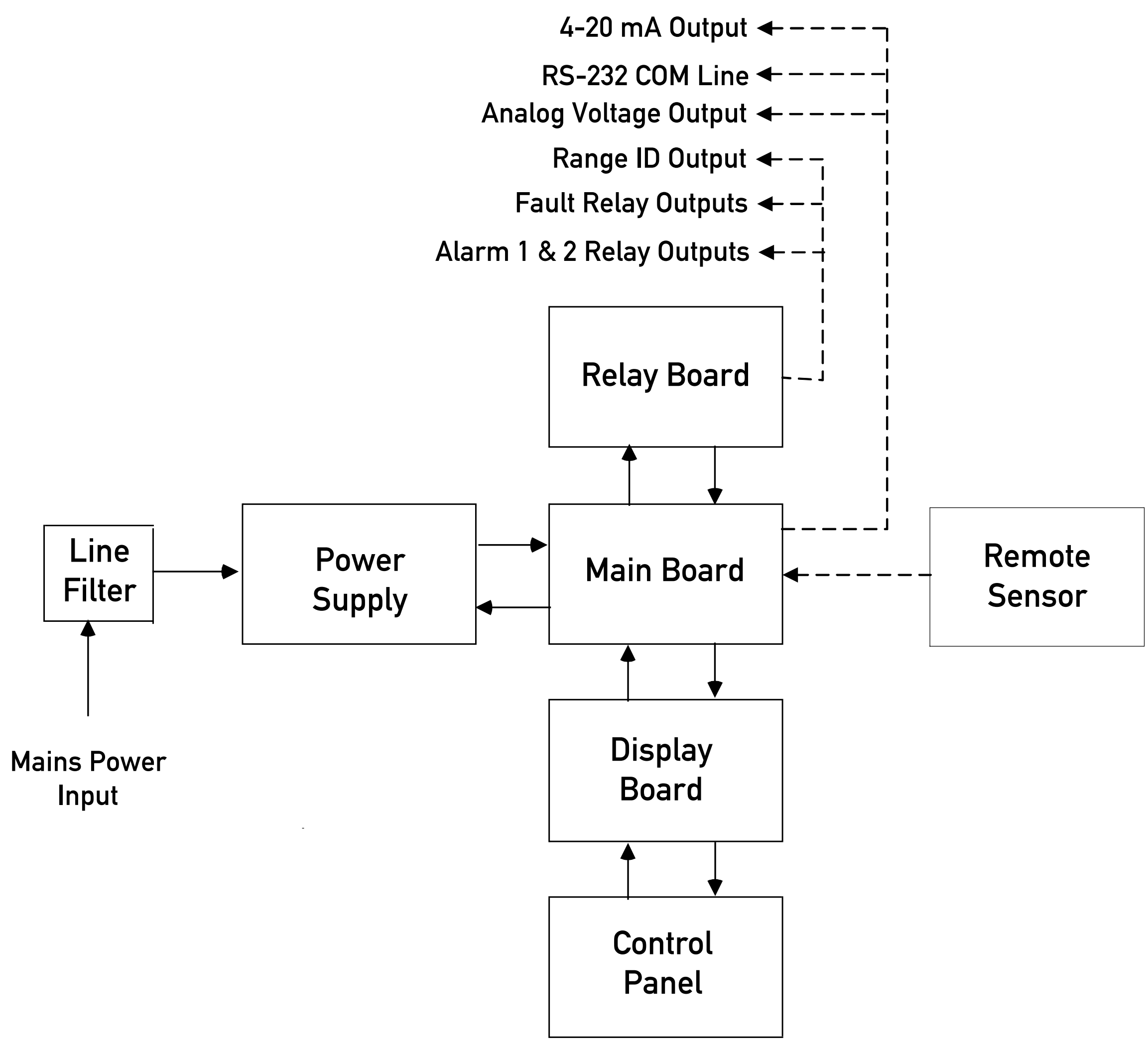


Figure 5 – Analyzer system configuration

1.4 Analyzer Inputs and Outputs

1.4.1 The Oxygen Sensor Input

The oxygen sensor electrical input to the model 1100 is used to indicate the oxygen concentration measured by the model CAG-250E oxygen sensor. It is proportional to the oxygen present in the measured gas at the sensor membrane. The oxygen sensor input is a female 3-pin 180° DIN connector to mate with the supplied sensor interface cable connector.

1.4.2 Alarm-1 Relay Output

The Alarm-1 relay is mapped to the Alarm-1 setpoint, and is provided for process control use. The user may set the oxygen level at which Alarm-1 activates (section 3.2.2). Alarm-1 may be configured as ascending (highest oxygen level allowable) or descending (lowest oxygen level allowable) action. The relay output may be configured for fail-safe (relay coil de-energized in alarm state) or non fail-safe (relay coil energized in alarm state) action. Factory default settings are ascending, and fail-safe (Appendix C, Factory Configuration). The Alarm-1 relay contacts are form C (DPDT), voltage-free.

1.4.3 Alarm-2 Relay Output

The Alarm-2 relay is mapped to the Alarm-2 setpoint, and is provided for process control use. The user may set the oxygen level at which Alarm-2 activates (section 3.2.3). Alarm-2 may be configured as ascending (highest oxygen level allowable) or descending (lowest oxygen level allowable) action. The relay output may be configured for fail-safe (relay coil de-energized in alarm state) or non fail-safe (relay coil energized in alarm state) action. Factory default settings are ascending, and fail-safe (Appendix C, Factory Configuration). The Alarm-2 relay contacts are form C (DPDT), voltage-free.

1.4.4 Fault Relay Output

The Fault relay output is used to indicate that there is at least one system fault active on the Model 1100 analyzer (section 4.3.1 – fault codes and definitions). The relay output action is non fail-safe, and is not configurable. The Fault relay contacts are Form B (SPST), voltage-free.

1.4.5 Analog Voltage Output

The Analog Voltage output is a dynamic potential used to indicate to a remote device the displayed oxygen concentration during normal analyzer operation and system maintenance. The Analog voltage output follows the oxygen readout displayed on the 7-segment LED display during all system and user modes except for user setup. For a complete listing of available output levels by analyzer range, refer to Appendix E – range / output chart.

The Analog voltage range can be adjusted by the user (section 4.1 – system setup). Available settings are 0-VDC for minimum-scale-deflection, to 1, 5 or 10-VDC full-scale. The factory default setting is 0-1 VDC (Appendix C, Factory Configuration). The Analog voltage output is scaled according to the analyzer's selected range, and must be used in conjunction with the Range ID voltage when the Analyzer is configured for auto-ranging (section 1.4.8).

1.4.6 Analog Current Output

The Analog Current output is a dynamic current flow used to indicate to a remote device the displayed oxygen concentration during normal analyzer operation and system maintenance. The Analog current output follows the oxygen readout displayed on the 7-segment LED display during all system and user modes except for user setup. For a complete listing of output levels by analyzer range, refer to Appendix E – range / output chart.

The minimum scale deflection may be set to either 0 mA or 4 mA. Full-scale is fixed at 20 mA. The Analog current output is scaled according to the analyzer's selected range, and must be used in conjunction with the Range ID voltage when the Analyzer is configured for auto-ranging (section 1.4.8).

1.4.7 Range ID Output

The model 1100 can be configured by the user to automatically switch its measurement range, based on the concentration of oxygen measured while in-service, to provide the most accurate, and highest resolution outputs at all times. For a complete listing of analyzer ranges, refer to Appendix E – range / output chart.

Remote auxiliary devices designed to interpret the model 1100 Analog outputs over multiple output range scales require an indication of the analyzer's selected range at all times for accurate scaling. The model 1100 features a 0-10 VDC Auto-Range Identification output. The range ID output is used in conjunction with the Analog voltage and Analog current outputs when auto-ranging is used. It provides an indication of the Analog outputs' selected full-scale. There are five range ID voltage levels used in the 1100 to correspond with its five output ranges (Appendix E – range / output chart).

1.4.8 Service Port

The Service port provides a user-friendly means of digital communications with the model 1100 Analyzer. Through this port, the unit may be configured, calibrated, and queried for most functions. The RS-232 port may also be programmed to send out information on a timed basis for users who prefer to use Digital instead of Analog interfacing with the analyzer. In addition, the service port may be used with a PC based computer (such as a portable notebook computer) over a standard bi-directional RS-232 serial interface.

1.5 Control panel User Interface

1.5.1 The "UP" Pushbutton

The "UP" pushbutton can be used to program the 1100 Analyzer via the control panel. This momentary push-button soft key is used to enter incremental information. Its function is menu-driven.

1.5.2 The "DOWN" Pushbutton

The "DOWN" pushbutton can be used to program the 1100 Analyzer via the control panel. This momentary push-button soft key is used to enter decremental information. Its function is menu-driven.

1.5.3 The "MODE" Pushbutton

The "MODE" pushbutton can be used to program the model 1100 via the control panel. This momentary push-button soft key is used to navigate the operational modes available through the control panel. Its function is menu-driven.

1.5.4 7-Segment Alphanumeric Display

The 7-Segment alphanumeric display feeds back information from the model 1100 to the user via the control panel. The primary purpose of the 7-Segment display is to show the oxygen concentration readout. It is also used for feedback of operational status, fault codes, and other information necessary to perform system setup and maintenance.

1.5.5 RUN Indicator LED

The purpose of the RUN Indicator LED is to inform the user via the control panel that the model 1100 is measuring the concentration of the sample gas and updating the display and outputs accordingly, and has not detected any alarm, or fault conditions.

1.5.6 Alarm-1 Indicator LED

The purpose of the Alarm-1 Indicator LED is to inform the user via the control panel that the measured oxygen concentration has exceeded the alarm-1 threshold; alarm-1 and its associated relay are in active mode.

1.5.7 Alarm-2 Indicator LED

The purpose of the Alarm-2 Indicator LED is to inform the user via the control panel that the measured oxygen concentration has exceeded the Alarm-2 threshold; alarm-2 and its associated relay are in active mode.

1.5.8 Fault Indicator LED

The purpose if the Fault Indicator LED is to inform the user via the control panel that at least one system fault is active. Note that when the fault Indicator LED is active, the fault relay will also be active.

2 CHAPTER 2 – SYSTEM INSTALLATION AND START-UP

2.1 Installing the Analyzer

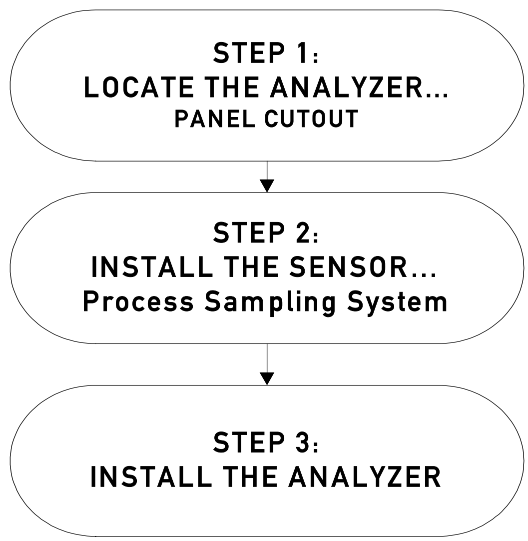


Figure 6 – Installation outline

2.1.1 Step 1 – Locate and Mount the Analyzer unit

The model 1100 is designed to be mounted flush to the surface of a stationary equipment control panel. Select a suitable location for the analyzer unit where the digital display and status LED's will be easy to read, and the interface buttons on the display panel will be easy to access.

Cut/drill the mounting panel to the specifications in figure-7. Clearance holes for the #8-32 threaded mounting studs do not need to be tapped. Hex nuts are included for securing the unit to a panel. Trim all burrs or sharp edges in the cutout or mounting-holes, which would interfere with or damage the gasket on the analyzer control panel.

Slide the analyzer unit into the cutout, rear-chassis first, and seat the control panel gasket on the mounting surface. The gasket on the analyzer control panel ensures a watertight seal around the control panel cutout. Secure the threaded mounting studs with the supplied hex-nuts, and internal-tooth lock-washers. The analyzer control panel is suitable for NEMA Type 4, IP20 environments when properly installed. The rear electronics chassis is suitable for NEMA Type 1, IP 20 environments.

The analyzer should not be exposed to water, adverse temperature, or shock. Ensure the analyzer unit is mounted in an area of free airflow to prevent the chassis from exceeding the operating temperature specifications. Do not mount the analyzer or sensor against hot surfaces. Do not block the ventilation louver on the analyzer chassis.

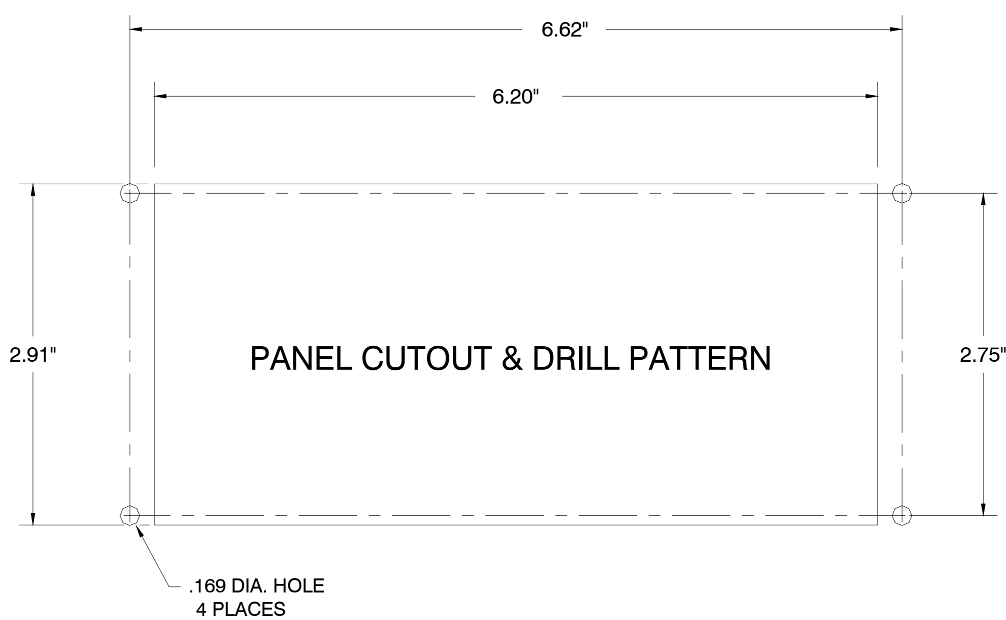


Figure 7 – Analyzer cutout

2.1.2 Step 2 – Install the Remote Sensor

The model 1100 is supplied with a model CAG-250E oxygen sensor, and sensor flow-through head for connection to a sampled process gas stream, and a sensor interface cable with a rubberized sheath to protect the sensor and the sensor electrical connector from dust and liquid spray.

The model 1100 can also be supplied with a Neutronics Inc. process Sampling system, built-to-application. For detailed instructions on remote sensor installation with a Neutronics Inc. Process Sampling System, please refer to the equipment manual.

CAUTION: The remote mounted sensor contains a weak acid electrolyte (concentrated acetic acid). Do not attempt to disassemble the sensor. Any sensor found leaking electrolyte should be disposed of according to local regulations. See material safety data supplied in the Appendix of this manual. Any damaged sensor should be replaced with a new unit.

2.1.2.1 Flow-through Head

Surface-mount the flow through head horizontally (as shown in figure 8) or vertically on a stationary panel. The sensor flow-through head is 1.25” diameter Delrin™ plastic or optional stainless steel, and is machined to accommodate two # 6-32 machine-type mounting screws (1-inch on center). Be careful not to over tighten the mounting screws. Allow sufficient space to screw the model CAG-250E oxygen sensor into the top threaded port of the flow through head, and for the sample lines and sample inlet and exhaust fittings.

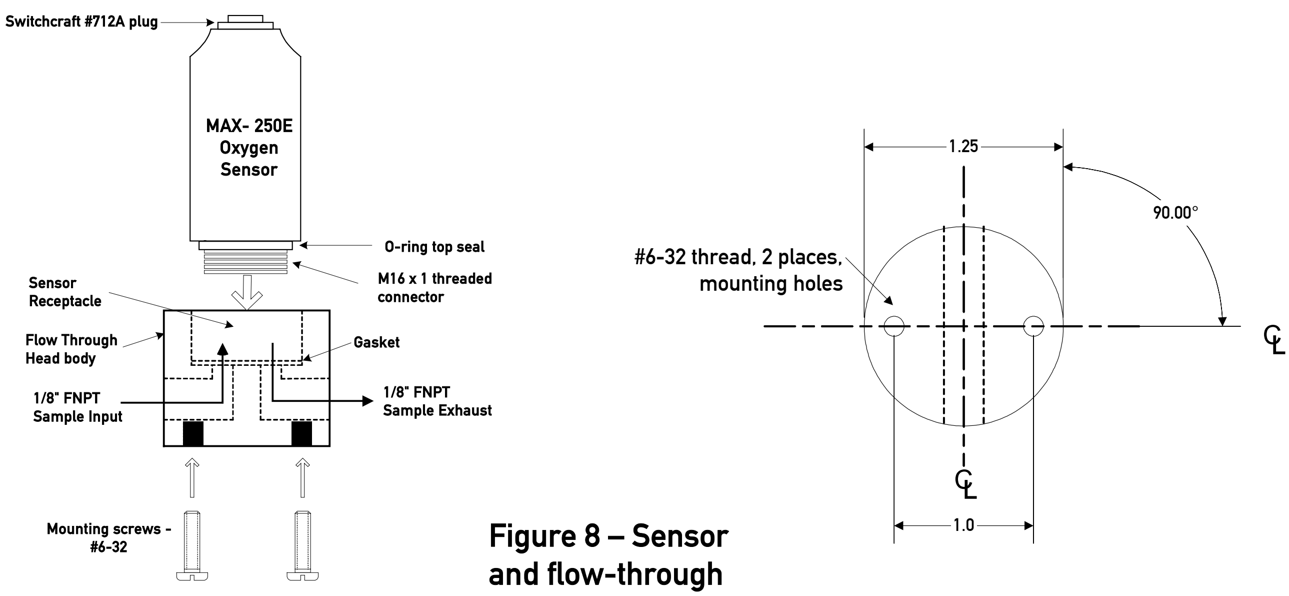


Figure 8 – Sensor and flow-through head mounting

2.1.2.2 Sample Inlet Port

Pneumatic connection to the measured process for sample extraction is made at either of the two interchangeable 1/8” FNPT fitting around the side of the flow-through head. For connecting the flow-through head to the measured process, use 1/8” or 1/4” rigid tubing, and 1/8” MNPT fittings of a material compatible with process gas composition. Ensure that no grease, particulate, or solvent is present in the tubing during installation. Use thread-tape to seal connections, and prevent gauling. Fix all sample tubing and connectors.

A fixed calibration port may be implemented in the process sampling line by installing a 1/8" or 1/4" 3-way manual ball valve into the sampling line as in figure-9. Use 1/8" or 1/4" rigid tubing and 1/8" MNPT fittings of a material compatible with process gas composition. Ensure that no grease, particulate, or solvent is present in the tubing during installation. Use thread-tape to seal connections, and prevent gauling. Fix all sample tubing and connectors.

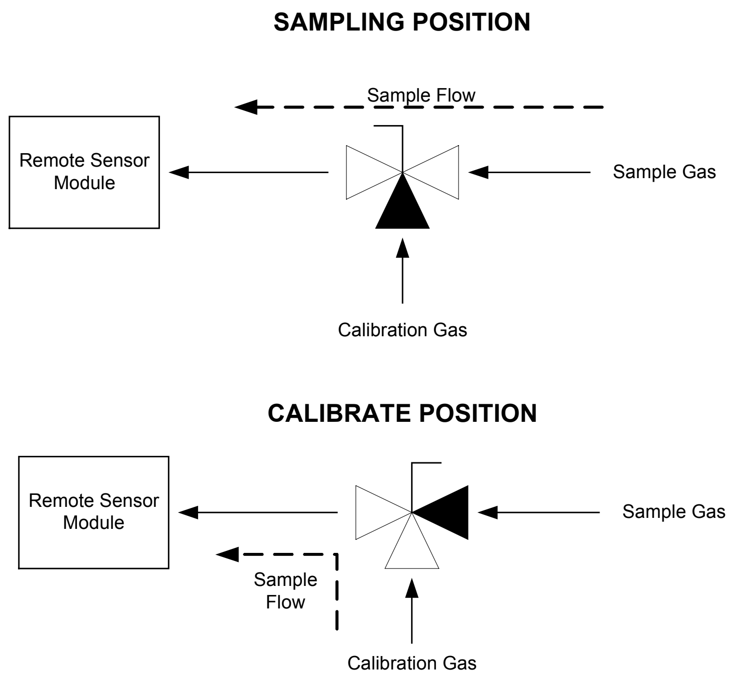


Figure 9 – Calibration gas fixture configuration

2.1.2.3 Sample Exhaust Port

Pneumatic connection to the measured process for sample extraction is made at either of the two interchangeable 1/8" FNPT fitting around the side of the flow-through head, but opposite the installed sample inlet port (section 2.1.2.2). For connecting the sample exhaust to vent, use 1/8" or 1/4" rigid tubing and 1/8" MNPT fittings of a material compatible with process gas composition. Select a vent location that is known to be at atmospheric pressure at all times. Use a minimum 2-meters of tubing to prevent back-flow of vent gas to the sensor. Ensure that no grease, particulate, or solvent is present in the tubing during installation. Use thread-tape to seal connections, and prevent gauling. Fix all sample tubing and connectors.

2.1.2.4 Sensor

The CAG-250E sensor pneumatic connection to the process gas stream is made at the M16x1 threaded flow-through head connection with a supplied top seal o-ring and receptacle gasket. Electrical connection to the model 1100 is made at the female SwitchCraft type #712A connector.

Connect the sensor to the flow-through head. Verify the supplied o-ring is in place at the base of the sensor, over the M16x1 threaded connector. Do not lubricate the o-ring. Verify the supplied gasket is seated in the bottom of the flow-through head sensor receptacle. Screw the sensor into the flow-through head sensor receptacle, and hand-tighten. Do not over-tighten. The o-ring and gasket should be slightly compressed. Match the sensor threaded flow-through head connection against the mating receptacle in the sensor flow-through head.

Attach the supplied sensor cable to the model CAG-250 oxygen sensor using the female SwitchCraft type #712A connector. Hand-tighten the capture-ring to secure the connection. Match the sensor electrical connection against the mating connector on the sensor interface cable. Slide the protective sheath over the sensor. Fix all wiring and connectors.

Sampled process gas may be applied to the sensor flow-through head any time after the sensor is attached to the flow-through head. Regulate sample gas to 1 to 3 psig at 1-SLPM flow rate. Do not exceed 3-psig at the sample inlet port. Never apply an unregulated gas source to the sensor flow-through head.

2.1.3 Step 3 – Install the Analyzer

DANGER: Electrical connections on the rear of the Model 1100 Oxygen analyzer may have hazardous voltages present once power has been applied to the unit. High voltages may remain present for a short time even after power has been disconnected from the analyzer. Take care in observing standard electrical practices when making electrical connections to the Model 1100 Oxygen analyzer.

DANGER: The model 1100 analyzer is not rated intrinsically safe or explosion proof. Be certain that no flammable gases are present in the area where the Model 1100 analyzer will be installed.

CAUTION: The model 1100 housing is not rated waterproof. Do not mount the analyzer or the sensor in an area where it may contact water or other liquid elements.

WARNING: Be certain that all power is OFF to the analyzer and associated wiring (cables) before attempting installation. DO NOT WORK WITH LIVE WIRES! Do not leave any exposed wire at the terminal blocks. Before applying power, ensure terminal blocks are fully inserted into the mating connector at the analyzer.

A label depicting the terminal block arrangement is affixed to the top of the chassis for easy reference during installation and maintenance (VAC configuration shown below). The terminal blocks feature screwed terminals. The terminal blocks are also removable for ease of wiring or removal of the analyzer module.

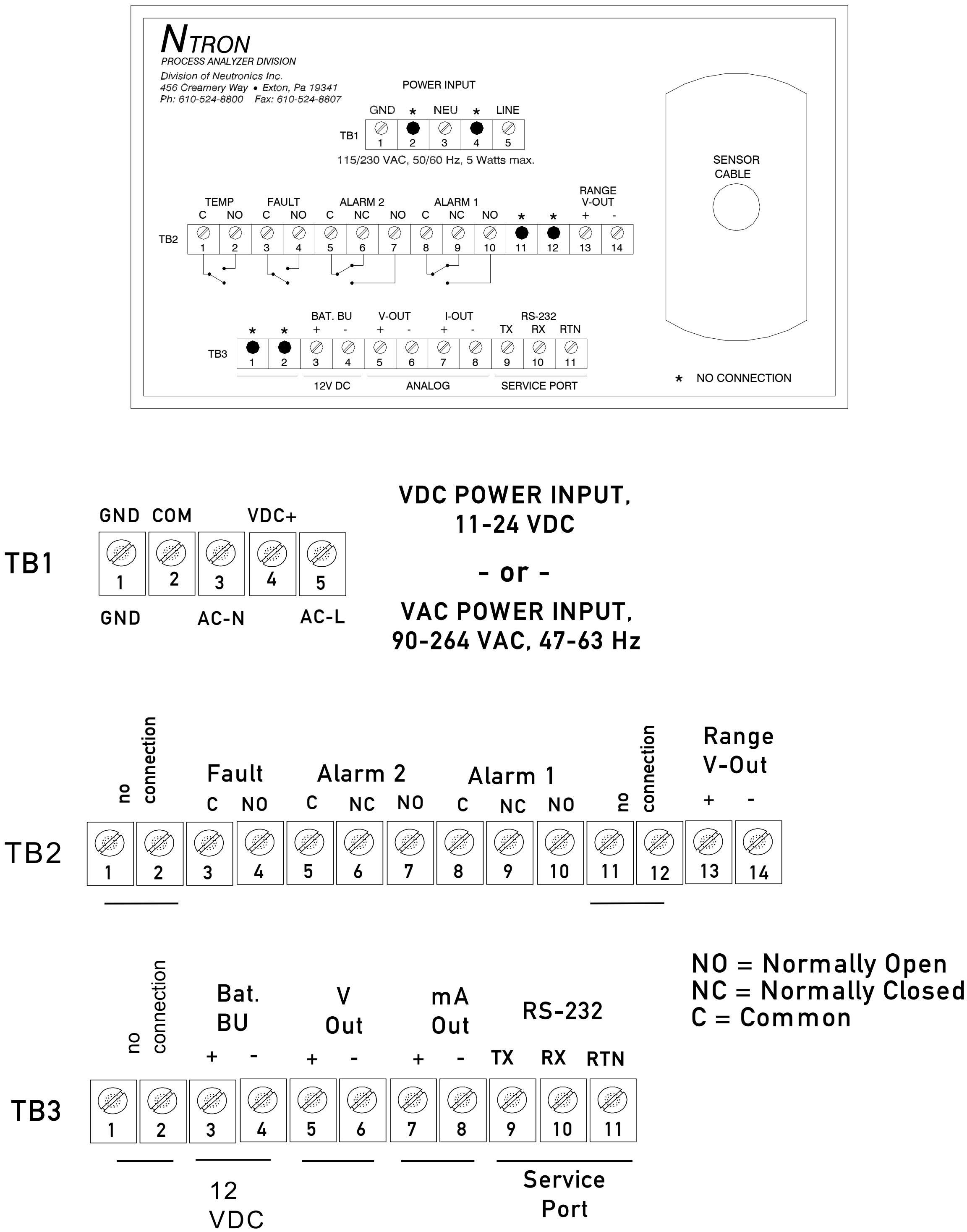


Figure 10 – Analyzer chassis electrical connections

2.1.3.1 Sensor Input

Electrical connection to the model CAG-250E oxygen sensor is made by connecting the supplied sensor interface cable between the analyzer and the sensor. Attach the sensor interface cable to the model 1100 analyzer female 180° 3-pin DIN cable connector. Match the sensor input connector against the mating connector on the sensor interface cable. Fix all wiring and connectors.

2.1.3.2 Alarm-1 Relay Output

Connections from the Alarm-1 relay contacts to the user's process control equipment are made at terminal block TB2 on the rear of the analyzer chassis. The oxygen alarm relay contacts are voltage-free Form C relay contacts, SPDT, 5A @ 250 VAC, 5A @ 30 VDC. Be certain to match the terminal pins against the terminal ID label on the top of the analyzer chassis.

2.1.3.3 Alarm-2 Relay Output

Connections from the Alarm-2 relay contacts to the user's process control equipment are made at terminal block TB2 on the rear of the analyzer chassis. The oxygen alarm relay contacts are voltage-free Form C relay contacts, SPDT, 5A @ 250 VAC, 5A @ 30 VDC. Be certain to match the terminal pins against the terminal ID label on the top of the analyzer chassis.

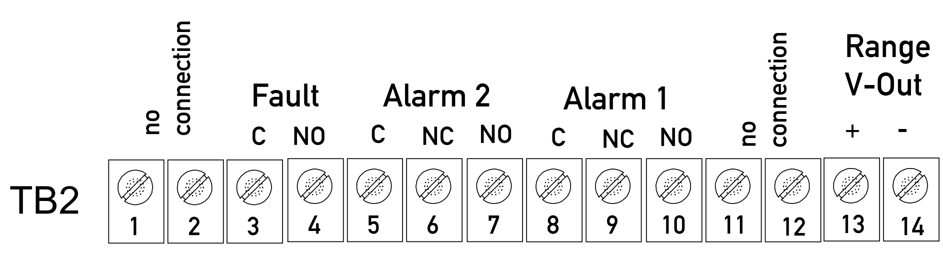
2.1.3.4 Fault Relay Output

Connections from the Fault relay contacts to the user's process control equipment are made at terminal block TB2 on the rear of the analyzer chassis. The fault relay contacts are voltage-free Form B relay contacts, SPST, 5A @ 250 VAC, 5A @ 30 VDC. Be certain to match the terminal pins against the terminal ID label on the top of the analyzer chassis.

2.1.3.5 Range ID Output

Connections from the Range ID output to the user's auxiliary equipment are made at terminal block TB2 on the rear of the analyzer chassis. Be certain to match the terminal pins against the terminal ID label on the top of the analyzer chassis.

Use 20-AWG, 2-conductor, stranded-wire, twisted pairs for the connections. It is not necessary to use shielded cable for the Range ID output, with or without electrical barriers. If shielded cable is used, it should be drained to dc ground at the auxiliary equipment.



2.1.3.6 Analog Voltage Output

Connections from the Analog Voltage output to the user's auxiliary equipment are made at terminal block TB3 on the rear of the analyzer chassis. Be certain to match the terminal pins against the terminal ID label on the top of the analyzer chassis.

Use 20-AWG, 2-conductor, stranded-wire, twisted pairs for the connections. It is not necessary to use shielded cable for the Analog voltage output, with or without electrical barriers. If shielded cable is used, it should be drained to dc ground at the auxiliary equipment.

2.1.3.7 Analog Current Output

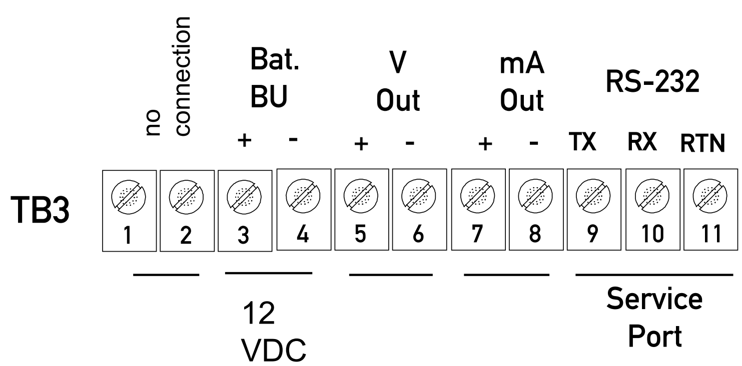
Connections from the Analog Current output to the user's auxiliary equipment are made at terminal block TB3 on the rear of the analyzer chassis. The Analog current output is a negative ground, non-isolated 0-20mA, or 4-20 mA current loop. 12 VDC Power is supplied by the model 1100 analyzer. Maximum electrical loading is 250 Ohms. Be certain to match the terminal pins against the terminal ID label on the top of the analyzer chassis.

Use 20-AWG, 2-conductor, stranded-wire, twisted pairs for the connections. It is not necessary to use shielded cable for the Analog current output, with or without electrical barriers. If shielded cable is used, it should be drained to dc ground at the auxiliary equipment.

2.1.3.8 Battery Backup

12-volt DC Battery Backup terminals are provided at terminal block TB3 on the rear of the analyzer chassis. These terminals may be connected to a fixed 12 VDC power source to act as a back up in case mains power has been lost. The circuit will detect loss of the mains power and the VDC battery backup will maintain power to the system.

Connection to the battery backup is not required for normal operation of the analyzer. Be certain to match the terminal pins against the terminal ID label on the top of the analyzer chassis.



2.1.3.9 RS-232 Service Port

Connections from the Range ID output to the user's auxiliary equipment are made at terminal block TB3 on the rear of the analyzer chassis. Be certain to match the terminal pins against the terminal ID label on the top of the analyzer chassis.

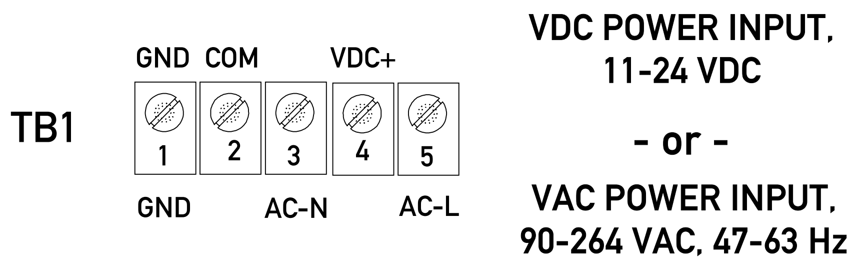
For interfacing with any standard PC computer via serial port, use 20-AWG, 3-conductor, shielded, stranded-wire, jacketed cable, terminated on one end with a female DB9 connector. The shielding should be drained to dc ground at the computer.

SIGNAL DESIGNATION AT ANALYZER	ANALYZER TB2 CONNECTION	SIGNAL DESIGNATION AT COMPUTER	COMPUTER DB9 SERIAL PORT CONNECTION
RX	Pin 9	TX	Pin 2
TX	Pin 10	RX	Pin 3
RTN	Pin 11	RTN	Pin 5

2.1.3.10 Mains Power

Connections for Mains Power input are made at terminal block TB1 on the rear of the analyzer chassis. Be certain to match the terminal pins against the terminal ID label on the top of the analyzer chassis.

For VAC versions, use minimum 16-AWG, 3-conductor, stranded-wire, for the connections. Supply single-phase 110/220 VAC, 50/60Hz to the unit. For VDC versions, use 18-AWG, 3-conductor, stranded-wire, for the connections. Supply 12/24 VDC to the unit. Refer to Appendix B for detailed power specifications.



2.2 Starting up and Commissioning the System

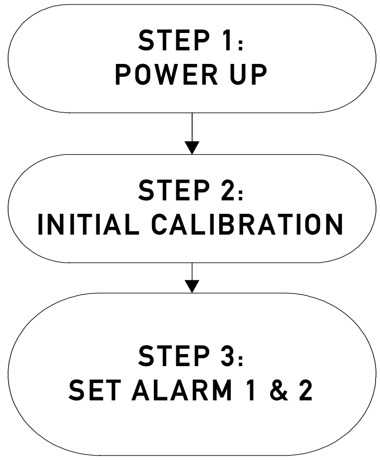


Figure 11 – Start-up outline

The Model 1100 is shipped ready to use, right from the carton. Factory default configuration settings are listed in Appendix C for your information. Those settings will be suitable for most applications. Review the factory default configuration settings before commissioning your system. If you wish to change any of the factory default settings, refer to sections 4.1.1 and 4.1.2.

POWER UP CHECK LIST

Have you:

- Mounted the analyzer and sensor in areas where there are no flammable vapors?
- Mounted the system away from exposure to rain, dripping water, or hose down?
- Correctly installed all of the wiring?
- Connected the sensor interface cable at both the sensor and analyzer?
- Ensured gas tight plumbing at the sensor flow-through head?
- Regulated the sample pressure as instructed in section 2.1.2.4?
- Read this manual in its entirety?

2.2.1 STEP 1 – Power Up the unit

When the Model 1100 is powered-up, it will go through a 5-second self-test. The 7-segment alphanumeric display will show “8.8.8.8.”, then XXXX (software build), and the Power Supply voltage setting. The Run, Alarm-1, Alarm-2 and Fault LED indicators will go through a display test sequence (Lamp Test). The unit will then check the sensor signal and update the digital display and status LED’s, and enter into the appropriate system mode according to programmed parameters (Appendix C – system configuration).

Once the analyzer reading has stabilized, the user may apply an instrument air source to the sensor to check the system. Allow the new reading to stabilize. It should take about 30-seconds for the gas to sweep out the sample lines, depending on the length.

2.2.2 STEP 2 – Calibrate the Unit

All units are calibrated at the Neutronics factory before shipping. However, it is recommended that the model 1100 be calibrated at commissioning, under ambient and process conditions similar to those encountered while in-service. Refer to section 3.2.1 for detailed analyzer calibration instructions.

Helpful hint The model 1100 is configured-to-order, as specified by the user per the application. If the application has changed, some adjustments in the system configuration may be necessary to optimize the model 1100 performance for the application. After reviewing the calibration instructions, review Appendix C – Factory Configuration Settings. Verify that the current settings are suitable for the application. Refer to Appendices E and F for all valid range and output settings available on the model 1100. If any changes are necessary, they can be performed via the control panel (section 4.1.1) or the service port (section 4.1.2).

2.2.3 STEP 3 –Set Alarm-1 and Alarm-2

After the unit has been calibrated on a known gas source, set the alarm points according to process control requirements. Refer to Appendix C for factory settings.

2.2.3.1 Set Alarm-1

For process control applications, alarm-1 is used normally as the “primary” oxygen-level alarm, and is set to the highest or lowest level of oxygen allowable in your process, according to the application. Refer to section 3.2.2 for information about setting the alarm-1 level.

2.2.3.2 Set Alarm-2

For process control applications, alarm-2 is used normally as the “secondary”, or “warning” oxygen-level alarm, and is set just below to the highest, or just above the lowest level of oxygen allowable in your process, according to the application. Refer to section 3.2.3 for information about setting the alarm-2 level.

The Model 1100 should now be ready for commissioning. Neutronics Inc. offers commissioning, and Factory Acceptance Testing services by our qualified technicians. You may contact the Neutronics factory toll-free at (800) 278-2287 in the continental United States. Elsewhere, call (610) 524-8800) and ask an Ntron Division Service Technician to schedule a service call.

3 CHAPTER 3 – ANALYZER OPERATION

3.1 System Organization

The Model 1100 has two types of operational modes – User-type, and System-type. User modes are initiated and controlled by the user, and are used to setup and maintain the analyzer. The User modes are: Calibration, Set/View Alarm-1, Set/View Alarm-2, View Active Faults, and Setup. Operating modes are accessed automatically by the Model 1100 during normal operation, according to its programming, and its configuration parameters. The Operating modes are: Self-Test & Warm-up, Run, Alarm-1 Active, Alarm-2 Active, and Fault Active.

3.2 USER Modes

At any time, the user can initiate any of the user modes either from the control panel or through the service port. Control panel access of the Calibration, Set/View Alarm-1, Set/View Alarm-2 and View Active Faults modes will be covered in this chapter. System setup mode and user access via the service port will be covered in section 4.1.

The user modes Calibration, Set/View Alarm-1, Set/View Alarm-2 and View Active Faults are accessed serially via the control panel, in the aforementioned order by repeatedly pressing and releasing the "MODE" key. When a user mode is accessed via the control panel, the model 1100 aborts any system mode active, and holds the state of Alarm-1, Alarm-2, Fault, and Heater OK relay outputs until the user returns the unit to Run mode.

3.2.1 CALIBRATE Mode & Calibration Procedure

Calibration mode allows the oxygen sensor and analyzer to be aligned to gases of known oxygen concentration for the most accurate on-line readings. For best accuracy in most ranges, the model 1100 requires single-gas calibration with ambient-level oxygen (20.9 %) at system commissioning, and at regular monthly intervals during the normal service life of the oxygen sensor (2-3 years). The simple procedure requires the user only to apply gas, and adjust the reading on the analyzer control panel. The model 1100 does the rest.

When a new sensor is put into service, the analyzer is calibrated with two gases, 20.9 % and 1 – 4 %, to ensure full range accuracy throughout the normal service life of the sensor. The analyzer will recognize the two calibration gases automatically. The user just applies gas, adjusts the reading on the analyzer control panel, and repeats the same simple steps with another gas. The model 1100 automatically sets up the new sensor for best accuracy throughout its service life.

Calibration should be performed at the following times:

- During commissioning [1]
- Once per 30-days of normal operation [1]
- When replacing an oxygen sensor [2]
- As required while troubleshooting the system [1]

[1] Single gas calibration 20.9 % O_2 [2] Two-gas calibration 20.9 % and 1 – 4 % O_2

3.2.1.1 Step-1: Select Calibration gases

The following calibration gas sources can be used to calibrate the model 1100:

For normal calibration – use Instrument grade compressed air (Dew-point < 35°, particulates < 3-micron, condensable hydrocarbons < 1-part-per-million), or Certified Standard grade bottled gas at 20.9 % oxygen concentration.

Additional gas for new sensor – use Certified Standard grade bottled calibration gas – 1.5 % O_2

WARNING Do not calibrate the model 1100 on zero gas. If the unit is calibrated on zero-gas, it will not operate properly.

3.2.1.2 Step-2: Remove the Oxygen Sensor from Online Service

The oxygen sensor requires removal from on-line service to perform calibration. Calibration or other maintenance of the model 1100 analyzer and sensor should be performed when the measured process is not operating. If the unit has been installed with a Neutronics Inc process sampling system, please refer to the equipment manual for detailed instructions.

Warning Before opening any part of the sampling system to air, make sure that the sampling lines are not pressurized, and are clear of any gas that may create a personnel or environmental hazard.

Disconnect the measured process from the sensor by completely removing the installed 1/8" MNPT fittings from the sensor flow-through head sample inlet port (this step is not necessary if using a fixed gas manifold – section 2.3.1). If it is necessary to exhaust to an alternate path during calibration, completely remove the installed 1/8" MNPT fittings from the sensor flow-through head sample exhaust port. Connect the oxygen sensor to an alternate exhaust location as in section 2.1.2.3.

3.2.1.3 Step-3: Normal Calibration – Apply calibration gas to the Oxygen Sensor

Attach a calibration gas source at 20.9 % oxygen concentration to the model 1100 sensor flow through head. The user may attach the regulated gas source to the sensor head sample inlet port directly, or through a fixed gas manifold. The latter method will help to prevent premature wear of tube-ends and fittings, and increase long-term sampling system integrity. Where a calibration manifold has not been installed, connect the calibration gas source to the oxygen sensor similar to section 2.1.2.2.

Apply calibration gas to the oxygen sensor. Adjust the regulated calibration gas pressure to match the pressure of the in-service sample gas, within the sensor pressure specification of 1-10psig (Appendix B). Be sure to flow calibration gas to the sensor until the analyzer display has stabilized to allow calibration gas to sweep out the sample lines.

Warning: Never apply an unregulated gas supply to the oxygen sensor. High or uncontrolled pressures may damage the oxygen sensor, and/or sampling system components.

3.2.1.4 Step-4: Normal Calibration – Calibrate the Model 1100

After a regulated stream of calibration gas has been applied to the sensor, press and release the "MODE" key once. The 7-segment alphanumeric display will show "CAL", then an oxygen concentration value. Adjust the displayed oxygen concentration value to read "20.9" by pressing the "UP" or "DOWN" arrow key as required. Press and release the "MODE" key four times to return to Run mode.

Note For normal monthly sensor calibration, skip to step-7, section 3.2.1.8 "Return the Oxygen Sensor to Online Service". The normal calibration procedure is complete. When replacing the oxygen sensor, the model 1100 must be calibrated to an additional gas 1.5 % oxygen. Continue on to Step-5, section 3.2.1.6 "New Sensor Calibration".

3.2.1.5 Step-5: New Sensor Calibration – Apply calibration gas to the Oxygen Sensor

Attach a calibration gas source at 1.5 % oxygen concentration to the model 1100 sensor flow through head. The user may attach the regulated gas source to the sensor head sample inlet directly, or through a fixed gas manifold (section 2.3.1). The latter method will help to prevent premature wear of tube-ends and fittings, and increase long-term sampling system integrity. Where a calibration manifold has not been installed, connect the calibration gas source to the oxygen sensor similar to section 2.1.2.2.

Apply calibration gas to the oxygen sensor. Adjust the regulated calibration gas pressure to match the pressure of the in-service sample gas, within the sensor pressure specification of 1-10psig (Appendix B). Be sure to flow calibration gas to the sensor until the analyzer display has stabilized to allow calibration gas to sweep out the sample lines.

Warning: Never apply an unregulated gas supply to the oxygen sensor. High or uncontrolled pressures may damage the oxygen sensor, and/or sampling system components.

3.2.1.6 Step-6: New Sensor Calibration – Calibrate the Model 1100

After a regulated stream of calibration gas has been applied to the sensor, press and release the "MODE" key once. The 7-segment alphanumeric display will show "CAL", then an oxygen concentration value. Adjust the displayed oxygen concentration to read "1.5" by pressing the "UP" or "DOWN" arrow key as required. Press and release the "MODE" key four times to return to Run mode.

3.2.1.7 Step-7: Return the Oxygen Sensor to Online Service

When calibration procedures are complete, the model 1100 is ready to return to service. Disconnect calibration gas from the oxygen sensor by completely removing the installed 1/8" FNPT fitting from the sensor flow-through head sample inlet port. Where a calibration manifold has not been installed, reconnect the sample inlet port to the process for in-service oxygen measurement (section 2.1.2.2). If an alternate vent connection has been made, reconnect the sensor flow-through head sample exhaust port to the primary vent source (section 2.1.2.3). Be sure to flow sample gas to the sensor until the analyzer display has stabilized to allow time to sweep the sample lines clear of calibration gas.

3.2.2 SET/VIEW ALARM-1 Mode

To enter Set Alarm-1 mode from run mode using the keypad; scroll through the user mode menu by pressing momentarily the "MODE" key two (2) times, until the 7-segment alphanumeric display reads "AL1" (set alarm-1 level), and the "RUN" and "ALM1" indicator LED's flash. The display will show momentarily "AL1" and then the current alarm-1 threshold level (an O_2 concentration). Use the "UP" and "DOWN" keys to adjust the alarm-1 setpoint level. Changed settings are automatically saved when the "MODE" key is pressed to enter the next mode.

3.2.3 SET/VIEW ALARM-2 Mode

To enter Set Alarm-2 mode from run mode using the keypad; scroll through the user mode menu by pressing momentarily the “MODE” key three (3) times, until the 7-segment alphanumeric display reads “AL2” (set alarm-2 level) and the “RUN” and “ALM2” indicator LED’s flash. The display will show momentarily “AL2” and then the current alarm-2 threshold level (an O_2 concentration). Use the “UP” and “DOWN” keys to adjust the alarm-2 setpoint level. Changed settings are automatically saved when the “MODE” key is pressed to enter the next mode.

3.2.4 VIEW ACTIVE FAULTS Mode

To enter View Active Faults mode from run mode using the keypad; scroll through the user mode menu by pressing momentarily the “MODE” key four (4) times until the 7-segment alphanumeric display reads “FL”, and the “RUN” and “FAULT” indicator LED’s flash. The display will show momentarily “FL” and then the highest priority active system fault. Press and release the “UP” or “DOWN key to scroll through all active system faults. Refer to section 4.3.1 for a complete fault code listing, and troubleshooting guide. To exit, press and release the “MODE” key.

3.2.5 Return to RUN Mode

To exit to run mode from any user mode, using the keypad; scroll through the control panel user mode menu by pressing repeatedly the “MODE” key until the 7-segment alphanumeric display shows ”run”. The display will then show an oxygen concentration. The “RUN”, “ALM1”, “ALM2”, and “FAULT” LED’s will flash for 120 seconds to indicate that the analyzer is in a stabilization period. This is to allow time to sweep the sample lines with sample gas before returning the unit to on-line service. During the stabilization period, alarm-1, alarm-2, and fault, relays remain inactive, and held to their last state before the control panel user mode menu was accessed.

3.3 System Modes

The model 1100 has five System modes – Self-Test & warm-up, Run, Alarm-1 Active, Alarm-2 Active, or Fault Active. Self-test & warm-up are fixed routines that are initiated upon each start-up. The remaining system modes, provided no valid manual input is received at the control panel or service port, are initiated automatically by the analyzer according to setup parameters entered by the user in setup mode, compared against monitored inputs and other monitored system hardware in real time.

3.3.1 Self-Test & Warm-up Mode

When the model 1100 is started up, it enters into Self-Test & Warm-up mode automatically (section 2.2.1). When the analyzer self-test is complete, the unit checks the current sensor signal, updates the 7-segment LED display, status LED’s, and Analog outputs, then enters into the appropriate system mode according to its programmed parameters.

3.3.2 RUN Mode

The model 1100 initiates Run mode when it is continuously measuring the oxygen concentration of the in-service sample gas, and updating the display and outputs accordingly, and it has not detected any valid user input. A solid lit or flashing “RUN” indicator LED indicates to the user that the instrument is on-line, and the system is operating properly.

When the measured process oxygen concentration falls outside of programmed alarm parameters, and/or the system experiences a fault condition, the model 1100 analyzer enters into Alarm-1 Active, Alarm-2 Active, and/or Fault Active mode accordingly. The system does not abort Run mode, and the "RUN" indicator LED stays lit. The appropriate indicator LED will light in addition to the "RUN" indicator LED.

When programmed alarm setpoints and/or fault conditions are cleared, the model 1100 analyzer aborts Alarm-1 Active, Alarm-2 Active, and/or Fault Active mode accordingly. The system does not abort Run mode, and the "RUN" indicator LED stays lit. Indicator LED's mapped to aborted modes go out.

When the model 1100 analyzer detects valid user-input, it enters into one of the user modes accordingly – Calibration, Set/View Alarm-1, Set/View Alarm-2, View Active Faults, or User Setup. The analyzer aborts Run mode and holds the state of Alarm-1, Alarm-2, and Fault. The "RUN" indicator LED goes out, except in Calibrate mode, where it flashes.

When the user manually aborts all user modes by returning the system to Run mode, or no valid user input is detected for 120-seconds, the model 1100 checks the current sensor signal, updates the 7-segment LED display, status LED's, and Analog outputs, then enters into the appropriate system mode according to its programmed parameters. Alarm-1, Alarm-2, and Fault relay outputs are released and the "RUN" indicator LED is lit.

3.3.3 ALARM-1 ACTIVE Mode

The model 1100 initiates Alarm-1 Active mode when it has detected that the measured oxygen concentration has exceed the set threshold value of Alarm-1 (section 3.2.2). The "ALM1" indicator LED will light, The "RUN" indicator LED will remain lit. The Alarm-1 relay will change state according to the analyzer configuration (Appendix C, Factory Setup). The Alarm status will be cleared automatically when the measured oxygen concentration is within the set threshold value of Alarm-1. The "ALM1" indicator LED will go out, and the Alarm-1 relay will return to its non-active state according to the analyzer configuration. The Alarm-1 Active mode held to its last state during manual access to the user mode menu.

3.3.4 ALARM-2 ACTIVE Mode

The model 1100 initiates Alarm-2 Active mode when it has detected that the measured oxygen concentration has exceed the set threshold value of Alarm-2 (section 3.2.3). The "ALM2" indicator LED will light, The "RUN" indicator LED will remain lit. The Alarm-2 relay will change state according to the analyzer configuration (Appendix C, Factory Setup). The Alarm status will be cleared automatically when the measured oxygen concentration is within the set threshold value of Alarm-2. The "ALM2" indicator LED will go out, and the Alarm-2 relay will return to its non-active state according to the analyzer configuration. The Alarm-2 Active mode is held to its last state during manual access to the user mode menu.

3.3.5 FAULT ACTIVE Mode

The model 1100 initiates Fault Active mode when it has detected that one or more Fault criterion have been satisfied (section 4.3.1). The "FAULT" indicator LED will light and the Fault relay will change state. The Fault status will be cleared automatically when no Fault criterion have been satisfied. The "FAULT" indicator LED will go out and the Fault relay will return to its non-active state. The user may view active faults at any time from the control panel (section 3.2.4).

4 CHAPTER 4 – MAINTENANCE AND TROUBLESHOOTING

4.1 System Setup

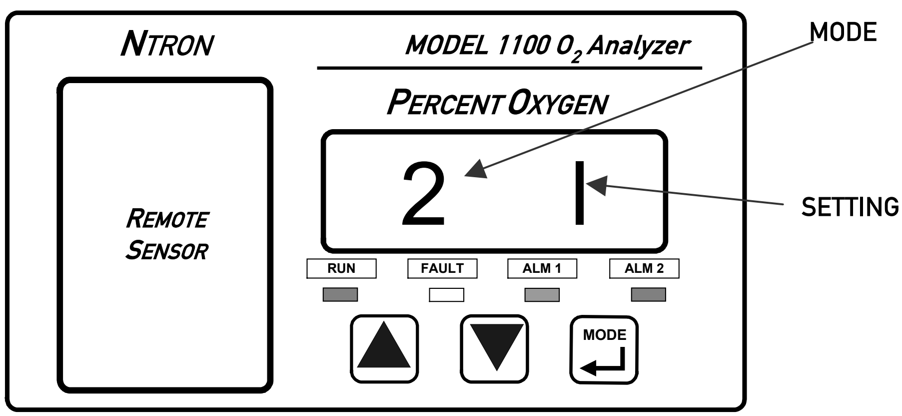
The model 1100 is shipped ready to install and operate with complete factory configuration already programmed and tested. The user may however wish to change the system configuration to suit the application of the analyzer. Some setup parameters may be changed by the user via the control panel keypad. All configuration parameters may be changed by the user via the Service Port.

Important: Before changing any of the model 1100 settings, refer to Appendix C – Factory Setup for reference. If the user has any questions before proceeding with changing analyzer settings, please contact the Neutronics Ntron division Service Department for assistance.

4.1.1 System Setup via Control panel Keypad

The control panel user setup menu may be accessed from the model 1100 control panel by pressing and holding the "MODE" key for at least 10-seconds until the 7-segment alphanumeric display shows"---" to indicate that the analyzer has accessed setup mode. Release the "MODE" key to activate setup mode. Once in setup mode, the user can access adjustable parameters sequentially by continuing to press and release the "MODE" key to scroll through the setup menu.

When you reach the mode that you wish to change, use the "UP" and "DOWN" keys to adjust the displayed setting. The modes are numerically identified by the number on the left side of the display. The current mode setting is identified by the number on the right side of the display. The new settings are automatically saved when the user advances to the next mode by pressing and releasing the "MODE" key. The user may exit the Setup menu at any time by pressing simultaneously the "UP" and "DOWN" keys (Appendix D, Control panel Hot-Key functions).



4.1.1.1 User Setup A: Display Range Select

This parameter allows the user to map the display and electrical output range scale of the model 1100 to suit the application (Appendix E – Range / Output Chart).

Valid Settings: 1 (fixed range 0-1 %) • 2 (fixed range 0-10 %) • 3 (fixed range 0-25 %) • 4 (fixed range 0-50 %) • 5 (fixed range 0-100 %) • 8 (low auto-range) • 9 (high auto-range) • 10 (full auto-range)

4.1.1.2 User Setup 1: Alarm-1 Relays Ascending/Descending Action

This parameter allows the user to set the Alarm-1 relay action to *ascending* (the relay is set to its active state when the oxygen level is above the Alarm-1 level set point) or to *descending* (the relay is set to its active state when the oxygen level is below the Alarm-1 level set point).

Valid Settings: 0 (Descending) • 1 (Ascending)

4.1.1.3 User Setup 2: Alarm-2 Relays Ascending/Descending Action

This parameter allows the user to set the Alarm-2 relay action to *ascending* (the relay is set to its active state when the oxygen level is above the Alarm-2 level set point) or to *descending* (the relay is set to its active state when the oxygen level is below the Alarm-2 level set point).

Valid Settings: 0 (Descending) • 1 (Ascending)

4.1.1.4 User Setup 3: Analog Voltage Output Setting

This parameter allows the user to set the Analog Output Voltage full scale to 1, 5, or 10 volts. *Note that the software settings must match the RA and RB jumper settings on the Main CPU PCB* (section 4.1.3).

Valid Settings: 0 (0-5 VDC) • 1 (0-10 VDC), 2 (0-1 VDC)

4.1.1.5 User Setup 4: Serial Output Format

This parameter allows the user to set the RS-232 communications timed output format.

Valid Settings: 0 (Output on Request) • 1 (Human Readable) • 2 (Machine Code) • 3 (Machine Code with Checksum) • 4 (Tab Delimited)

4.1.1.6 User Setup 7: Set Assume Low-End Calibration Range Code

DO NOT CHANGE THIS SETTING

4.1.1.7 User Setup F: Alarm-1 and Alarm-2 Relays Failsafe/Non Failsafe Action

This parameter allows the user to set the Alarm-1 and Alarm-2 relays to either *failsafe* action (relay coils not powered in active alarm state) or *non-failsafe* (relay coils powered in active alarm state).

Valid Settings: 0 (Non-Failsafe) • 1 (Failsafe)

4.1.1.8 User Setup B: RS-232 Baud Rate

This parameter allows the user to set the RS-232 communications baud rate.

Valid Settings: 1 (300BPS) • 2 (1200BPS) • 3 (2400BPS) • 4(4800BPS) • 5 (9600BPS) 6 (19200BPS) • 7 (38400BPS)

4.1.1.9 User Setup 8: Factory Setup Restore.

This parameter allows the user to return the model 1100 to its initial factory-commissioned settings. Always perform a gas calibration after restoring factory settings.

Valid Settings: 88. A setting of 88 will activate the Factory Setup restore.

4.1.2 System Setup via Service Port

The model 1100 analyzer features a Service Port, which is accessible for programming the system, monitoring the analyzer output, and determining active fault codes for troubleshooting. The Service Port has been designed for communication with a PC based computer or other device capable of receiving and transmitting ASCII data packets over a standard RS-232 serial interface.

Access to the Serial Service Port may made through a terminal emulator program such as **HyperTerminal**, available in Microsoft Windows 95 or later:

4.1.2.1 RS-232 Service Port Interfacing with HyperTerminal in Microsoft Windows 95 or later

Turn off your PC computer, and remove power from the Model 1100. Complete the instructions for wiring and connecting the Model 1100 to a PC computer (section 2.1.3.10). Apply power to the Model 1100, and start up the PC computer.

On your PC computer, open HyperTerminal: Navigate from the Windows desktop – Select **Start → Programs → Accessories → Communications → HyperTerminal**

In HyperTerminal, create and configure a new connection – follow the prompts:

PROMPT	**YOU ENTER**
CONNECTION NAME	1100
CONNECT TO	COM1, or other available COM port

In HyperTerminal, select the correct COM port properties, to interface properly with the Model 1100:

PROPERTIES	**YOU ENTER**
BITS PER SECOND	9600
DATA BITS	8
PARITY	None
STOP BITS	1
FLOW CONTROL	None
TERMINAL EMULATION	VT 100 *

* Not all versions of MS Windows prompt for this parameter.

Select "Apply" and "OK" as prompted. The Hyper Terminal program will immediately begin communicating with the model 1100, and the model 1100 will commence sending data via ASCII code dump to the PC. The information from the analyzer will be sent in ASCII strings, at 1-second intervals. Data will be sent in the factory default "Human Readable" format.

4.1.2.2 Troubleshooting Your HyperTerminal Interface

If serial communications with the model 1100 fails, isolate the problem by performing the following tests:

Disconnect the RS-232 cable from the model 1100 by removing the terminal block connector from TB3. Insert a jumper between pins 9 & 10 on the terminal block connector. Enter a few letters from the PC keyboard. The PC monitor should display the corresponding alpha-characters as they are typed. If the letters do not display on the monitor screen, there is a problem with the RS-232 cable, the PC serial COM port, or the HyperTerminal setup.

If the typed letters DO show on the monitor screen and serial communications with the model 1100 still has not been established, then PC COM port pins 2 & 3 (1100 pins 9 & 10) may be reversed. Verify the cable wiring (section 2.1.3.10). If no transmitted data from the model 1100 is seen on the monitor screen, call the Neutronics Inc. Service Department for further assistance.

4.1.2.3 Organization of RS-232 Serial Data

There are three levels of access through the service port that can be used for interfacing with the model 1100:

Standard Access: ASCII dump to a PC, printer, or DAQ, and provides basic operator access.

Advanced Level-1 Access: Allows user setup and configuration, such as alarms, and data format.

Advanced Level-2 Access: Allows access to vital control areas via password.

4.1.2.4 Standard Level Access

Standard Level Access is the default level of access to the model 1100 available to the user via a host computer or printer over a standard RS-232 serial interface. In Standard Level access, the user can make inquiries about oxygen concentration, sensor signal level, and other parameters for system servicing, and troubleshooting.

When communications are established between the model 1100 and a host computer, 2-way communication begins automatically in Standard Level access. Data is sent out the analyzer RS-232 Service Port to the host terminal once-per-second, in the factory-default Human Readable format (section 4.1.2.4.2). There are no commands necessary to begin viewing information transmitted by the model 1100 in Standard Level access.

To request and view specific information via the RS-232 interface, type the desired command key selected from he Standard Access level command chart below (It is not necessary to press return).

Helpful Hint: For viewing convenience, before requesting specific information from the model 1100, disable automatic 1-second updates from the model 1100 and allow access of information by-request-only (section 4.1.2.4.1), by typing “SSERFMT=0”, followed by the Return key. To return to automatic 1-second updates of data from the analyzer in Human Readable format (section 4.1.2.4.2), type “SSERFMT=1”, followed by the Return key.

The STANDARD ACCESS level commands

TYPED COMMAND	DESCRIPTION OF QUERIED FUNCTION
A	Short software version
C	Analyzer Model number
E	Sensor output in Percent Oxygen
G	Sensor output in Volts
H	Active Fault codes
I	Active Fault code descriptions
V	Long software version
@	Unit Serial Number

There are several data formats of the ASCII data dump available. They may be changed from Standard Level Access to suit the user's needs as follows:

TYPED COMMAND	DESCRIPTION OF QUERIED FUNCTION
SSERFMT=0	Disables RS-232 continuous periodic data-dump
SSERFMT=1	Enables RS-232 output in HUMAN READABLE format
SSERFMT=2	Enables RS-232 output in MACHINE format w/o Checksum
SSERFMT=3	Enables RS-232 output in MACHINE format w/Checksum
SSERFMT=4	Enables RS-232 output in TAB DELIMITED (Excel) format
SCALIBRATE=.XXXXXX	The user can send a calibration value in decimal format where 100 % Oxygen = 1. The number format entered must be 6-decimal places.

4.1.2.4.1 Disable RS 232 continuous output – SSERFMT=0

The factory default 1-second data-dump in Standard Level access can be disabled through the RS-232 interface in Standard Access level. While this setting is active, the user must request information by pressing the desired key according to the STANDARD ACCESS level commands chart.

4.1.2.4.2 Human Readable Data Format – SSERFMT=1

The factory default format is Human Readable and can be changed via the analyzer control panel, or through the RS-232 interface in Standard Level Access. Human Readable data is presented in dynamic columns (columns appear only when data is present). It is intended for most users, to aid in setup and maintenance of the unit. Column headings from left to right: **Mode • O_2 Concentration • Alarm-1 status • Alarm-1 status • list of Fault codes active**.

4.1.2.4.3 . Machine Data Format with NO Checksum

Machine format with NO checksum can be selected via the analyzer control panel, or through the RS-232 interface in Standard Access level. Machine format with NO checksum data is streamed in packets defined by start/stop transmit bits. The order of data in each packet is as follows: **Start Transmit • O_2 Concentration • Fault codes active • List of Fault Codes • Alarm-1 status • Alarm-1 status • End Transmit**. For detailed information on data formats, please contact the Neutronics Service Department.

4.1.2.4.4 Machine Data Format WITH Checksum

Machine format with checksum can be selected via the analyzer control panel, or through the RS-232 interface in Standard Access level. Machine format with checksum data is streamed in packets defined by start/stop transmit bits. The order of data in each packet is as follows: **Start Transmit • O_2 Concentration • Fault codes active • List of Fault Codes • Alarm-1 status • Alarm-2 status • Checksum • End Transmit**. For detailed information on data formats, please contact the Neutronics Service Department.

4.1.2.4.5 Tab delimited Data Format

Tab delimited format can be selected via the analyzer control panel, or through the RS-232 interface in Standard Access level. Tab delimited data is presented in static columns (the same number of columns is always transmitted in a complete data message). Column headings from left to right: **Time since last re-boot ^{tab} • Mode ^{tab} • O2 Concentration ^{tab} • Alarm-1 status ^{tab} • Alarm-2 status ^{tab} • list of Fault codes active ^{tab}**. For detailed information on data formats, please contact the Neutronics Service Department.

4.1.2.5 Advanced Level 1 Access

Advanced Level-1 access is the computer-interfaced user Setup mode. Access to Advanced Level-1 can be accomplished on a PC by typing "setup" when viewing the Human Readable ASCII output. The User Setup menu will be displayed on the PC screen allowing access for changing the system setup.

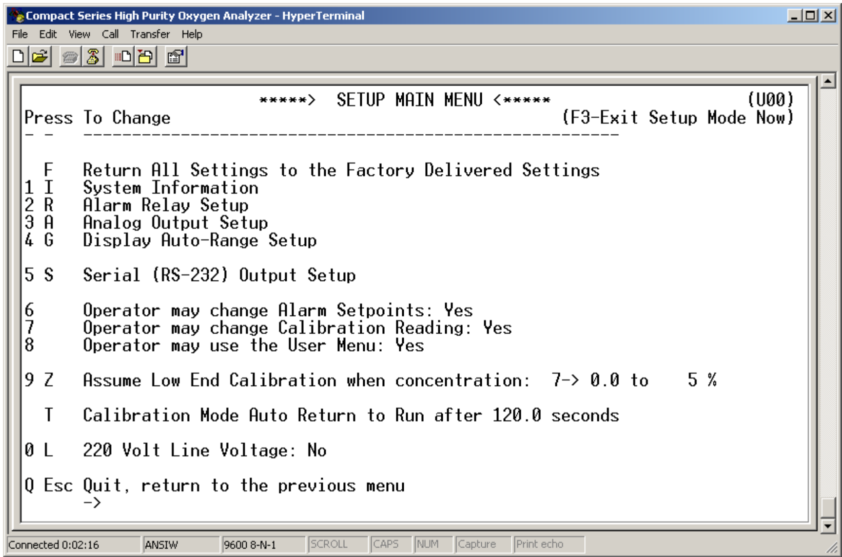


Figure 12 – Level-1 Access (SETUP) Mode Menu

4.1.2.6 Advanced Level-2 Access

Advanced Level-2 access is available to the user via a PC by use of a password. This level of access allows the manipulation of all code settings. Contact the Neutronics Inc. Service Department for support before attempting to use Advanced Level-2 access.

4.1.2.7 SETTING UP THE MODEL 1100 – The RS-232 User Setup Menu

The RS-232 User Setup menu **U00** is the "Home" screen in Advanced Level-1 access (section 4.1.2.5), and provides access to all the parameters that may need to be adjusted by the user. The interactive menu is initiated by typing "setup" and pressing the "Enter" key on the RS-232 terminal; as in entering Advanced Level-1 access. To navigate backwards, use the <Esc> or "Q" key on the RS-232 terminal.

4.1.2.8 Return all Settings to Factory Delivered Settings

In case of severe corruption of calibration and setting information, this setting will allow the user to restore the Model 1100 analyzer to its "out-of-box" setting. The user may type "Y" at the prompt to initiate a restore, or "N" and the prompt to bypass a restore. This setting is accessed from the Setup Main Menu by typing "F" on the RS-232 Terminal. To navigate backwards, use the <Esc> or "Q" key on the RS-232 terminal.

4.1.2.9 System Information Display

The System Information Display **U10** is a list of all the current settings for the 1100 analyzer. It is accessed from the Setup Main Menu by typing "1" or "I" on the RS-232 Terminal.

4.1.2.10 (U20) Alarm Relay Setup Menu

The RS-232 Alarm/Relay Setup menu **U20** provides access to all of the settings related to the Alarms, controls, and relays on the Model 1100 analyzer. It is accessed from the Setup Main Menu by typing “2” or “R” on the RS-232 Terminal. To navigate backwards, use the <Esc> or “Q” key on the RS-232 terminal.

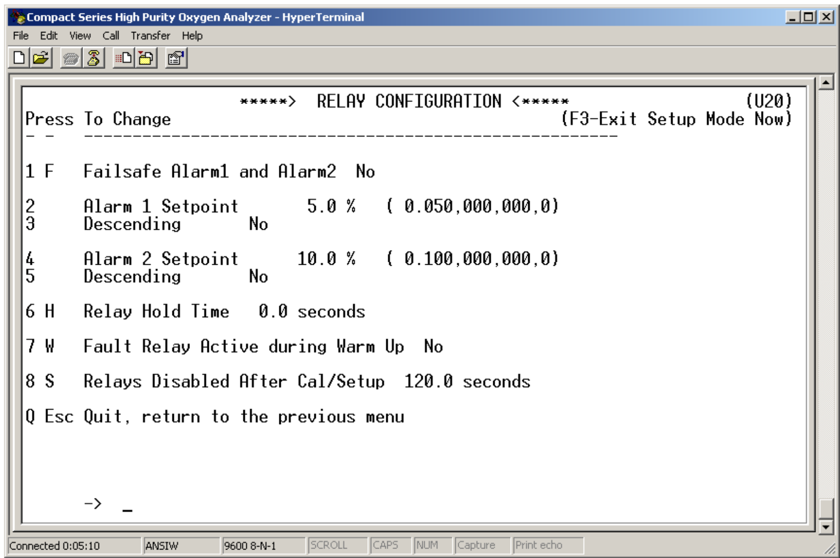


Figure 13 – Relay Configuration Menu

4.1.2.10.1 Alarm-1 and Alarm-2 Relays Failsafe

This parameter allows the user to set the Alarm-1 and Alarm-2 relays to either *failsafe* or *non-failsafe* action. *Failsafe* action is defined as; relay coils are not powered (contacts are in *normal* position) in active alarm state. *Non-Failsafe* action is defined as; relay coils are powered (contacts are in *non-normal* position) in active alarm state. The Alarm-1 and Alarm-2 Relays Failsafe setting may be set to “YES” or “NO”. This setting is accessed from the Alarm and Relay Setup Menu by typing “1” or “F” on the RS-232 terminal.

4.1.2.10.2 Alarm-1 Level Setting (setpoint)

This setting sets the threshold level for Alarm-1. Depending on whether or not it is set to ascending or descending, Alarm-1 becomes active when the oxygen concentration is above or below this threshold level. The Alarm-1 setpoint may be set anywhere from 0.0 % to 100.0 %. This setting is accessed from the Alarm Relay Setup Menu by typing “2” on the RS-232 terminal.

4.1.2.10.3 Alarm-1 Descending

This setting configures Alarm-1 to either ascending or descending action. Ascending is defined as Alarm-1 active when the oxygen concentration is above the Alarm-1 setpoint level. Descending is defined as; Alarm-1 active when the oxygen concentration is below the alarm-1 setpoint level. The descending setting may be set to “YES” or “NO”. This setting is accessed from the Alarm and Relay Setup Menu by typing “3” on the RS-232 terminal.

4.1.2.10.4 Alarm-2 Level Setting (setpoint)

This setting sets the threshold level for Alarm-2. Depending on whether or not it is set to ascending or descending, Alarm-2 becomes active when the oxygen concentration is above or below this threshold level. The Alarm-2 setpoint may be set anywhere from 0.0 % to 100.0 %. This setting is accessed from the Alarm Relay Setup Menu by typing “4” on the RS-232 terminal.

4.1.2.10.5 Alarm-2 Descending

This setting configures Alarm-2 to either ascending or descending action. Ascending is defined as Alarm-2 active when the oxygen concentration is above the Alarm-2 setpoint level. Descending is defined as; Alarm-2 active when the oxygen concentration is below the alarm-2 setpoint level. The descending setting may be set to “YES” or “NO”. This setting is accessed from the Alarm and Relay Setup Menu by typing “5” on the RS-232 terminal.

4.1.2.10.6 Relay Hold Time

This setting determines the minimum time that Alarm-1 and Alarm-2 relays will hold their active state once the Alarm-1 and Alarm-2 setpoint levels have been exceeded, regardless of the actual Oxygen concentration after Alarm-1 and Alarm-2 have been activated. The Hold Time level may be set anywhere from 0 to 300 seconds. This setting is accessed from the Alarm Relay Setup Menu by typing “6” or “H” on the RS-232 terminal.

4.1.2.10.7 Fault Relay Active during Warm-up

This setting determines the active status of the Fault relay during the Model 1100 warm-up routine (section 4.3.1.2). The activate setting may be set to “YES” or “NO”. This setting is accessed from the Alarm Relay Setup Menu by typing “7” or “W” on the RS-232 terminal.

4.1.2.10.8 Relays Disabled after CAL/Setup

This setting determines the time that relays will be held in their last state before returning to Run mode from the control panel or service port user menus. The relays disabled time may be set anywhere from 0 to 14,400 seconds. This setting is accessed from the Alarm Relay Setup Menu by typing “8” or “S” on the RS-232 terminal.

4.1.2.11 (U30) Analog Output Setup Menu

The RS-232 Analog Output Setup menu **U30** provides access to all of the settings related to the Analog Voltage Output (TB3-Pin 5, TB3-Pin 6) and Analog Current Output (TB3-Pin 7, TB3-Pin 8). It is accessed from the Setup Main Menu by typing “3” or “A” on the RS-232 terminal. To navigate backwards, use the <Esc> or “Q” key on the RS-232 terminal.

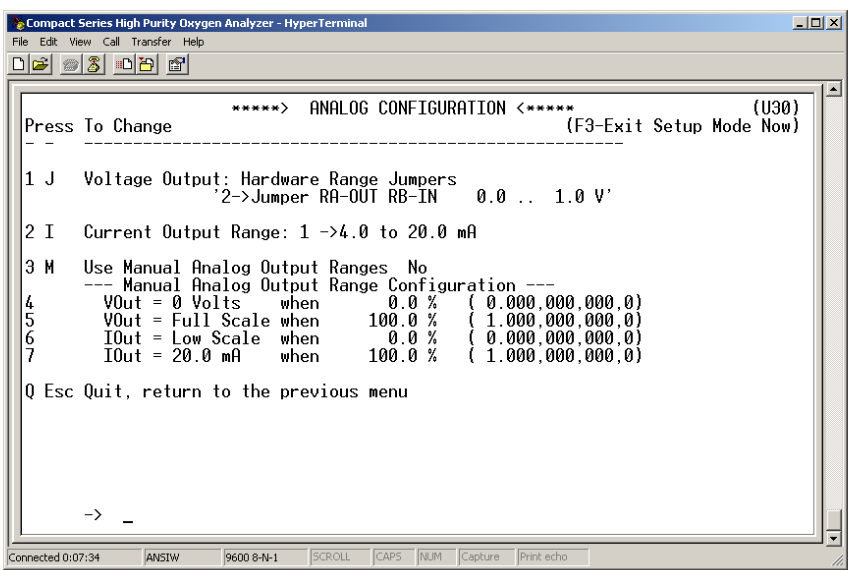


Figure 14 – Analog Output Configuration Menu

4.1.2.11.1 Analog Voltage Output Range

This menu sets the Analog Voltage Output full-scale value. It may be set to 0 (0-5 VDC minimum to full scale), 1 (0-10 VDC minimum to full scale) or 2 (0-1 VDC minimum to full scale). This setting must match the RA and RB hardware jumper settings on the bottom of the main CPU PCB (section 4.1.3). This menu is accessed from the Analog Output Setup menu by typing "1" or "J" on the RS-232 terminal.

4.1.2.11.2 Analog Current Output Range

This menu sets the Analog Current Output range. It may be set to 0 (0-20mA minimum to full scale), or 1 (4-20mA minimum to full scale). This menu is accessed from the Analog Output Setup menu by typing "2" or "I" on the RS-232 terminal.

4.1.2.11.3 Use Manual Analog Output Ranges

This menu is used to enable manual override of Analog output mapping to display range, and to force minimum and maximum Analog outputs to absolute Oxygen measurement values. This menu is accessed from the Analog Output Setup menu by typing "3" or "M" on the RS-232 terminal.

4.1.2.11.4 Force minimum Voltage Output to O_2 Concentration

This menu sets the Oxygen concentration at which the Analog Voltage output is at zero. This setting is entered in percent oxygen increments, and can be anywhere from 0.0% to 100.0%. This menu is accessed from the Analog Output Setup menu by typing "4" on the RS-232 terminal.

4.1.2.11.5 Force Maximum Voltage to O_2 Concentration

This menu sets the Oxygen concentration at which the Analog Voltage output is at maximum range (section 4.1.2.11.1). This setting is entered in percent oxygen increments, and can be anywhere from 0.0 % to 100.0 %. This menu is accessed from the Analog Output Setup menu by typing "5" on the RS-232 terminal.

4.1.2.11.6 Force minimum Current Output to O_2 Concentration

This menu sets the Oxygen concentration at which the Analog Current output is at minimum range (section 4.1.2.11.2). This setting is entered in percent oxygen increments, and can be anywhere from 0.0 % to 100.0 %. This menu is accessed from the Analog Output Setup menu by typing "6" on the RS-232 terminal.

4.1.2.11.7 Force Maximum Current Output to O_2 Concentration

This menu sets the Oxygen concentration at which the Analog Current output is at maximum range (section 4.1.2.11.2). This setting is entered in percent oxygen increments, and can be anywhere from 0.0 % to 100.0 %. This menu is accessed from the Analog Output Setup menu by typing "7" on the RS-232 terminal.

4.1.2.12 (U14) Display/Auto-Range Setup

The RS-232 Display/Auto-Range Setup menu **U14** provides access for the user to map the display and Analog output range scale(s) of the Model 1100 to suit the application (Appendix E – Range / Analog output Chart). The Analog Output Range may be set to 1 (fixed range 0-1 %) • 2 (fixed range 0-10 %) • 3 (fixed range 0-25 %) • 4 (fixed range 0-50 %) • 5 (fixed range 0-100 %) • 8 (low auto-range) • 9 (high auto-range) • 10 (full auto-range). This menu is accessed from the Setup Main Menu by typing "4" or "G" on the RS-232 terminal. To navigate backwards, use the <Esc> or "Q" key on the RS-232 terminal.

4.1.2.13 (U50) RS-232 Serial Setup Menu

This menu provides access to set the RS-232 serial communications options. It is accessed from the Setup Main Menu by typing “5” or “S” on the RS-232 terminal. To navigate backwards, use the <Esc> or “Q” key on the RS-232 terminal.

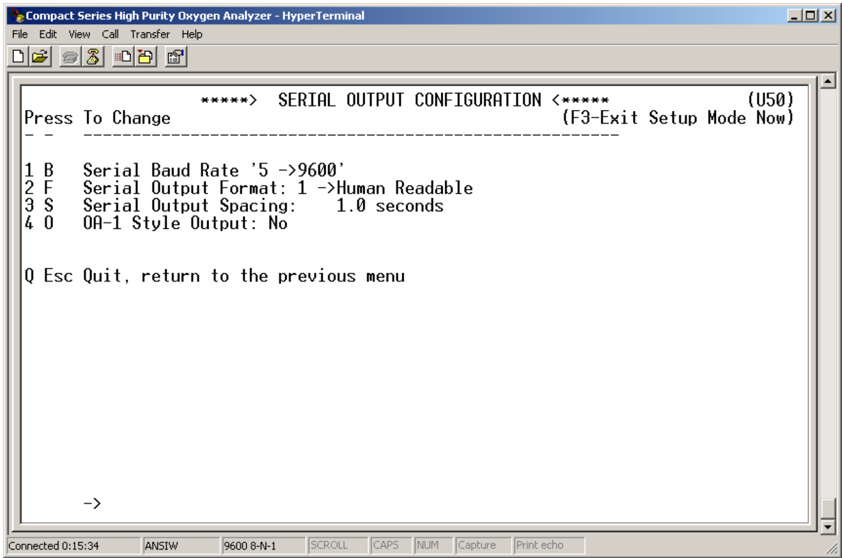


Figure 15 – Serial Output Configuration Menu

4.1.2.13.1 Baud Rate

This menu sets the RS-232 baud rate. The baud rate can be set to 1 (300BPS), 2 (1200BPS), 3 (2400BPS), 4 (4800BPS), 5 (9600BPS), 6 (19200BPS) or 7 (38400BPS). This menu is accessed from the RS-232 Serial Setup menu by typing “1” or “B” on the RS-232 terminal.

4.1.2.13.2 Automatic Serial Output Format

This menu sets the format of the automatic timed RS-232 serial output (section 4.1.2.4). The timed serial output format may be set to 0 (Output on Request), 1 (Human Readable), 2 (Machine Code), 3 (Machine Code with Checksum), 4 (Tab delimited) 5 (OA1 style; not used). This menu is accessed from the RS-232 Serial Setup menu by typing “2” or “F” on the RS-232 terminal.

4.1.2.13.3 Serial Output Spacing

This menu sets the rate at which the RS-232 sends complete ASCII data packets to the Service Port. The send rate can be set anywhere from 1 to 86,400 seconds (24-hours). This menu is accessed from the RS-232 Serial Setup menu by typing “3” or “S” on the RS-232 terminal.

4.1.2.13.4 OA1 Style Output – NOT USED

4.1.2.14 Alarm Setpoint Lockout

If the Alarm Setpoint Lockout is enabled, the user may not change, but only view the Alarm-1 and Alarm-2 level settings. The Alarm Lockout setting is accessed from the Setup Main Menu by typing “6” on the RS-232 terminal. To navigate backwards, use the <Esc> or “Q” key on the RS-232 terminal.

4.1.2.15 Gas Calibration Lockout

If the Gas Calibration Lockout is enabled, the user may not change, but only view the Gas Calibration value. The Gas Calibration Lockout setting is accessed from the Setup Main Menu by typing “7” on the RS-232 terminal. To navigate backwards, use the <Esc> or “Q” key on the RS-232 terminal.

4.1.2.15.1 User Menu Lockout

If the Front Menu Lockout is enabled the user may not manually initiate any User mode from the control panel. The User Menu Lockout setting is accessed from the Control panel Locks menu by typing “8” on the RS-232 terminal. To navigate backwards, use the <Esc> or “Q” key on the RS-232 terminal.

4.1.2.16 Assume Low-End Calibration Range

WARNING: The Assume Low-End Calibration Range (Zero Calibration Range in the setup menu) is set to 0 % to 5 % Oxygen at the factory, and it should not be adjusted by the user. If the user changes the Assume Low-End Calibration Range setting, the model 1100 will not operate properly.

4.1.2.16.1 Calibration Mode Auto Return to RUN

This setting determines the minimum time that the Model 1100 allows after exiting from control panel or service port user menus, before returning the unit to on-line status. The calibration mode auto return setting is accessed from the Control panel Locks menu by typing ”T” on the RS-232 terminal. To navigate backwards, use the <Esc> or “Q” key on the RS-232 terminal.

4.1.2.17 220 Volt Line Voltage – NOT USED

4.1.3 Change factory settings via Hardware Jumpers

4.1.3.1 Analog Voltage Output

The Analog voltage output must be configured using the hardware settings. In addition, the software settings must match the jumper settings. Software changes are made via the Control panel User Setup menu (section 4.1.1), or the Service Port RS-232 User Setup menu (section 4.1.2.7).

4.1.3.1.1 Remove the unit from service

Make certain that all interfacing to the model 1100 is disabled at the user device. Make sure that interrupting outputs, from the unit will not interfere with normal process monitoring or control. Disconnect power from the model 1100 unit. Disconnect the removable terminal blocks from the rear of the model 1100 chassis. Follow all lock-out/tag-out procedures.

4.1.3.1.2 Change jumper settings

Turn the model 1100 upside down to access the jumpers through the port provided. Identify the appropriate jumper position. Use an insulated jumper-puller to remove and replace jumpers (Figure 12).

4.1.3.1.3 Return to service

Replace cables, and terminal blocks. Reapply power. Change Analog Voltage Output setting from control panel or service port to match new hardware settings. Perform a calibration check. Check function of changes to ensure the new settings are recognized by the model 1100.

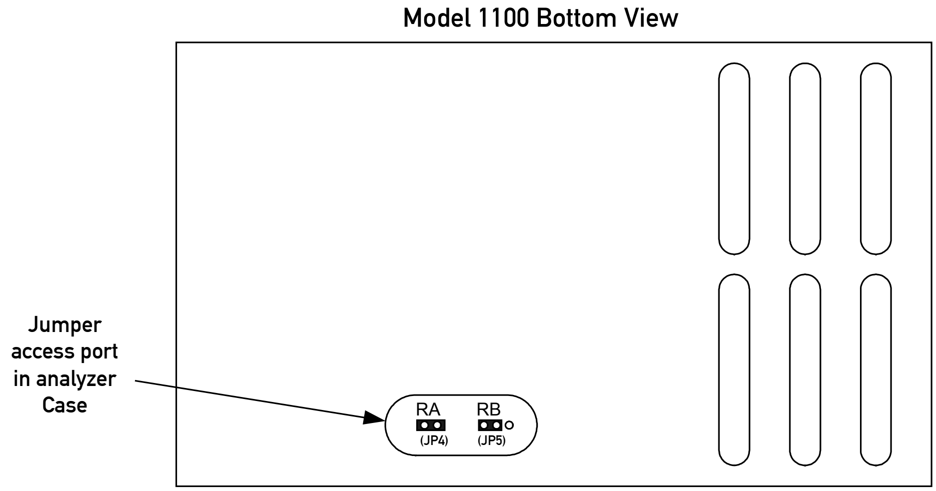


Figure 16 – Range select jumpers

JP4 / JP5 JUMPERS (1=SHORTED; 0=OPEN)		SELECT VOLTAGE OUTPUT RANGE
RA	RB	
0	1	V_{out}= 0-1 VDC
0	0	V_{out}= 0-5 VDC
1	0	V_{out}= 0-10 VDC

Figure 17 – Range select jumper settings

4.2 Routine Periodic Maintenance

Maintenance for the Model 1100 Oxygen analyzer is very simple. Apart from the normal maintenance for any instrument, such as cleaning the chassis, wiping the display, and replacing the sensor, the Model 1100 does not require any major periodic servicing. Calibration of the sensor on a known gas source should be performed on a regular basis. The chart below should serve as a general guide for maintenance personnel.

TASK	RECOMMENDED FREQUENCY			
	AT COMMISSIONING	EVERY 30-DAYS	EVERY YEAR	AS REQUIRED
Calibrate Sensor	√	√		√
Clean the analyzer chassis and display panel with soft cloth. Make sure the ventilation ports are clear.			√	√
Configure alarms	√			√
Check the Analog outputs and RS-232 output against display	√		√	
Replace the oxygen sensor				√ Sensor life expectancy 2 years

Figure 18 –Maintenance schedule

4.3 Troubleshooting

4.3.1 Fault Codes

When trouble occurs during normal operation of the model 1100, the user has several tools available to aid in isolating the cause(s) of given symptoms. As a starting point, the user may use the control panel to enter into “View Active Faults” mode (section 3.2.4). The user may also view active faults and other useful information via the Service Port (section 4.1.2). In addition, there are four system Hot-Keys available to perform special functions, and to gather important information quickly and easily (Appendix-D). Descriptions of faults are given below, with indication of common causes. Refer to the appropriate sections of this manual for more details as needed.

4.3.1.1 Fault Code 2 – Relays are in Standby mode

The “Relays are in Standby mode” fault indicates that the user has aborted the control panel user mode menu properly (section 3.2.5), and the unit is in a stabilization period to allow time to sweep the sample lines with sample gas before returning the unit to on-line service. During the stabilization period, Alarm-1, Alarm-2, and Fault relays remain inactive, and held to their last state before the control panel user mode menu was accessed. The factory default setting for this period is 120-seconds. This setting is user-configurable (section 4.1.2.10.8).

4.3.1.2 Fault Code 3 – Device is in Setup mode – Service Port

The “Device is in Setup mode” fault indicates that the user has entered the user setup mode from the service port (section 4.1.2), and the model 1100 is not monitoring oxygen in the process. The 7-segment alphanumeric display will show “SU”. The Device is in Setup Mode fault will clear when the user returns the unit to Run mode.

4.3.1.3 Fault Code 5 – Analog Output range overflow

The “Analog Output range overflow” fault indicates an oxygen reading that is above the range configuration entered in the model 1100 setup (section 4.1.2.12). Possible causes of fault code-5 may be: Incorrect or contaminated calibration gases, faulty process or calibration sampling lines/components.

4.3.1.4 Fault Code 6 – Analog Output range underflow

The “Analog Output range overflow” fault indicates an oxygen reading that is below the range configuration entered in the model 1100 setup (section 4.1.2.12). Possible causes of fault code-6 may be: Analog Range lower limit set to a value greater than zero (section 4.1.2.11.1).

4.3.1.5 Fault Code 8 – A concentration reading is not yet available

The “concentration reading is not yet available” fault is active when the model 1100 is not ready for online service. It is active during start-up, calibration and during fault code-2 – relays are in standby mode.

4.3.1.6 Fault Code 10 –Sensor appears to be disconnected

The “Sensor appears to be disconnected” fault indicates that there is not a continuous electrical circuit connecting the Model 1100 and the oxygen sensor. Possible causes may be: An open in the sensor interface wiring, faulty connecting hardware on/in the model 1100 or the sensor, the sensor interface cable has been un-plugged.

4.3.1.7 Fault Code 11 – Non-native display range

The "non-native display range" fault indicates an oxygen reading that is above the range configuration entered in the model 1100 setup (section 4.1.2.12). Fault code-11 is active when fault code 5 is active. Possible causes of fault code-11 may be: Incorrect or contaminated calibration gases, faulty process or calibration sampling lines/components.

4.3.1.8 Fault Code 12 – User calibration too large

The "user calibration too large" fault indicates that the reading during calibration was out of tolerance high with respect to the known calibration gas concentration. The calibration tolerance window is factory-set and cannot be changed by the user. Possible causes of fault code-12 may be: Incorrect or contaminated calibration gases, faulty process or calibration sampling lines/components.

4.3.1.9 Fault Code 13 – User calibration too small

The "user calibration too small" fault indicates that the reading during calibration was out of tolerance low with respect to the known calibration gas concentration. The calibration tolerance window is factory-set and cannot be changed by the user. Possible causes of fault code-13 may be: Incorrect or contaminated calibration gases, faulty process or calibration sampling lines/components, faulty or failing sensor.

4.3.1.10 Fault Code 15 – Bad user calibration

The "bad user calibration" fault indicates that the user has attempted to calibrate the model 1100 with what appears to be a faulty sensor. Possible causes of fault code 15 are: Incorrect or contaminated calibration gases, improper calibration procedure, faulty sensor.

5 Chapter 5 – Appendices

5.1 Appendix A – Spare Parts List

PART NUMBER	DESCRIPTION
5-06-4900-01-0	Operations Manual
C1-16-1000-01-0	Replacement Oxygen Sensor – model CAG-250E
C6-02-1000-10-0	Sensor Interface Cable – 3 meter with connectors
C1-11-1220-03-0	VAC Fuses for Power Supply Board (for VAC units only). – 1A, 250 VAC, Slo-Blo
C1-17-0052-00-0	Replacement terminal block – TB1
C1-17-0142-00-0	Replacement terminal block – TB2
C1-17-0112-00-0	Replacement terminal block – TB3

5.2 Appendix B – Specifications

OXYGEN SENSOR	External weak-acid galvanic oxygen fuel-cell
DISPLAY	**0.75" 7-segment LED digital display, 4 characters** Displays oxygen from 0 to 100 percent. **Resolution:** 0.00–0.99 % X.XX 1.00–9.99 % X.XX 10.0–99.9 % XX.X 100.0 % XXX.X **Color -Coded LED's for system status:** **RUN:** Green **FAULT:** Yellow **ALARM-1:** Red **ALARM-2:** Red
SIGNAL INTERFACE	**Serial Service Port:** Bi-directional RS-232 **Analog Voltage Output:** 0–1, 0–5, or 0–10 VDC **Analog Current Output:** Non-isolated 4 – 20 mA, 12 VDC, negative ground, powered by analyzer, maximum electrical load 250 Ohms **Range ID Voltage:** 0 %–1 % 5.63 VDC $\pm$ 0.1VDC 0 %–10 % 6.25 VDC $\pm$ 0.1VDC 0 %–25 % 6.88 VDC $\pm$ 0.1VDC 0 %–50 % 7.50 VDC $\pm$ 0.1VDC 0 %–100 % 8.13 VDC $\pm$ 0.1VDC
RELAY OUTPUTS	**Alarm-1:** Field Adjustable Form C (SPDT) Voltage-free, 5A @ 250 VAC, 5A @ 30 VDC. Configurable to fail-safe/non fail-safe and ascending/descending action **Alarm-2:** Field Adjustable Form C (SPDT) Voltage-free, 5A @ 250 VAC, 5A @ 30 VDC. Configurable to fail-safe/non fail-safe and ascending/descending action **Fault:** Non-adjustable Form B (SPST) Voltage-free, 5A @ 250 VAC, 5A @ 30 VDC, non Fail Safe action, non-configurable.

Specifications are subject to change without notice.

RANGE	0–1 % • 0–10 %• 0–25 % • 0–50 % • 0–100 %
ACCURACY	± 2.0 % of range @ calibrated temperature and pressure
RESPONSE TIME	T_{90} < 20 seconds
WARM UP TIME	None
HUMIDITY	**Analyzer:** 0-95 % non-condensing **Sensor:** 5-95 % non-condensing
OPERATING TEMPERATURE	**Analyzer:** 32-149° F (0–65° C) **Sensor:** 41-104° F (5–40° C)
STORAGE TEMPERATURE	**Analyzer:** 23-149° F (5–65° C) **Sensor:** 41-79° F (5–25° C)
SAMPLE PRESSURE	15” Hg vacuum–7 PSIG (0.5–1.5 Bar)
SAMPLE FLOW	100–300 CCM (100 CCM nominal)
POWER	**VAC Unit:** 90–264 VAC, 47–63 Hz, Single Phase, 3 Watts **VDC Unit:** 11–30 VDC, 3 Watts
MECHANICAL	**Faceplate:** Height 3.75”x Width 7.00” • NEMA 4 • IP66 **Panel Cut-out:** Height 2.91” x Width 6.20” **Electronic Compartment:** Height 2.81“ x Width 5.98” x 3.60” Depth • NEMA 1 • IP20
WEIGHT	2 Lbs (0.9Kg)
WARRANTY	12-months from date of shipment

Specifications are subject to change without notice.

5.3 APPENDIX C – ANALYZER FACTORY CONFIGURATION SETTINGS

Alarm and Relay Setup Information

Alarm-1/Alarm-2 Relays Failsafe/Non-Failsafe	NON-FAILSAFE
Alarm-1/Alarm-2 Relay Ascending/Descending	ASCENDING
Alarm-1 Trigger Level	5 %
Alarm-2 Trigger Level	10 %

Display Range

0–1 % Fixed	
0–10 % Fixed	
0–25 % Fixed	
0–50 % Fixed	
0–100 % Fixed	
Low Auto Ranging	
High Auto Ranging	
Full Auto Ranging	X

Analog Voltage Output

0–1 VDC	X
0–5 VDC	
0–10DC	

Relay Disable after Cal/Setup

120-seconds	X

Rs-232 Baud Rate

300 BPS	
1200 BPS	
2400 BPS	
4800 BPS	
9600 BPS	X
19200 BPS	
38400 BPS	

Assume Low End Calibration Range

Single Point	
1–5 %	X
1–50 %	
18–24 %	

Rs-232 Output Format

Output on Request Only	
Human Readable Format	X
Machine Code	
Machine Code With Checksum	
Tab Delimited (Spreadsheet)	

Supply Voltage

90 – 264 VAC, 47 – 63 Hz	X
11 – 30 VDC	

RS-232 Dump Rate

1-second	X

5.4 APPENDIX D – Control panel Hot-Key Functions

For convenience in operating and troubleshooting, the Model 1100 has four Control panel Hot-Key functions that can be performed quickly via the control panel without entering the normal Control panel, or Service Port user menus.

KEYS PRESSED	DESCRIPTION OF FUNCTION
UP + DOWN	Return to "RUN" mode from any User mode
UP + DOWN (hold both keys for 10 seconds *)	Run Lamp Test
DOWN then **MODE** (hold both keys for 10 seconds *)	Show Sensor Voltage
UP then **MODE** (hold both keys for 10 seconds *)	Re-start Model 1100

* Hold all keys indicated until the 7-segment alphanumeric display shows "---" then release the pressed keys. To return to normal operation, press and release the same keys again.

APPENDIX E – Range / Output Chart

RANGE NAME	MEASURED RANGE	DISPLAY	ANALOG RANGE	RANGE ID VOLTAGE OUTPUT
FULL AUTO RANGE	0.00 % – .9 % 1.00 % – 9.99 % 10.0 % – 24.9 % 25.0 % – 49.0 % 50.0 % – 99.9 % 100.0 %	X.XX X.XX XX.X XX.X XX.X XXX.X	0–1 % 0–10 % 0–25 % 0–50 % 0–100 %	5.63 VDC 6.25 VDC 6.88 VDC 7.50 VDC 8.13 VDC
LOW AUTO RANGE	0.00 % – .99 % 1.00 % – 9.99 % 10.0 % – 24.9 %	X.XX X.XX XX.X	0–1 % 0–10 % 0–25 %	5.63 VDC 6.25 VDC 6.88 VDC
HIGH AUTO RANGE	10.0 % – 24.9 % 25.0 % – 49.0 % 50.0 % – 100.0 %	XX.X XX.X XXX.X	0–25 % 0–50 % 0–100 %	6.88 VDC 7.50 VDC 8.13 VDC
FIXED RANGE 0–1 %	0.00 % – .99 %	X.XX	0–1 %	5.63 VDC
FIXED RANGE 0–10 %	0.00 % – 9.99 %	X.XX	0–10 %	6.25 VDC
FIXED RANGE 0–25 %	0.0 % – 9.99 % 10.0 % – 24.9 %	X.XX XX.X	0–25 %	6.88 VDC
FIXED RANGE 0–50 %	0.0 % – 9.99 % 10.0 % – 49.9 %	X.XX XX.X	0–50 %	7.50 VDC
FIXED RANGE 0–100 %	0.0 % – 99.9 % 100.0 %	XX.X XXX.X	0–100 %	8.13 VDC

5.5 APPENDIX F – Zero Calibration Range Settings

ENTERED VALUE	RANGE	AVAILABLE SETTINGS
0	Single Point Calibration	
1	1 PPB – 50 PPB	
2	1 PPB – 500 PPB	
3	1 PPM – 5 PPM	
4	10 PPM – 50 PPM	
5	10 PPM – 500 PPM	
6	0.0 % – 0.5 %	
7	1 % – 5 %	X
8	1 % – 50 %	
9	18 % - 24 %	
10	10 PPM – 20 PPM	

5.6 APPENDIX G – MSDS Material Safety Data Sheet

1. Product Identification

Oxygen sensor, galvanic type, model CAG-250E furnished by Neutronics Inc. • 456 Creamery Way • Exton, PA USA, 19341 • Telephone: 610-524-8800.

2. Hazardous Ingredients of Solution

Electrolyte composed of weak acid solution (Acetic Acid) Lead Acetate, Trihydrate. Anode is pure lead. Components are encapsulated in a plastic housing. CAS Numbers: Glacial Acetic Acid 64-19-7, Lead Acetate 6080-56-4 Pb 7439-92-1

3. Health Hazard

Pb: 0.05 mg/cu.m. OSHA PEL, KOH: 2 mg/cu.m. ACGIH TLV, Acetic Acid, Glacial: 10 PPM OSHA PEL, ACGIH/TLV 10 PPM (Stated for 100 %) Lead Acetate, Trihydrate: 0.05mg/m3 OSHA PEL 0.15 mg/m3 ACGIH/TLV

4. Physical and Chemical Data

	KOH	PB (PURE)	ACETIC ACID
Melting Point	**-10 to 0°C**	**328°C**	**Not Available**
Boiling Point	**100 to 115°C**	**1744°C**	**Not Available**
Specific Gravity	**1.09 @ 20°C**	**11.34**	**Not Available**
pH	**>14**	**N/A**	**3.5 to 4.5**
Solubility in Water	**Completely**	**Insoluble**	**Completely**
% Volatiles by Volume	**None**	**N/A**	**Not Available**
Appearance and Odor	**Colorless, odorless solution**	**Grey Metal, odorless**	**Colorless, Vinegar like odor**

5. Unusual Fire and Explosion Hazards

Lead acetate decomposes at boiling point and toxic gases are produced. Acetic acid vapors may flow along surfaces to distant ignition sources and flash back. Closed containers exposed to high heat may explode. Sensors are stable under normal operating conditions. Avoid contact of electrolyte on skin and with strong acids or caustics.

6. **Health Hazard Data**

Lead (use for Lead Acetate & Lead): TLV/TWA 0.15 mg/m3, PEL 0.05 mg/m3

Toxicity: Intraperitoneal Rate LD 50 for lead acetate trihydrate is 200 mg/Kg

Carcinogenicity: This substance is listed as a NTP anticipated human carcinogen and an IARC animal carcinogen.

Reproductive Effects: None identified

Effects of overexposure:

Inhalation – Tightness and pain in chest, coughing, difficult breathing

Skin Contact – Irritation

Eye Contact – Irritation

Skin Absorption – May be harmful

Ingestion – Is harmful and may be fatal, headache, nausea, vomiting dizziness, gastrointestinal irritation

Chronic Effects – Anemia, kidney damage, blurred vision, lead build-up, in central nervous system.

KOH electrolyte: (ACGIH TLV) 2mg/cu.m.

Toxicity: May be harmful or fatal if swallowed Oral LD50 (RAT)=3650 mg/kg

Reproductive Effects: None identified

Effects of overexposure:

Inhalation – unlikely

Skin Contact – Irritation

Eye Contact – Irritation, could result in permanent loss of vision

Skin Absorption – May be harmful

Ingestion – Is harmful and may be fatal.

Chronic Effects – Contact with skin or eyes will cause a burning sensation &feel soapy or slippery to touch.

Acetic Acid (concentrated): TLV/TWA 25mg/cu.m.

Toxicity: May be harmful or fatal if swallowed Oral LD50 (RAT)=3310 mg/kg

Carcinogenicity: None Identified

Reproductive Effects: None identified

Effects of overexposure:

Inhalation – Irritation

Skin Contact – Irritation

Eye Contact – Irritation, could result in permanent loss of vision

Skin Absorption – May be harmful

Ingestion – Is harmful and may be fatal

Chronic Effects – Lung damage, teeth damage

7. Emergency and First-Aid Procedures

Eye Contact: Immediately flush with water for at least 15 minutes.

Inhalation: Expose to fresh air, inhalation unlikely.

Ingestion: Call a physician; take large amounts of water.

Skin Contact: Immediately flush skin with plenty of water for 15 minutes.

8. Handling

Wear respiratory, rubber gloves, and eye protection

Protective measures during cell replacement:

- Do not remove sensor from shipping container until ready to install
- Inspect the sensor for leakage before removal from shipping package. If it is leaking, do not remove from package.
- Put on gloves and eye protection when replacing sensor

Note: The above data is based on MSDS provided by the manufacturers of components and by tests conducted by Neutronics. Neutronics believes that this information to be accurate and reliable. This information is supplied as reference only. Neutronics disclaims any liability for damage or injury which results from the use of the data and nothing contained therein shall constitute a guarantee, warranty, or merchantability or representation by Neutronics with respect to the data, the product described, or their use for any specific purpose, even if that purpose is known to Neutronics.

5.7 APPENDIX H – Warranty

Neutronics warrants to the original purchaser, that the Model 1100 Oxygen analyzer is free from defects in material and workmanship for a period of one (1) year from the date of shipment from Neutronics or from one of Neutronics' authorized dealers. Our liability will be limited to the repair or replacement, at our factory, of parts found to be defective within the warranty period, as determined by Neutronics. The parts will be repaired or replaced free of charge if shipped prepaid to the factory in the original shipping carton. This warranty is void if the product has been subject to misuse or abuse, including but not limited to: exposure to water, humidity, temperature, shock or pressure outside of the listed specifications, or has not been operated or installed in accordance with operating and maintenance instructions, for repairs which were not performed by Neutronics or by one of its authorized dealers, or if the identifying markings on the product label have been altered or removed.

The seller assumes no liability for consequential damages of any kind, and the buyer, by acceptance through purchase of this product, will assume all liability for the consequences of its use or misuse by the buyer, his employees, or others.

Neutronics reserves the right to use any materials in the manufacture, repair or service of the products and to modify the design as deemed suitable, in so far as these materials or modifications maintain the stated warranty.

It is the sole responsibility of the buyer / user to determine if this product is suitable for the intended application.

THESE WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, OR IMPLIED INCLUDING WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE.

Intended Use for the Model 1100

The model 1100 Oxygen analyzer was designed to provide the trained operator with useful information relating to the concentration of Oxygen. This information may be used in process control or to minimize possible hazardous conditions, which may be present in various processes. Before implementation, the user must fully understand the operation and limitations of this instrument as well as the application for its use. The responsibility for the proper application, operation, installation, and maintenance of the model 1100 Oxygen analyzer is the sole obligation of the trained operator. The purchaser is required to ensure operators are properly trained in the use of this unit as well as in the possible hazards associated with its use or with the intended application. The purchaser must ensure that all of the proper warnings, labels, instruction manuals, lock outs, redundant components, hazard analysis, and system validation have been completed and provided to the trained operator before implementation of the model 1100 instrument.

ENMET **Corporation**
PO Box 979
Ann Arbor, MI 48106-0979

MED AIR 2000

Operation and Maintenance Manual

80002-031
06/03/96

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MCN-167,	**09/20/00**
MCN-176,	**03/06/98**
MCN-200,	**09/04/98**
MCN-204,	**01/29/99**
MCN-237,	**09/21/00**
MCN-274,	**05/01/02**

Table of Contents

List of Illustrations

Reference Information:

NOTE: [important information about use of instrument]

CAUTION: [affects equipment – if not followed may cause damage to instrument, sensor etc…]

***WARNING*: [affects personnel safety – if not followed may cause bodily injury or death.]**

1.0 Introduction

The **MED AIR 2000** is a gas and dew point detection instrument that monitors compressed air from medical air supply systems for certain hazards to the user. The instrument is available with sensors that monitor air for carbon monoxide (CO), for variations in the oxygen (O_2) content and for dew point. The sensors can be used alone or up to three sensors can be used together. In the instrument, a sample of the compressed air is passed over electrochemical CO and O_2 sensors, a solid state dew point sensor and the resultant electrical outputs are used to evaluate the air for the target gases. Some features of the instruments are as follows:

- continuous monitoring of the sample air
- continuous LCD display of gas and vapor concentrations
- menu driven operational and maintenance controls
- menu driven calibration procedure
- audio and visual alarms indicate unsafe conditions
- alarm relay contacts available on terminals
- a fault relay and visual fault alarm
- flowmeter plus low flow fault indication and display
- alarm acknowledgement capability including audio defeat
- mA outputs for each target gas
- NEMA-12 packaging

NOTE: *All specifications stated in this manual may change without notice.*

1.1 Unpack

Unpack the **MED AIR 2000** and examine it for shipping damage. If such damage is observed, notify both ***ENMET*** customer service personnel and the commercial carrier involved immediately.

Regarding Damaged Shipments

NOTE: **It is your responsibility to follow these instructions. If they are not followed, the carrier will not honor any claims for damage.**

- ❑ This shipment was carefully inspected, verified and properly packaged at our company and delivered to the carrier in good condition.
- ❑ When it was picked up by the carrier at ***ENMET***, it legally became your company's property.
- ❑ If your shipment arrives damaged:
  - Keep the items, packing material, and carton "As Is." Within 5 days of receipt, notify the carrier's local office and request immediate inspection of the carton and the contents.
  - After the inspection and after you have received written acknowledgment of the damage from the carrier, contact ***ENMET*** Customer Service for return authorization and further instructions. Have your Purchase Order and Sales Order numbers available.
- ❑ ***ENMET*** either repairs or replaces damaged equipment and invoices the carrier to the extent of the liability coverage, usually $100.00. Repair or replacement charges above that value are your company's responsibility.
- ❑ The shipping company may offer optional insurance coverage. ***ENMET*** only insures shipments with the shipping company when asked to do so in writing by our customer. If you need your shipments insured, please forward a written request to ***ENMET*** Customer Service.

Regarding Shortages

If there are any shortages or questions regarding this shipment, please notify ***ENMET*** Customer Service within 5 days of receipt at the following address:

ENMET Corporation
680 Fairfield Court
Ann Arbor, MI 48108
734-761-1270 734-761-3220 Fax

1.2 Check Order

Check, the contents of the shipment against the purchase order. Verify that the **MED AIR 2000** is received as ordered. If there are accessories on the order, ascertain that they are present. Check the contents of calibration kits. Notify ***ENMET*** customer service personnel of any discrepancy immediately.

1.3 Serial Numbers

Each **MED AIR 2000** is serialized. These numbers are on tags on the equipment and are on record in an ***ENMET*** database.

2.0 Instrument Features

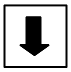
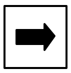
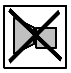
2.1 Exterior Features

The exterior of the instrument is shown in **Figure 1**. The exterior features are as follows:

Feature	Description
Enclosure	A NEMA-12 plastic box, approximately 10x8x6, with a clear hinged front cover.
Sample Air Hose	A five foot long hose to conduct a sample of the air from the source to the instrument. See **Figure 1A**.
Sample Port	The fitting for the sample air hose.
Sample/Calibration Valve	A red handled ball valve which directs the air from either the sample or the calibrate port. The handle points at the port, sample or calibrate, which is providing the air to the instrument
Calibration Port	The entrance for the calibration gas. The quick release fitting mates with one on the calibration adapter.
Front Cover Latch	A quick-release latch that holds the clear front cover in place, and is capable of being padlocked if desired.
Humidifier Tube	Located under a black sheet metal cover. Is a tube that extracts moisture from the atmosphere and adds it to dry sample air, before it is presented to the carbon monoxide and oxygen sensors.
Line Cord	A cord to supply 110 VAC to the equipment. Not illustrated.
Audio Alarm	A loud horn activated by certain alarm conditions.
Mounting Flanges	Flanges with holes for mounting the enclosure to a vertical surface.
Regulator	To connect to the compressed air line. Regulator output to the **MED AIR 2000** should be set to 55 PSI. See **Figure 1A**.

2.2 Display Panel Features

The display panel, shown in **Figure 1**, is viewed through the clear front cover of the enclosure, and is accessed by opening the cover. Features are as follows:

Feature	Description
Display	A 2 line, 16 character per line, LCD with backlight. The numerical values of gas concentrations, and other information are displayed.
Flowmeter	A flow indicator located at the output of the sample flow stream, which indicates quantitatively the flow of sample air or calibration gas through the instrument.
Visual Alarms	On both sides of the display, a red LED for each sensor on the instrument. Near the center of the panel,. a green power LED and a red fault LED,
Pushbutton Switches	There are three of these, located near the center of the panel; they are yellow rectangular membrane switches. They are:
· Option Switch	The top left switch. 
· Select Switch	Directly to the right of the option switch. 
· Alarm Acknowledge/ Audio Defeat Switch	Directly under the option switch. 

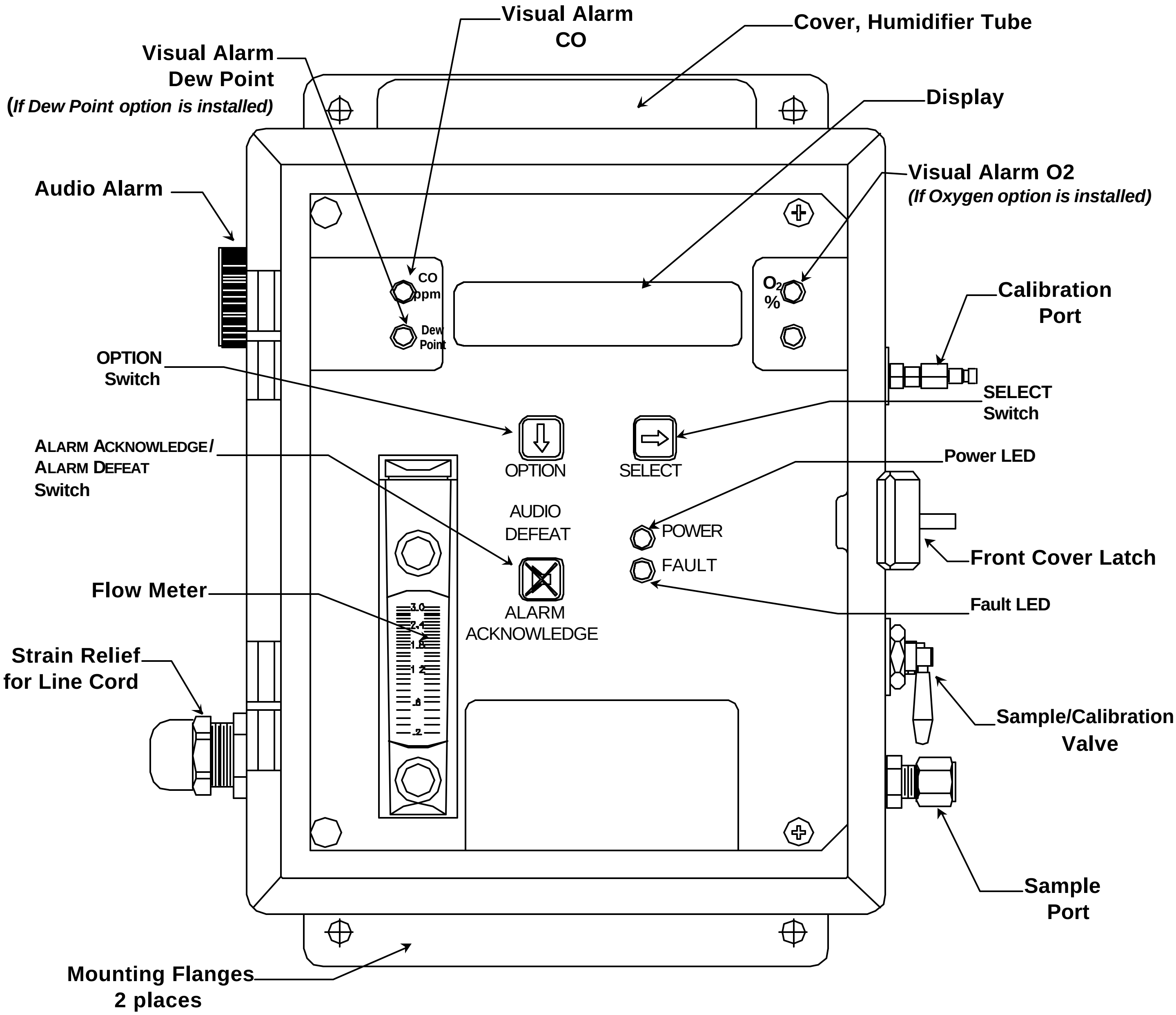


Figure 1: Features of MED AIR 2000 External

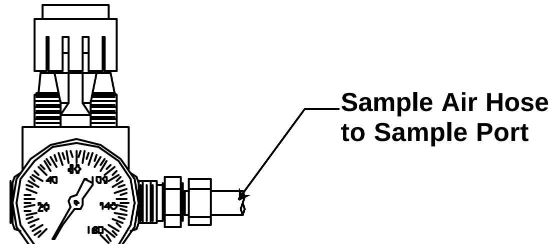


Figure 1A: Regulator

2.3 Circuit Board Features

The Display Panel is hinged on the right and is released by unscrewing the 2 thumb screws located in the left corners. After releasing the panel, it is swung to the right, exposing the interior of the enclosure. The Circuit Board is mounted on a plate at the back surface of the enclosure interior. Features are shown in **Figure 2**.

Feature	Description
Terminal Strip	This twenty-three position terminal is located at the bottom of the Circuit Board. On it are twelve positions for three contacts for each of four alarm relays, and three positions for the contacts of a fault relay. There are also two positions for each of the 4-20 mA outputs. (optional)
Manifold Housing	The sample manifold, the carbon monoxide and oxygen sensors are located under this small aluminum housing. Not illustrated in figure 2, see **Figure 8**.

2.4 Power Supply

The power supply circuit is located on the bottom surface of the inside of the enclosure. The circuit is protected by two 1.0 Amp fuses mounted in fuse holders on the power supply board.

2.5 Dew Point Sensor

If present in the instrument, the solid state dew point sensor is located on the plate to the right of the main circuit board.

2.6 Dew Point Circuit

If present in the instrument, the dew point circuit is located on the top surface of the inside of the enclosure.

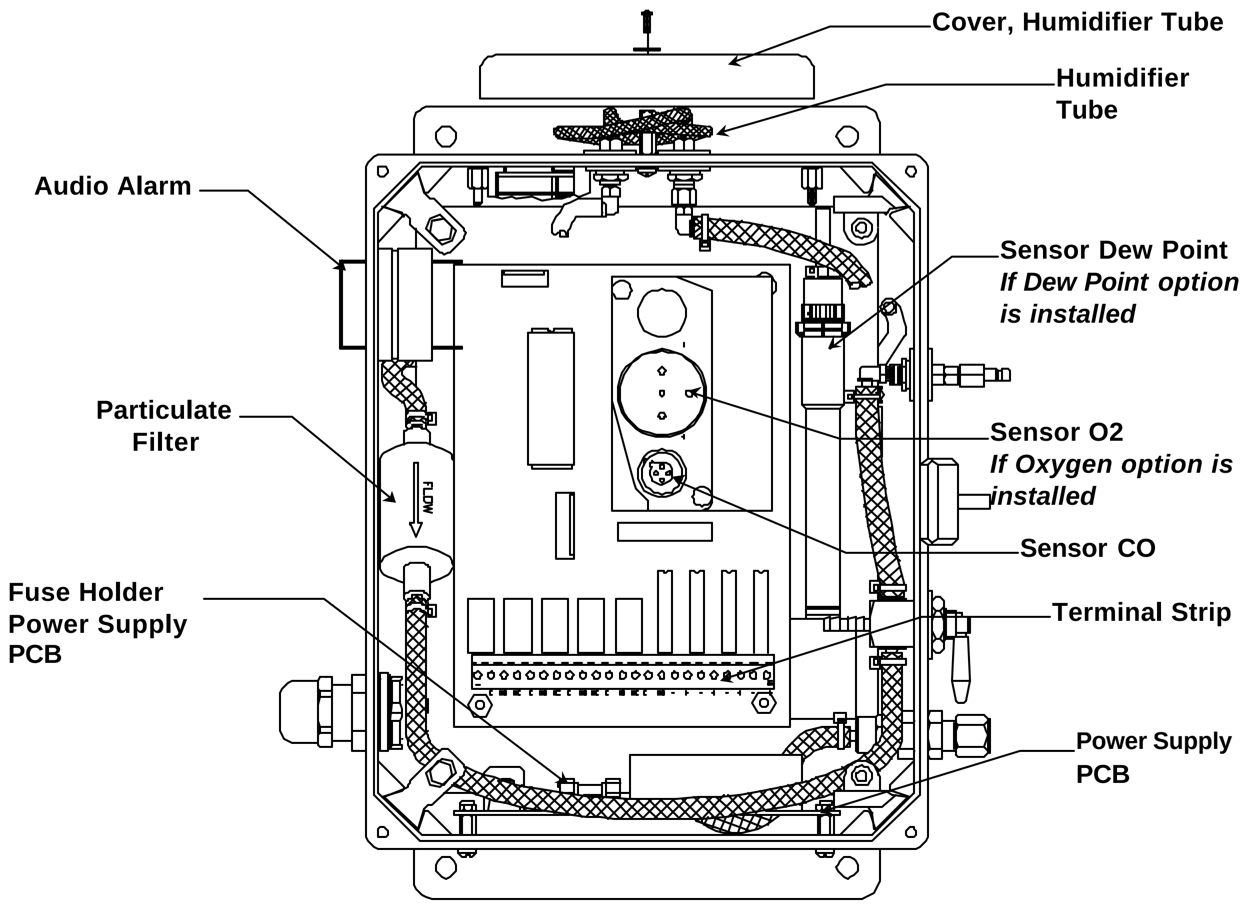


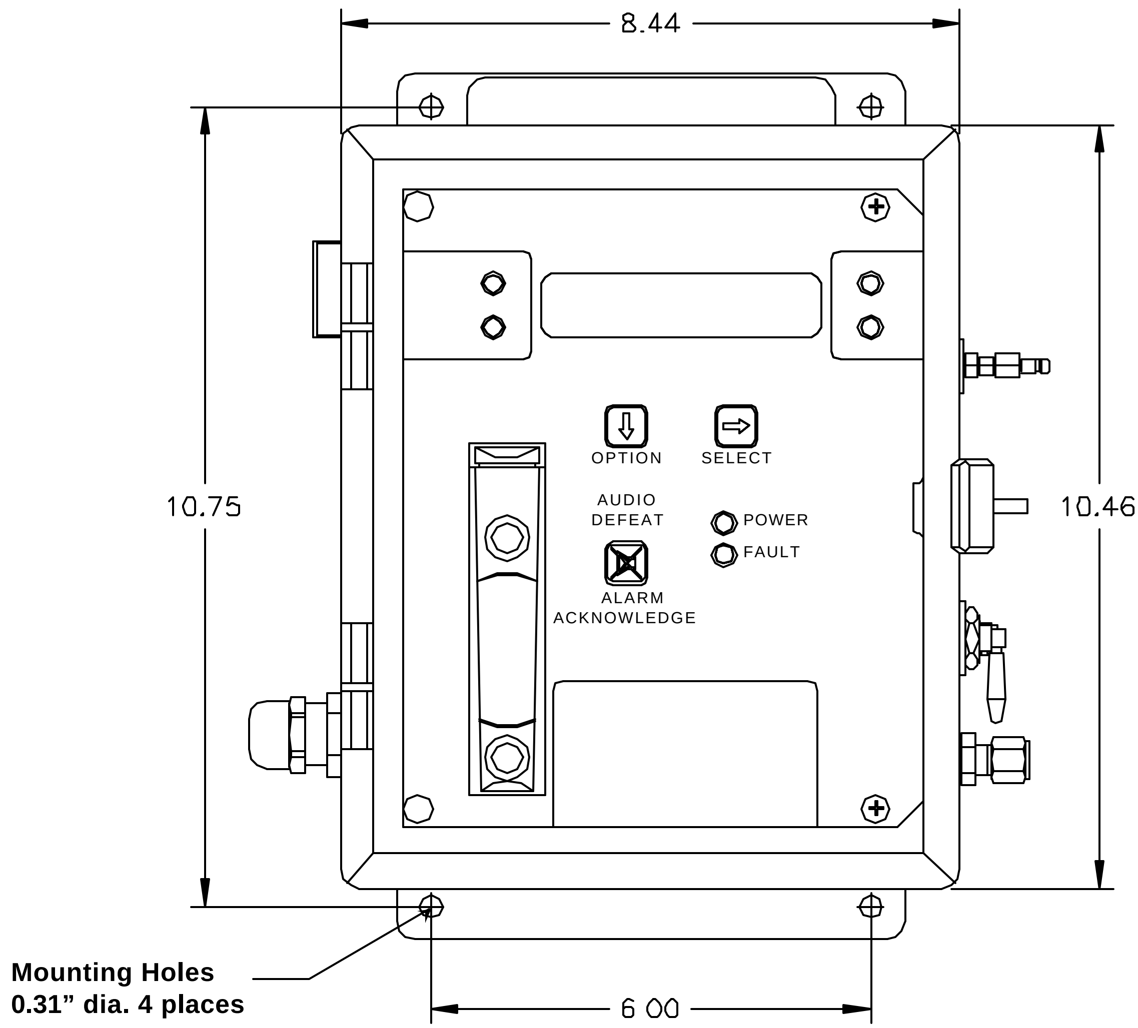
Figure 2: MED AIR 2000 Interior Features

3.0 Installation

3.1 Mounting of Instrument

The **MED AIR 2000** should be located near the pipe or tank containing the air to be monitored, and upstream from where the air is being used. So that, the air sample enters the instrument before it reaches the users.

Upright (plumb and level) vertical orientation of the instrument is necessary for proper operation. Mount the instrument on an appropriate vertical surface using the mounting flanges provided. Avoid areas with excessive vibration. The holes in the flanges are 0.31 inch in diameter and form a 6 x 10.75 inch rectangle. **See Figure 3.**



Dimensions are in inches.

Figure 3: MED AIR 2000 Mounting Dimensions

3.2 Sample Air Supply

Tap the pipe or tank containing the breathing air and use appropriate fittings to connect the sample input hose. The instrument is designed to operate from an air supply pressure of 50-55 psig; adjust the regulator and set the pressure at 55 psig. The flowmeter on the display panel indicates approximately 2 SCFH when the input pressure is 55 psig.

The sample air exits the instrument from two separated ports on the back surface of the enclosure. Take care not to obstruct these exit ports. After mounting the enclosure, they are not accessible.

Be sure that the red sample-calibrate valve handle on the right side of the enclosure is pointed down toward the sample input port.

3.3 Power Supply

Plug the line cord in a source of 110VAC power. The input power can vary from 100 to 240VAC, 50/60 Hz; if other than 110 VAC power is desired, the plug on the line cord must be changed.

Upon supplying air and power to the instrument:

- The green power on LED is lit.
- The display backlight is lit, and numbers are given on the display.

The instrument may go into alarm briefly, but the sensors stabilize quickly. If the instrument persists in alarm, acknowledge the alarm by pressing the ALARM ACKN/AUDIO DEFEAT switch. If alarm persists longer than 30 minutes, call ***ENMET*** customer service personnel.

3.4 Outputs

Two types of alarm outputs are available, relay contacts and optional 4-20mA outputs.

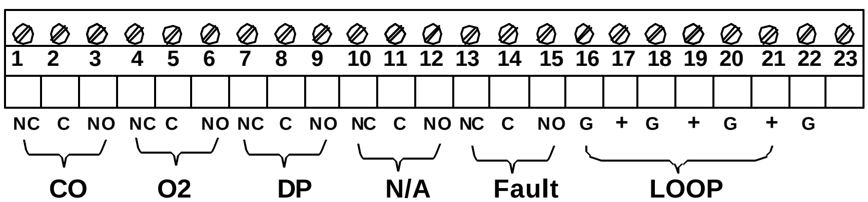


Figure 2A: Terminal Strip

3.4.1 Relay Contacts

Relay contacts are available for each alarm; these are SPDT, rated at 2.0Amp at 110VAC, and may be latching or non-latching as required by the application. They are accessed on the terminal strip at the bottom of the circuit board see **Figure 2 & 2A**. The positions given in Table 1:

Table 1: Relay Contacts

Position	Function	Contact
1	CO Alarm	NC
2	CO Alarm	C
3	CO Alarm	NO
4	O_2 Alarm*	NC
5	O_2 Alarm*	C
6	O_2 Alarm*	NO
7	DP Alarm	NC
8	DP Alarm	C
9	DP Alarm	NO
10	Not Used	
11	Not Used	
12	Not Used	

* This relay is activated by both the deficiency and abundance alarms.

These relay coils are energized when they are in the non-alarm state; the contact conditions given above are for the non-energized state, which is identical to the alarm state.

In addition, there is a fault relay, which changes state whenever the instrument is in a fault condition.

The contact positions are given in Table 2:

Table 2: Fault Relay Contacts

Position	Function	Contact
13	Fault	NC
14	Fault	C
15	Fault	NO

The coil of this relay is energized when the instrument is in the non-fault state; the contact conditions given above are for the non-energized state, which is identical to the fault state.

These relay contacts can be used to operate auxiliary alarms or other functions. Punch a hole at the bottom of the left side of the enclosure for a wire exit, and use appropriate cable and fittings to preserve the NEMA-12 rating of the enclosure.

3.4.2 Optional 4-20mA Outputs

Isolated 4-20 mA outputs are available for data logging or other purposes. An output is supplied for each sensor supplied in a particular instrument, and can be added when a sensor is added in the field. When all three sensors are supplied, these outputs are available on the terminal strip in the positions given in Table 3:

Table 3: Outputs for 4-20mA

Position	Channel	Function	Range
16	CO	Ground	4 mA = 0 ppm
17	CO	+ 4 to 20 mA	20 mA = 100 ppm
18*	DP	Ground	4 mA = –100°F
19*	DP	+ 4 to 20 mA	20 mA = +50°F
20*	O_2	Ground	4 mA = 0%
21*	O_2	+ 4 to 20 mA	20 mA = 25.5%

*When two of the three sensors are supplied, one sensor is for CO, and the output for this sensor is on positions 16 & 17 as shown in Table 3 above. The second output is on positions 20 & 21. Positions 18 & 19 are not used.

Wiring requirements are the same as for the relays.

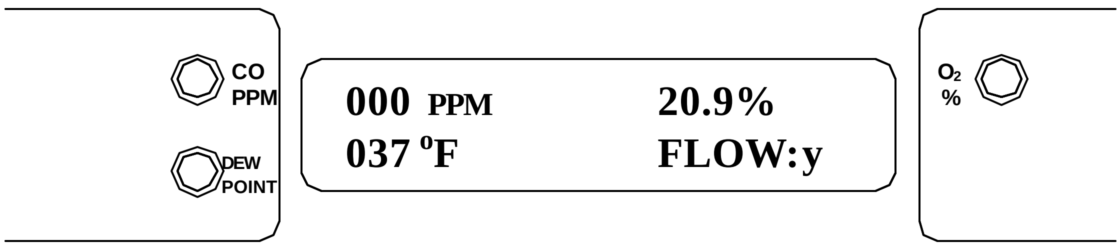
3.5 Initial Calibration

All instruments are calibrated at the factory. You may, if a calibration kit is available, calibrate the CO and O_2 channels of the instrument 24 hours after installation. The dew point sensor can not be calibrated in the field. See Section 5.0, Maintenance, for calibration instructions. After calibration, be sure to return the red sample-calibrate valve handle to the down position, pointing toward the sample input port.

4.0 Operation

4.1 Normal Operation Condition

With the **MED AIR 2000** installed as described in section 3, and in clean air, the POWER green LED is on, the display is lit, the flowmeter reads approximately 2 SCFH, and the information on the display is as shown in **Figure 4 Display**, for the sensor(s) installed in the **MED AIR 2000**. The red alarm and fault LEDs are not lit.



Example of display with Dew Point and Oxygen option installed

Figure 4: MED AIR 2000 Operational Display

4.2 Alarm Set Points

There is one alarm set point for CO and dew point, and two for oxygen. The factory settings of these alarm set points are shown in Table 4.

Table 4: Factory Alarm Set Points

Gas	Set Point
Carbon Monoxide	10 ppm
Dew point	39°Fahrenheit at 55PSIG
Oxygen Deficiency	19.5 % by volume
Oxygen Abundance	23.5 % by volume

These alarm set points can be changed within limits; see the maintenance section of this manual for the procedure.

- If the CO concentration increases above that of the alarm set point, the associated red LED is lit, the associated relay changes state, and the audio alarm is activated.
- If the dew point increases above that of the alarm set point, the associated red LED is lit, the associated relay chances state, and the audio alarm is activated.
- If the oxygen content of the sample air decreases below the deficiency alarm set point, the associated red LED is lit, the associated relay chances state, and the audio alarm is activated.
- If the oxygen content of the sample air exceeds that of the abundance alarm set point, the associated red LED is lit, the audio alarm is activated, and both the oxygen alarm relay and the oxygen high alarm relay change state.
- There is one alarm LED for both the deficiency and abundance alarms.

4.3 Alarm Latching

An instrument is shipped with the alarms in the non-latching mode. The alarms may be independently configured in the non-latching mode by use of the maintenance menu.

- IN THE LATCHING MODE: at the cessation of the condition which causes an alarm, the alarm indications do not cease, and the alarm relay contacts do not revert to the non-alarm state, until the ALARM ACKN/AUDIO DEFEAT switch is pressed. An alarm can also be acknowledged by pressing the switch during the alarm condition; then at the cessation of the alarm condition, alarm indications cease and alarm relays revert to the non-alarm state. After an alarm is acknowledged, alarms in the latching configuration are re-armed to latch at the next alarm condition.
- IN THE NON-LATCHING MODE: at the cessation of the condition which causes an alarm, the alarm indications automatically cease, and the alarm relay contacts revert to the non-alarm state.

4.4 Audio Defeat

With the alarms in the non-latching configuration, pressing the ALARM ACKN/AUDIO DEFEAT switch during an alarm silences the audio alarm.

With an alarm in the latching configuration, pressing the ALARM ACKN/AUDIO DEFEAT switch during an alarm silences the audio alarm and unlatches the associated relay(s).

4.5 Display

In clean air with the correct dew point, the display is as shown in **Figure 4**, for the sensor(s) installed in the **MED AIR 2000**. This position of the display is termed the "**operational display**". As explained below, the display can be changed to furnish other information by using the OPTION and SELECT switches.

Concentrations of CO are given in PPM (parts per million parts of air). Dew point is given in degrees Fahrenheit at 55 PSIG; this can be changed to degrees Centigrade by pressing the SELECT switch. Oxygen concentration is given in per cent by volume. When sample flow is reduced below a limit, the display switches from "Flow: yes" to" Flow: no", or from "Flow: y" to "Flow: n".

4.6 Operational Menu

The operational menu allows the user to:

- View alarm set point concentration values
- View alarm latching configurations
- Enter the maintenance menu with the proper key.

The operational menu is accessed with the OPTION and SELECT switches. The operational menu flow chart is shown in **Figure 5**,

- The OPTION switch is indicated with a "**O**"
- The select switch is indicated with a "**S**".

If the instrument is left at any location in the operational or maintenance menus, other than the operational display, with no action taken for a period of 45 seconds, it returns to the operational display.

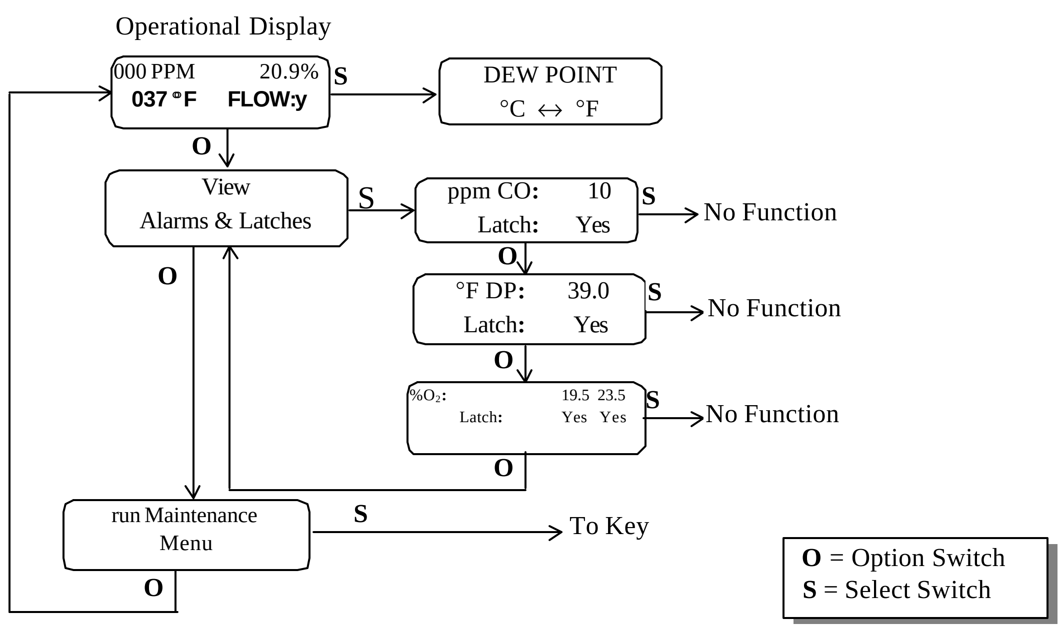


Figure 5: MED AIR 2000 Operation Menu Flow Chart

4.7 Fault Indications

4.7.1 Low Flow Indication

A sensitive pressure switch is used to furnish a low flow indication. When the sample air pressure drops below approximately 30 PSIG, the fault light and audio alarm are activated, and the display reads either "Flow: no" or "Flow: n", depending upon the number of sensors installed in the instrument.

4.7.2 Other Fault Indications

Other fault indications are associated with sensor zero and calibration activities, and are described in the maintenance section 5.0 of this manual.

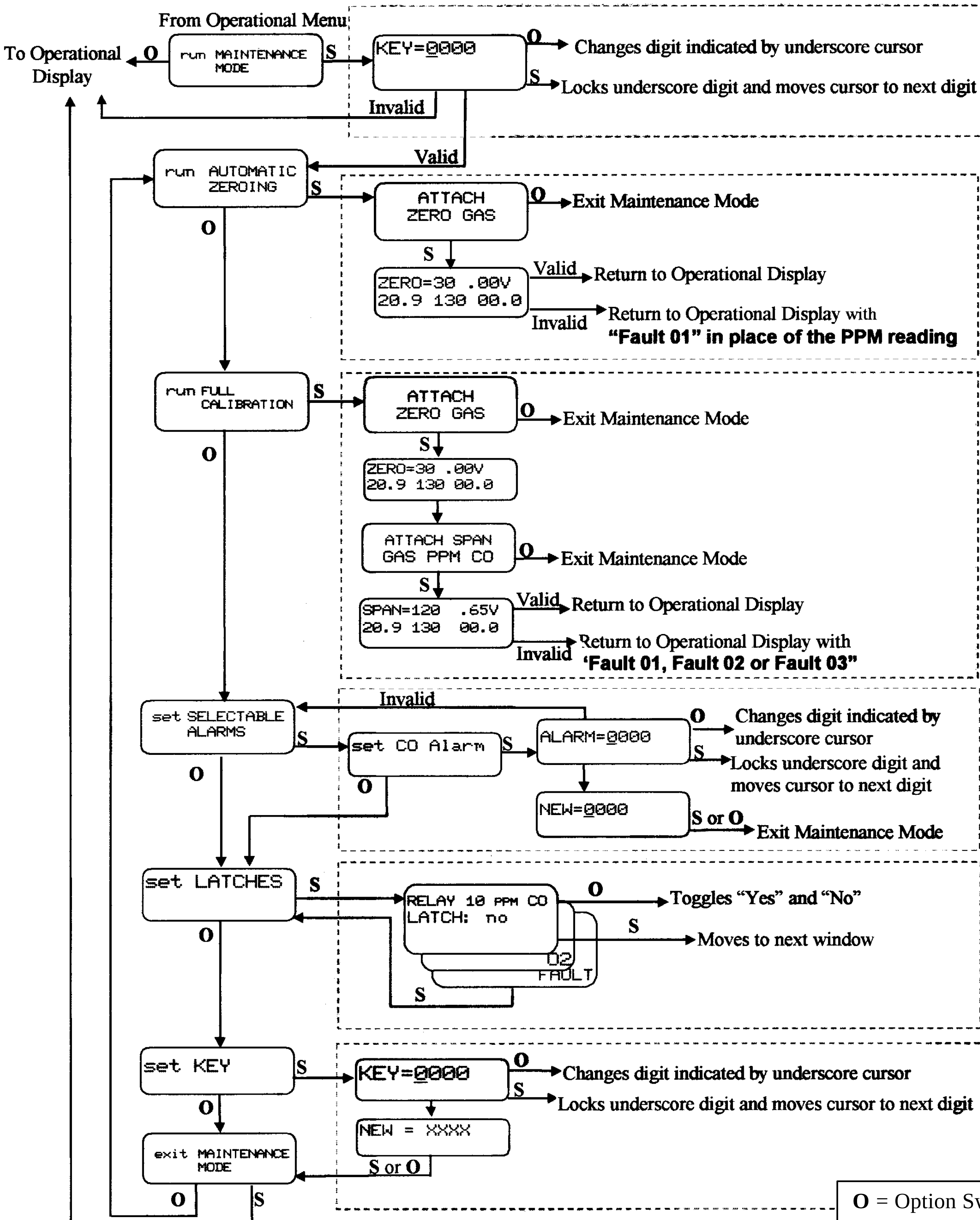
4.8 Dew Point Sensor Response

It is a characteristic of this solid state sensor that it takes more time to extract moisture from it by passing dry air over it, than it does to add moisture to it by passing moist air over it. Therefore, the time response of the sensor to a step change from moist to dry air is relatively slow, while the response to a step change from dry to moist air is rapid.

5.0 Maintenance

5.1 Maintenance Menu

The **MED AIR 2000** maintenance menu is accessed with the OPTION and SELECT switches. The maintenance menu diagram is shown in **Figure 6 Maintenance Menu Flow Chart**. From the operational display, press the OPTION switch twice; "run MAINTENANCE MODE" is displayed.



O = Option Switch
S = Select Switch

Figure 6: MED AIR 2000 Maintenance Menu Flow Chart.

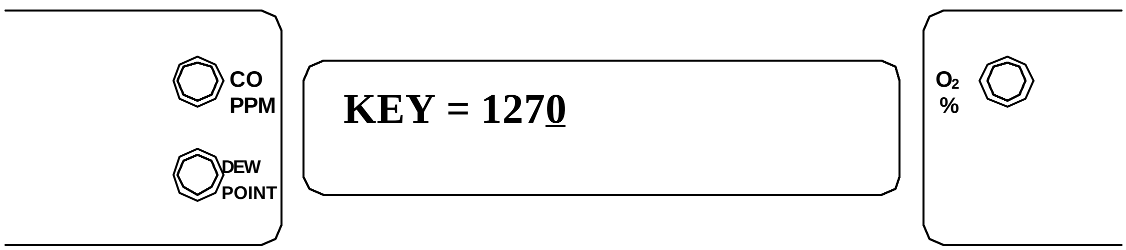
5.1.1 Key

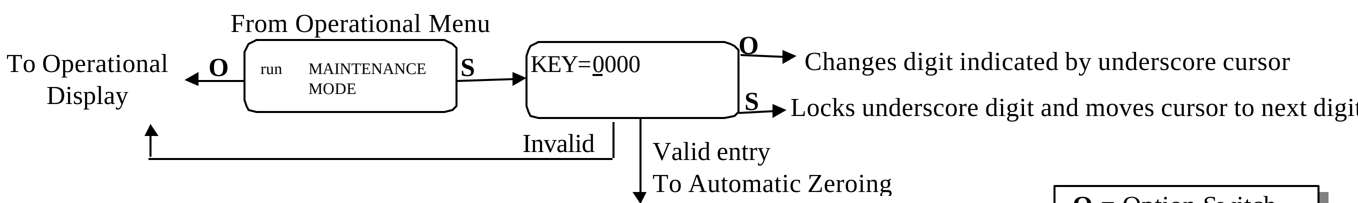
Entrance to the maintenance menu is guarded with a four-digit key. The factory default setting of the key is 1270. When a valid numerical key is inserted, the user is allowed to enter the maintenance menu.

In the "run MAINTENANCE MODE" position

- Press the SELECT switch; "KEY = 0000" is displayed.
- In the "KEY = 0000" position, the underline cursor is under the left digit.
- Press the OPTION switch to change the left digit; select the correct digit.
- Press the SELECT switch, which locks the correct digit in place and moves the cursor one digit to the right.

Continue this process until the four-digit key is complete. When a valid key is inserted in this manner, the display is transferred to the "run AUTOMATIC ZEROING" portion of the menu. If an invalid key is inserted, "INVALID" is displayed briefly; then the **MED AIR 2000** returns to the operational display.





O = Option Switch
S = Select Switch

Example: Key Display and Flow Chart

5.1.2 Automatic Zeroing

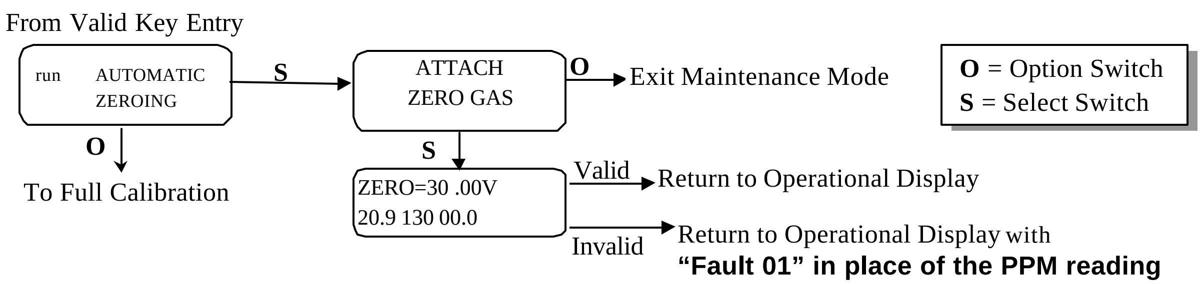
A valid key entry sets the instrument in the "run AUTOMATIC ZEROING" position, which enables the setting of the zero gas concentration point. This is desirable if the zero reference of one of the sensors has drifted over time. For CO, the zero reference point is 0000 ppm CO; the zero reference point for oxygen is 20.9% oxygen by volume. Note that the calibration procedure described in section 5.1.3 also includes setting the zero point. If a full calibration is required, instead of setting just the zero point, press the OPTION switch once; "run FULL CALIBRATION" is displayed. See section 5.1.3.

TO SET THE ZERO POINT WITHOUT PERFORMING FULL CALIBRATION:

- From the "run AUTOMATIC ZEROING" position, see flow chart.
- Press the SELECT button; "ATTACH ZERO GAS" is displayed.

NOTE: While it is possible to zero the sensor(s) using a sample from a "clean" air line, this entails using the sample as a standard, and is best avoided. The best zero gas is a cylinder of 20.9% oxygen in nitrogen with no CO present. This is available in the calibration kit listed in section 6.0

Pressing the OPTION switch at this point aborts the procedure and transfers the display to the "exit MAINTENANCE MODE" position.



Example: Automatic Zeroing Flow Chart

TO CONTINUE THE PROCEDURE: attach a cylinder of zero gas to the Calibration Port using the calibration adapter, as shown in **Figure 7**. Open the cylinder valve, set the regulator at 55 psig, and turn the red handle of the sample-calibrate valve up toward the calibration port. Let the gas flow for about a minute

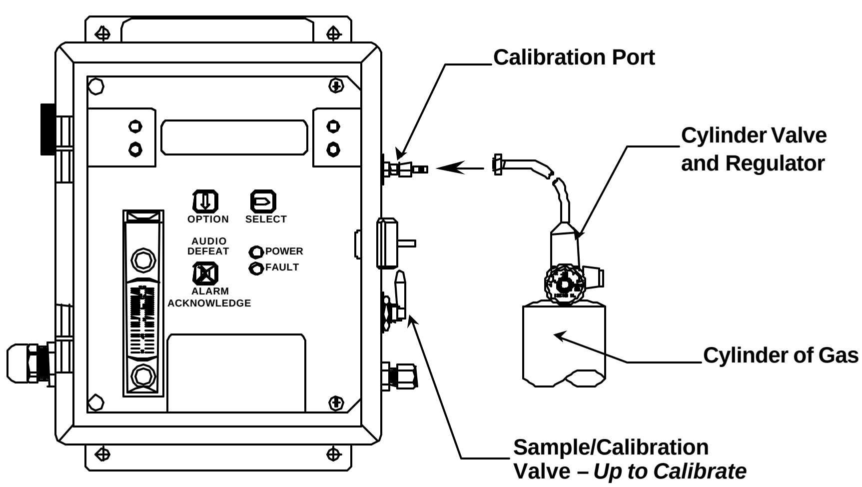


Figure 7: Connection of Calibration Gas Cylinder

- press the SELECT switch.
- "ZERO = **30** .00V" is displayed. This is a timer that counts down from 30 seconds, at the end of that time the procedure is finished. The instrument sets the clean air voltage point for the CO sensor and the 20.9% O_2 point for the oxygen sensor *if it is present*. It then examines the validity of these values; if they are valid, it goes back to the operational display. If a failure occurs, "Fault-01" is displayed in place of PPM reading in the operational display.

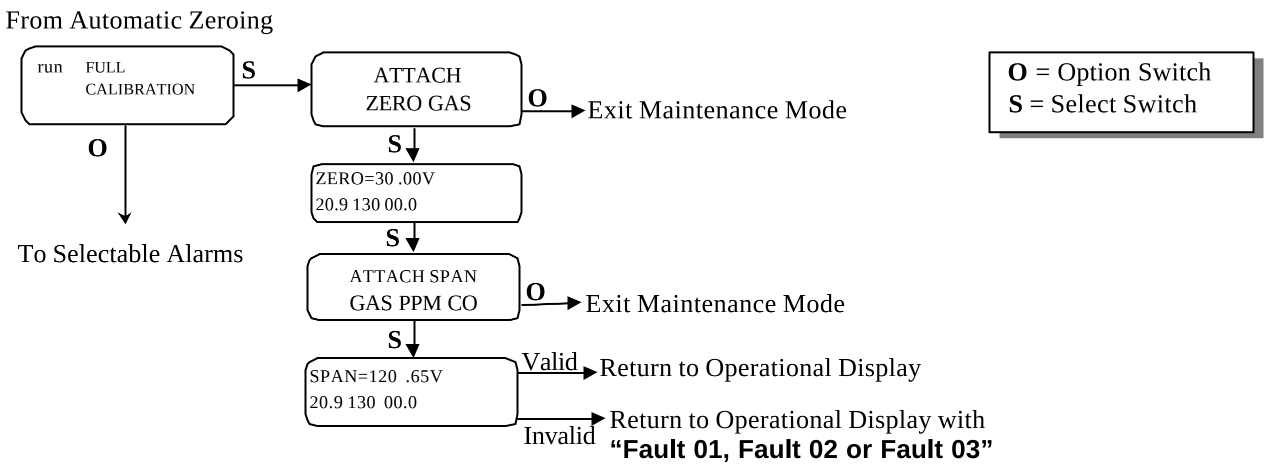
FAULT 01 indicates a clean air fault. Verify the proper zero gas is attached to the calibration Port and the sample-calibrate valve is up toward the calibration port. Repeat automatic zeroing procedure. If fault 01 still occurs, replace sensor in accordance with section 5.2.

After this procedure is complete, be sure to return the red handle of the Sample-Calibrate valve to the down position, pointing toward the Sample Port. If the Sample-Calibrate valve is not switched back to the sample port, the low flow fault indication is activated when the zero gas is removed.

5.1.3 Calibration

Insertion of a valid key results in the display: "run AUTOMATIC ZEROING". Press the OPTION switch once; "run FULL CALIBRATION" is displayed. Press the SELECT switch; "ATTACH ZERO GAS" is displayed; this is the start of the automatic zeroing procedure as described in paragraph 5.1.2, above. When this procedure is complete, "ATTACH SPAN GAS - SPAN = 20" is displayed to indicate that the correct span gas for this procedure is 20 ppm CO in a mixture of 20.9% oxygen in nitrogen. *Do Not Use Any Other Than The Correct Span Gas For This Procedure.*

Pressing the OPTION switch at this point aborts the procedure and sets the display at the "exit MAINTENANCE MODE" position.



Example: Full Calibration Flow Chart

TO CONTINUE THE PROCEDURE:

- Attach the correct span gas to the Calibration Port with the calibration adapter turn the red handle of the Sample-Calibrate valve up toward the Calibration Port. See **Figure 7**.
- Open the cylinder valve, set the regulator at 55 PSIG.
- Allow the calibration gas to flow for **at least one minute**, then press the SELECT switch.

CAUTION: Pressure fluctuations may lead to aberrant oxygen readings if the SELECT switch is activated in less than one minute.

- "SPAN = 120 .00V" is displayed. This is a timer that counts down 120 seconds, at that point the procedure is complete. The ".00V"portion of the display reflects the sensor signal, as it responds to the CO gas. This value should increase.

After a valid zero and calibration, the instrument reverts to the operational display.

After an invalid zero or calibration one of the following will be displayed in place of the PPM reading in the operational display:

Table 5: Fault Alarm

Displayed	Cause	Possible remedy
• **Fault 01**	An invalid zero	· verify proper zero gas is attached to calibration port and sample-calibration valve handle is up · perform automatic zero · change sensor in accordance with section 5.2
• **Fault 02**	An invalid calibration	· verify proper calibration gas is attached to calibration port and sample-calibration valve handle is up · perform calibration · change sensor in accordance with section 5.2
• **Fault 03**	An invalid zero and calibration	· verify proper calibration gas is attached to calibration port and sample-calibration valve handle is up · perform calibration · change sensor in accordance with section 5.2

After this procedure is complete, return the red handle of the Sample-Calibrate valve to the down position, pointing toward the Sample Port. If the Sample-Calibrate valve is not returned to the sample port, the low flow alarm is activated when the calibration gas is removed.

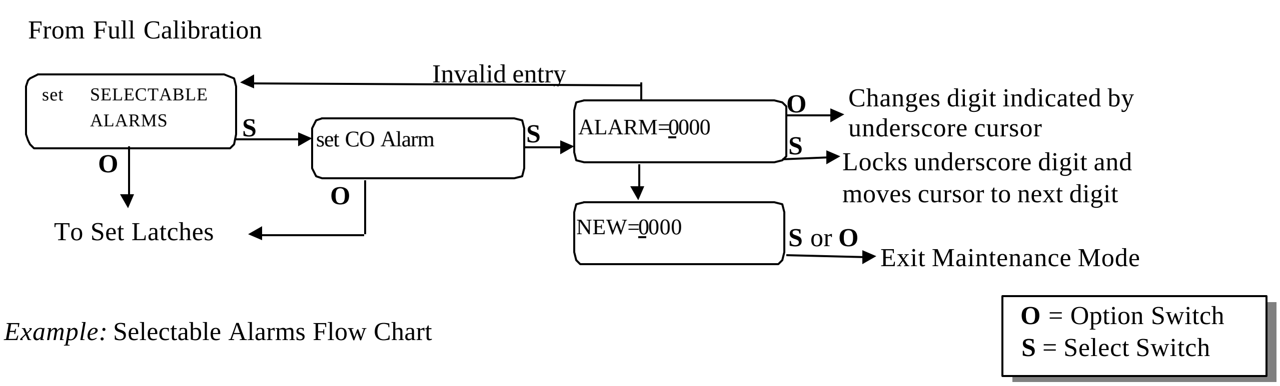
NOTE: During the zero and span process, the sensor singles must fall within a preset limit. If they do not, the fault codes above are generated. If a fault code 02 is generated with calibrating the CO sensor, and the span voltage is close to, but not greater then 0.38V, an adjustment may be capable of being made, to extend the life of the sensor. Follow the procedure foe calibrating a sensor as outlined in section 5.2.

5.1.4 Select Alarm Set Points

- Factory alarm set points are discussed in paragraph 4.2. To change the alarm set points, after inserting a valid key,
- Press the OPTION switch twice; "set SELECTABLE ALARMS" is displayed.
- Press the SELECT switch; "ALARM = 0000" is displayed, with the underscore cursor under the left digit.
- Press the OPTION switch to change the left digit; select the correct digit.
- Press the SELECT switch to lock in the correct digit and move the cursor one digit to the right. When a valid new alarm is selected, the "NEW = XXXX" is displayed.
- Press the OPTION or the SELECT switch, and the display changes to the next sensor. After all sensors have been displayed, the display returns to the "set SELECTABLE ALARMS" position.

Valid alarm ranges are as follows:

- CO: 5 to 99 ppm
- Dew Point: 0° to 37°C (30° to 98.6°F)
- The Oxygen alarm set points are 19.5% for deficiency and 23.5% for abundance, and are not adjustable.

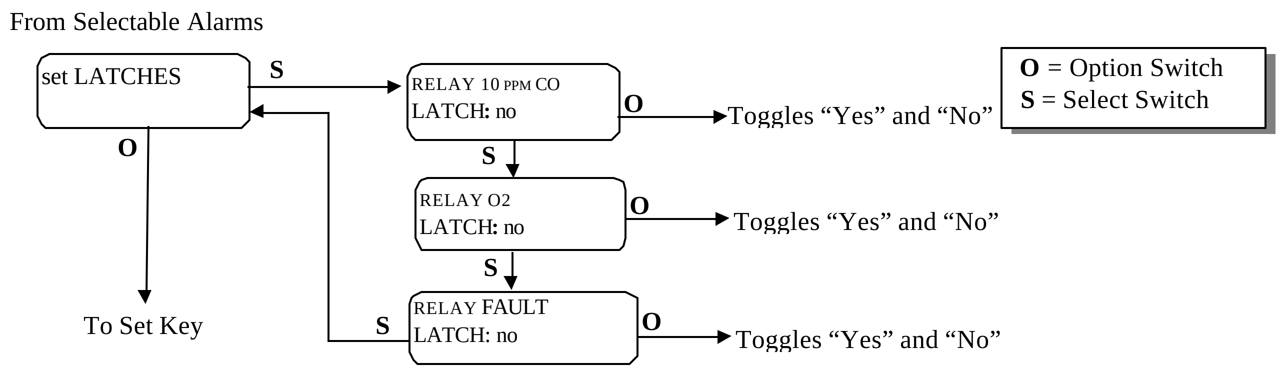


Example: Selectable Alarms Flow Chart

5.1.5 Set Latches

To latch and unlatch the alarm relays, after inserting a valid key, press the OPTION switch three times; "set LATCHES" is displayed.

- Press the Select switch; the particular alarm relay and its latch mode is displayed, for example, "RELAY: 10ppm CO, LATCH: no".
- Use the OPTION switch to toggle the latch mode between "yes" and "no". Select the desired mode. See section 4.3.
- Press the SELECT switch to step to the next relay. The procedure steps sequentially to all alarm relays in this manner; when complete, it returns to the "set LATCHES" position.

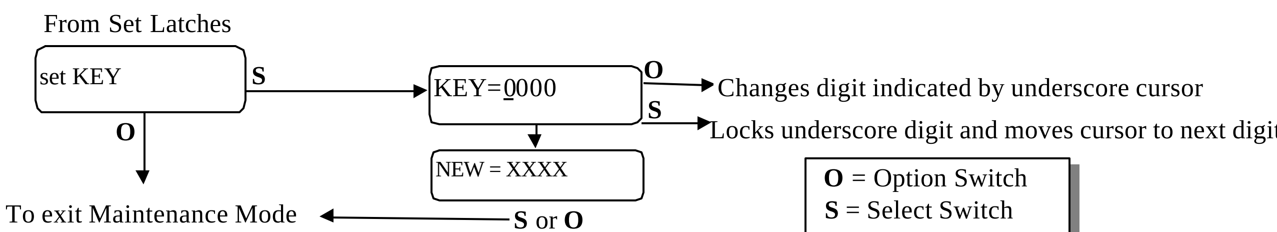


Example: Set Latches Flow Chart

5.1.6 Set the Key

To set a new key, after inserting a valid key, press the OPTION switch four times; "set KEY" is displayed. Press the SELECT switch; "KEY = 0000" is displayed, with the underscore cursor under the left digit. Use the OPTION switch to change the left digit, select the desired digit, and use the SELECT switch to lock the digit in place and move the cursor one digit to the right. When all four digits of the new key have been selected, "NEW = XXXX" is displayed. Record the new key; without it, the maintenance menu cannot be reentered once it is left. If the key is lost, call ***ENMET*** customer service personnel.

From the "NEW = XXXX" position, press either the OPTION or the SELECT switch; "exit MAINTENANCE MODE" is displayed.



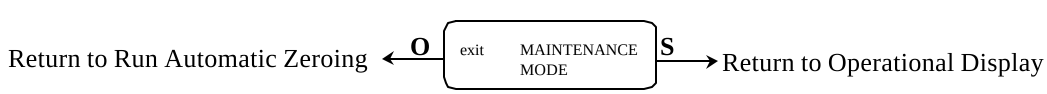
Example: Set Key Flow Chart

5.1.7 Exit

From the "exit MAINTENANCE MODE" position

Press the SELECT switch to resume the operational display.

Press the OPTION switch to reenter the maintenance menu at the "run AUTOMATIC ZEROING" position.



5.2 Sensor Replacement

5.2.1 CO Sensor

A CO sensor must be replaced when it can no longer be calibrated. To replace a sensor, perform the following steps.

- Turn off the electrical power. The sample air can continue to flow.
- Open the display panel and remove the two manifold retention screws and remove the manifold. See **Figure 9**.
- Remove the old CO sensor, which is the bottom most sensor, and replace it with a new sensor.

CAUTION: New sensors come with a shorting clip that must be removed for proper operation. See **Figure 8**.

- Replace the manifold. Observe that the flowmeter reading is correct.
- Turn on the electrical power.
- Wait 30 minutes, then recalibrate the sensor per the instructions in Section 5.1.3. As the timer is counting down during calibration, a voltage is displayed on the screen beside the timing count. This voltage must be between:

For Serial No.	Range	Adjust to
133 and above	.38V - .68V	.65V
132 and below	.59V - .68V	.64V

- Adjust to: .65V if it is not between .38 – .68V. Adjust this voltage during the last 30 seconds of the calibration interval, using the bottom most potentiometer on the sensor circuit board. See **Figure 10**.
- Replace the manifold housing, and secure the display panel. An instrument without the manifold housing in place is susceptible to RFI.

5.2.2 Oxygen Sensor

An oxygen sensor must be replaced when it can no longer be calibrated in clean air. To replace the sensor, follow the general steps given for the replacement of the CO sensor, but effect a replacement of the oxygen sensor, which is the large sensor in the center position of the manifold. After sensor installation, wait four hours before recalibrating. When recalibrating, it is not necessary to make a voltage adjustment.

5.3 Humidifier Tube

The humidifier tube is used to assure that the CO and oxygen sensors are not subjected to extremely dry air for a long period of time, which would decrease their useful life. Change the humidifier tube when changing a CO sensor at the completion of its useful life.

To change the humidifier tube:

- Remove the sheet metal cover from the top of the enclosure, exposing the humidifier tube. See **Figure 10**.
- Note the coiled arrangement of the tube. Remove the old tube and replace it with the new one.
- Replace the sheet metal cover.

5.4 Dew Point Sensor

Unlike the CO and O_2 sensors, the dew point sensor cannot be field calibrated. To assure correct performance, the dew point sensor should be calibrated biyearly. To minimize instrument downtime, take advantage of the dew point sensor exchange program available through ***ENMET***, in which a year old dew point sensor can be exchanged for a newly calibrated sensor. Call ***ENMET*** customer service personnel for details.

5.5 Flow Control Orifice

A 0.006-inch diameter orifice is used to set the flow rate and to drop the air pressure. It is located where the air enters the humidifier tube, see **Figure 10**. In well-maintained medical air systems, this orifice should not clog. However, if difficulty is experienced in maintaining flow rate with assured inlet pressure, remove air pressure from the equipment and examine this orifice; replace it if necessary.

5.6 Particulate Filter Replacement

On instruments with serial numbers S/N 332 and above, a filter is installed inside the enclosure, as shown in **Figure 10**.

To replace this filter:

- Obtain a new filter
- Note the correct direction of flow, as denoted by the arrow on the filter body
- Remove the old filter
- Replace with the new filter

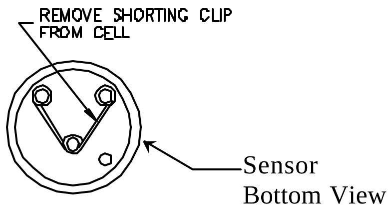


Figure 8: Remove Shorting Clip

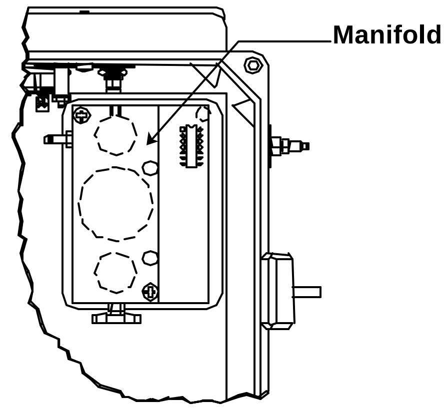


Figure 9: Manifold

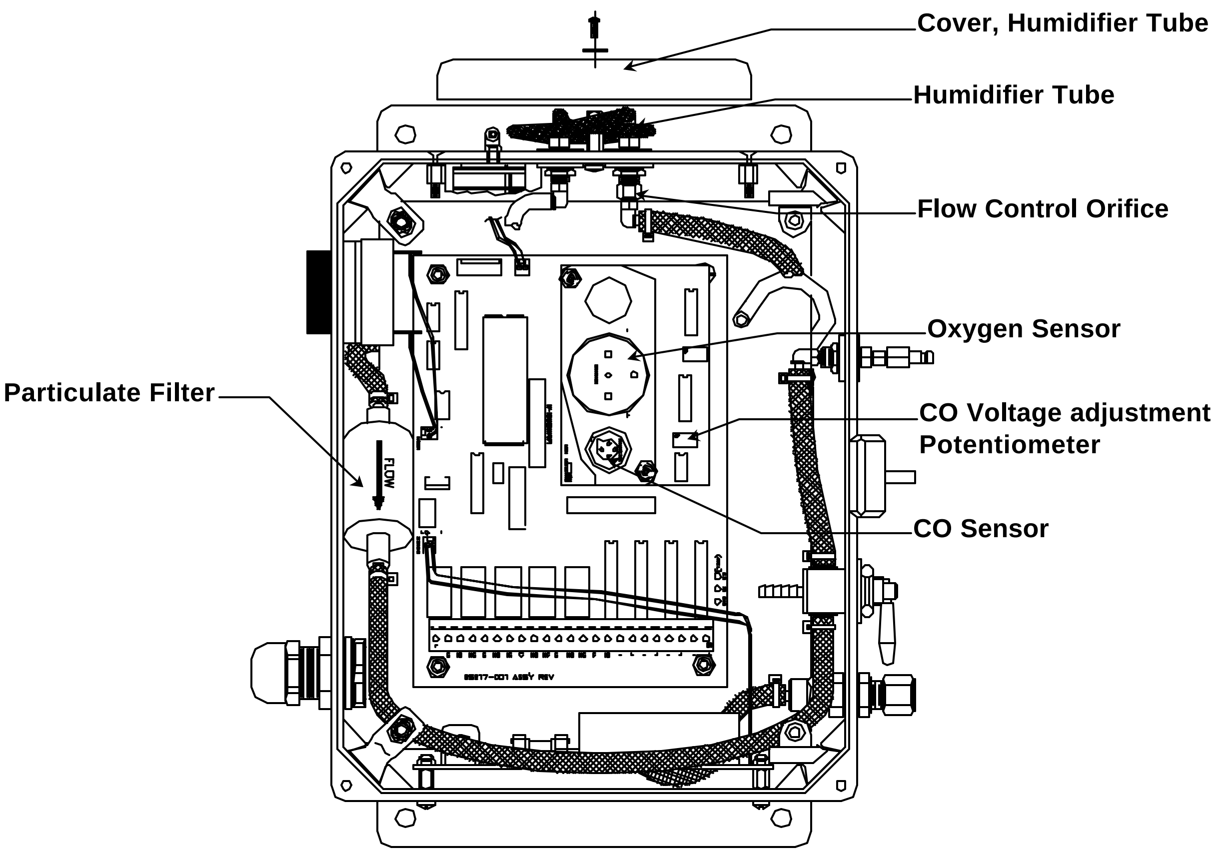


Figure 10: Location of Parts for Replacement

6.0 Replacement Part Numbers

ENMET part numbers for replacement parts:

Part number	Description
03009-001	Dew Point sensor
05221-001	Power Supply Circuit
64002-1000	Fuse, 1.0 Amp 5x20mm
67016-1106	Sensor, Oxygen
67020-1200	Sensor, CO (*for units S/N 299 and below)*
67016-1204	Sensor, CO (*for units S/N 300 and above)*
73070-009	Orifice
73108-002	Humidifier Tube
03401-000	Calibration Kit
03219-020	Gas Cylinder, 20 ppm CO in air
03296-209	Gas Cylinder, 20.9% oxygen in nitrogen
03700-022	Calibration Adapter
73089-002	Filter, particulate (*for units S/N 332 and above)*

7.0 WARRANTY

ENMET warrants new instruments to be free from defects in workmanship and material under normal use for a period of one year from date of shipment from ***ENMET***. The warranty covers both parts and labor excluding instrument calibration and expendable parts such as calibration gas, filters, batteries, etc... Equipment believed to be defective should be returned to ***ENMET*** within the warranty period (transportation prepaid) for inspection. If the evaluation by ***ENMET*** confirms that the product is defective, it will be repaired or replaced at no charge, within the stated limitations, and returned prepaid to any location in the United States by the most economical means, e.g. Surface UPS/RPS. If an expedient means of transportation is requested during the warranty period, the customer is responsible for the difference between the most economical means and the expedient mode. ***ENMET*** shall not be liable for any loss or damage caused by the improper use of the product. The purchaser indemnifies and saves harmless the company with respect to any loss or damages that may arise through the use by the purchaser or others of this equipment.

This warranty is expressly given in lieu of all other warranties, either expressed or implied, including that of merchantability, and all other obligations or liabilities of ***ENMET*** which may arise in connection with this equipment. ***ENMET*** neither assumes nor authorizes any representative or other person to assume for it any obligation or liability other than that which is set forth herein.

NOTE: When returning an instrument to the factory for service:

- ❑ Be sure to include paperwork.
- ❑ A purchase order, return address and telephone number will assist in the expedient repair and return of your unit.
- ❑ Include any specific instructions.
- ❑ For warranty service, include date of purchase
- ❑ If you require an estimate, please contact ***ENMET*** Corporation.

There is Return for Repair Instructions and Form on the last pages of this manual. This form can be copied or used as needed.

ENMET **Corporation**
PO Box 979
Ann Arbor, MI 48106-0979

MEDAIR 2200

Operation and Maintenance Manual

80002-042
January 2006
MCN-344, 03/23/06
MCN-345, 04/12/06
MCN-346, 04/21/06

Table of Contents

List of Figures

List of Tables

Reference Information:

NOTE: [important information about use of instrument]

CAUTION: [affects equipment – if not followed may cause damage to instrument, sensor etc…]

***WARNING*: [affects personnel safety – if not followed may cause bodily injury or death.]**

 Attention / Warning

 Earth Ground

1.0 Introduction

The **MEDAIR 2200** is a compressed air monitoring instrument that measures and detects certain hazards in medical air supply systems. The instrument is available with sensors that monitor air for carbon monoxide (CO), carbon dioxide (CO_2) for variations in the oxygen (O_2) content and for dew point. The sensors can be used alone or up to four sensors can be used together. In the instrument, a sample of the compressed air is passed over each sensor and the resultanting electrical outputs are used to evaluate the air for the target gases. Some features of the instruments are as follows:

- continuous monitoring of the sample air
- continuous LCD display of gas and vapor concentrations
- menu driven operational and maintenance controls
- menu driven calibration procedure
- audio and visual alarms indicate unsafe conditions
- alarm relay contacts available on terminals
- a fault relay and visual fault alarm
- low air flow fault indication and display
- alarm acknowledgement capability including audio defeat
- mA outputs for each target gas

NOTE: *All specifications stated in this manual may change without notice.*

1.1 Unpack

Unpack the **MEDAIR 2200** and examine it for shipping damage. If such damage is observed, notify both ***ENMET*** customer service personnel and the commercial carrier involved immediately.

Regarding Damaged Shipments

NOTE: **It is your responsibility to follow these instructions. If they are not followed, the carrier will not honor any claims for damage.**

- ❑ This shipment was carefully inspected, verified and properly packaged at our company and delivered to the carrier in good condition.
- ❑ When it was picked up by the carrier at ***ENMET***, it legally became your company's property.
- ❑ If your shipment arrives damaged:
  - Keep the items, packing material, and carton "As Is." Within 5 days of receipt, notify the carrier's local office and request immediate inspection of the carton and the contents.
  - After the inspection and after you have received written acknowledgment of the damage from the carrier, contact ***ENMET*** Customer Service for return authorization and further instructions. Have your Purchase Order and Sales Order numbers available.
- ❑ ***ENMET*** either repairs or replaces damaged equipment and invoices the carrier to the extent of the liability coverage, usually $100.00. Repair or replacement charges above that value are your company's responsibility.
- ❑ The shipping company may offer optional insurance coverage. ***ENMET*** only insures shipments with the shipping company when asked to do so in writing by our customer. If you need your shipments insured, please forward a written request to ***ENMET*** Customer Service.

Regarding Shortages

If there are any shortages or questions regarding this shipment, please notify ***ENMET*** Customer Service within 5 days of receipt at the following address:

ENMET Corporation
680 Fairfield Court
Ann Arbor, MI 48108
734-761-1270 734-761-3220 Fax

1.2 Check Order

Check, the contents of the shipment against the purchase order. Verify that the **MEDAIR 2200** is received as ordered. If there are accessories on the order, ascertain that they are present. Check the contents of calibration kits. Notify ***ENMET*** customer service personnel of any discrepancy immediately.

1.3 Serial Numbers

Each **MEDAIR 2200** is serialized. These numbers are on tags on the equipment and are on record in an ***ENMET*** database.

2.0 Instrument Features

2.1 Exterior Features

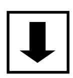
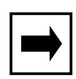
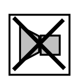
The exterior of the instrument is shown in **Figure 1**. The exterior features are as follows:

Feature	Description
Enclosure	An engineered thermoplastic box, approximately 10x8x6, with a clear hinged front cover.
Input Port	The entrance for the air sample and calibration gas. The quick release fitting mates with one on the calibration adapter.
Front Cover Latch	A quick-release latch that holds the clear front cover in place, and is capable of being padlocked if desired.
Audio Alarm	A loud horn activated by certain alarm conditions.
Mounting Flanges	Flanges with holes for mounting the enclosure to a vertical surface.
Sample Air Hose	A five foot long hose to conduct a sample of the air from the source to the instrument. The hose has a Female quick release fitting and Male ¼” NPT fitting. See **Figure 1A**.

NOTE: When connecting to a standard 55 PSI USA Medical air system, Regulator is Not required.

2.2 Display Panel Features

The display panel, shown in **Figure 1**, is viewed through the clear front cover of the enclosure, and is accessed by opening the cover. Features are as follows:

Feature	Description
Display	A 2 line, 16 character per line, LCD with backlight. The numerical values of gas concentrations, and other information are displayed.
Visual Alarms & Indicators	On either sides of the display: A red alarm LED for each sensor installed in the instrument, Low level alarm. The top center of the panel: A red alarm LED for all sensors installed in the instrument, High level alarm. Near the center of the panel: A green power indicator LED A red fault alarm indicator LED
Pushbutton Switches	There are three of these, located near the center of the panel; they are yellow rectangular membrane switches. They are:
•OPTION Switch	The top left switch. 
•SELECT Switch	Directly to the right of the OPTION switch. 
• AUDIO DEFEAT / ALARM ACKNOWLEDGE Switch	Directly below the OPTION switch. 

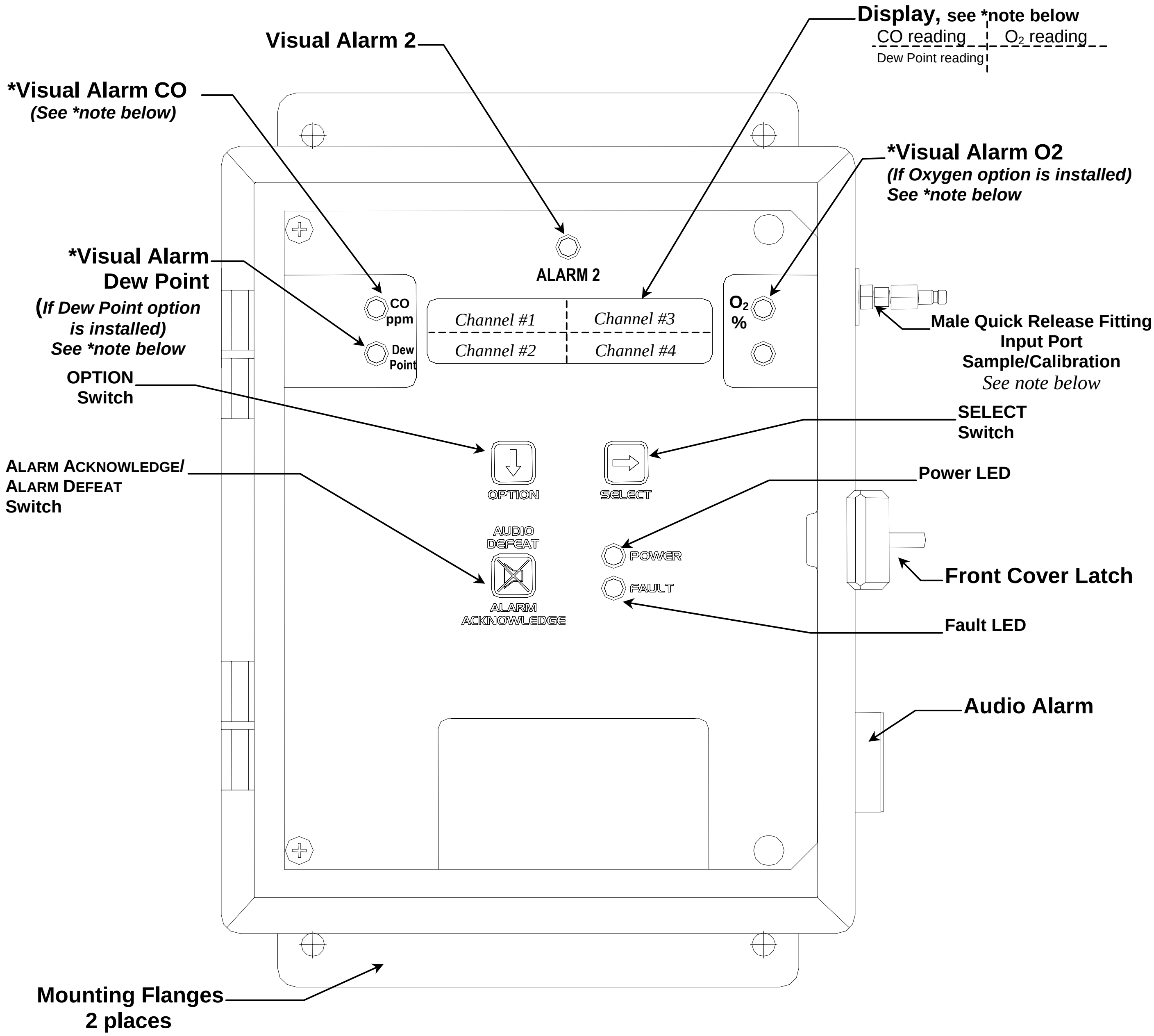


Figure 1: Features of MEDAIR 2200 External

*** NOTE: Typical gas reading & alarm locations, depending on instrument configuration, alarms & readings may be in alternate locations**

> **NOTE:** When connecting to a standard 55 PSI USA Medical air system, Regulator is Not required.

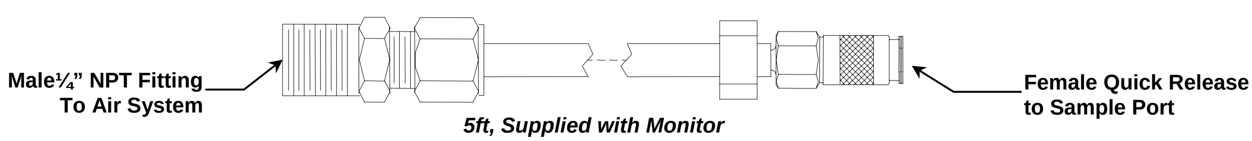


Figure 1A: Sample Air Hose

2.3 Circuit Board Features

The Display Panel is hinged on the left and is released by unscrewing the 2 screws located in the right corners. After releasing the panel, it is swung to the left, exposing the interior of the enclosure. The Circuit Board is mounted at the back surface of the enclosure interior. Features are shown in **Figure 2**.

Feature	Description
Relay Terminals	This group of terminals is located at the left side of the Circuit Board. For the contacts for each of four alarm relays, and for the contacts of a fault relay.
Output Terminals	One 4-20mA output per active channel. 2 channels/outputs per connector.
Sensor Manifold	The sample manifold, the carbon monoxide, carbon dioxide and oxygen sensors are located under this housing.
Dew Point Manifold	The dew point sensor is installed into this housing.

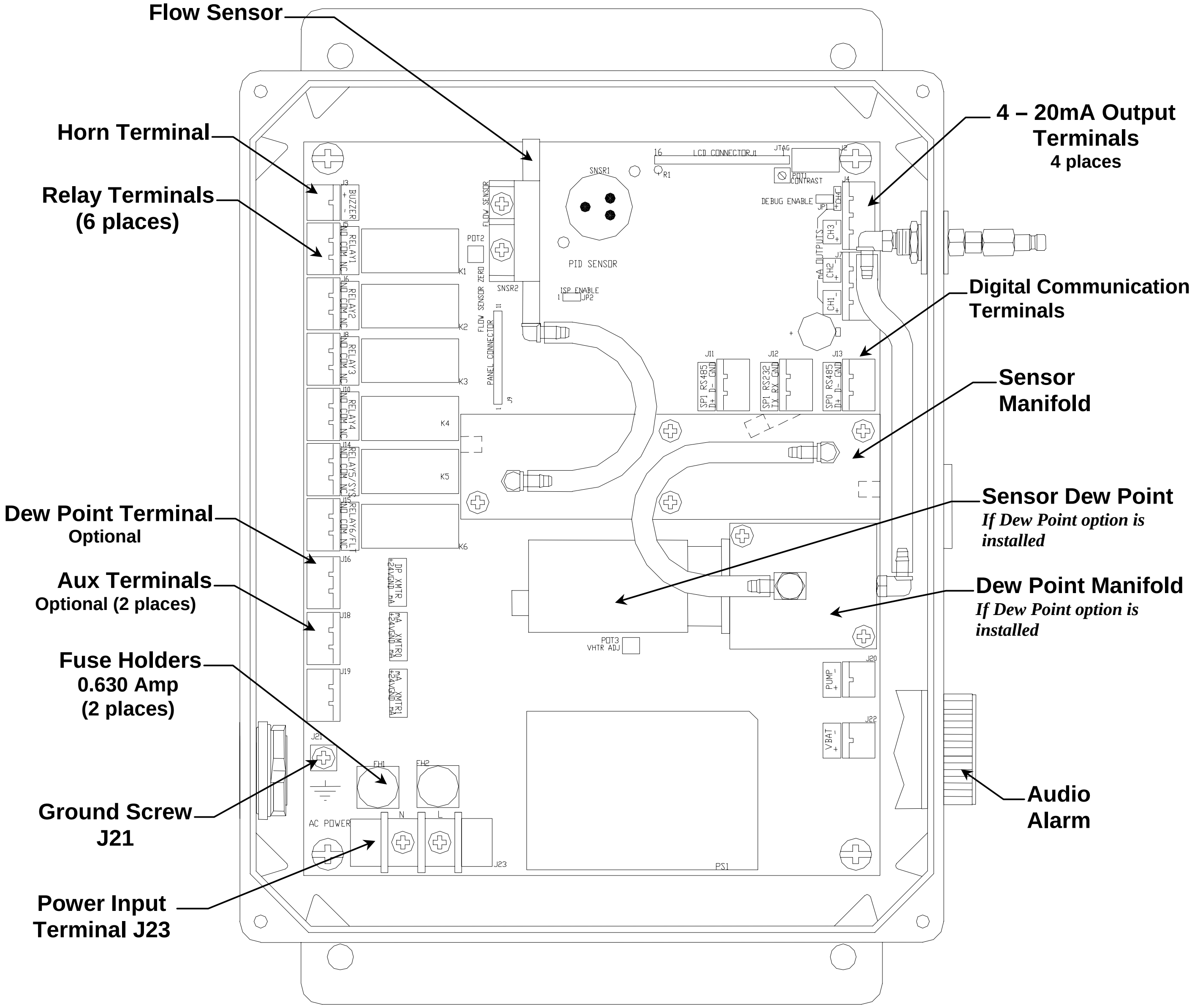


Figure 2: MEDAIR 2200 Interior Features

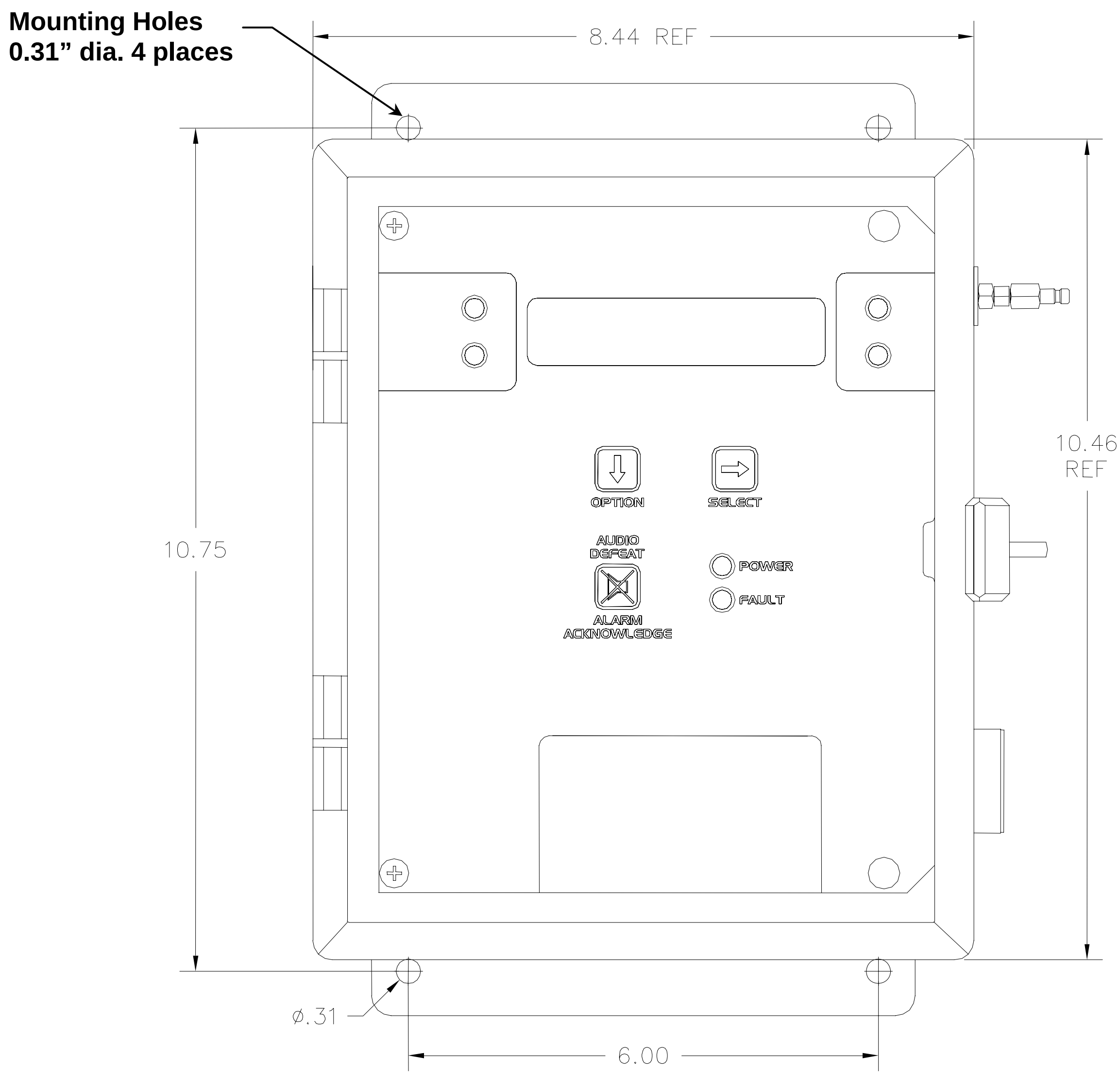
3.0 Installation

3.1 Mounting of Instrument

The **MEDAIR 2200** should be located near the pipe or tank containing the air to be monitored, and upstream from where the air is being used. The **MEDAIR 2200** must be installed such that it samples the compressed air before it reaches the users.

Mount the instrument on an appropriate vertical surface using the mounting flanges provided. Avoid areas with excessive vibration or temperature extremes. The holes in the flanges are 0.31 inch in diameter and form a 6 x 10.75 inch rectangle. **See Figure 3.**

It is recommended to use #8 drywall anchors and screws for mounting the **MEDAIR 2200** to a drywall/sheetrock surface.



Dimensions are in inches.

Figure 3: MEDAIR 2200 Mounting Dimensions

3.2 Sample Air Supply

Tap the pipe or tank containing the breathing air and use appropriate fittings to connect the sample input hose. The instrument is designed to operate from an air supply pressure 55 PSIG.

The sample air exits the instrument from the hole plug located on the bottom of the enclosure. Take care not to obstruct this exit port.

3.3 Power Supply

The input power can vary from 100 to 240VAC, 50/60 Hz. Mains power should be connected to the Power Input Terminal **J23** and the ground screw **J21**. S**ee Figure 2** for location.

Upon supplying air and power to the instrument:

- The green power on LED is lit.
- The display backlight is lit, and instrument will step through a start-up sequence: unit serial number, software revision and gases monitored may be shown on the display.

The instrument may go into alarm briefly, but the sensors stabilize quickly. If the instrument persists in alarm, acknowledge the alarm by pressing the **AUDIO DEFEAT / ALARM ACKNOWLEDGE** switch. If alarm persists longer than 30 minutes, call ***ENMET*** customer service personnel.

3.4 Outputs

Two types of alarm outputs are available, relay contacts and 4-20mA outputs.

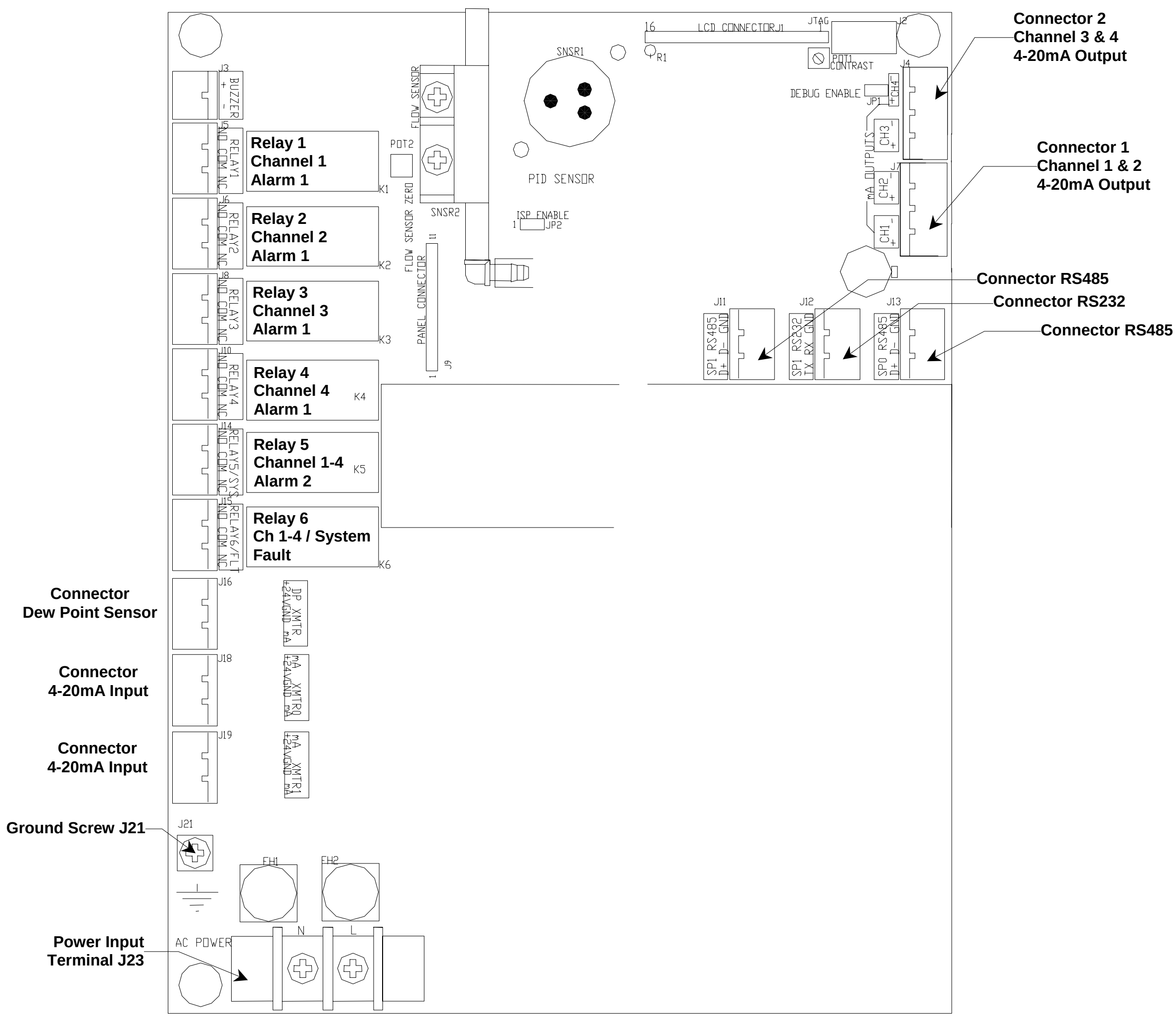


Figure 2A: Relay, Input and Output Terminals

3.4.1 Relay Contacts

Relay contacts are available for each alarm; these are SPDT, rated at 10Amp at 110VAC, and may be latching or non-latching as required by the application.

They are accessed on the terminals next to each relay see **Figure 2 & 2A**. The contact positions are noted on the circuit board next to each terminal.

Relays may also be configured as failsafe or non-failsafe. The default alarm relay configuration is for latching mode, and failsafe. They may be reconfigured in the maintenance menu. **See section 5.3.5 & 5.3.6**

The PC Board is labeled for the relays in their un-energized state. If the relay is configured for failsafe, then this is also the alarm condition state. Non-failsafe configured relays in the alarm state, are the reverse of the PC board labeling. Note that the Fault(FLT) relay cannot be set to operate in a Non-Failsafe mode. Please see the **Table 1** below:

Table 1 : Relay Failsafe Settings

Position	Failsafe-Alarm	Non-Failsafe-Alarm
J5 Relay 1 - NO	Normally Open	Normally Closed
J5 Relay 1 - COM	Common	Common
J5 Relay 1 - NC	Normally Closed	Normally Open
J6 Relay 2 - NO	Normally Open	Normally Closed
J6 Relay 2 - COM	Common	Common
J6 Relay 2 - NC	Normally Closed	Normally Open
J8 Relay 3 - NO	Normally Open	Normally Closed
J8 Relay 3 - COM	Common	Common
J8 Relay 3 - NC	Normally Closed	Normally Open
J10 Relay 4 - NO	Normally Open	Normally Closed
J10 Relay 4 - COM	Common	Common
J10 Relay 4 - NC	Normally Closed	Normally Open
J14 Relay 5 - NO	Normally Open	Normally Closed
J14 Relay 5 - COM	Common	Common
J14 Relay 5 - NC	Normally Closed	Normally Open
J15 Relay 6/FLT - NO	Normally Open	N/A
J15 Relay 6/FLT - COM	Common	N/A
J15 Relay 6/FLT - NC	Normally Closed	N/A

Relays can be linked to specific alarms. The table below shows the default relay links. They may be changed in the maintenance menu if required. See **Section 5.0**.

	Channel 1	Channel 2	Channel 3	Channel 4
Relay 1	Low Alarm			
Relay 2		Low Alarm		
Relay 3			Low Alarm	
Relay 4				Low Alarm
Relay 5	High Alarm	High Alarm	High Alarm	High Alarm

In addition, there is a fault relay, which changes state whenever the instrument is in a fault condition. The contact positions are noted on the circuit board next to each terminal. **See Figure 2A.** The coil of this relay is energized when the instrument is in the non-fault state; the contact conditions given on the circuit board next to the terminal, are for the non-energized state, which is identical to the fault state.

These relay contacts can be used to operate auxiliary alarms or other functions. Place a hole in the enclosure for a wire exit, and use appropriate cable fittings. Be sure to note the location and depth of hardware inside the enclosure.

3.4.2 Optional 4-20mA Outputs

Isolated 4-20 mA outputs are available for data logging or other purposes. An output is supplied for each sensor supplied in a particular instrument, and can be added when a sensor is added in the field. These outputs are available on the Connector 1 for channels 1 & 2 and Connector 2 for channels 3 & 4.

4mA corresponds to a sensor reading at the bottom of the instrument range and 20mA corresponds to a full scale reading. Standard ranges are shown in **Table 2**.

Table 2: Sensor Output

Sensor	4mA	20mA
CO	0	50
Dew Point	-112 F	68 F
O2	0	30
CO2	0	5000

Wiring requirements are the same as for the relays.

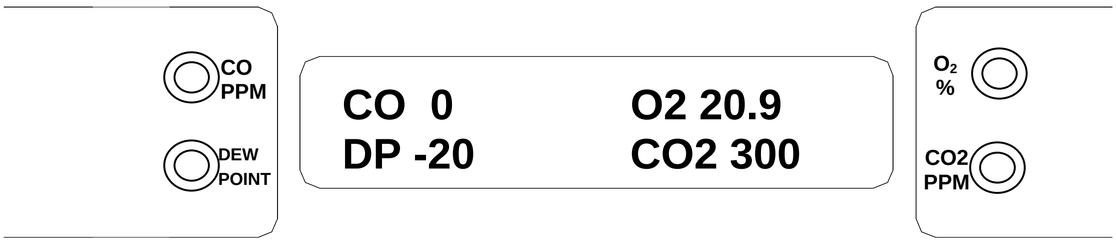
3.5 Installation Verification

All instruments are calibrated at the factory. You may, if a calibration kit is available, calibrate the CO, O_2 and CO_2 channels of the instrument 24 hours after installation to verify proper installation and instrument operation. See **Section 5.0**, Maintenance, for calibration instructions. Calibration is also recommended after the first month of operation. Subsequent calibrations should be performed every 3 months. The dew point sensor can not be calibrated in the field.

4.0 Operation

4.1 Normal Operation Condition

With the **MEDAIR 2200** installed as described in **Section 3**, and in clean air, the POWER green LED is on, the display is lit and the information on the display is as shown in **Figure 4 Display**, for the sensor(s) installed in the **MEDAIR 2200**. The red alarm and fault LEDs are not lit.



Example of display with CO(ch 1), Dew Point((ch 2), Oxygen(ch 3) and CO_2(ch 4)options installed

Figure 4: MEDAIR 2200 Operational Display

4.2 Alarm Set Points

There are two alarm set points for CO, CO_2 dew point, and oxygen. The factory settings of these alarm set points are shown in **Table 3**.

Table 3: Factory Alarm Set Points

Typical Channel #	Gas	Alarm 1, Flashing LED	Alarm 2, Steady LED
1	Carbon Monoxide	10 ppm	20 ppm
2	Dew point	-40°Fahrenheit at 55PSIG	39°Fahrenheit at 55PSIG
3	Oxygen Deficiency	19.5 % by volume	23.5 % by volume
4	Carbon Dioxide	500 ppm	1000 ppm

These alarm set points can be changed within limits; see the maintenance section of this manual for the procedure.

- If the CO concentration increases above that of the alarm set point, the associated red LED is lit, the associated relay changes state, and the audio alarm is activated.
- If the dew point increases above that of the alarm set point, the associated red LED is lit, the associated relay changes state, and the audio alarm is activated.
- If the oxygen content of the sample air decreases below the deficiency alarm set point, the associated red LED is lit, the associated relay changes state, and the audio alarm is activated.
- If the oxygen content of the sample air exceeds that of the abundance alarm set point, the associated red LED is lit, the audio alarm is activated, and both the oxygen alarm relay and the oxygen high alarm relay change state.

4.3 Alarm Latching

An instrument is shipped with the alarms in the latching mode. The alarms may be independently configured in the non-latching mode by use of the maintenance menu. ***See Section 5.3.3***, for setting alarm 1 and alarm 2.

- IN THE LATCHING MODE: at the cessation of the condition which causes an alarm, the alarm indications do not cease, and the alarm relay contacts do not revert to the non-alarm state, until the **AUDIO DEFEAT / ALARM ACKNOWLEDGE** switch is pressed. An alarm can also be acknowledged by pressing the switch during the alarm condition; then at the cessation of the alarm condition, alarm indications cease and alarm relays revert to the non-alarm state. After an alarm is acknowledged, alarms in the latching configuration are re-armed to latch at the next alarm condition.
- IN THE NON-LATCHING MODE: at the cessation of the condition that causes an alarm, the alarm indications automatically cease, and the alarm relay contacts revert to the non-alarm state.

4.4 Audio Defeat

Pressing the **AUDIO DEFEAT / ALARM ACKNOWLEDGE** switch during an alarm temporarily silences the audio alarm. Relays and alarm LEDs continue to function, in the alarm state, during an alarm condition. As long as the alarm condition persists, the audio alarm will "chirp" every 20 seconds.

- If after 15 minutes the alarm condition continues the audio alarm will reactivate at full intensity.
- If any other alarm condition occurs while the audio alarm has been silenced it will force the audio alarm to reactivate immediately.

4.5 Display

In clean air a display is shown in **Figure 4**. This position of the display is termed the "**operational display**". As explained below, the display can be used to view other information by using the **OPTION** and **SELECT** switches.

Concentrations of CO and CO_2 are given in PPM (parts per million parts of air). Dew point is given in degrees Fahrenheit at 55 PSIG; *this can be changed to degrees Centigrade by pressing the SELECT switch.* Oxygen concentration is given in percent by volume.

When sample flow is reduced below a limit, the bottom line of the display flashes "Low Flow Alarm".

4.6 Operational Menu

The operational menu allows the user to:

- View alarm set point concentration values
- View alarm ascending/descending trigger, latching and delay configurations
- Enter the maintenance menu with the proper Password.

The operational menu is accessed with the **OPTION** and **SELECT** switches. The operational menu flow chart is shown in **Figure 5**,

- Pressing the **OPTION** switch is indicated with a "**O**"
- Pressing the **SELECT** switch is indicated with a "**S**".

If the instrument is left at any location in the operational or maintenance menus, other than the operational display, with no action taken for a period of 45 seconds, it returns to the operational display.

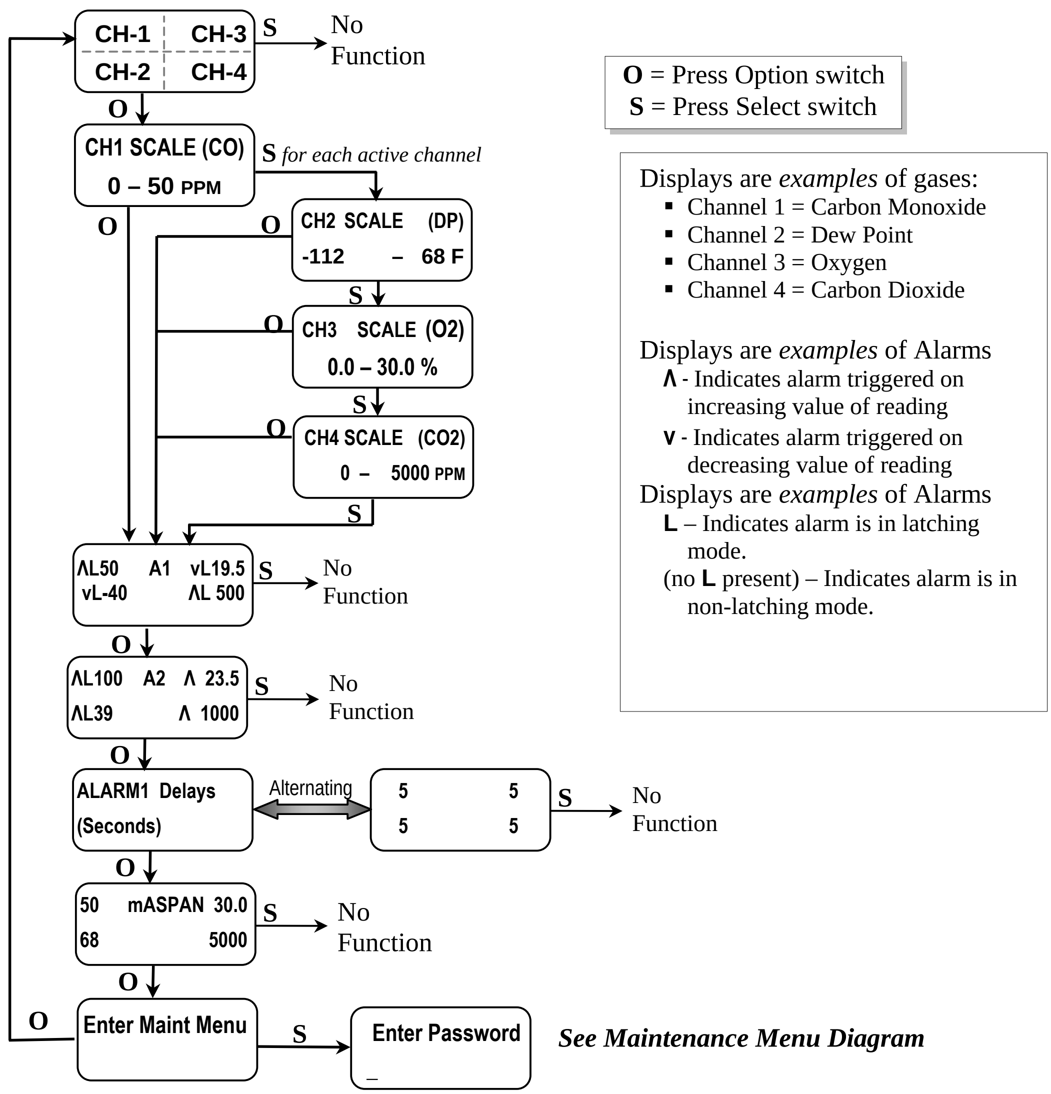


Figure 5: MEDAIR 2200 Operation Menu Flow Chart

4.7 Fault Indications

4.7.1 Low Flow Indication

A flow sensor is used to furnish a low flow indication. When the sample air pressure drops below approximately 0.3 LPM, the fault light and audio alarm are activated, and the display flashes “Low Flow Alarm”.

4.7.2 Other Fault Indications

Other fault indications are associated with sensor zero and calibration activities, and are described in the maintenance **Section 5.0** of this manual.

4.8 Dew Point Sensor Response

It is a characteristic of the **MEDAIR 2200** that it takes more time to extract moisture from a sample by passing dry air through it, than it does to add moisture to a sample by passing moist air though it. Therefore, the time response of the instrument to a step change from moist to dry air is slower, then the response to a step change from dry to moist air.

It is the nature of most materials to absorb and release moisture at different rates. In general, it typically takes longer for a system to establish moisture equilibrium when going form a high to low humidity than it does to go from low to high. The **MEDAIR 2200** is no different. It may take up to 12 hours to establish moisture equilibrium when the instrument is first put on the air line if the Dew Point is less than 0°F. The sensor T90 response time is 10 seconds for a –40° to +50°F step change and 240 seconds for a +50° to –40°F step change. The delivery apparatus such as regulators, piping and tubing account for the additional response time of the instrument as a system.

5.0 Maintenance

The **MEDAIR 2200** requires periodic sensor calibration and replacement. Calibration of toxic gas and oxygen sensor should be performed immediately following installation, one month after installation and every 3 months thereafter. Oxygen and CO sensor have an estimated lifetime of 1 – 2 years. The CO2 sensor has an estimated lifetime of 3 years. Sensors should be replaced when they will not calibrate or shortly before the end of their estimated lifetime.

The dew point probe(sensor) can not be field calibrated. Dew point sensors should be exchanged with the factory on an annual bases.

5.1 Cleaning Instructions

⚠ ***CAUTION:*** Never spray a cleaning solution on the surfaces of the **MEDAIR 2200** devices.

Clean the exterior of the **MEDAIR 2200** enclosures with a mild soap solution on a clean, damp cloth. Do not soak the cloth with solution so that moisture drips onto, or lingers on, external surfaces.

Under no circumstances should organic solvents such as paint thinner be used to clean instrument surfaces.

5.2 Maintenance Menu

5.2.1 Accessing Maintenance Menu

The **MEDAIR 2200** maintenance menu is accessed by entering the proper password with the **OPTION** and **SELECT** switches. See **Section 5.2.2 Figure 6** for full Maintenance Menu flow chart.

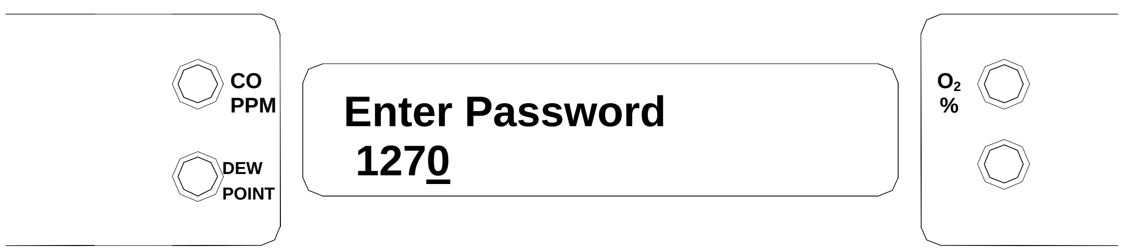
Entrance to the maintenance menu is guarded with a four-digit Password. The factory default setting of the password is 1270. When a valid numerical password is inserted, the user is allowed to enter the maintenance menu.

To enter the maintenance menu. Press the **OPTION** switch until "Enter Maint Menu" is displayed then press **SELECT** switch for the Enter Password menu. Enter the valid password as described below.

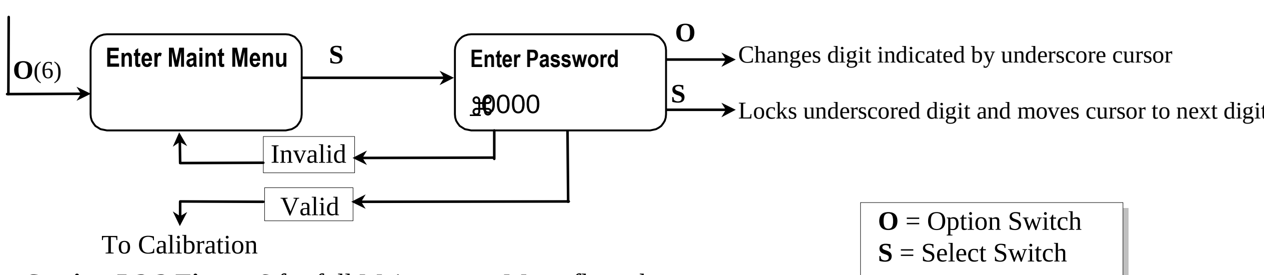
In the "Enter Maint Menu" position

- Press the **SELECT** switch "Enter Password ζ 0" is displayed. Press **SELECT** switch once, to move cursor to next digit, this will be the first digit of the password.
- In the ζ000 position, the underline cursor is under the left digit.
- Press the **OPTION** switch to change the left digit; select the correct digit.
- Press the **SELECT** switch, which locks the digit in place and moves the cursor one digit to the right.

Continue this process until the four-digit password is complete. When a valid password is inserted in this manner, the display is transferred to the "Calibration" portion of the menu. If an invalid password is inserted you are returned to the Enter Maint Menu display.



Example: Password Display (*with factory installed password entered*) and Flow Chart below.



See **Section 5.2.2 Figure 6** for full Maintenance Menu flow chart.

5.2.2 Maintenance Menu Flow Chart

The maintenance menu diagram is shown in **Figure 6 Maintenance Menu Flow Chart**. From the operational display, press the **OPTION** switch 6 times; "Enter MAINTENANCE Menu" is displayed.

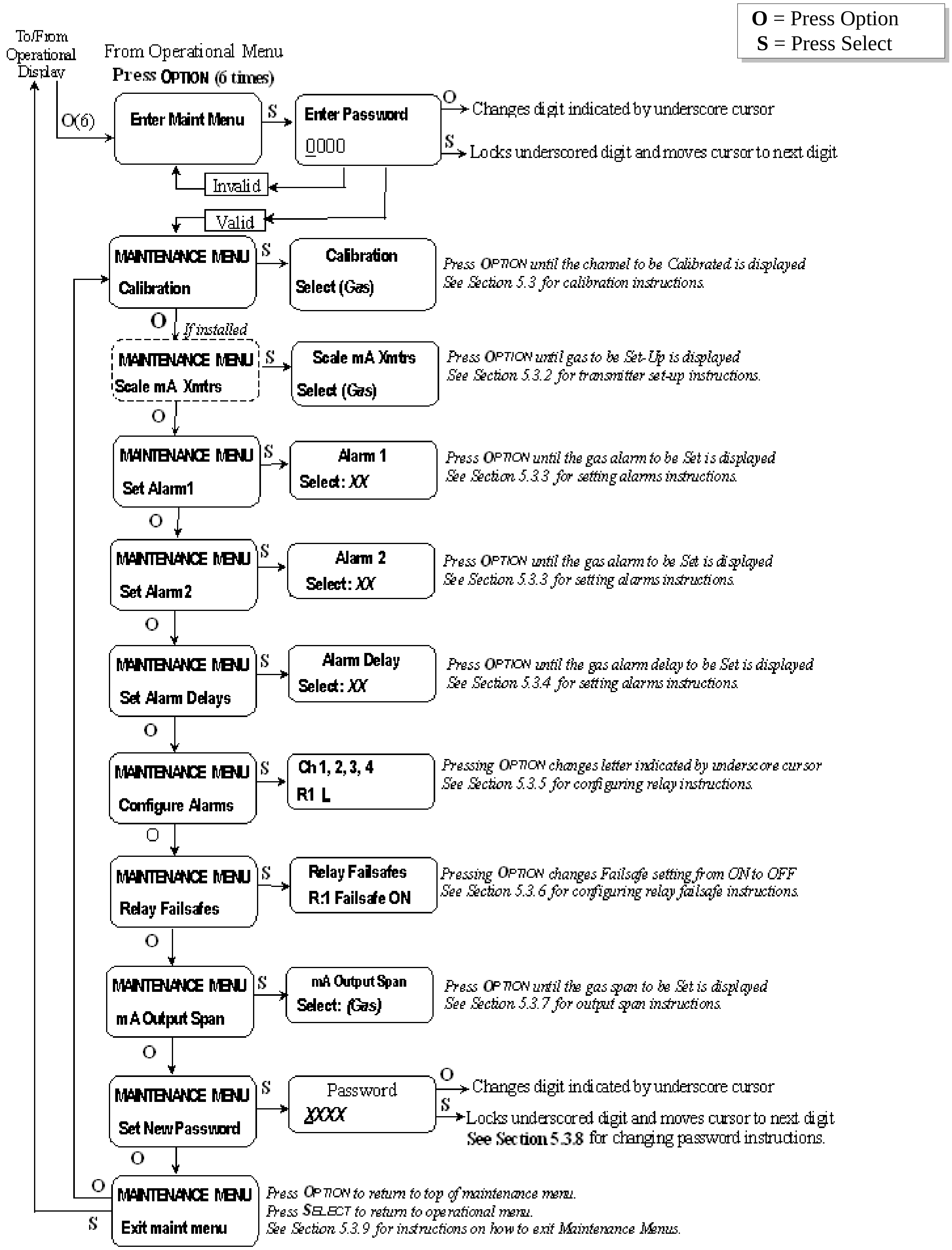


Figure 6: MEDAIR 2200 Maintenance Menu Flow Chart.

5.3 Calibration for CO, O_2 and CO_2

Calibration is the process of setting the instrument up to read accurately when exposed to a target gas. This is a two step process. A Low Calibration sets clean air reference point and the High Calibration function sets the sensitivity of the instrument.

Calibration equipment is available from ***ENMET*** Corporation to calibrate the **MEDAIR 2200**. A list of needed material is in Section 7.0. A calibration adapter will have a fitting for the gas cylinder on one side, and a quick-disconnect to attach to the instrument on the other.

You may exit the calibration section, at any time, by *pressing and holding* the **OPTION** switch for 3 seconds, if entering calibration section by mistake or calibration gas is not available.

Wait 24 hours after initially supplying air and power to the **MEDAIR 2200** sensor before initial calibration. It is not necessary to open the Front Panel to make adjustment. The calibration functions are operated through the **OPTION** and **SELECT** switches on the front panel.

After entering a valid password to maintenance menu, see **Section 5.2.1**, the calibration section is the first menu section; enter by pressing the **SELECT** switch.

Supply sensor with clean air for LowCal/ZeroCal setting and apply calibration gas for HiCal/SpanGas setting.

- Press the **SELECT** switch "Calibration Select *XX*" is displayed. *XX* = the gas to be calibrated
- Press the **OPTION** switch, if needed, to change to the gas to be calibrated.
- Press the **SELECT** switch, the gas & current reading are displayed in upper portion of display. The mV reading & "LowCal 0" is displayed in the lower portion of display. This is the LowCal setting, *usually zero*, clean air must be supplied to the sensor. This reading needs to be at or near zero. If it is not then a cylinder of clean 20.9 air should be used. See Figure 7 if this is required.
- Press the **SELECT** switch, that moves the cursor one digit to the right when the last digit is accepted the display will move to "HiCal *xx*" gas calibration. *xx* = the level of gas to be used for calibration. The mV reading is shown in the upper right hand corner of the display.
- Apply calibration gas to sensor. See **Figure 7**. After about 1 minute and mV reading has stabilized.
- Press the **SELECT** switch, that moves the cursor one digit to the right, when the last digit is accepted and the calibration is successful the display will momentarily show Cal OK then slope and off set readings, before returning to the Calibration Menu

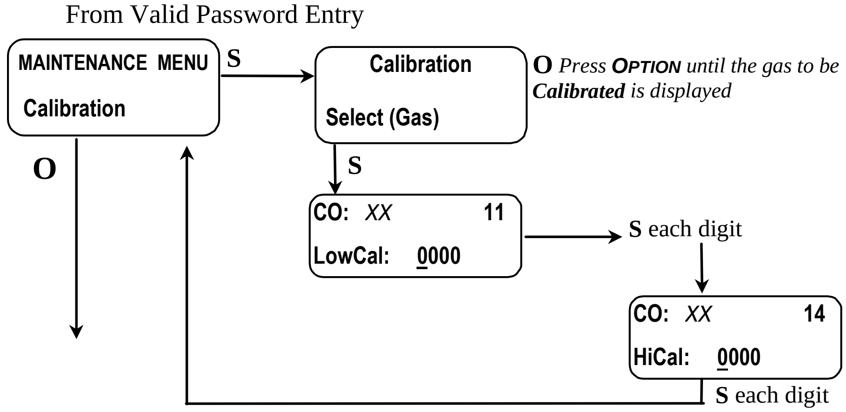
Repeat above steps for each channel to be calibrated.

To continue on too next section Press the **OPTION** switch.

- Press **OPTION** switch until "Exit maint menu" appears and then press **SELECT** switch to return the instrument to the Operational Display

Example: Full Calibration Flow Chart, for CO

From Valid Password Entry



Default Calibration Points

Gas	LowCal	HiCal
CO	0	20
O2	N/A	20.9
CO2	0	1000

O = Press Option
S = Press Select

NOTE: The dew point sensor/probe can not be calibrated in the field. ***ENMET*** offers a pre-calibrated dew point probe exchange program. Dew point probes can be exchanged with the factory, on an annual base. Contact ***ENMET*** customer service for cost and details.

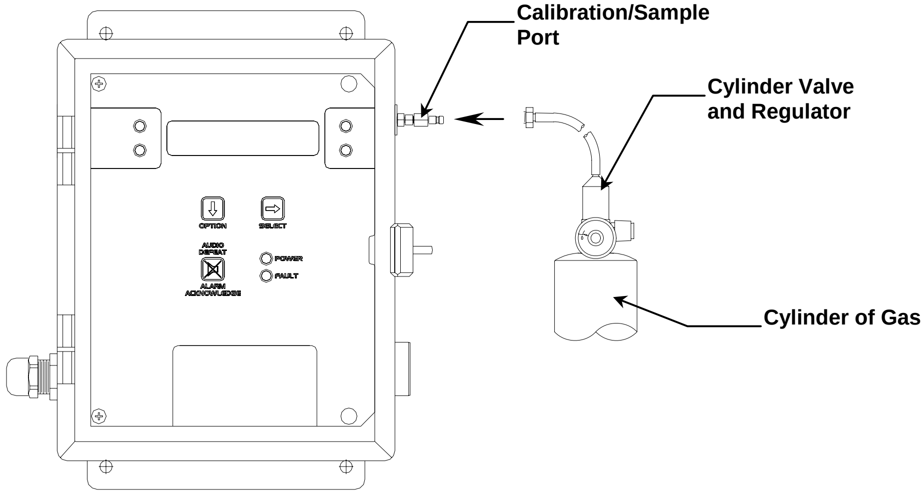


Figure 7: Connection of Calibration Gas Cylinder

5.3.1A Low Cal/ZeroCal Adjust

A Low Cal function should be performed only when the **MEDAIR 2200** sensor are exposed to clean uncontaminated air. Use a cylinder of 20.9% oxygen to provide a clean air reference if necessary. Attach the cylinder to the calibration adapter, attach the adapter to the instrument and allow gas to flow over the sensor for up to 4 minutes.

Enter the maintenance menu by repeatedly pressing **OPTION** switch, until the maintenance menu is displayed. See **Figure 6, MEDAIR 2200** Maintenance Menu flow chart.

The first menu available is the Low Cal/ZeroCal.

Press the **SELECT** switch 4 times to perform a Low Cal.

- *If the Low Cal/ZeroCal is successful*, The display will change to Hi Cal/SpanGas.
  If you wish to Hi Cal/SpanGas the sensor apply calibration gas. **Proceed to gas calibration Section 5.3.1B**
  If you wish to Exit the maintenance menu, Press and *hold* **OPTION** switch until the Maintenance Menu is displayed then release. Then press **OPTION** switch until "Exit maint menu" appears and then press **SELECT** switch to return the instrument to the Operational Display

- *If the Low Cal/ZeroCal is Not successful*, sensor is outside of safe parameters to Low Cal, a "SLP/Off Set err" will be indicated. Repeat Section 5.3.1 Low Cal/ZeroCal Adjust making sure to use a cylinder of 20.9% Oxygen.

5.3.1B High Cal/SpanGas Adjust

A High Cal/Span Gas should only be preformed after a successful Low Cal/ZeroCal has been completed.

- Press the **SELECT** switch, that moves the cursor one digit to the right when the last digit is accepted the display will move to "HiCal *xx*" gas calibration. *xx* = the level of gas to be used for calibration. The mV reading is shown in the upper right hand corner of the display.
- Apply calibration gas to sensor. See **Figure 7**. After about 1 minute and mV reading has stabilized.
- Press the **SELECT** switch, that moves the cursor one digit to the right, when the last digit is accepted and the calibration is successful the display will momentarily show Cal OK then slope and off set readings, before returning to the Calibration Menu

Repeat above steps for each channel to be calibrated.

To continue on too next section Press the **OPTION** switch.

- Press **OPTION** switch until "Exit maint menu" appears and then press **SELECT** switch to return the instrument to the Operational Display

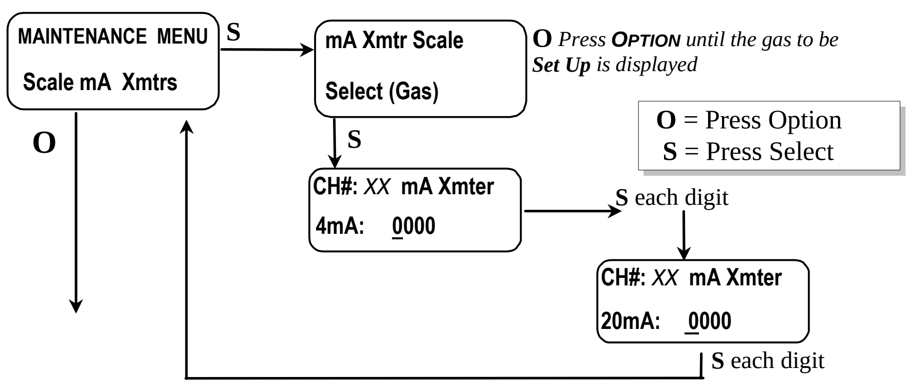
5.3.2 Set 4 –20mA Transmitter Scale

This section of the maintenance menu is installed when there are 4-20mA style sensors for dew point or other gases. This function is normally performed at the factory and is not usually required to be performed in the field unless a new transmitter is installed.

After entering a valid password into maintenance menu, the Scale mA Xmtrs section is the second menu section, if it is installed, enter by pressing the SELECT switch

- Press the **SELECT** switch "mA Xmter Scale: Select *XX*" is displayed. *XX* = the gas to be set up.
- Press the **OPTION** switch, if needed, to change to the gas to be set up.
- Press the **SELECT** switch, "Ch#: mAXmter: 4mA: 0000" is displayed
- Press the **SELECT** switch, that moves the cursor one digit to the right when the last digit is accepted the display move to the full Scale mA Xmtrs menu
- Press the **SELECT** switch, "Ch#: mAXmter: 20mA: 0000" is displayed
- Press the **SELECT** switch, that moves the cursor one digit to the right when the last digit is accepted the display will return to the Scale mA Xmtrs menu
- Repeat these steps for each 4 –20mA transmitter.
- Press **OPTION** switch until "Exit maint menu" appears and then press **SELECT** switch to return the instrument to the Operational Display

Example: Sensor/Transmitter Set Up Flow Chart



Example: Set up values

DP	-112F	68F

5.3.3 Set Alarm Points

Factory alarm set points are discussed in Section 4.2, See Table 1. To change the alarm points, you must enter the maintenance menu.

Entrance to the maintenance menu is guarded with a four-digit Password. The factory default setting of the password is 1270. When a valid numerical password is inserted, the user is allowed to enter the maintenance menu.

In the "Enter Maint Menu" position

- Press the **SELECT** switch "Enter Password ζ 0" is displayed. Press **SELECT** switch once, to move cursor to next digit, this will be the first digit of the password.
- In the ζ000 position, the underline cursor is under the left digit.
- Press the **OPTION** switch to change the left digit; select the correct digit.
- Press the **SELECT** switch, which locks the digit in place and moves the cursor one digit to the right.

Continue this process until the four-digit password is complete. When a valid password is inserted in this manner, the display is transferred to the "Calibration" portion of the menu. If an invalid password is inserted you are returned to the Enter Maint Menu display.

After entering a valid password:

- Press the **OPTION** switch until; "Maintenance Menu Set Alarm1" appears on display.
- Press the **SELECT** switch, "ALARM1 Select: *XX*" is displayed. *XX* = the gas alarm point to be changed.
- Press the **OPTION** switch until, desired gas is displayed.
- Press the **SELECT** switch; "ALARM 1 ζ *XX*" is displayed, with the flashing place holder underscore cursor, under the left most character, **Λ** or **V** ascending or descending indicator.
- Press the **OPTION** switch to change the indicated character; select the correct indicator.
- Press the **SELECT** switch to lock in the correct character and move the cursor to the right.
  - The next character is the latching indicator **L** or **NOL** press the **OPTION** switch to toggle the latching mode.
  - The next character is the negative sign **–** press the **OPTION** switch to toggle the negative sign.
  - The next characters are the alarm 1 value, press the **OPTION** switch to select each digit of the value

  When the last digit is accepted display returns to the "Set Alarm1" position.
- Repeat for each sensor alarm 1 to be changed.
- Press the **OPTION** switch to move to alarm 2, "Set ALARM2" is displayed.
- Repeat as for alarm 1.
- Press **OPTION** switch until "Exit maint menu" appears, then press **SELECT** switch to return the instrument to the Operational Display

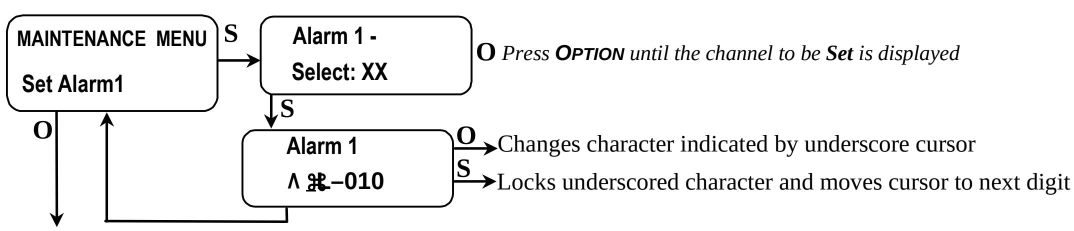
Example: Set Alarms Flow Chart

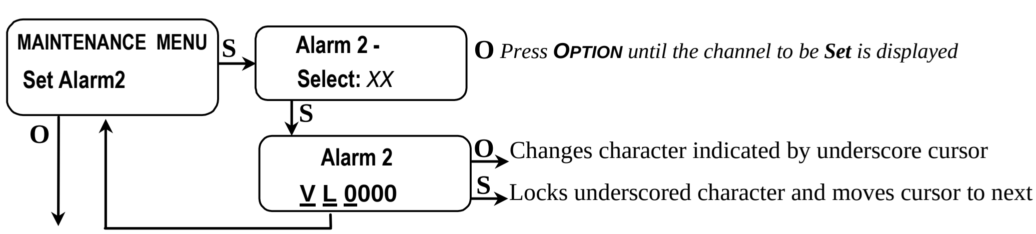
Displays are *examples* of Alarms

Λ - Indicates alarm triggered on increasing value of reading
V - Indicates alarm triggered on decreasing value of reading

L- Indicates alarm is set for latching
NOL- Indicates alarm is set for non-latching

O = Press Option
S = Press Select





See **Section 4.2 Table 3** for factory alarm set points.

5.3.4 Set Alarm Delay

The alarms may be set to delay by 1 second increments, up to 255 seconds. Alarm delays are factory set to 5 seconds.

To change an alarm delay, you must enter the maintenance menu. Press the **OPTION** switch until “Enter Maint Menu” is displayed then press **SELECT** switch for the Enter Password menu. Enter the valid password as described in **Section 5.2.1**. See **Table 4** below for factory set delays. A space is provided to record changes.

After entering a valid password:

- Press the **OPTION** switch until; “Maintenance Menu Set Alarm Delay” appears on display.
- Press the **SELECT** switch, "ALARM Delay Select: *XX*" is displayed. *XX* = the gas alarm to be changed.
- Press the **OPTION** switch until, desired gas is displayed.
- Press the **SELECT** switch; "ALARM Delay = 0000" is displayed, with the underscore cursor under the left digit.
- Press the **OPTION** switch to change the left digit; select the correct digit.
- Press the **SELECT** switch to lock in the correct digit and move the cursor one digit to the right. When the last digit is accepted display returns to the "Set Alarm Delay" position.
- Repeat for each sensor alarm delay to be changed.
- Press **OPTION** switch until “Exit maint menu” appears and then press **SELECT** switch to return the instrument to the Operational Display

Example: Set Alarm Delay Flow Chart

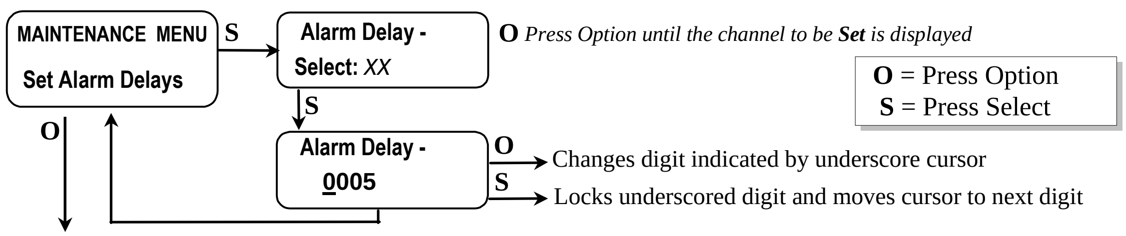


Table 4: Factory Set Gas alarms Delay

Gas	Delay	
CO	5 sec	
DP	5 sec	
O_2	5 sec	
CO_2	5 sec	

5.3.5 Relay Configuration

To change a relay configuration you must enter the maintenance menu. Press the **OPTION** switch until "Enter Maint Menu" is displayed then press **SELECT** switch for the Enter Password menu. Enter the valid password as described below.

In the "Enter Maint Menu" position

- Press the **SELECT** switch "Enter Password ζ 0" is displayed. Press **SELECT** switch once, to move cursor to next digit, this will be the first digit of the password.
- In the ζ000 position, the underline cursor is under the left digit.
- Press the **OPTION** switch to change the left digit; select the correct digit.
- Press the **SELECT** switch, which locks the digit in place and moves the cursor one digit to the right.

Continue this process until the four-digit password is complete. When a valid password is inserted in this manner, the display is transferred to the "Calibration" portion of the menu. If an invalid password is inserted you are returned to the Enter Maint Menu display.

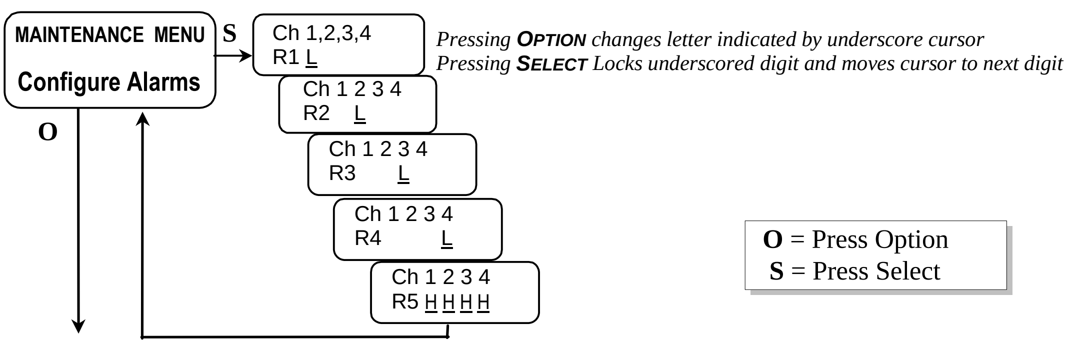
After entering a valid password:

- Press the **OPTION** switch until "Configure Alarms" is displayed
- Press the **SELECT** switch to enter the Configure Alarms menu
- Press the **OPTION** switch to set relay configuration as needed, see below for indications

L = Low Alarm, **H** = High Alarm, **B** = Both Alarms, ζ = No Relay linked to channel

- Press the **SELECT** switch to lock setting and move to next, channel and relay
- Press **OPTION** switch until "Exit maint menu" appears and then press **SELECT** switch to return the instrument to the Operational Display

Example: Set Relay Configuration Flow Chart



The table below shows the default relay links.

	Channel 1	Channel 2	Channel 3	Channel 4
Relay 1	Low Alarm			
Relay 2		Low Alarm		
Relay 3			Low Alarm	
Relay 4				Low Alarm
Relay 5	High Alarm	High Alarm	High Alarm	High Alarm

Relays can be linked to specific alarms.

NOTE: Each operating channel must be linked to at least 1 relay.

5.3.6 Failsafe Configuration

To change a relay failsafe configuration you must enter the maintenance menu. Press the **OPTION** switch until "Enter Maint Menu" is displayed then press **SELECT** switch for the Enter Password menu. Enter the valid password as described below.

In the "Enter Maint Menu" position

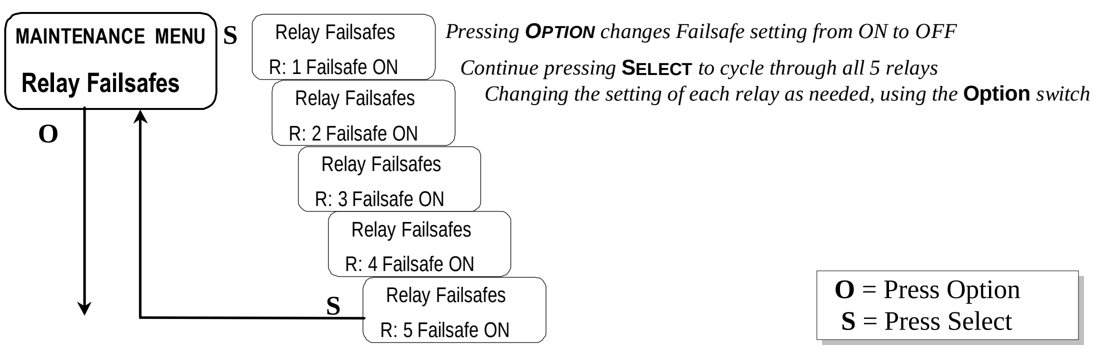
- Press the **SELECT** switch "Enter Password ζ 0" is displayed. Press **SELECT** switch once, to move cursor to next digit, this will be the first digit of the password.
- In the ζ000 position, the underline cursor is under the left digit.
- Press the **OPTION** switch to change the left digit; select the correct digit.
- Press the switch, which locks the digit in place and moves the cursor one digit to the right.

Continue this process until the four-digit password is complete. When a valid password is inserted in this manner, the display is transferred to the "Calibration" portion of the menu. If an invalid password is inserted you are returned to the Enter Maint Menu display.

After entering a valid password:

- Press the **OPTION** switch until "Relay Failsafes" is displayed
- Press the **SELECT** switch to indicate relay to be set.
- Press the **OPTION** switch to set relay indicated, On or Off as appropriate.
- Press the **SELECT** switch to cycle through each of the 5 relays, return to "Maintenance Menu Relay Failsafes"
- Press **OPTION** switch until "Exit maint menu" appears and then press **SELECT** switch to return the instrument to the Operational Display

Example: Set Relay Failsafe Configuration Flow Chart

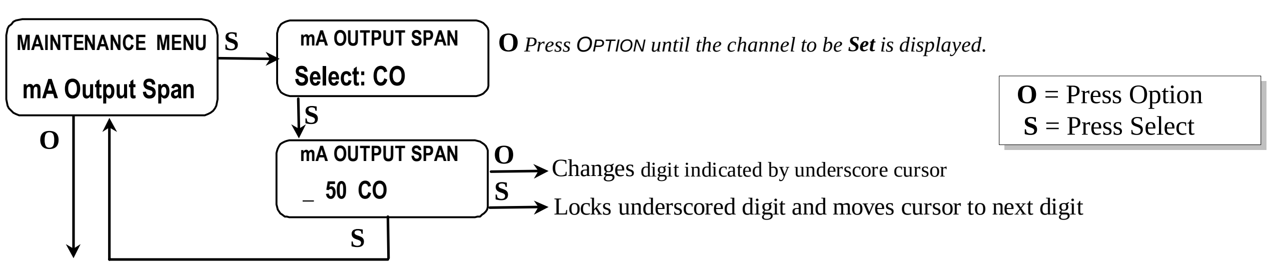


5.3.7 Set Output Span Range

To change 4-20 mA output range. This range is set at the factory and should not be changed, contact ***ENMET*** for information.

- Press the **OPTION** switch to continue to next section of maintenance menu.
- Press **OPTION** switch until "Exit maint menu" appears and then press **SELECT** switch to return the instrument to the Operational Display

Example: Set Output Span Flow Chart



5.3.8 Set New Password

To change the password, you must enter the maintenance menu. Press the **OPTION** switch until “Enter Maint Menu” is displayed then press **SELECT** switch for the Enter Password menu. Enter the valid password as described in Section 5.2.1.

To set a new password, after inserting a valid password,

- Press the **OPTION** switch until; "Set New Password” is displayed.
- Press the **SELECT** switch; "Password ζ1270" is displayed, with the underscore cursor under the left digit.
- Use the **OPTION** switch to change the left digit, when the desired digit is displayed.
- Press the **SELECT** switch to lock the digit in place and move the cursor one digit to the right.

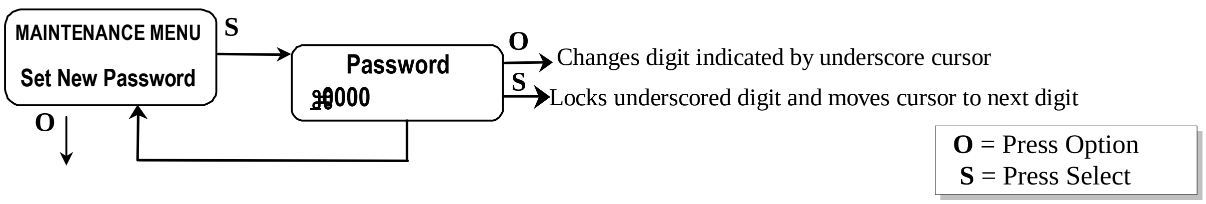
When all four digits of the new password have been selected, "Set New Password" is displayed.

Record the new password; without it, the maintenance menu cannot be reentered once you exit the Maintenance Menu. If the password is lost, call ***ENMET*** customer service personnel.

From the "Password *XXXX*" position,

- Press the **SELECT** switch to return to Set New Password section.
- Press the **OPTION** switch; to continue to "exit MAINTENANCE Menu"

Example: Set Password Flow Chart

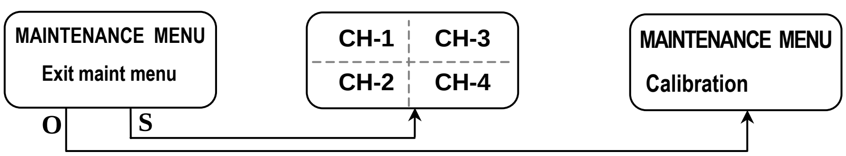


5.3.9 Exit Maintenance Menu

From the "exit MAINTENANCE Menu" position

- Press the **SELECT** switch to resume the operational display.
- Press the **OPTION** switch to reenter the maintenance menu at the "Calibration" position.

Example: Exit Maintenance Menu Flow Chart



5.4 Sensor Replacement

5.4.1 Gas Sensor

A Gas sensor must be replaced when it can no longer be calibrated. To replace a sensor, perform the following steps.

- Turn off the electrical power. The sample air can continue to flow.
- Open the display panel and remove the four manifold retention screws and remove the manifold. See **Figure 9**.
- Remove the old sensor, and replace it with a new sensor.

CAUTION: Some new sensors come with a shorting clip that must be removed before installation, for proper operation. See **Figure 8**.

- Replace the manifold.
- Turn on the electrical power.
- Recalibrate the sensor per the instructions in Section 5.3. Recalibrate the sensor and again 1 month after replacement.

5.4.2 Oxygen Sensor

An oxygen sensor must be replaced when it can no longer be calibrated in clean air. To replace the sensor, follow the general steps given for the replacement of a gas sensor, but effect a replacement of the oxygen sensor. After sensor installation, wait four hours before re-calibrating, and again 1 month after replacement.

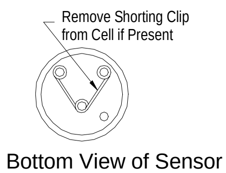


Figure 8: Shorting Clip

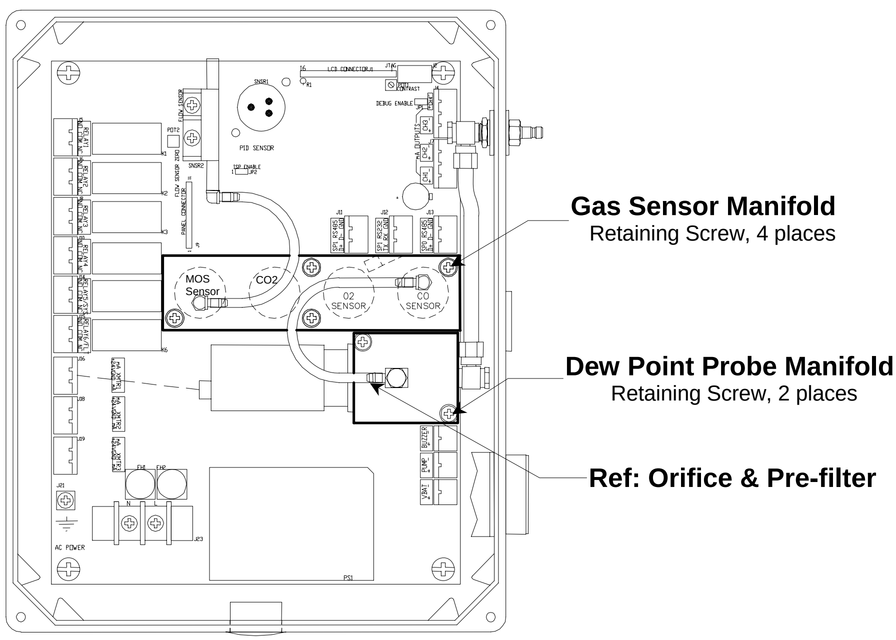


Figure 9: Location Gas Sensor Manifold

5.5 Dew Point Sensor

Unlike the CO and O_2 sensors, the dew point sensor cannot be field calibrated. To assure correct performance, the dew point sensor should be replaced annually. To minimize instrument downtime, take advantage of the dew point sensor exchange program available through ***ENMET***, in which an old dew point sensor can be exchanged for a newly calibrated sensor. Call ***ENMET*** customer service personnel for details.

5.6 Flow Control Orifice / Pre-filter

A 0.006-inch diameter orifice is used to set the flow rate and to drop the air pressure. A pre-filter is in line to help prevent clogging. In well-maintained medical air systems, this orifice should not clog. However, if difficulty is experienced in maintaining flow rate with assured inlet pressure, remove air pressure from the equipment and examine this orifice and pre-filter; replace it if necessary.

Orifice location will depend on instrument sensor configuration. Orifice and pre-filter are located at the output point of the dew point probe manifold or on the inlet line to the gas sensor manifold.

6.0 Technical Data and Specifications

Electrical Power	15 Amp fused branch circuit	
	100-240 VAC	
	0.9 A	
	50/60 Hz	
	Board Mounted Fuse FH2, 0.630A, 5 x 20mm	
Storage and Transport	*(to also be included on shipping box)*	
	Temperature:	-20° to +60°C (-4° to +140°F)
	preferred	0° to +20°C (32° to 68°F)
	Relative Humidity	0 - 99% RH, non-condensing
	Atmospheric Pressure	20 to 36 inHg (68 to 133 kPa)
Operation	Temperature:	0° to +40°C (32° to +104°F)
	Relative Humidity	0 - 99% RH, non-condensing
	Atmospheric Pressure	20 to 36 inHg (68 to 133 kPa)
	Air Line Pressure	55 PSI (± 5 PSI)
Mechanical		
	Dimensions:	11 x 9 x 6 inches (4.3 x 3.5 x 2.4 cm)
	Weight:	8 lbs (3.6 kg)
	Material:	Engineered thermoplastic with hinged front cover
Outputs		
	Strain relief:	5-12 mm OD, 3 supplied
	Relays:	SPDT Resistive Load Inductive Load 10A at 110 VAC 7.5A at 110 VAC 10A at 30 VDC 5A at 30 VDC
	Analog:	4-20 mA x 3
	Digital:	RS-232 – Modbus RS-485 – Modbus
	Audio:	95 db at 2 ft

Sensors	**Type**	**Range**	**Response Time**	**Life**
	CO	0 – 50 ppm	T_{90} = 30 seconds	1 – 3 years
	Dew Point	-112 - +68°F	T_{90} = 10 seconds for –40°F to 50°F step change	5+ years
	O_2	0 – 30%	T_{90} = 15 seconds	1 – 2 years
	CO_2	0 – 5000 ppm	T_{90} = 30 seconds	3 – 5 years

7.0 Replacement Part Numbers

7.1 ***ENMET*** part numbers for sensors and replacement parts:

Part number	Description
03009-005	Dew Point Probe (New Probe)
03009-006	Dew Point Probe (Exchange: Pre-calibrated Probe)
03053-000	Sensor, CO2
67025-1100	Sensor, Oxygen
67025-1200	Sensor, CO
73540-701	Orifice
73583-700	Pre-filter, orifice
64002-630	Fuse, 0.630 Amp 5x20mm
06008-004	Sensor Gasket
65057-011	Terminal plug, 3 position
65057-012	Terminal plug, 4 position
65057-010	Terminal plug, 2 position

7.2 ***ENMET*** part numbers for Calibration equipment:

Part number	Description
03401-000	Calibration Kit
03219-020	Gas Cylinder, 20 ppm CO in air
03296-209	Gas Cylinder, 20.9% oxygen in nitrogen
03223-1000	Gas Cylinder, 1000 ppm CO2 in air
03700-022	Calibration Adapter

8.0 WARRANTY

ENMET warrants new instruments to be free from defects in workmanship and material under normal use for a period of one year from date of shipment from ***ENMET***. The warranty covers both parts and labor excluding instrument calibration and expendable parts such as calibration gas, filters, batteries, etc... Equipment believed to be defective should be returned to ***ENMET*** within the warranty period (transportation prepaid) for inspection. If the evaluation by ***ENMET*** confirms that the product is defective, it will be repaired or replaced at no charge, within the stated limitations, and returned prepaid to any location in the United States by the most economical means, e.g. Surface UPS/RPS. If an expedient means of transportation is requested during the warranty period, the customer is responsible for the difference between the most economical means and the expedient mode. ***ENMET*** shall not be liable for any loss or damage caused by the improper use of the product. The purchaser indemnifies and saves harmless the company with respect to any loss or damages that may arise through the use by the purchaser or others of this equipment.

This warranty is expressly given in lieu of all other warranties, either expressed or implied, including that of merchantability, and all other obligations or liabilities of ***ENMET*** which may arise in connection with this equipment. ***ENMET*** neither assumes nor authorizes any representative or other person to assume for it any obligation or liability other than that which is set forth herein.

NOTE: When returning an instrument to the factory for service:

- ❑ Be sure to include paperwork.
- ❑ A purchase order, return address and telephone number will assist in the expedient repair and return of your unit.
- ❑ Include any specific instructions.
- ❑ For warranty service, include date of purchase
- ❑ If you require an estimate, please contact ***ENMET*** Corporation.

There is Return for Repair Instructions and Form on the last pages of this manual. This form can be copied or used as needed.

Appendix A

The Characteristics and Effects of Carbon Monoxide

Carbon monoxide is a colorless odorless toxic gas generated by incomplete combustion of a hydrocarbon fuel in air. It may be present where internal combustion engines, furnaces, boilers, and other combustion devices are present. It is toxic when inhaled because of its great affinity to hemoglobin, the oxygen carriers in the red cells of the blood. CO replaces the oxygen normally carried by the hemoglobin, and thus inhibits the delivery of oxygen throughout the body; the victim suffers from oxygen deficiency, and may die from asphyxiation. The symptoms and degree of danger resulting from exposure to CO depend upon the concentration of the gas and the length of exposure; this is shown in **Figure 8**. The **MEDAIR 2200** instrument is employed to warn the user of the presence of CO, and to facilitate the assessment of the degree of danger that he or she is exposed to.

Based upon knowledge of the effects of CO, the Occupational Safety and Health Authority (OSHA) has set limits on exposure to CO in the workplace. These are 35 ppm (parts CO per million parts air) as an time weighted average for an eight hour day, and a maximum exposure of 200 ppm. For compressed air line applications, OSHA requires Grade D breathing air supplied, using a Compressed Gas Association (CGA) definition (G-7.1). Depending on interpretation of the OSHA respiratory standard, 10 ppm and 20 ppm CO have been used as maximum limits and standard instrument alarm points.

The **MEDAIR 2200** has two preset alarm set points, at 10 ppm and 20 ppm CO, which are adjustable, but cannot be set below 5 ppm or above 100 ppm.

The curves below are for percent carboxalhemoglobin with 50% being the top curve, 5% the bottom. %COHb is a measure of the amount of hemoglobin occupied by CO rather than oxygen. CO effects upon children, adults engaging in physical activity, and smokers, are more pronounced.

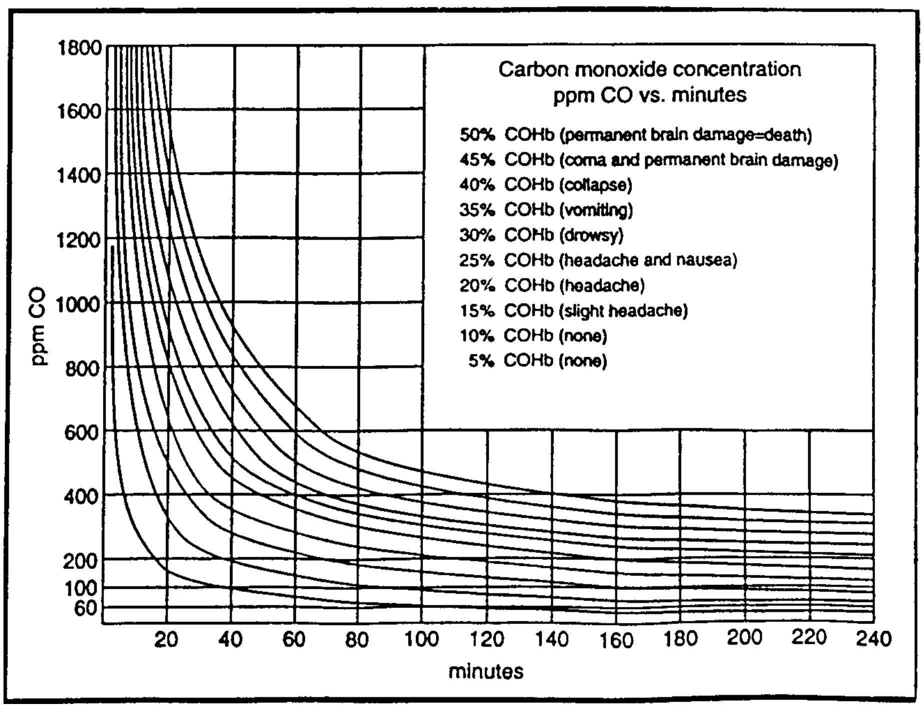


Figure 10: Carbon Monoxide Concentration

PO Box 979
680 Fairfield Court
Ann Arbor, Michigan 48106-0979
734.761.1270 Fax 734.761.3220

Returning an Instrument for Repair

ENMET instruments may be returned to the factory or any one of our Field Service Centers for regular repair service or calibration. The ***ENMET*** Repair Department and Field Service Centers also perform warranty service work.

When returning an instrument to the factory or service center for service, paperwork must be included which contains the following information:

- A purchase order number or reference number.
- A contact name with return address, telephone and fax numbers
- Specific instructions regarding desired service or description of the problems being encountered.
- Date of original purchase and copy of packing slip or invoice for warranty consideration.
- If a price estimate is required, please note it accordingly *and be sure to include a **fax number**.*

Providing the above information assists in the expedient repair and return of your unit.

Failure to provide this information can result in processing delays.

ENMET charges a one hour minimum billing for all approved repairs with additional time billed to the closest tenth of an hour. All instruments sent to ***ENMET*** are subject to a minimum $30 evaluation fee, even if returned unrepaired. Unclaimed instruments that ***ENMET*** has received without appropriate paperwork or attempts to advise repair costs that have been unanswered, after a period of 60 days, may be disposed of or returned unrepaired COD with the evaluation fee.
Service centers may have different rates or terms. Be sure to contact them for this information.

Repaired instruments are returned by UPS/FedEx Ground and are <u>not insured</u> unless otherwise specified. If expedited shipping methods or insurance is required, it must be stated in your paperwork.

Note: Warranty of customer installed components.

If a component is purchased and installed in the field, and fails within the warranty term, it can be returned to ***ENMET*** and will be replaced, free of charge, per ***ENMET***'s returned goods procedure.

If the entire instrument is returned to ***ENMET*** Corporation with the defective item installed, the item will be replaced at no cost, but the instrument will be subject to labor charges at half of the standard rate.

Repair Return Form

Mailing Address:
***ENMET* Corporation**
PO Box 979
Ann Arbor, Michigan 48106

Shipping Address:
***ENMET* Corporation**
Attn: Repair Department
680 Fairfield Court
Ann Arbor, Michigan 48108

Phone Number: 734.761.1270
FAX Number: 734.761.3220

Your Mailing Address:

____
____
____
____

Your Shipping Address:

____
____
____
____

Contact Name: ____________________________ **Your Phone:** ________________________

Your PO/Reference Number: ________________ **Your FAX:** ________________________

Payment Terms: θ ***COD***
(Check one) θ ***VISA / MasterCard***_______________________ ________
Card number Expiration

Return Shipping Method:

θ UPS: θ Ground θ 3 Day Select θ Next Day Air θ ND Air Saver θ 2-Day Air

θ Federal Express: θ Ground θ Express Saver θ P-1 θ Standard θ 2-Day Air

θ FedEx Account number: _________________________

Would you like *ENMET* to insure the return shipment?

θ No θ Yes **Insurance Amount:** $_________________

Feed Air Compressor

- Feed Air Compressor Component Layout
- Feed Air Compressor Drive Motor Installation and Maintenance
- Scroll Air Compressor Service and Maintenance
- Scroll Air Compressor Parts List

On Site Gas Systems, Inc.
35 Budney Road, Budney Industrial Park, Newington, CT 06111 U.S.A.
Telephone: 860.667.8888 • Fax: 860.667.2222
Website: www.onsitegas.com • Email: info@onsitegas.com
A BUSINESS INCORPORATED IN THE STATE OF CONNECTICUT, U.S.A.

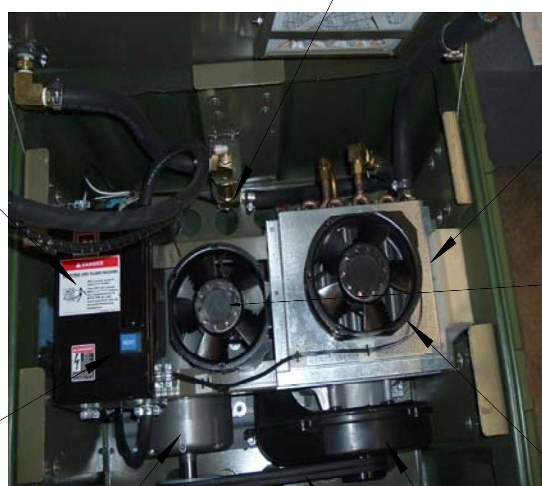
Feed Air Compressor

Feed Air Compressor Component Layout

Feed Air Compressor Component Layout

Feed Air Compressor – Lid Opened

FEED AIR COMPRESSOR INTERIOR
TOP VIEW WITH COVER REMOVED



FEED AIR COMPRESSOR INTERIOR
BACK SIDE VIEW

STANBY
PRESSURE
SWITCH
(Fig..6.134)

AUTO DRAIN
REGULATOR
(Fig.6.127)

AUTO DRAIN
VALVE
(Fig.6.126)

35 Budney Road, Budney Industrial Park, Newington, CT 06111 U.S.A.
Telephone: 860.667.8888 • Fax: 860.667.2222
Website: www.onsitegas.com • Email: info@onsitegas.com

Feed Air Compressor

Feed Air Compressor Drive Motor
Installation and Maintenance

On Site Gas Systems, Inc.
35 Budney Road, Budney Industrial Park, Newington, CT 06111 U.S.A.
Telephone: 860.667.8888 • Fax: 860.667.2222
Website: www.onsitegas.com • Email: info@onsitegas.com
A BUSINESS INCORPORATED IN THE STATE OF CONNECTICUT, U.S.A.

Table of Contents

Section 1
General Information

Overview This manual contains general procedures that apply to Baldor Motor products. Be sure to read and understand the Safety Notice statements in this manual. For your protection, do not install, operate or attempt to perform maintenance procedures until you understand the Warning and Caution statements. A Warning statement indicates a possible unsafe condition that can cause harm to personnel. A Caution statement indicates a condition that can cause damage to equipment.

Important: **This instruction manual is not intended to include a comprehensive listing of all details for all procedures required for installation, operation and maintenance. This manual describes general guidelines that apply to most of the motor products shipped by Baldor. If you have a question about a procedure or are uncertain about any detail, Do Not Proceed. Please contact your Baldor distributor for more information or clarification.**

Before you install, operate or perform maintenance, become familiar with the following:

- NEMA Publication MG-2, Safety Standard for Construction and guide for Selection, Installation and Use of Electric Motors and Generators.
- The National Electrical Code
- Local codes and Practices

Limited Warranty

1. Baldor Electric motors are warranted for a period of one (1) year, from date of shipment from the factory or factory warehouse against defects in material and workmanship. To allow for stocking and/or fabrication period and to provide one year of actual service, the warranty period is extended for an additional period of six (6) months for a total of eighteen (18) months from the original date of shipment from the factory or factory warehouse stock. In no case will the warranty period be extended for a longer period. Baldor extends this limited warranty to each buyer of the electric motor for the purpose of resale and to the original purchaser for use.
2. Baldor will, at its option repair or replace a motor which fails due to defects in material or workmanship during the warranty period if:
   a. the purchaser presents the defective motor at or ships it prepaid to, the Baldor plant in Fort Smith, Arkansas or one of the Baldor Authorized Service Centers and
   b. the purchaser gives written notification concerning the motor and the claimed defect including the date purchased, the task performed by the Baldor motor and the problem encountered.
3. Baldor will not pay the cost of removal of any electric motor from any equipment, the cost of delivery to Fort Smith, Arkansas or a Baldor Authorized Service Center, or the cost of any incidental or consequential damages resulting from the claimed defects. (Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply to you.) Any implied warranty given by laws shall be limited to the duration of the warranty period hereunder. (Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.)
4. Baldor Authorized Service Centers, when convinced to their satisfaction that a Baldor motor developed defects in material or workmanship within the warranty period, are authorized to proceed with the required repairs to fulfill Baldor's warranty when the cost of such repairs to be paid by Baldor does not exceed Baldor's warranty repair allowance. Baldor will not pay overtime premium repair charges without prior written authorization.
5. The cost of warranty repairs made by centers other than Baldor Authorized Service Centers **WILL NOT** be paid unless first authorized in writing by Baldor.
6. Claims by a purchaser that a motor is defective even when a failure results within one hour after being placed into service are not always justified. Therefore, Baldor Authorized Service Centers must determine from the condition of the motor as delivered to the center whether or not the motor is defective. If in the opinion of a Baldor Authorized Service Center, a motor did not fail as a result of defects in material or workmanship, the center is to proceed with repairs only if the purchaser agrees to pay for such repairs. If the decision is in dispute, the purchaser should still pay for the repairs and submit the paid invoice and the Authorized Service Center's signed service report to Baldor for further consideration.
7. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

   Note that **Baldor Super–E® Premium Efficiency** electric motors are warranted for a period of three (3) years. **Baldor IEEE 841** electric motors are warranted for a period of five (5) years.
   All other terms and conditions of the Limited Warranty statement apply.

Safety Notice:

This equipment contains high voltage! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt installation, operation and maintenance of electrical equipment.

Be sure that you are completely familiar with NEMA publication MG-2, safety standards for construction and guide for selection, installation and use of electric motors and generators, the National Electrical Code and local codes and practices. Unsafe installation or use can cause conditions that lead to serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

WARNING: **Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.**

WARNING: **Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury. National Electrical Code and Local codes must be carefully followed.**

WARNING: **Avoid extended exposure to machinery with high noise levels. Be sure to wear ear protective devices to reduce harmful effects to your hearing.**

WARNING: **This equipment may be connected to other machinery that has rotating parts or parts that are driven by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt to install operate or maintain this equipment.**

WARNING: **Do not by-pass or disable protective devices or safety guards. Safety features are designed to prevent damage to personnel or equipment. These devices can only provide protection if they remain operative.**

WARNING: **Avoid the use of automatic reset devices if the automatic restarting of equipment can be hazardous to personnel or equipment.**

WARNING: **Be sure the load is properly coupled to the motor shaft before applying power. The shaft key must be fully captive by the load device. Improper coupling can cause harm to personnel or equipment if the load decouples from the shaft during operation.**

WARNING: **Use proper care and procedures that are safe during handling, lifting, installing, operating and maintaining operations. Improper methods may cause muscle strain or other harm.**

WARNING: **Before performing any motor maintenance procedure, be sure that the equipment connected to the motor shaft cannot cause shaft rotation. If the load can cause shaft rotation, disconnect the load from the motor shaft before maintenance is performed. Unexpected mechanical rotation of the motor parts can cause injury or motor damage.**

WARNING: **Disconnect all electrical power from the motor windings and accessory devices before disassembly of the motor. Electrical shock can cause serious or fatal injury.**

WARNING: **Do not use these motors in the presence of flammable or combustible vapors or dust. These motors are not designed for atmospheric conditions that require explosion proof operation.**

WARNING: **Motors that are to be used in flammable and/or explosive atmospheres must display the UL label on the nameplate.**

Specific service conditions for these motors are defined in NEC 70-599.

WARNING: **UL rated motors must only be serviced by authorized Baldor Service Centers if these motors are to be returned to a flammable and/or explosive atmosphere.**

Caution: **To prevent premature equipment failure or damage, only qualified maintenance personnel should perform maintenance.**

Caution: **Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load from the motor shaft before moving the motor.**

Caution: **If eye bolts are used for lifting a motor, be sure they are securely tightened. The lifting direction should not exceed a 20° angle from the shank of the eye bolt or lifting lug. Excessive lifting angles can cause damage.**

Caution: **To prevent equipment damage, be sure that the electrical service is not capable of delivering more than the maximum motor rated amps listed on the rating plate.**

Caution: **If a HI POT test (High Potential Insulation test) must be performed, follow the precautions and procedure in NEMA MG-1 and MG-2 standards to avoid equipment damage.**

If you have any questions or are uncertain about any statement or procedure, or if you require additional information please contact your Baldor distributor or an Authorized Baldor Service Center.

Receiving

Each Baldor Electric Motor is thoroughly tested at the factory and carefully packaged for shipment. When you receive your motor, there are several things you should do immediately.

1. Observe the condition of the shipping container and report any damage immediately to the commercial carrier that delivered your motor.
2. Verify that the part number of the motor you received is the same as the part number listed on your purchase order.

Storage

If the motor is not put into service immediately, the motor must be stored in a clean, dry and warm location. Several precautionary steps must be performed to avoid motor damage during storage.

1. Use a "Megger" periodically to ensure that the integrity of the winding insulation has been maintained. Record the Megger readings. Immediately investigate any significant drop in insulation resistance.
2. Do not lubricate bearings during storage. Motor bearings are packed with grease at the factory. Excessive grease can damage insulation quality.
3. Rotate motor shaft at least 10 turns every two months during storage (more frequently if possible). This will prevent bearing damage due to storage.
4. If the storage location is damp or humid, the motor windings must be protected from moisture. This can be done by applying power to the motors' space heater (if available) while the motor is in storage.

Unpacking

Each Baldor motor is packaged for ease of handling and to prevent entry of contaminants.

1. To avoid condensation inside the motor, do not unpack until the motor has reached room temperature. (Room temperature is the temperature of the room in which it will be installed). The packing provides insulation from temperature changes during transportation.
2. When the motor has reached room temperature, remove all protective wrapping material from the motor.

Handling

The motor should be lifted using the lifting lugs or eye bolts provided.

1. Use the lugs or eye bolts provided to lift the motor. Never attempt to lift the motor and additional equipment connected to the motor by this method. The lugs or eye bolts provided are designed to lift only the motor. Never lift the motor by the motor shaft or the hood of a WPII motor.
2. When lifting a WPII (weatherproof Type 2) motor, do not lift the motor by inserting lifting lugs into holes on top of the cooling hood. These lugs are to be used for hood removal only. A spreader bar should be used to lift the motor by the cast lifting lugs located on the motor frame.
3. If the motor must be mounted to a plate with the driven equipment such as pump, compressor etc., it may not be possible to lift the motor alone. For this case, the assembly should be lifted by a sling around the mounting base. The entire assembly can be lifted as an assembly for installation. Do not lift using the motor lugs or eye bolts provided.

   If the load is unbalanced (as with couplings or additional attachments) additional slings or other means must be used to prevent tipping. In any event, the load must be secure before lifting.

Overview

Installation should conform to the National Electrical Code as well as local codes and practices. When other devices are coupled to the motor shaft, be sure to install protective devices to prevent future accidents. Some protective devices include, coupling, belt guard, chain guard, shaft covers etc. These protect against accidental contact with moving parts. Machinery that is accessible to personnel should provide further protection in the form of guard rails, screening, warning signs etc.

Location

The motor should be installed in an area that is protected from direct sunlight, corrosives, harmful gases or liquids, dust, metallic particles, and vibration. Exposure to these can reduce the operating life and degrade performance. Be sure to allow clearance for ventilation and access for cleaning, repair, service and inspections. Ventilation is extremely important. Be sure the area for ventilation is not obstructed. Obstructions will limit the free passage of air. Motors get warm and the heat must be dissipated to prevent damage.

These motors are not designed for atmospheric conditions that require explosion proof operation. They must NOT be used in the presence of flammable or combustible vapors or dust.

1. ODP motors are suitable only for indoor applications.
2. TEFC and WPII motors are suitable for indoor or outdoor standard service applications.

Mounting

The motor must be securely installed to a rigid foundation or mounting surface to minimize vibration and maintain alignment between the motor and shaft load. Failure to provide a proper mounting surface may cause vibration, misalignment and bearing damage.

Foundation caps and sole plates are designed to act as spacers for the equipment they support. If these devices are used, be sure that they are evenly supported by the foundation or mounting surface.

After installation is complete and accurate alignment of the motor and load is accomplished, the base should be grouted to the foundation to maintain this alignment.

The standard motor base is designed for horizontal or vertical mounting. Adjustable or sliding rails are designed for horizontal mounting only. Consult your Baldor distributor or authorized Baldor Service Center for further information.

Alignment

Accurate alignment of the motor with the driven equipment is extremely important.

1. **Direct Coupling**
   For direct drive, use flexible couplings if possible. Consult the drive or equipment manufacturer for more information. Mechanical vibration and roughness during operation may indicate poor alignment. Use dial indicators to check alignment. The space between coupling hubs should be maintained as recommended by the coupling manufacturer.
2. **End-Play Adjustment**
   The axial position of the motor frame with respect to its load is also extremely important. The motor bearings are not designed for excessive external axial thrust loads. Improper adjustment will cause failure.
3. **Pulley Ratio**
   The pulley ratio should not exceed 8:1.
4. **Belt Drive**
   Align sheaves carefully to minimize belt wear and axial bearing loads (see End-Play Adjustment). Belt tension should be sufficient to prevent belt slippage at rated speed and load. However, belt slippage may occur during starting.

Caution: **Do not over tension belts.**

5. Sleeve bearing motors are only suitable for coupled loads.

Doweling & Bolting

After proper alignment is verified, dowel pins should be inserted through the motor feet into the foundation. This will maintain the correct motor position should motor removal be required. (Baldor motors are designed for doweling.)

1. Drill dowel holes in diagonally opposite motor feet in the locations provided.
2. Drill corresponding holes in the foundation.
3. Ream all holes.
4. Install proper fitting dowels.
5. Mounting bolts must be carefully tightened to prevent changes in alignment. Use a flat washer and lock washer under each nut or bolt head to hold the motor feet secure. Flanged nuts or bolts may be used as an alternative to washers.

Power Connection

Motor and control wiring, overload protection, disconnects, accessories and grounding should conform to the National Electrical Code and local codes and practices.

Conduit Box

For ease of making connections, an oversize conduit box is provided. The box can be rotated 360° in 90° increments. Auxiliary conduit boxes are provided on some motors for accessories such as space heaters, RTD's etc.

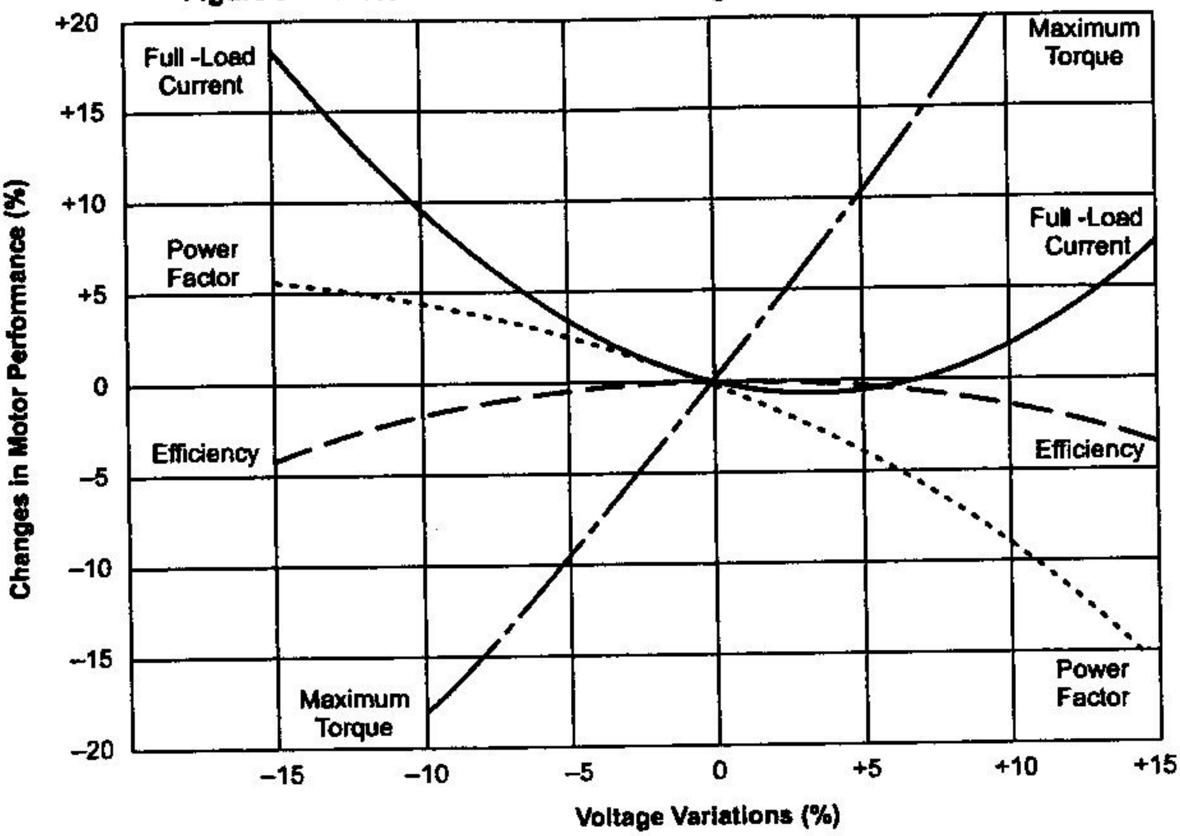
AC Power

Connect the motor leads as shown on the connection diagram located on the name plate or inside the cover on the conduit box. Be sure the following guidelines are met:

1. AC power is within ±10% of rated voltage with rated frequency. (See motor name plate for ratings).
   OR
2. AC power is within ±5% of rated frequency with rated voltage.
   OR
3. A combined variation in voltage and frequency of ±10% (sum of absolute values) of rated values, provided the frequency variation does not exceed ±5% of rated frequency.

Performance within these voltage and frequency variations are shown in Figure 2-1.

Figure 2-1 Motor Performance VS Voltage Variations



First Time Start Up

Be sure that all power to motor and accessories is off. Be sure the motor shaft is disconnected from the load and will not cause mechanical rotation of the motor shaft.

1. Make sure that the mechanical installation is secure. All bolts and nuts are tightened etc.
2. If motor has been in storage or idle for some time, check winding insulation integrity with a Megger.
3. Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity.
4. Be sure all shipping materials and braces (if used) are removed from motor shaft.
5. Manually rotate the motor shaft to ensure that it rotates freely.
6. Replace all panels and covers that were removed during installation.
7. Momentarily apply power and check the direction of rotation of the motor shaft.
8. If motor rotation is wrong, be sure power is off and change the motor lead connections. Verify rotation direction before you continue.
9. Start the motor and ensure operation is smooth without excessive vibration or noise. If so, run the motor for 1 hour with no load connected.
10. After 1 hour of operation, disconnect power and connect the load to the motor shaft. Verify all coupling guards and protective devices are installed. Ensure motor is properly ventilated.

Coupled Start Up

This procedure assumes a coupled start up. Also, that the first time start up procedure was successful.

1. Check the coupling and ensure that all guards and protective devices are installed.
2. Check that the coupling is properly aligned and not binding.
3. The first coupled start up should be with no load. Apply power and verify that the load is not transmitting excessive vibration back to the motor though the coupling or the foundation. Vibration should be at an acceptable level.
4. Run for approximately 1 hour with the driven equipment in an unloaded condition.

The equipment can now be loaded and operated within specified limits. Do not exceed the name plate ratings for amperes for steady continuous loads.

Jogging and Repeated Starts

Repeated starts and/or jogs of induction motors generally reduce the life of the motor winding insulation. A much greater amount of heat is produced by each acceleration or jog than by the same motor under full load. If it is necessary to repeatedly start or jog the motor, it is advisable to check the application with your local Baldor distributor or Baldor Service Center.

Heating - Duty rating and maximum ambient temperature are stated on the motor name plate. Do not exceed these values. If there is any question regarding safe operation, contact your local Baldor distributor or Baldor Service Center.

WARNING: UL rated motors must only be serviced by authorized Baldor Service Centers if these motors are to be returned to a flammable and/or explosive atmosphere.

General Inspection

Inspect the motor at regular intervals, approximately every 500 hours of operation or every 3 months, whichever occurs first. Keep the motor clean and the ventilation openings clear. The following steps should be performed at each inspection:

WARNING: Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

1. Check that the motor is clean. Check that the interior and exterior of the motor is free of dirt, oil, grease, water, etc. Oily vapor, paper pulp, textile lint, etc. can accumulate and block motor ventilation. If the motor is not properly ventilated, overheating can occur and cause early motor failure.
2. Use a "Megger" periodically to ensure that the integrity of the winding insulation has been maintained. Record the Megger readings. Immediately investigate any significant drop in insulation resistance.
3. Check all electrical connectors to be sure that they are tight.

Lubrication & Bearings

Bearing grease will lose its lubricating ability over time, not suddenly. The lubricating ability of a grease (over time) depends primarily on the type of grease, the size of the bearing, the speed at which the bearing operates and the severity of the operating conditions. Good results can be obtained if the following recommendations are used in your maintenance program.

Type of Grease

A high grade ball or roller bearing grease should be used. Recommended grease for standard service conditions is Polyrex EM (Exxon Mobil).

Equivalent and compatible greases include:
Texaco Polystar, Rykon Premium #2, Pennzoil Pen 2 Lube and Chevron SRI.

– Maximum operating temperature for standard motors = 110° C.
– Shut–down temperature in case of a malfunction = 115° C.

Lubrication Intervals

Recommended lubrication intervals are shown in Table 3-1. It is important to realize that the recommended intervals of Table 3-1 are based on average use.

Refer to additional information contained in Tables 3-2 and 3-3.

Table 3-1 Lubrication Intervals *

NEMA / (IEC) Frame Size	Rated Speed - RPM					
	10000	6000	3600	1800	1200	900
Up to 210 incl. (132)	**	2700 Hrs.	5500 Hrs.	12000 Hrs.	18000 Hrs.	22000 Hrs.
Over 210 to 280 incl. (180)			3600 Hrs.	9500 Hrs.	15000 Hrs.	18000 Hrs.
Over 280 to 360 incl. (225)			* 2200 Hrs.	7400 Hrs.	12000 Hrs.	15000 Hrs.
Over 360 to 5800 incl. (300)			*2200 Hrs.	3500 Hrs.	7400 Hrs.	10500 Hrs.

* Lubrication intervals are for ball bearings. For roller bearings, divide the listed lubrication interval by 2.

** For 6205 and 6806 bearings. For 6807 bearings, consult oil mist lubrication (MN401).
Relubrication interval for 6205 bearing bearing is 1550Hrs. (using grease lubrication).
Relubrication interval for 6806 bearing bearing is 720Hrs. (using grease lubrication).

Table 3-2 Service Conditions

Severity of Service	Ambient Temperature Maximum	Atmospheric Contamination	Type of Bearing
Standard	40° C	Clean, Little Corrosion	Deep Groove Ball Bearing
Severe	50° C	Moderate dirt, Corrosion	Ball Thrust, Roller
Extreme	>50° C* or Class H Insulation	Severe dirt, Abrasive dust, Corrosion	All Bearings
Low Temperature	<–30° C **		

* Special high temperature grease is recommended (Dow Corning DC44). Note that Dow Corning DC44 grease does not mix with other grease types. Thoroughly clean bearing & cavity before adding grease.

** Special low temperature grease is recommended (Aeroshell 7).

Table 3-3 Lubrication Interval Multiplier

Severity of Service	Multiplier
Standard	1.0
Severe	0.5
Extreme	0.1
Low Temperature	1.0

Table 3-4 Bearings Sizes and Types

Frame Size NEMA (IEC)	Bearing Description (These are the "Large" bearings (Shaft End) in each frame size)					
	Bearing	OD D mm	Width B mm	Weight of Grease to add * oz (Grams)	Volume of grease to be added in³	Volume of grease to be added tea-spoon
Up to 210 incl. (132)	6307	80	21	0.30 (8.4)	0.6	2.0
Over 210 to 280 incl. (180)	6311	120	29	0.61 (17)	1.2	3.9
Over 280 to 360 incl. (225)	6313	140	33	0.81 (23)	1.5	5.2
Over 360 to 449 incl. (280)	6319	200	45	2.12 (60)	4.1	13.4
Over 5000 to 5800 incl. (355)	6328	300	62	4.70 (130)	9.2	30.0
Over 360 to 449 incl. (280)	NU319	200	45	2.12 (60)	4.1	13.4
Over 5000 to 5800 incl. (355)	NU328	300	62	4.70 (130)	9.2	30.0
Spindle Motors						
76 Frame	6207	72	17	0.22 (6.1)	0.44	1.4
77 Frame	6210	90	20	0.32 (9.0)	0.64	2.1
80 Frame	6213	120	23	0.49 (14.0)	0.99	3.3

* Weight in grams = .005 DB

Note: Not all bearing sizes are listed. For intermediate bearing sizes, use the grease volume for the next larger size bearing.

Lubrication Procedure

Be sure that the grease you are adding to the motor is compatible with the grease already in the motor. Consult your Baldor distributor or an authorized service center if a grease other than the recommended type is to be used.

Caution: **To avoid damage to motor bearings, grease must be kept free of dirt. For an extremely dirty environment, contact your Baldor distributor or an authorized Baldor Service Center for additional information.**

With Grease Outlet Plug

1. Clean all grease fittings.
2. Remove grease outlet plug.
3. If motor is stopped, add the recommended amount of grease.

   If motor is to be greased while running, a slightly greater quantity of grease will have to be added. Add grease slowly until new grease appears at shaft hole in the endplate or purge outlet plug.
4. Re-install grease outlet plug.

Without Grease Outlet Plug

1. Clean the grease fitting.
2. Add recommended amount of grease to bearing (see Table 3-4).

Sample Lubrication Determination

Assume - NEMA 286T (IEC 180), 1750 RPM motor driving an exhaust fan in an ambient temperature of 43° C and the atmosphere is moderately corrosive.

1. Table 3-1 list 9500 hours for standard conditions.
2. Table 3-2 classifies severity of service as "Severe".
3. Table 3-3 lists a multiplier value of 0.5 for Severe conditions.
4. Table 3-4 shows that 1.2 in^3 or 3.9 teaspoon of grease is to be added.

Note: Smaller bearings in size category may require reduced amounts of grease.

Accessories

The following is a partial list of accessories available from Baldor. Contact your Baldor distributor for availability and pricing information.

Note: Space heaters and RTD's are standard on some motors.

Bearing RTD
RTD (Resistance Temperature Detector) devices are used to measure or monitor the temperature of the motor bearing during operation.

Bearing Thermocouples
Used to measure or monitor bearing temperatures.

Bearing Thermostat
Temperature device that activates when bearing temperatures are excessive. Used with an external circuit to warn of excessive bearing temperature or to shut down a motor.

Conduit Boxes
Optional conduit boxes are available in various sizes to accommodate accessory devices.

Cord & Plug Assembly
Adds a line cord and plug for portable applications.

Drains and Breathers
Stainless steel drains with separate breathers are available.

Drip Covers
Designed for use when motor is mounted in a vertical position. Contact your Baldor distributor to confirm that the motor is designed for vertical mounting.

Fan Cover & Lint Screen
To prevent build-up of debris on the cooling fan.

Nameplate
Additional stainless steel nameplates are available.

Roller Bearings
Recommended for belt drive applications with a speed of 1800 RPM or less.

Rotation Arrow Labels
Rotation arrows are supplied on motors designed to operate in one direction only. Additional rotation arrows are available.

Space Heater
Added to prevent condensation of moisture within the motor enclosure during periods of shut down or storage.

Stainless Hardware
Stainless steel hardware is available. Standard hardware is corrosion resistant zinc plated steel.

Winding RTD
RTD (Resistance Temperature Detector) devices are used to measure or monitor the temperature of the motor winding during operation.

Winding Thermocouples
Used to measure or monitor winding temperatures.

Winding Thermpstat
Temperature device that activates when winding temperatures are excessive. Used with an external circuit to warn of excessive winding temperature or to shut down a motor.

Note: On some motors, leads for accessory devices are brought out to a separate conduit box located on the side of the motor housing (unless otherwise specified).

Table 3-5 Troubleshooting Chart

Symptom	Possible Causes	Possible Solutions
Motor will not start	Usually caused by line trouble, such as, single phasing at the starter.	Check source of power. Check overloads, fuses, controls, etc.
Excessive humming	High Voltage.	Check input line connections.
	Eccentric air gap.	Have motor serviced at local Baldor service center.
Motor Over Heating	Overload. Compare actual amps (measured) with nameplate rating.	Locate and remove source of excessive friction in motor or load. Reduce load or replace with motor of greater capacity.
	Single Phasing.	Check current at all phases (should be approximately equal) to isolate and correct the problem.
	Improper ventilation.	Check external cooling fan to be sure air is moving properly across cooling fins. Excessive dirt build-up on motor. Clean motor.
	Unbalanced voltage.	Check voltage at all phases (should be approximately equal) to isolate and correct the problem.
	Rotor rubbing on stator.	Check air gap clearance and bearings.
		Tighten "Thru Bolts".
	Over voltage or under voltage.	Check input voltage at each phase to motor.
	Open stator winding.	Check stator resistance at all three phases for balance.
	Grounded winding.	Perform dielectric test and repair as required.
	Improper connections.	Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity. Refer to motor lead connection diagram.
Bearing Over Heating	Misalignment.	Check and align motor and driven equipment.
	Excessive belt tension.	Reduce belt tension to proper point for load.
	Excessive end thrust.	Reduce the end thrust from driven machine.
	Excessive grease in bearing.	Remove grease until cavity is approximately $^3/_4$ filled.
	Insufficient grease in bearing.	Add grease until cavity is approximately $^3/_4$ filled.
	Dirt in bearing.	Clean bearing cavity and bearing. Repack with correct grease until cavity is approximately $^3/_4$ filled.
Vibration	Misalignment.	Check and align motor and driven equipment.
	Rubbing between rotating parts and stationary parts.	Isolate and eliminate cause of rubbing.
	Rotor out of balance.	Have rotor balance checked are repaired at your Baldor Service Center.
	Resonance.	Tune system or contact your Baldor Service Center for assistance.
Noise	Foreign material in air gap or ventilation openings.	Remove rotor and foreign material. Reinstall rotor. Check insulation integrity. Clean ventilation openings.
Growling or whining	Bad bearing.	Replace bearing. Clean all grease from cavity and new bearing. Repack with correct grease until cavity is approximately $^3/_4$ filled.

Suggested bearing and winding RTD setting guidelines

Most large frame AC Baldor motors with a 1.15 service factor are designed to operate below a Class B (80°C) temperature rise at rated load and are built with a Class H winding insulation system. Based on this low temperature rise, RTD (Resistance Temperature Detectors) settings for Class B rise should be used as a starting point. Some motors with 1.0 service factor have Class F temperature rise.

The following tables show the suggested alarm and trip settings for RTDs. Proper bearing and winding RTD alarm and trip settings should be selected based on these tables unless otherwise specified for specific applications.

If the driven load is found to operate well below the initial temperature settings under normal conditions, the alarm and trip settings may be reduced so that an abnormal machine load will be identified.

The temperature limits are based on the installation of the winding RTDs imbedded in the winding as specified by NEMA. Bearing RTDs should be installed so they are in contact with the outer race on ball or roller bearings or in direct contact with the sleeve bearing shell.

Winding RTDs – Temperature Limit In °C (40°C Maximum Ambient)

Motor Load	Class B Temp Rise ≤ 80°C (Typical Design)		Class F Temp Rise ≤ 105°C		Class H Temp Rise ≤ 125°C	
	Alarm	Trip	Alarm	Trip	Alarm	Trip
≤ Rated Load	130	140	155	165	175	185
Rated Load to 1.15 S.F.	140	150	160	165	180	185

Note: • Winding RTDs are factory production installed, not from Mod–Express.
• When Class H temperatures are used, consider bearing temperatures and lubrication requirements.

Bearing RTDs – Temperature Limit In OC with 40°C Max Ambient

Bearing Type Oil or Grease	Anti–Friction		Sleeve	
	Alarm	Trip	Alarm	Trip
Standard*	95	100	85	95
High Temperature**	110	115	105	110

Note: * Bearing temperature limits are for standard design motors operating at Class B temperature rise.
** High temperature lubricants include some special synthetic oils and greases.

Greases that may be substituted that are compatible with Polyrex EM (but considered as "standard" lubricants) include the following:

– Texaco Polystar
– Rykon Premium #2
– Chevron SRI #2

See the motor nameplate for replacement grease or oil recomendation. Contact Baldor application engineering for special lubricants or further clarifications.

Feed Air Compressor
Drive Motor
M3218T
Installation and Maintenance

On Site Gas Systems, Inc.

35 Budney Road, Budney Industrial Park, Newington, CT 06111 U.S.A.
Telephone: 860.667.8888 • Fax: 860.667.2222
Website: www.onsitegas.com • Email: info@onsitegas.com
A BUSINESS INCORPORATED IN THE STATE OF CONNECTICUT, U.S.A.

Appendix A

The Characteristics and Effects of Carbon Monoxide

Carbon monoxide is a colorless odorless toxic gas generated by incomplete combustion of a hydrocarbon fuel in air. It may be present where internal combustion engines, furnaces, boilers, and other combustion devices are present. It is toxic when inhaled because of its great affinity to hemoglobin, the oxygen carriers in the red cells of the blood. CO replaces the oxygen normally carried by the hemoglobin, and thus inhibits the delivery of oxygen throughout the body; the victim suffers from oxygen deficiency, and may die from asphyxiation. The symptoms and degree of danger resulting from exposure to CO depend upon the concentration of the gas and the length of exposure; this is shown in **Figure 8**. The **MED AIR 2000** instrument is employed to warn the user of the presence of CO, and to facilitate the assessment of the degree of danger that he or she is exposed to.

Based upon knowledge of the effects of CO, the Occupational Safety and Health Authority (OSHA) has set limits on exposure to CO in the workplace. These are 35 ppm (parts CO per million parts air) as an time weighted average for an eight hour day, and a maximum exposure of 200 ppm. For compressed air line applications, OSHA requires Grade D breathing air supplied, using a Compressed Gas Association (CGA) definition (G-7.1). Depending on interpretation of the OSHA respiratory standard, 10 ppm and 20 ppm CO have been used as maximum limits and standard instrument alarm points.

The **MED AIR 2000** has two preset alarm set points, at 10 ppm and 20 ppm CO, which are adjustable, but cannot be set below 5 ppm or above 100 ppm.

The curves below are for percent carboxalhemoglobin with 50% being the top curve, 5% the bottom. %COHb is a measure of the amount of hemoglobin occupied by CO rather than oxygen. CO effects upon children, adults engaging in physical activity, and smokers, are ore pronounced.

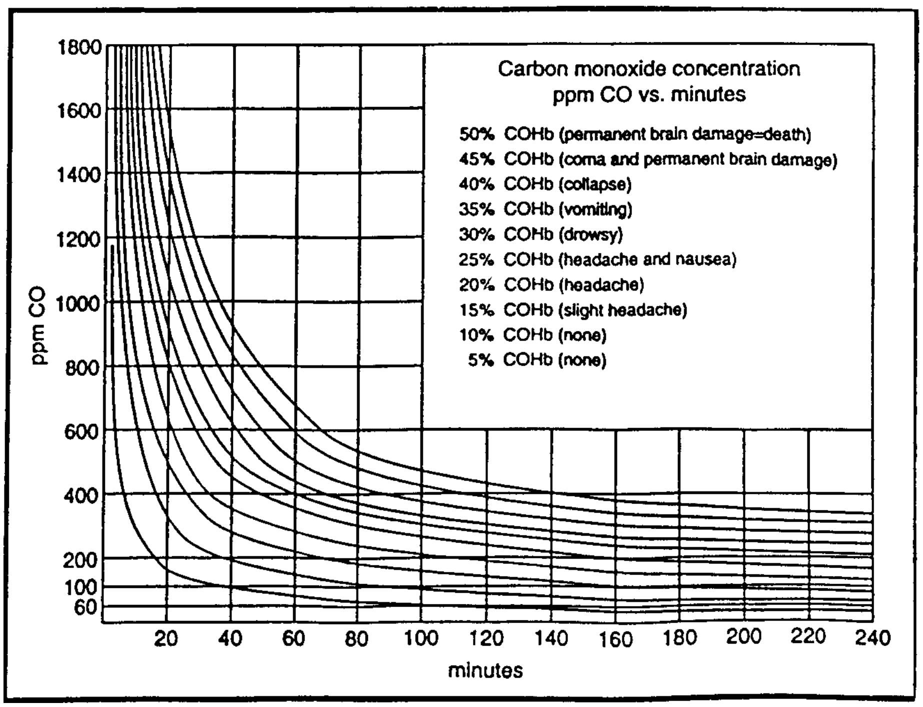


Figure 11: Carbon Monoxide Concentration

Feed Air Compressor

Scroll Air Compressor Service and Maintenance

On Site Gas Systems, Inc.
35 Budney Road, Budney Industrial Park, Newington, CT 06111 U.S.A.
Telephone: 860.667.8888 • Fax: 860.667.2222
Website: www.onsitegas.com • Email: info@onsitegas.com

O_2N_2 SITE Gas Systems, Inc.

Scroll Air Compressor Service and Maintenance

Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

Description

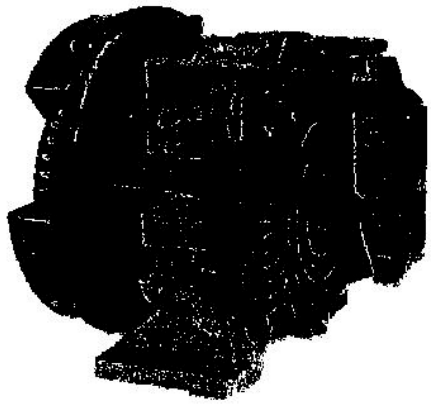
GENERAL

The Powerex Oilless Rotary Scroll Air Compressor has advanced scroll compressor technology through the development of a completely oilless unit.

The Powerex Scroll Compressor offers a dynamically balanced air end which insures vibration-free operation. The rotary design permits a continuous 100% duty cycle. No oil separation, oil filtration, or inlet valves are required on the Powerex Scroll air compressor .

The Powerex oilless rotary scroll air compressor is based on the theory of scroll compression. A scroll is a free standing, intricate spiral bounded on one side by a solid, flat plane or base. A scroll set, the basic compression element of a scroll compressor, is made up of two identical spirals which form right and left hand parts. One of these scroll components is indexed or phased 180° with respect to the other so the scrolls can mesh.

Crescent-shaped gas pockets are formed and bounded by the spirals and the base plate of both scrolls. As the moving scroll is orbited around the fixed scroll, the pockets formed by the meshed scrolls follow the spiral toward the center and diminish in size. The moving scroll is prevented from rotating during this process so the 180° phase relationship of the scrolls is maintained. The compressor's inlet is at the outer boundary of the scrolls. The compressed gas is discharged through the outlet at the center of the fixed scroll so no valves are needed.



Grease Compressor Bearings

10,000 HOURS - MAINTENANCE

CAUTION ***This service should be performed by an authorized Powerex Service Center to avoid failure.***

MAIN BEARINGS

1. Remove the plastic dust cap. Use only one of two locations found on the air end (See Figure 2).
2. Rotate the compressor pulley until the grease fitting is visible through the dust cap hole (See Figure 2). This will allow regreasing of the main bearings.
3. Use a grease gun extension adaptor to engage the grease fitting and supply the proper volume of grease as indicated on the grease delivery chart (See Grease Delivery chart below & Figure 2).

CAUTION ***Use only Powerex genuine grease. Pump grease gun before feeding (this eliminates air from the grease passage of the extension adapter. (Complete Grease Kit Part Number IP616200AJ and Grease Tube Part Number IP600000AV).***

GREASING PIN CRANK BEARINGS

4. Replace plastic dust cap.

The bearings on the scroll compressor are regreaseable to allow extended compressor life. Service should be performed every 10,000 hours of operation.

1. Remove the V-Belts and the fan cover.
2. Remove the air end pulley and cooling fan with a gear puller (See Figure 3).
3. Remove the fan duct shroud.
4. Remove the three grease caps. **Do not attempt to loosen or tighten the bolt.**

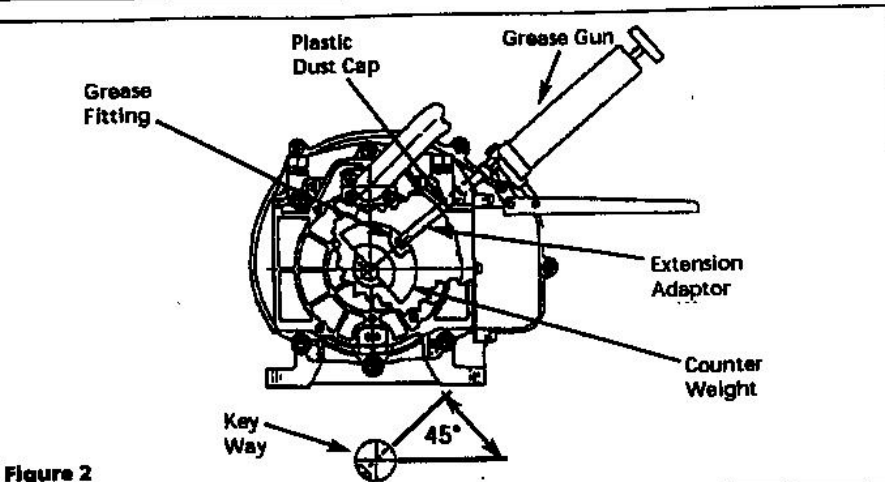


Figure 2

5. Grease all three pin crank bearings (See Figures 3, 4 & 5 and Grease Delivery Chart below).

CAUTION ***The grease fitting, located in the center of the pin crank bearing, feeds only the orbit scroll side bearing. Use a needle adapter to supply grease to the housing side bearing. PUMP GREASE GUN BEFORE FEEDING TO ELIMINATE AIR FROM GREASE PASSAGE OF THE NEEDLE ADAPTER. Hold grease gun for 5 - 10 seconds after feeding to prevent grease blowback from the grease fitting.***

6. Replace grease caps, fan shroud, pulley, etc.

(See Scroll Service and Maintenance Video for Audio and Visual Instructions.)

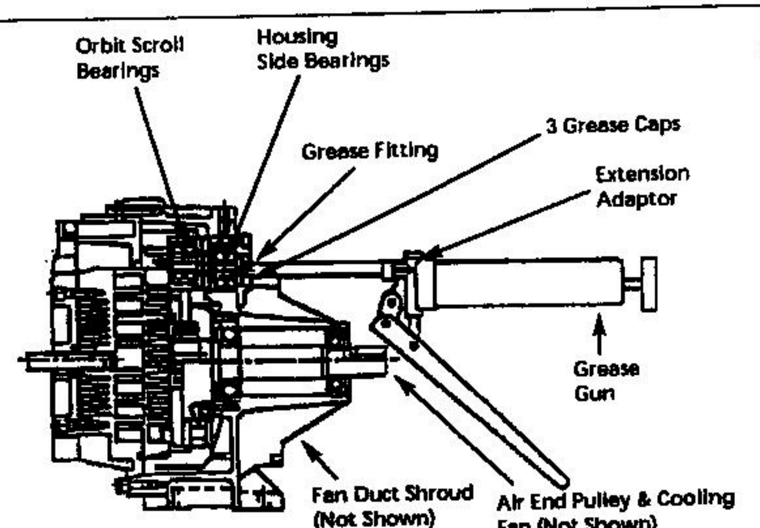


Figure 3

GREASE DELIVERY	SLAE03		SLAE05	
Bearing	1st Time	2nd Time	1st Time	2nd Time
Orbit Scroll Bearing	5 Times	3 Times	6 Times	4 Times
Pin Crank Bearing Orbit Scroll Side	5 Times	3 Times	6 Times	4 Times
Pin Crank Bearing Housing Side	5 Times	3 Times	6 Times	4 Times

NOTE: Each pump of the grease gun equals 0.65 grams of grease.

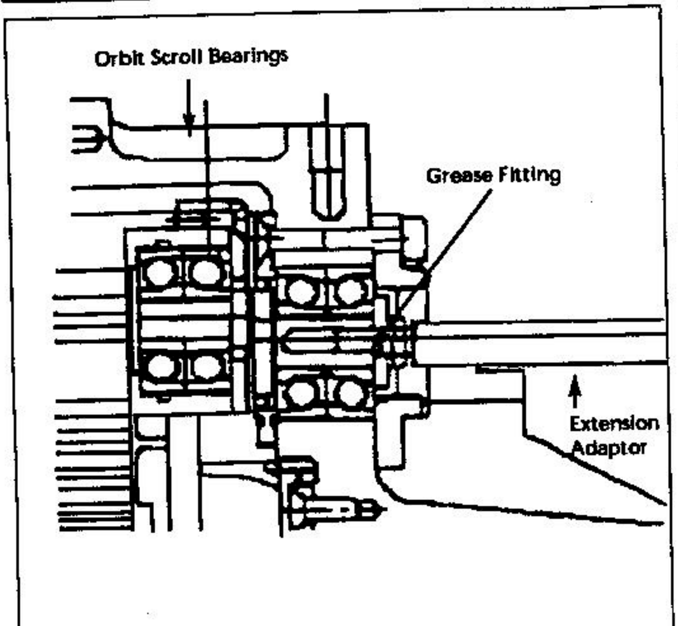


Figure 4

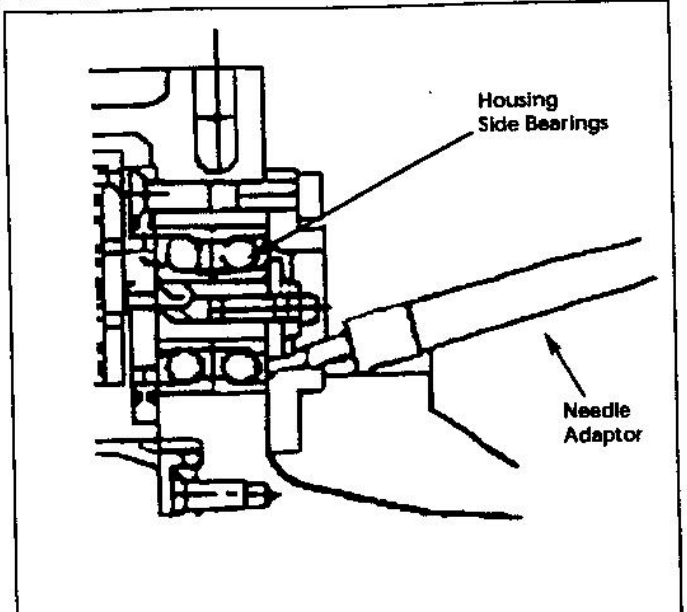


Figure 5

Maintenance Schedule

Item	Action needed	500	2500	Operating Hours 5000	10,000	15,000	20,000	Remarks
Tank	Drain moisture	Daily						
Inlet air filter	Replace	●	▲	*(Every 2,500 hrs or less)*				Part #IP032901AV
Blower fan	Clean			●	●	●	●	
Fan Duct	Clean			●	●	●	●	
Compressor Fins	Clean		●	*(Every 2,500 hrs or less)*				
Bearings	Grease				▲		▲	Service Center Only
Tip seal	Replace				▲		▲	
Dust seal	Replace				▲		▲	
V-belt	Inspect, replace	*Note 3	●	▲	▲	▲	▲	
Pressure Switch	Confirm operation				●		●	
Magnetic starter	Inspect				●		●	Replace if contact points deteriorated
Safety valve	Confirm operation		●	*(Every 2,500 hrs or less)*				
Pressure gauge	Inspect		●	*(Every 2,500 hrs or less)*				
●	Inspect							
▲	Replace							

NOTES:

1. Inspect and perform maintenance periodically according to maintenance schedule.
2. The maintenance schedule relates to the normal operating conditions. If the circumstances and load condition are adverse, shorten the cycle time and do maintenance accordingly.
3. * The tension of the V-belt should be adjusted during the initial stage and inspected every 2,500 hours afterwards. Proper belt tension for 3 HP units is 7 lbs./.16" deflection; for 5 HP units, 7 lbs./.19" deflection.
4. See Compressor Pump Manuals for replacement or service procedures.

Tip Seal Set Replacement

10,000 HOURS - MAINTENANCE

The "Tip Seal Set" is a replacement part for SLAE03 and SLAE05 air ends. Please read these instructions thoroughly and carefully to ensure correct replacement.

(See Scroll Service and Maintenance Video for Audio and Visual Instructions.)

Tip Seal Set	SLAE03	SLAE05
Air End Model	3 Hp	5 Hp
Part No.	IP604500AV	IP604600AV

The tip seal on the scroll compressor is self-lubricated and allows the unit to operate efficiently without oil and expensive filtration. The tip seal should be replaced every 10,000 hours of operation.

CONFIRMATION OF THE PARTS

1. Confirm if the tip seal you purchased is correct for the air end you are repairing (See Parts Listing below).

Item No.	Description	Qty.
1	HP tip seal for FS	1
2	LP tip seal for FS	1
3	HP tip seal for OS	1
4	LP tip seal for OS	1
5	Dust Seal	1
6	Backup Tube	1

HP = High Pressure LP = Low Pressure
FS = Fixed Scroll OS = Orbital Scroll

2. Confirm if the following parts are included (See Figure 6).

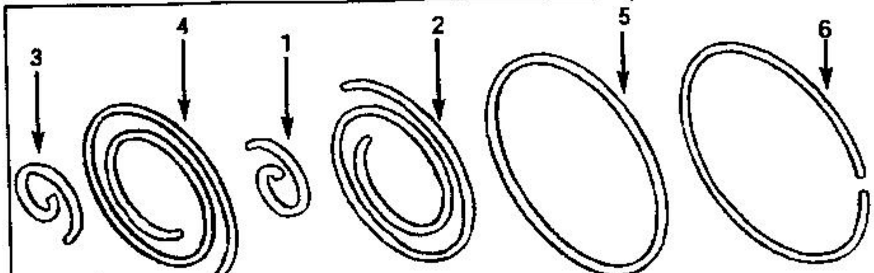


Figure 6

REPLACEMENT

1. Remove six nuts with T-type wrench and then FS set from air end (See Figure 7).
2. Remove LP and HP tip seals from Fixed Scroll set and Orbit set. Using the tip of a ball-point pen at the start will make it much easier (See Figure 7).
3. Remove dust from Scroll with clean cloth or air.

INSERTING TIP SEALS

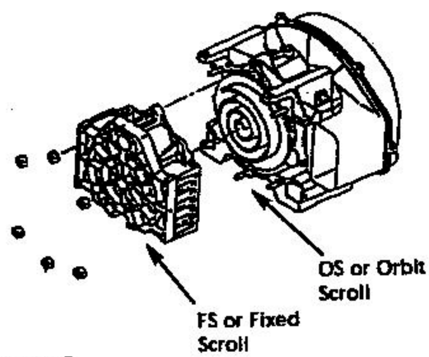
NOTE: Tips seals for Fixed Scroll and Orbit Scroll have opposing seal cut angels (See NOTE and explanatory diagram below).

Insert tip seal so that the lip of tip seal is on the bottom of seal groove and inner side of involute and the direction of lip faces the center of involute (curving spiral). See Figure 9. This is to be done for both FS and OS sets.

Use caution not to tear or distort lip.

1. Insert new HP tip seal from the center section for OS or Orbit Scroll so that there will be no clearance at the tip (start) section (See Figure 8 and 9).

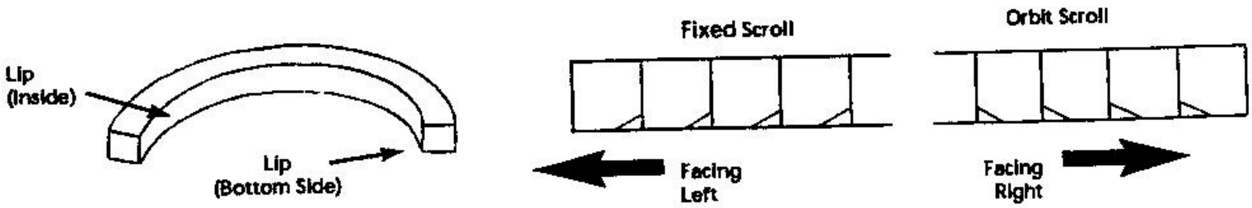
Figure 8



Tip Seal Removal

Figure 7

NOTE: In order to distinguish between the tip seal for Fixed Scroll and the tip seal for Orbit Scroll place the tip seal as shown below then view from the arrow direction and refer to the figure on the right.



Tip Seal Set Replacement (Continued)

2. Insert so that new LP tip seal will contact closely with HP tip seal inside Scroll Groove (See Figure 7 on page 4).

⚠CAUTION ***Insert approximately half of the LP tip seal and remove the tip seal to confirm that a notch in the tip seal has been achieved. This will prevent movement during installation (See Figure 11).***

3. Repeat the same procedure for FS or Fixed Scroll tip seal set, remove both the dust seal and backup tube located on outermost side FS set.
4. Insert new backup tube in the FS Scroll in the 6 o' clock position (See Figure 10).
5. Insert new dust seal on the backup tube. Face seamed section of the dust seal in the 3 o'clock position (See Figure 10).
8. After replacing tip seal set, reassemble Fixed Scroll set to the Orbit Scroll. Tighten 6 nuts temporarily and confirm if crankshaft rotates smoothly by hand and tighten them firmly. Tightening torques are:

Bolt Torque	First	Second
SLAE03	15 in lb.	175 in lb.
SLAE05	15 in lb.	175 in lb.

NOTE: Assemble so that dust seal and tip seal will not drop between Orbit Scroll set and Fixed Scroll set.

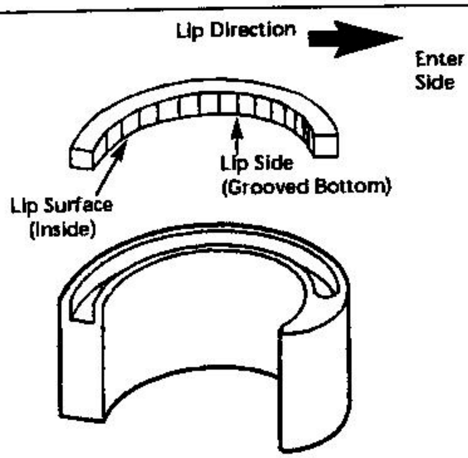


Figure 9

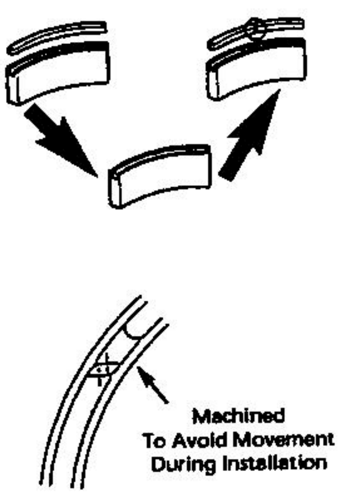


Figure 11

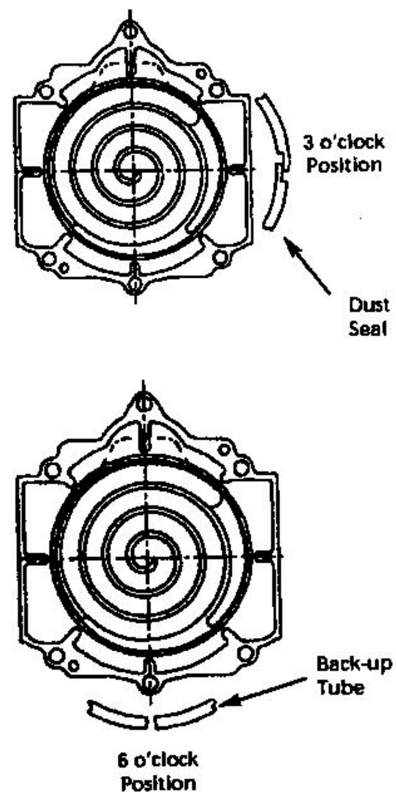


Figure 10

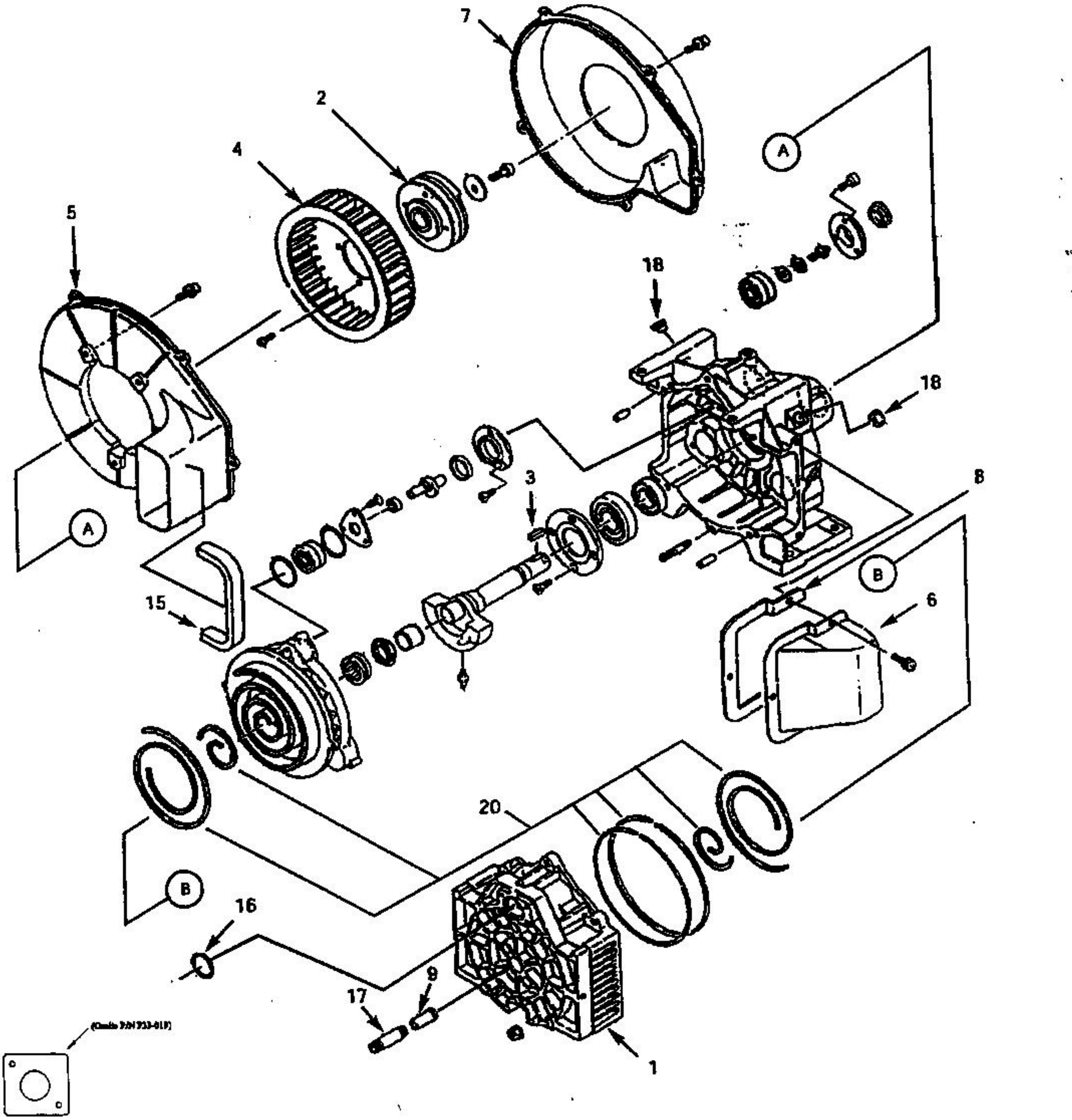


Figure 12 - Compressor Parts

Feed Air Compressor

Scroll Air Compressor Parts List

On Site Gas Systems, Inc.
35 Budney Road, Budney Industrial Park, Newington, CT 06111 U.S.A.
Telephone: 860.667.8888 • Fax: 860.667.2222
Website: www.onsitegas.com • Email: info@onsitegas.com

Service Parts List

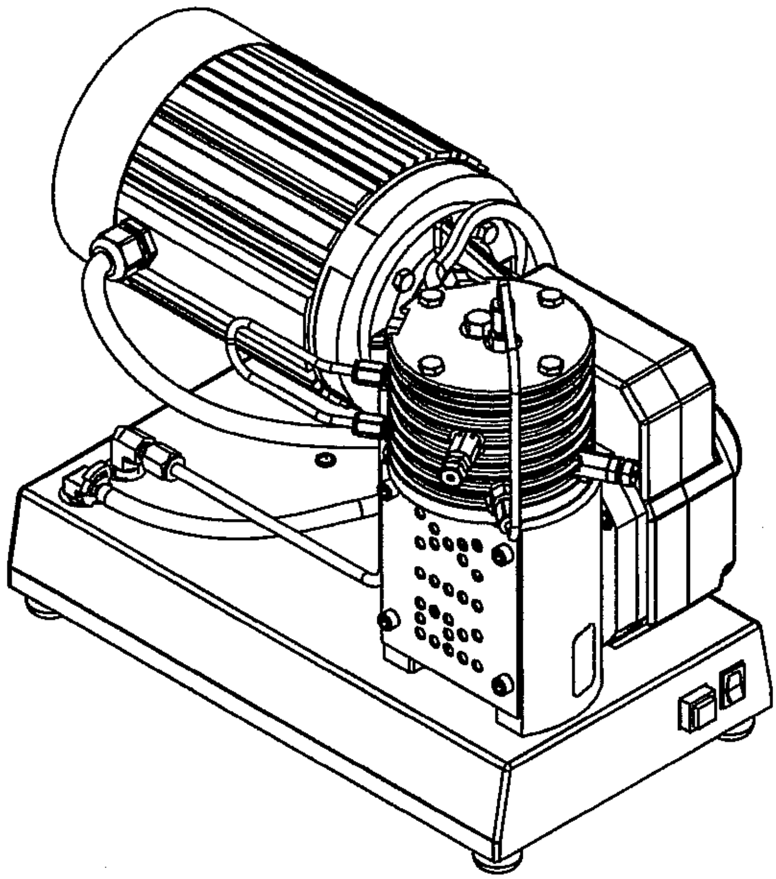
Ref. No.	Description	Part No. For Models SLAE03	Part No. For Models SLAE05	Quantity Per Unit SLAE03	Quantity Per Unit SLAE05
1	Stational Scroll Set	IP600100AV	IP600200AV	1	1
2	Airend Pulley	IP600300AV	IP600400AV	1	1
3	Key	IP600600AV	IP600600AV	1	1
4	Centrifugal Fan	IP601300AV	IP601300AV	1	1
5	Fan Duct (1)	IP601400AV	IP601400AV	1	1
6	Fan Duct (2)	IP601500AV	IP601600AV	1	1
7	Fan Cover	IP601700AV	IP601700AV	1	1
8	Fan Dust Gasket (1)	IP601800AV	IP601900AV	1	1
9	Heat Insulation Pipe	IP602000AV	IP602000AV	1	1
10	Filter Plate	IP602100AV	IP602100AV	1	1
11	Cartridge Filter	IP032901AV	IP032901AV	1	1
12	Intake Pipe	IP602200AV	IP602200AV	1	1
13	Intake Filter Cover	IP016101AV	IP016101AV	1	1
14	Filter Cover Pipe	IP602300AV	IP602300AV	6	6
15	Fan Duct Gasket (2)	IP602400AV	IP602400AV	1	1
16	O-Ring	IP603200AV	IP603200AV	2	2
17	Long Nipple	IP603300AV	IP603300AV	1	1
18	Dust Cap	IP603500AV	IP603500AV	2	2
19	Wing Bolt	IP604200AV	IP604200AV	1	1
20	Tip Seal Set	IP604500AV	IP604600AV	1	1

RIX

COMPRESSORS

MICROBOOST
Owner's Manual

MB-115
MB-230



February 19, 2004
APPLICABILITY [CD]

WARNING!!!

To prevent FIRE, SERIOUS INJURY and/or DEATH, it is the User's responsibility to ensure that all parts used in the compression assembly and gas plumbing of a RIX Oxygen or Nitrox compressor are cleaned for oxygen service. Cleaning should be in accordance with Compressed Gas Association G-4.1. Factory oxygen cleaned parts are denoted by an "X" prefix at the beginning of the part number. It is the Buyers responsibility to maintain the cleanliness of factory-cleaned parts throughout installation and start-up.

Furthermore, non-factory supplied parts will void all warranties, as improper materials can cause oxygen fires resulting in serious fires injury and/or death.

FOR ALL REPAIRS:

1) Refer to the applicable service manual for assembly instructions
2) Refer to applicable compressor start-up instructions after all repairs

INTRODUCTION

Congratulations on your purchase of the Rix Microboost compressor. We anticipate that with proper care you will get many years of satisfactory performance from this compressor.

This manual is prepared to help you operate this equipment safely and so that you get the most benefit from this package. Please read it carefully.

This equipment is protected by warranty, a copy of which should have been provided separately by your dealer. We suggest that you read the warranty policy to fully understand your coverage and your responsibilities of ownership.

Rix recommends that all servicing be done by trained and qualified personnel. Rix recommends that you contact our offices at 707-747-5900 for a list of qualified service centers.

Rix Industries
4900 industrial Way
Benicia, CA 94510
Phone (707) 747-5900
Fax (707) 747-9200

INTRODUCTION

Safety

This electromechanical equipment is designed to produce high pressure gas. Operating personnel must follow these safety requirements at all times to avoid injury to personnel or damage to property.

Keep away from live circuits. Do not attempt to replace components or make adjustments unless the power to the compressor has been disconnected and all pressure relieved.

Never operate with safety devices removed or disabled. This includes guards for moving objects, protection from high temperature surfaces, pressure relief valves, pressure switches, or covers over electrical components.

When compressing oxygen it is critical that surfaces in contact with oxygen be kept clean and free from contamination, especially hydrocarbon contamination or any flammable material. This compressor is shipped oxygen clean and must be maintained that way to avoid the hazard of explosion or fire.

Safety warnings are provided in a variety of forms, including:
Safety Labels-located on the equipment
Safety Messages- provided in this manual and proceeded by a safety alert label, DANGER, WARNING, CAUTION, and NOTE.

DANGER You will likely be killed or seriously hurt if you don't follow instructions, and equipment damage is certain.

WARNING You may be killed or seriously hurt if you don't follow instructions, and equipment damage is certain.

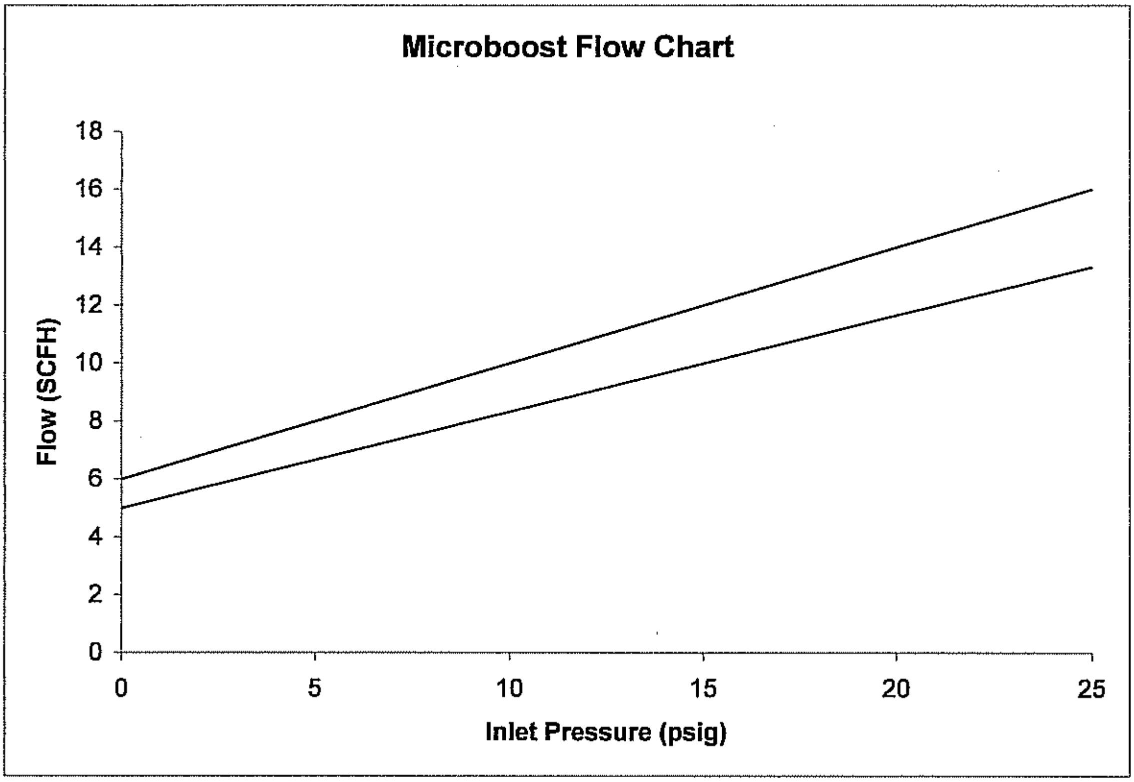
CAUTION You can be hurt if you don't follow instructions, and equipment damage is likely.

NOTE Highlights a certain operation, maintenance condition, or statement, which is useful but not associated with a known hazard, as indicated by a warning or caution.

CONTENTS

PERFORMANCE

The Microboost Compressor is designed to take oxygen at 0-25 psig and compress it to 2200 psig. The discharge flow rate varies with inlet pressure according to the chart below:



Top line 60 Hz flow
Bottom line 50 Hz flow

Inlet Pressure Range	0-25 psig
Discharge Pressure Range	0-2200 psig

This compressor is designed to compress clean, dry, oxygen or nitrogen. For other gasses contact Rix Industries.

DANGER

Keep away from live circuits. Do not attempt to replace components or make adjustments unless the power to the compressor has been disconnected and all pressure relieved.

DANGER

Never operate with safety devices removed, modified, or disabled. This includes guards for moving objects, protection from high temperatures surfaces, pressure relief valves, or covers over electrical components.

WARNING

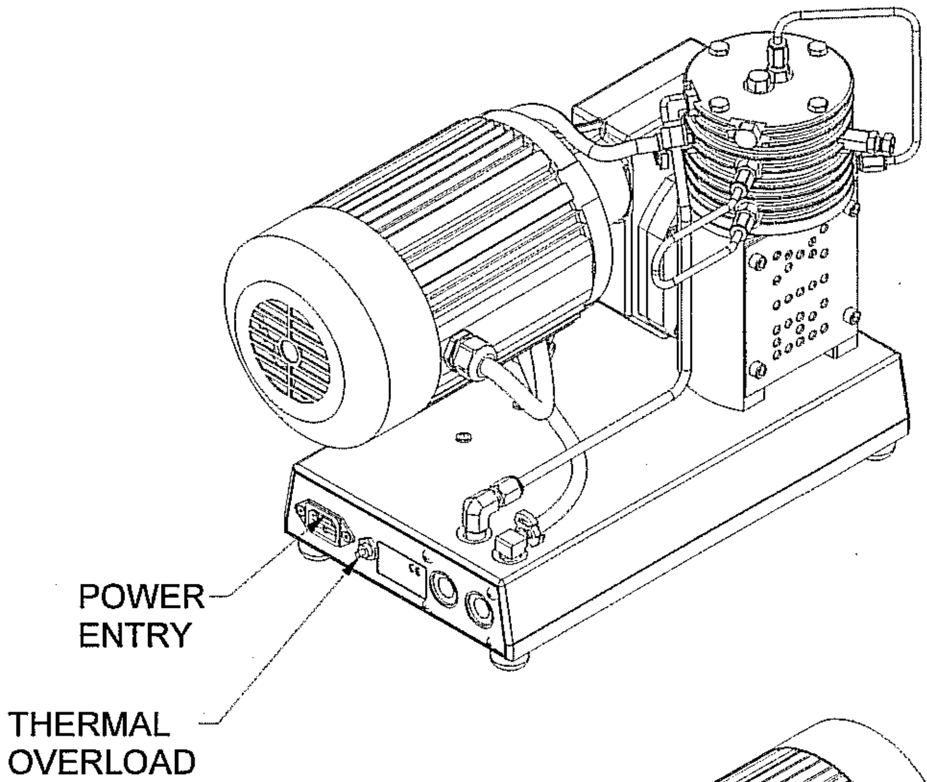
Surfaces on the motor and compressor can become hot and may cause pain or discomfort when touched. Allow the equipment to cool before handling it.

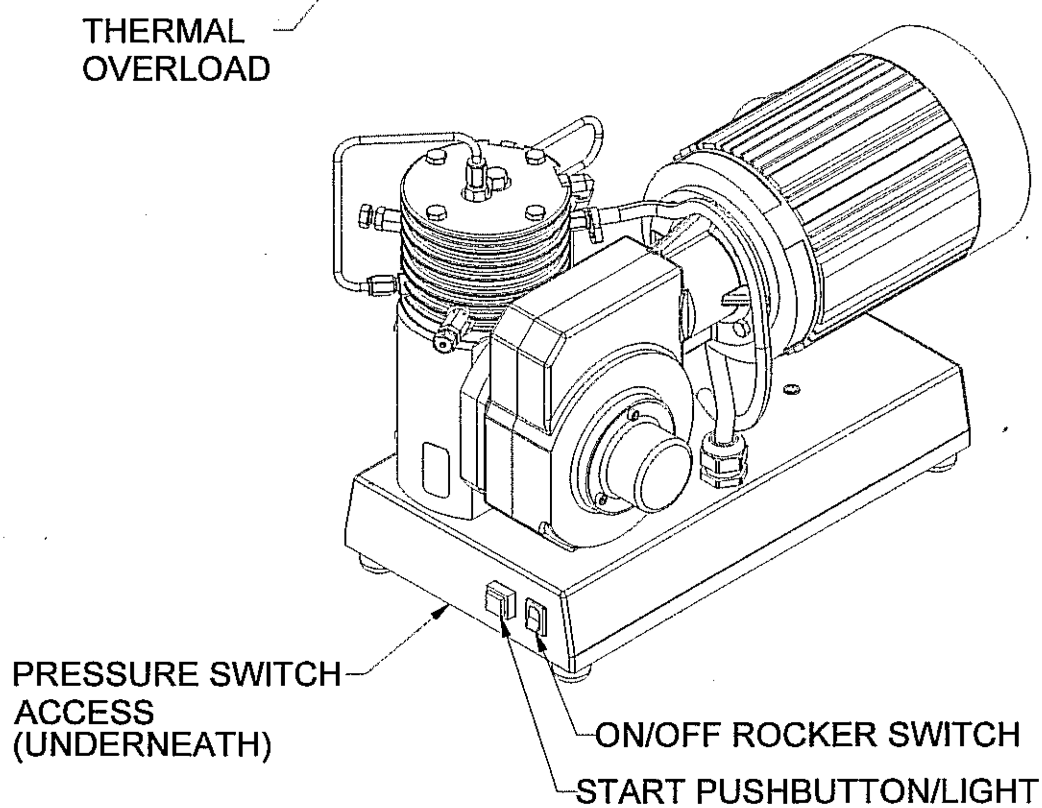
DANGER

To prevent **FIRE, SERIOUS INJURY, and/or DEATH,** it is the User's responsibility to ensure that all parts used in the compression assembly and gas plumbing of this Rix Oxygen compressor and any other portions of the gas stream that may be exposed during the installation of new or replacement parts are cleaned for Oxygen Service prior to installation.
Any work to be done on the compressor where the gas stream may be exposed must be done in accordance with **safe Oxygen Equipment handling procedures.**
No attempt should be made to work on the machine without full knowledge of Oxygen handling equipment handling and the potential hazards of contamination.
Factory oxygen cleaned parts are denoted by an "X" prefix at the beginning of the part number. It is the User's responsibility to maintain the cleanliness of factory cleaned parts and any other existing portions of the gas stream that may be exposed during the initial installation, start-up, or during installation of replacement parts.

Rix Industries recommends the customer establish a procedure for working with oxygen machinery. Refer to Compressed Gas Association, Inc. publication number CGA G-4.1, Cleaning Equipment for Oxygen Service.

CONTROLS AND FEATURES





Power Entry Module- The Microboost is connected to a source of power using a power cord connected to the Power Entry Module (conforming to IEC-320-C13). A power cord suitable for the intended voltage, 115 VAC or 230 VAC, at 10 amps should be used to connect the Microboost to the source of power.

Overload- The pushbutton reset overload is provided to protect the equipment if the motor current draw exceeds 10 amps. A separate automatic reset thermal switch is located inside the motor to protect the motor from overheating.

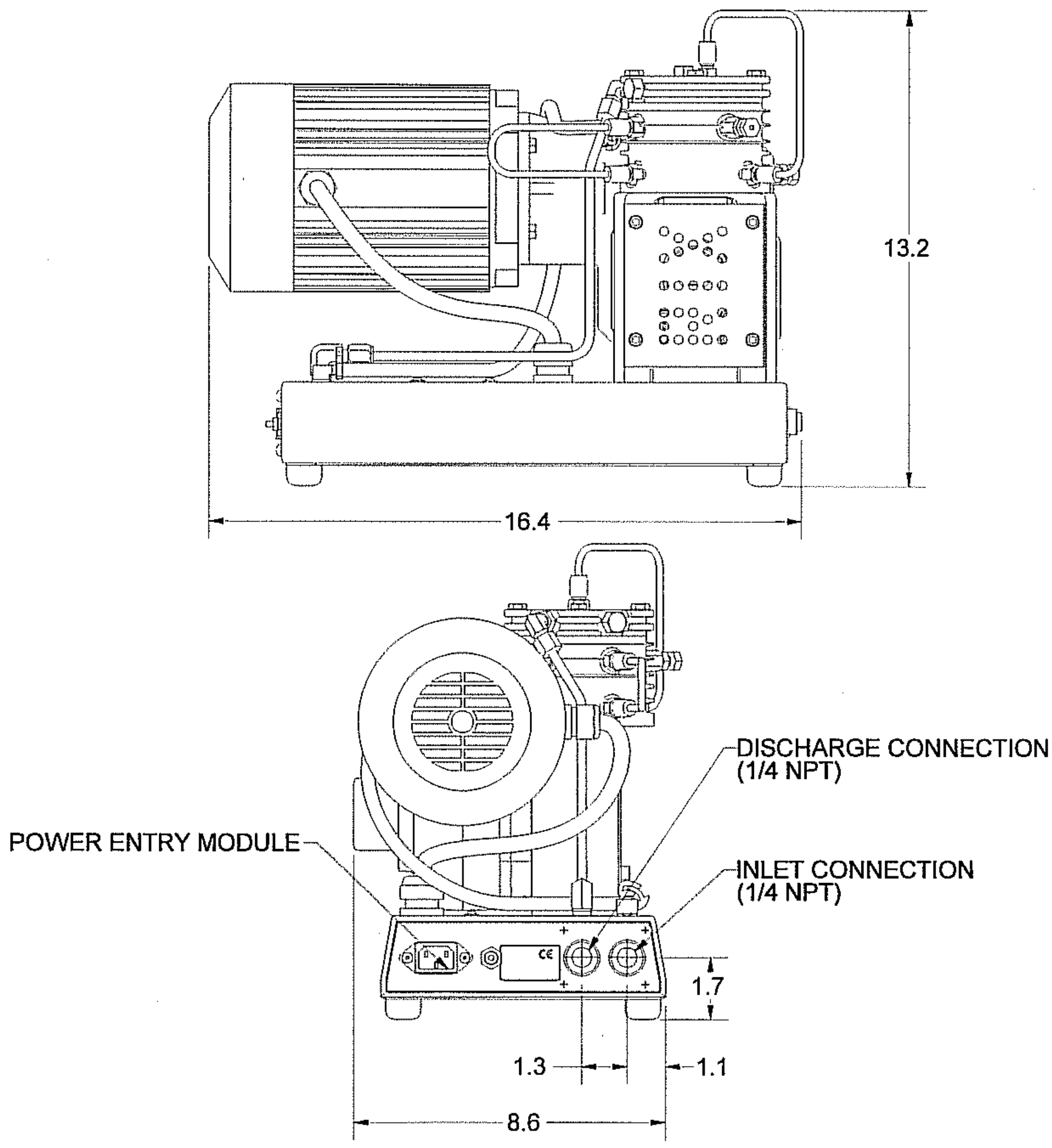
Power On/Off Rocker Switch- The rocker switch is used to turn power on to the Microboost control system. This switch is also used to stop the unit manually when it is running.

Start Pushbutton- The momentary lighted pushbutton is provided for starting the compressor. With the unit plugged ~~into a source~~ of electric power and the On/Off rocker switch in the On position the Start Pushbutton can be pressed to start the compressor motor. The compressor runs until the pressure switch signals it to stop or until the On/Off rocker switch is switched Off.

Pressure Switch- The pressure switch is provided to automatically stop the compressor when the set pressure is reached. Th~~is is usually~~ factory set at 2200 psig. The switch is located inside the ~~Microboost base~~ and is accessible for adjusting through a rectangular opening provided in the underside cover.

Relief Valves- Relief valves are provided for all compression stages. The first stage (set at 35~~0 psig~~) and second sta~~ge (set at 1200 psig)~~ relief valves are located on the outside of the compressor as shown. The third stage relief valve (set at 2400 psig) is ~~located inside the~~ compressor base. These prevent pressures from rising to levels that might cause damage.

INSTALLATION



The Microboost is a free standing package weighing 61 lbs and is meant to be located in open air on a table, shelf, or on the floor. It may also be mounted inside a frame or cabinet as long as sufficient air circulation is provided to prevent overheating. Locate the compressor in an area with good ventilation. An ambient temperature of 90° F or less is preferable. Circulating air across the compressor with an external fan will make it operate better and last longer.

Rix recommends installing a flow check valve after the Microboost discharge to prevent reverse flow when the compressor is off.

Pressure gauges should be installed at the suction and discharge to help in monitoring performance and for troubleshooting.

Plug into a source of power that is protected for 15 amps (115 V) or 10 amps (230 V).

Connect the compressor inlet to a source of clean, dry gas regulated not to exceed 25 psig. Inlet filtration to 2 micron max particle size is recommended. Particle contamination can cause failure.

Connect the compressor discharge to a high pressure cylinder or manifold designed to handle pressures at 2300 psig. A discharge filter of at least 5 micron is recommended to remove seal wear (Teflon) particles. The customer is responsible for designing and adequately protecting the plumbing and equipment he attaches to the Microboost.

CAUTION

Exposed surfaces of the operating motor and compressor can reach 180° F and may cause pain or discomfort if touched. Locate the unit in a safe location where it is protected from human contact.

OPERATION

Check that power is connected to the Microboost.

Check that the compressor suction is connected to a source of clean, dry oxygen or nitrogen gas.

Check that the compressor discharge is connected to a fill system suitable for 2300 psig and that there are no restrictions in the line.

Check that the compressor discharge is relieved of any pressure build-up.

Caution

Do not attempt to start the compressor against discharge pressure. Vent all gas pressure at the compressor discharge prior to starting. If the compressor stalls it is probably because there is residual pressure in the system.

Push the **Power On** rocker switch to the ON position.

Push the **Start** pushbutton, the compressor should come on. Verify that the compressor comes on and the **Start** pushbutton light is illuminated.

Periodically monitor the compressor for proper operation. Observe that there are no leaks or unusual noises. Make sure there is adequate air circulation around the compressor and that the location temperature where the compressor is operating does not exceed 110° F.

Compressor Shutdown
Press the On/Off rocker switch to the OFF position.

Oxygen compression equipment has very special requirements because of the hazards of explosion and fire associated with compressed oxygen. Rix recommends that only trained and qualified personnel work on this equipment. Rix recommends returning the compressor to Rix or to an approved Rix service center when repairs are to be made.

Simple operations such as repairing leaks or replacing valves or relief valves may be done locally by competent mechanics trained in working on oxygen equipment. Care must be taken when handling these parts so that surfaces in contact with oxygen do not become contaminated.

Changing Suction and Discharge Valves (first and second stages)

The compression valves are designed into the tube fittings for the first and second stages suction and discharge. These valves are not designed to be serviceable except by the factory. To replace a valve, remove the fitting nut and tube line and then remove the valve. When reinstalling a valve make sure that the O-ring is in place and is lightly lubricated with oxygen compatible grease such as Krytox®.

Valves are marked with an 'S' for suction and a 'D' for discharge. Make sure the proper valve is used when reinstalling. Do not interchange suction and discharge valves. Reinstall the tube line and tighten the nut as necessary to eliminate leakage. Use a soap type leak test fluid to check for leaks while the compressor is running. Tighten just enough to eliminate all leakage.

Caution

Do not over-tighten as this may damage the sealing surfaces making it more difficult to attain a leak-free joint.

SERVICING

Changing Suction Valve (third stage)
This suction valve is similar to the first and second stage suction valve but is marked "3S". It should not be interchanged with any other stage valve, but otherwise may be serviced in the same way as the suction valves for the first and second stages.

Changing Discharge Valve (third stage)
The discharge valve is located under the hex plug on top of the third stage head. It is critically important to keep the internal parts from becoming contaminated and this valve should be serviced by personnel trained in handling oxygen systems. Lightly lubricate the small O-ring on the tip of the poppet with an oxygen compatible lubricant such as Krytox®.

Changing Relief Valves
The relief valves are not meant to be serviced except by the factory. If it becomes necessary they may be replaced with new valves using care so that the surfaces in contact with oxygen do not become contaminated. The first and second stage relief valves are located on the side of the compressor. The third stage or final relief valve is located inside the base of the compressor.

Setting The Pressure Switch
A pressure switch is located inside the base of the compressor and is factory set at 2200 psig. It is important that the set point never exceeds this pressure. If it becomes necessary to reset this switch it is accessible through a square shaped cutout in the plate covering the underside of the base. Push the sleeve on the body of the pressure switch back to expose the pressure adjustment mechanism. Insert a flat bladed tool such as a screwdriver in the slot and rotate the adjustment mechanism clockwise to increase pressure and counterclockwise to decrease it.

Circuit breaker in Microboost base trips
Likely causes:
1. A short circuit in the motor or electrical wiring.
2. A bearing is failing in the drive system.
3. A problem internal to the compressor or gearbox has increased the motor load.

Thermal switch in motor trips (note: this will reset automatically)
Likely causes:
1. Inadequate air circulation where the compressor is operating.
2. Motor current draw is high (see overload causes listed above).

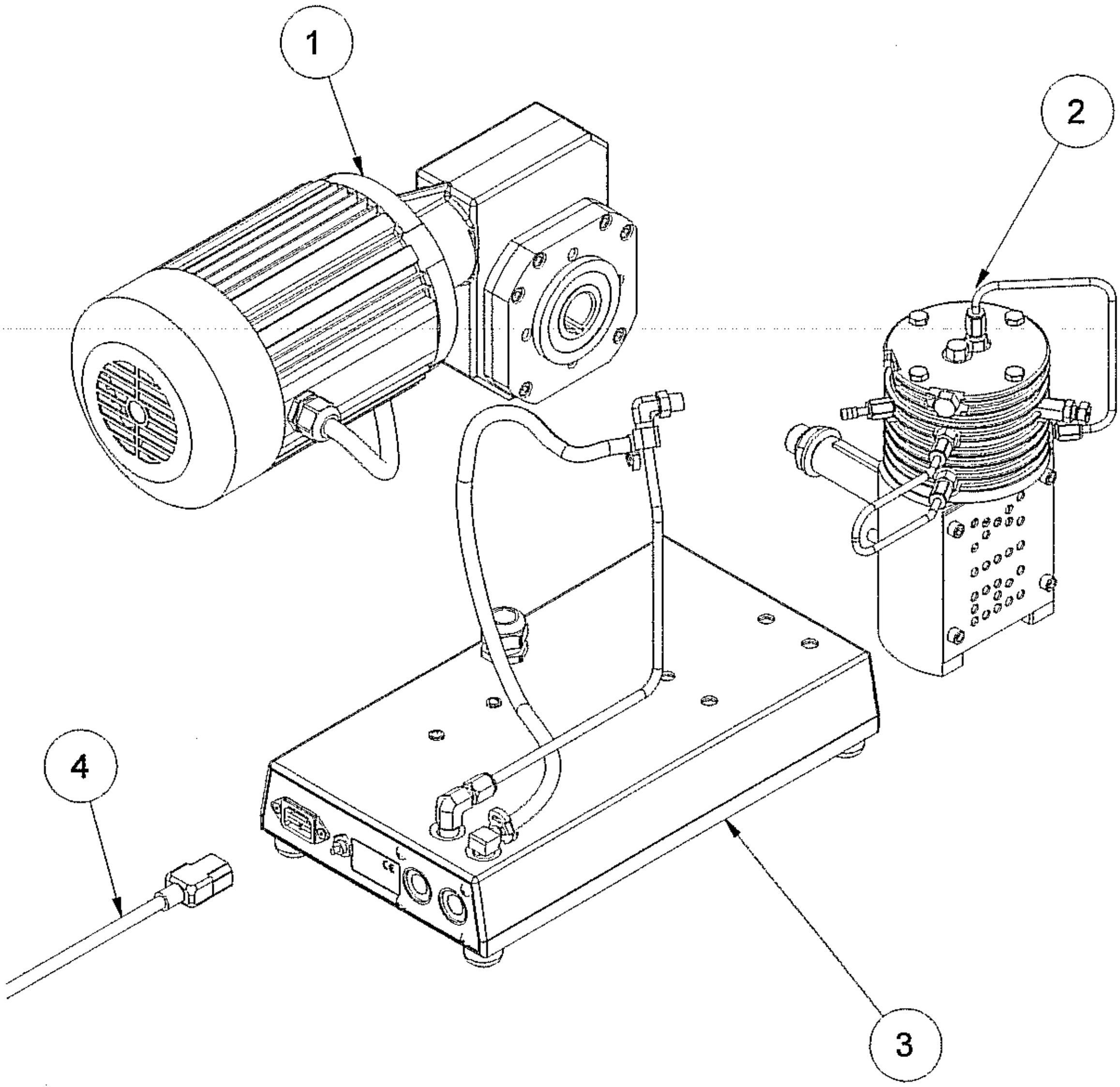
Relief valves leaks or relieves
Likely causes:
1. A valve problem (either suction or discharge) in the next higher stage of compression.
2. A faulty relief valve (damaged seat or maladjustment).

Low flow
Likely causes:
1. A leak in a tube or pipe fitting on the compressor.
2. A leaking relief valve.
3. Worn piston seals in the compressor.

Compressor stalls
Likely causes:
1. Mechanical failure such as a bearing seizure.

Compressor will not start
Likely causes:
1. The compressor pressure is above the pressure switch setting.
2. The motor has overheated and tripped the thermal switch.
3. The circuit breaker tripped.

PARTS BREAKDOWN



Compressor Assembly Major Components

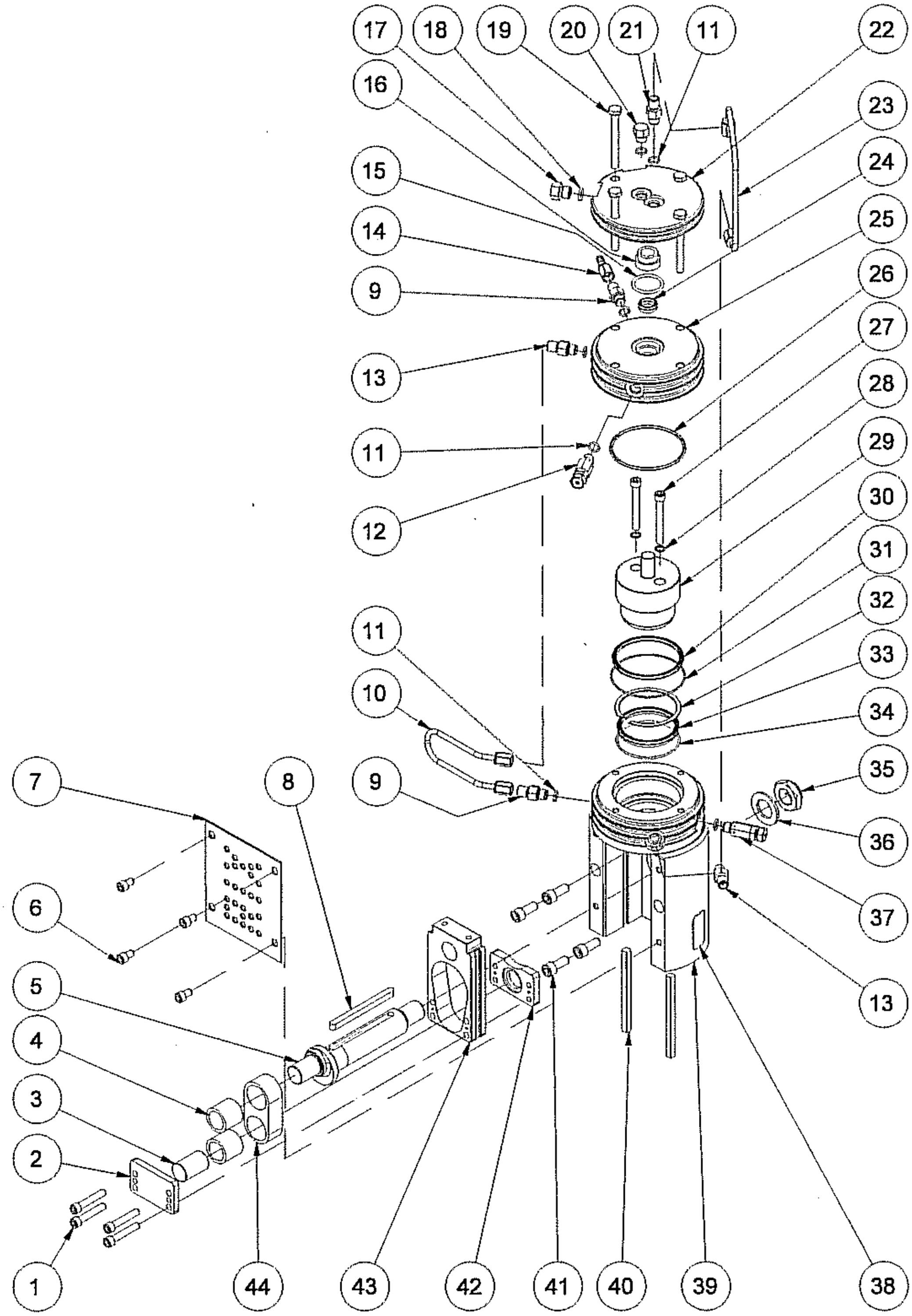
MICROBOOST Model MB-D-115
115 V, 50/60 Hz

ITEM	QTY	PART NUMBER	DESCRIPTION	
1	1	107-7309	MOTOR/GEARBOX	
2	1	G100-MB-B	COMPRESSOR	(see separate parts list, page 17)
3	1	G200-MB-115-B	BASE	(see separate parts list, page 19)
4	1	138-5777	POWER CORD	

MICROBOOST Model MB-D-230
230 V, 50/60 Hz

ITEM	QTY	PART NUMBER	DESCRIPTION	
1	1	107-7309	MOTOR/GEARBOX	
2	1	G100-MB-B	COMPRESSOR	(see separate parts list, page 17)
3	1	G200-MB-230-B	BASE	(see separate parts list, page 19)
4	1	N/A	POWER CORD	(provided by customer)

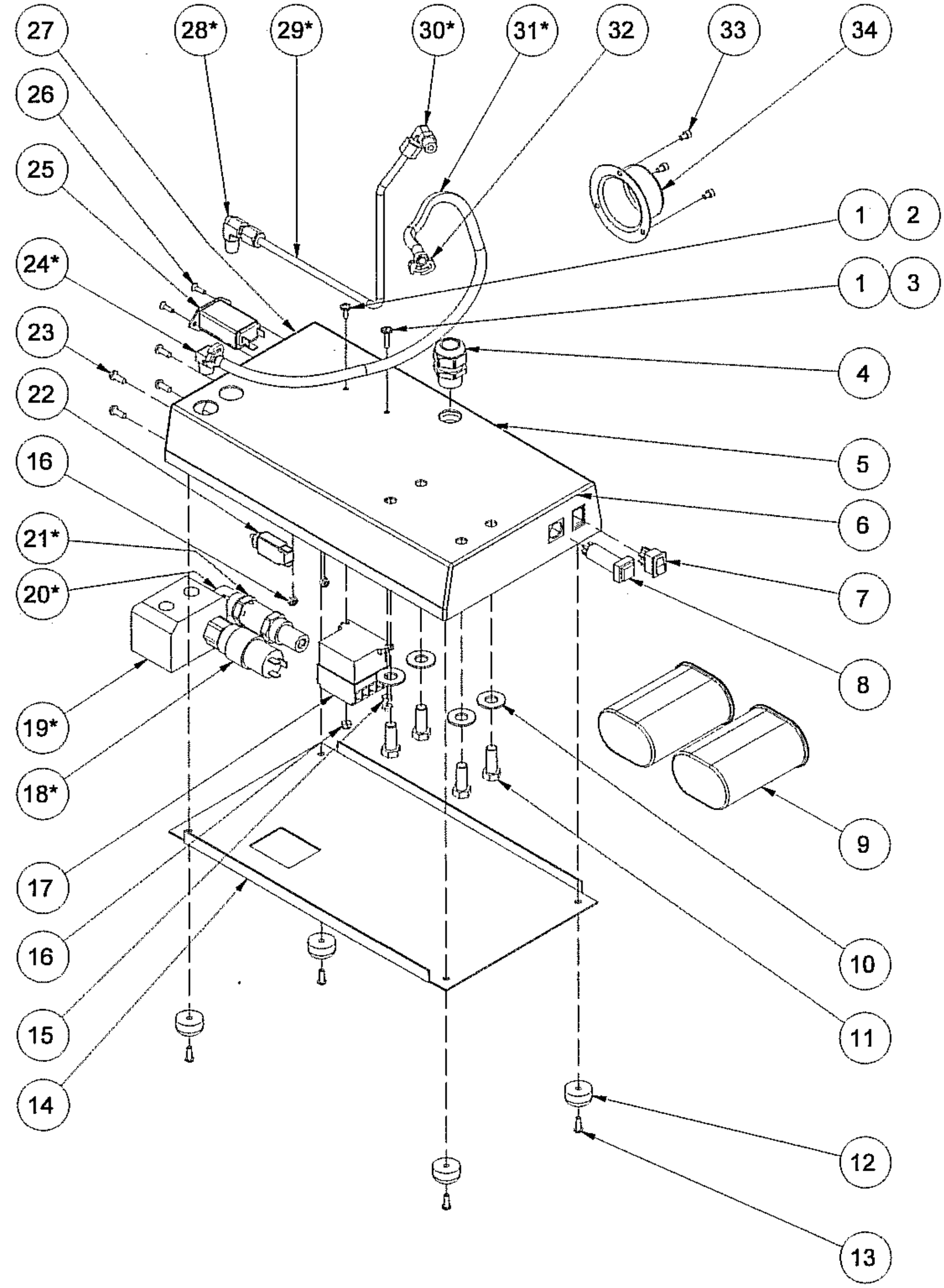
PARTS BREAKDOWN



PARTS BREAKDOWN

Item	Part Number	Qty	Description	Item	Part Number	Qty	Description
1	32-A9020	4	Bolt, Soc Hd, 1/4-28, 1 3/8L	23	XA455-B8447	1	Tube Line Assy, 2nd Stg
2	6-A8781	1	Front Plate	24	XA125-A9503	1	Seal, 3rd Stage
3	27-A8784	1	Shaft	25	X1-C2750-1	1	Cylinder Block, 1st Stage
4	181-5704	REF	Needle Bearing (in item 44)	26	X123-146-5	1	O-ring
5	5-C2974	1	Crankshaft	27	X32-1151	2	Bolt, Soc Hd, 1/4-20, 2L
6	32-6040	4	Bolt, Hex Hd	28	X20-A8486	2	Washer, Copper
7	38-A8941	1	Plate, Cover	29	X8-C2751	1	Piston, Compression
8	91-A9262	1	Key	30	XA125-A9501	1	Seal, 1st Stage
9	XAS15-A8450	2	Suction Valve, 1st, 2nd	31	X123-038-5	1	O-ring, 1st Stage
10	XA455-B7146	1	Tube Line assembly, 1st	32	X31-1003	1	Snap Ring
11	X123-903-5	REF	O-ring	33	XA125-A9502	1	Seal 2nd Stage
12	XA515-A8448	1	Relief Valve, 1st Stage	34	X123-035-5	1	O-ring, 2nd Stage
13	XAD15-A8451	2	Discharge Valve, 1st, 2nd	35	53-70	1	Nut, Nylok, 3/4-16
14	XA54-A8595	1	Fitting Assy, Inlet	36	20-4862	1	Washer, AN, 3/4, Steel
15	X123-120-5	1	O-ring, 3rd Stg Cylinder	37	XA515-A8449	1	Relief Valve, 2nd Stage
16	X63-B7013	1	Cylinder Liner, 3rd Stg	38	62-A8993	1	Label, Nameplate
17	X54P-4P50NSS	1	Plug, 7/16 ST THD	39	A100-D3316	1	Crankcase
18	X123-904-5	1	O-ring,	40	58-A8484	REF	Guide (part of item 39)
19	32-1175	4	Bolt, Hex Hd	41	32-4038	4	Bolt, Soc Hd, 5/16-18, 3/4L
20	XAD15-A8576	1	Discharge Valve, 3rd Stage	42	6-A8780	1	Back Plate
21	XAS15-A8594	1	Suction Valve, 3rd Stage	43	52-A8779	1	Yoke
22	X2-B7112	1	Head, 3rd Stage	44	A7-A9290	1	Connecting Rod Assy

PARTS BREAKDOWN



APPLICABILITY [CD]

Base Assembly

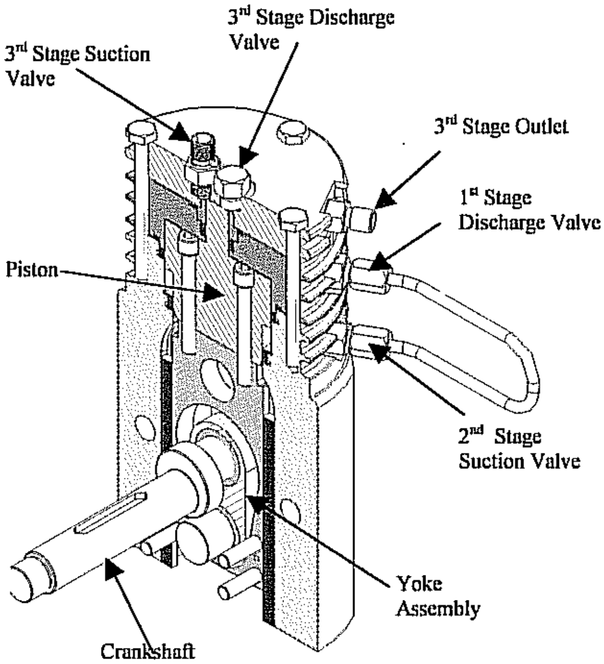
Item	Part Number	Qty	Description
1	20-4028	2	Washer, #6, Zinc Pl.
2	32-4169	1	Bolt, Round Head, #6-32, 1/2L, Zinc Pl.
3	32-6667	1	Bolt, Round Head, #6-32, 3/4L, Zinc Pl.
4	138-6148	1	Cord Grip Fitting
5	70-D3319	1	Base Plate
6	62-A8994	1	Label, Front
7	76-5470	1	Rocker Switch
8	(see below)	1	Pushbutton, Lighted
9	167-6955	2	Capacitor
10	20-4460	4	Washer, 3/8, Zinc Pl.
11	32-1046	4	Bolt, Hex Head,3/8-16, 1L
12	39-5751	4	Rubber Bumper
13	32-4555	4	Bolt, Round Head, #8-32, 1/2L, Zinc Pl.
14	38-C2837	1	Coverplate, Base
15	53-1035	2	Nut, Hex, #6-32, Zinc Pl.
16	53-30393	3	Nut, Nylock, #6-32, Zinc Pl.
17	(see below)	1	Relay, 115V
18	X76-5659	1	Pressure Switch
19	X10-B7562	1	Manifold Block
20	X54P-1/4CDS	1	Street Elbow, 1/4 T
21	X515-61	1	Relief Valve, 2400 psi
22	163-7586	1	Circuit Breaker
23	32-4164	4	Bolt, Round Head, #10-24, 1/2L, Zinc Pl.
24	X54P-229-64B	1	Hose Barb Elbow
25	138-5707	1	Electrical Connector
26	32-1184	2	Bolt, Flat Head, #6-32, 1/2L, SS
27	62-A9334	1	Label, Back
28	X54P-44CBUSS	1	Elbow, Male, 1/4 P
29	X455-B8446	1	Tube Line, Discharge
31	X54P-4CBUSS	1	Elbow, Male, 1/4 T
31	X6-4340	1	Hose, Inlet (20" L)
32	79-6778	2	Hose Clamp
33	32-7804	3	Bolt, Socket Head, #8-32, 1/4L, Bl. Oxide
34	156-A9328	1	Shaft Guard
35	61-A9289	1	Wire Kit (not shown)

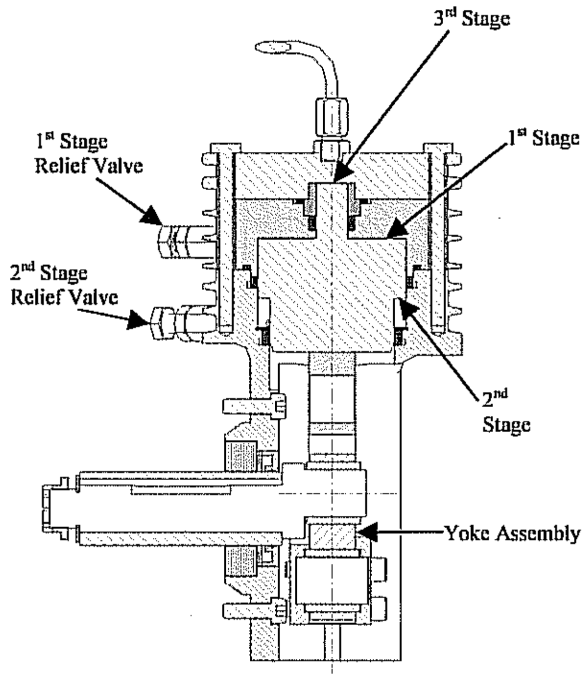
Accessory Group 115 Volt

Item	Part Number	Qty	Description
8	76-5657	1	Pushbutton, Lighted, 115 V
16	76-5655	1	Relay, 115V

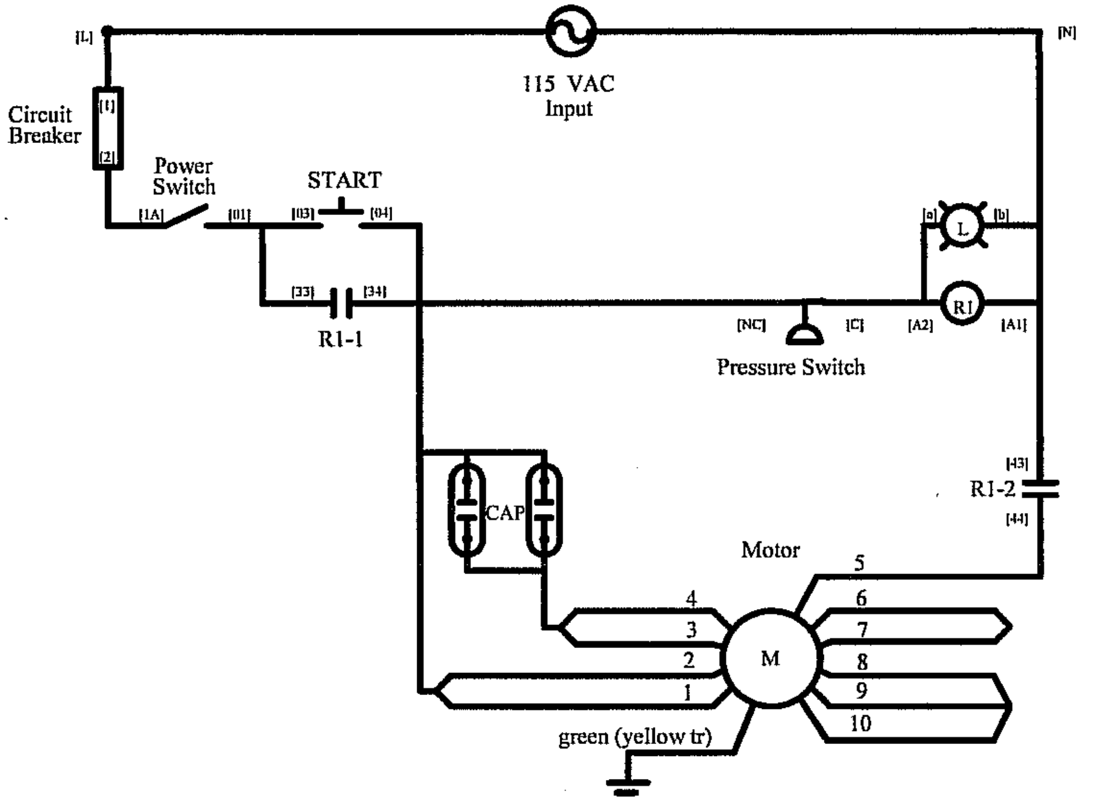
Accessory Group 230 Volt

Item	Part Number	Qty	Description
8	76-5658	1	Pushbutton, Lighted, 230 V
16	76-5656	1	Relay, 230V





Compression occurs in three stages, all configured on a single stepped piston. The first stage is 2.375 inches in diameter and compresses on the upstroke discharging at a pressure about 250 psig. The second stage is located directly under the first stage and has a diameter of 2.00 inches compressing on the downstroke at a pressure of about 900 psig. The third stage is .500 inches in diameter located above the first stage and compresses on the upstroke to the final discharge pressure of 2,200 psig. Each stage is provided with an inlet valve and a discharge valve. These one-way poppet valves control the direction of gas flow from stage to stage. Relief valves are also provided on each stage to prevent overpressurization in the event of a poppet valve failure. The heat generated during compression is removed in the cylinder block, which has a relatively large thermal mass and cooling fins. Peak gas temperatures are held under 250 °F. A discharge pressure switch shuts the compressor down when the pressure reaches the switch set pressure, usually 2,200 psi.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Breaker
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[2]
Power
Switch
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[01]
[03]
[04]
[a]
[b]
L
[33]
[34]
R1-1
[NC]
[C]
[A2]
[A1]
R1
Pressure Switch
[43]
R1-2
[44]
CAP
Motor
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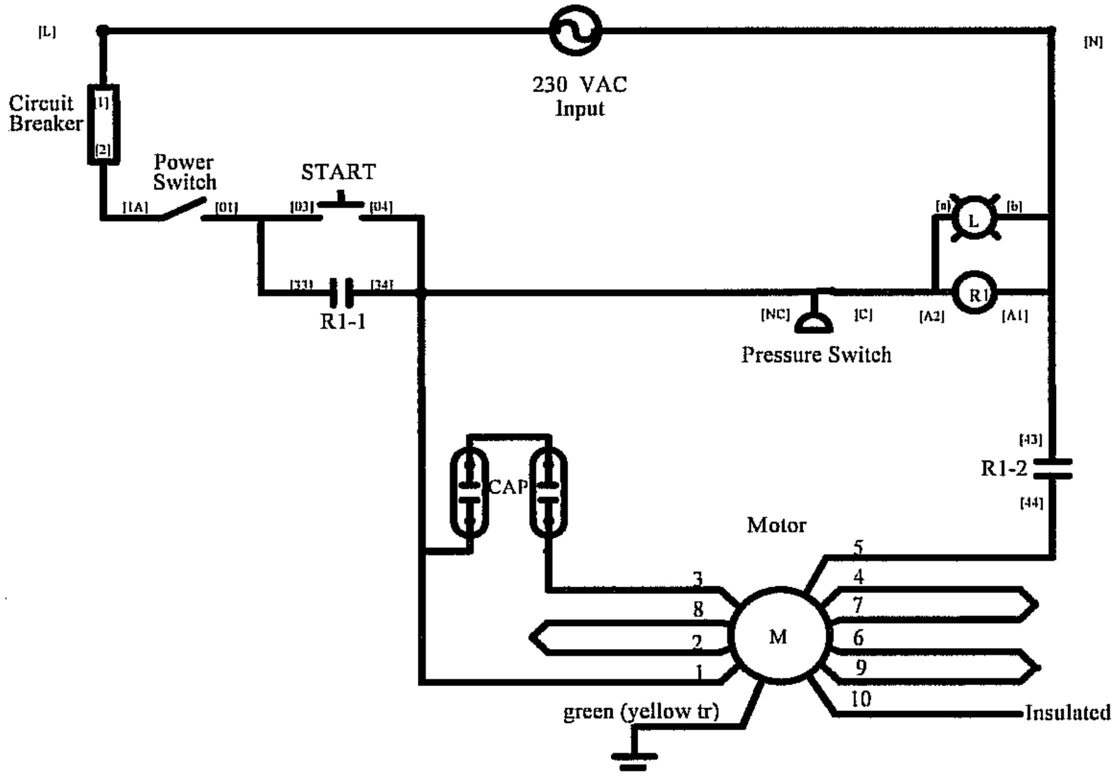
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R1-1
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[C]
[A2]
[A1]
R1
Pressure Switch
[43]
R1-2
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Insulated
green (yellow tr)

OPERATING INSTRUCTIONS and PARTS LIST for

RIX GAS COMPRESSOR

MODEL NO. 2PS2B-.85

(FOR SPECIFIC MODEL NUMBER INFORMATION, SEE TABLE ON FOLLOWING PAGE.)

APPLICABLE TO S/N# 10369 AND ABOVE

GENERIC MANUAL FOR
2PS2B-.85 COMPRESSOR

This is a generic manual for all of the RIX Model 2PS2B-.85 compressors. The various compressors are summarized in the table below.

SPECIFIC PACKAGE INFORMATION FOR THE
RIX INDUSTRIES' 2PS2B-.85 COMPRESSOR

FLOW (SCFH)	HP	SPEED (RPM)	SUCTION PRESSURE PSIG	VOLTAGE FREQUENCY (HZ)	MODEL * NUMBER
30 to 60	1-1/2	190	30 to 70	120 V - 60 HZ 240 V - 50 HZ	2PS2B-.85-L 2PS2B-.85-L50
60 to 120	1-1/2	390	30 to 70	120 V - 60 HZ 240 V - 60 HZ 240 V - 50 HZ	2PS2B-.85-H 2PS2B-.85-HH 2PS2B-.85-H50

Generally speaking the compressors are identical except for differences in the motors, motor starters, sheaves, etc. The parts applicable to each different model are clearly indicated in the parts list.

Overload heaters may vary from compressor to compressor.

Part numbers appropriate to the different options are indicated in the parts list.

* Some compressors may have been invoiced using a different model number. All represented models use the 2PS nomenclature.

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PART I (Continued)

LIST OF CHARTS

LIST OF ILLUSTRATIONS

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PART II

MANUFACTURER'S DRAWING AND TECHNICAL INFORMATION FOR:

SERIAL NUMBER PAGE

This manual is applicable to all

RIX Industries
Model 2PS2B-.85 Oxygen Compressors
bearing one of the following serial numbers:

10369 AND ABOVE

SAFETY SUMMARY

The following is a general safety precaution that is not related to any specific procedure and therefore does not appear elsewhere in this publication. This is a recommended precaution that personnel **must** understand and apply during many phases of operation and maintenance:

> **KEEP AWAY FROM LIVE CIRCUITS.** Operating personnel **must** at all times observe all safety regulations. Do not replace components or make adjustments inside the electrical enclosures with the voltage supply turned on.

The following WARNINGS and CAUTIONS appear in this manual and are repeated here for emphasis.

CAUTION

Do not operate if safety guards are damaged or removed.(Pg. 1-1)

CAUTION

Do not attempt any repair without first cutting off power at the main breaker switch and consulting cleanliness requirements. In automatic mode, the compressor may start at any time.(Pg. 1-1)

CAUTION

Check relief valves for correct operation at regular periods. Do not reset for any pressure other than that stamped on the valve body.(Pg. 1-1)

CAUTION

Do not bypass the pressure switches. This would eliminate safety features and could result in damage to the compressor (Pg. 1-1)

WARNING

Do not touch discharge gas lines from the cylinders. These are hot and can cause serious burns(Pg. 1-1)

WARNING

To prevent FIRE, SERIOUS INJURY, and/or DEATH, it is the User's responsibility to ensure all parts used in the compression assembly, gas plumbing of this RIX Oxygen compressor and any other existing portions of the gas stream that may be exposed during the installation of new or replacement parts are cleaned for Oxygen Service prior to installation.

Any work to be done on the compressor where the gas stream may be exposed must be done in accordance with safe Oxygen Equipment handling procedures.

No attempt should be made to work on the machine without full knowledge of Oxygen equipment handling and the potential hazards of contamination.

Factory Oxygen cleaned parts are denoted by an "X" prefix at the beginning of the part number. It is the User' s responsibility to maintain the cleanliness of factory cleaned parts and any other existing portions of the gas stream that may be exposed during the initial installation, start up, or during installation of replacement parts.

RIX Industries recommends the customer establish a procedure for working with oxygen machinery.

Refer to Compressed Gas Association, Inc. publication number CGA G-4.1, Cleaning Equipment for Oxygen Service.

WARNING

Before performing any of the scheduled maintenance tasks in Chapter 4, the compressor should be shut off and tagged **Out of Service**. This is to prevent an inadvertent start which could cause injury to personnel or damage to the equipment. After completing the maintenance action, the compressor should be restored to full operation and the tags removed.(Pg. 4-1)

WARNING

Discharge pipes, fittings, and port areas can cause painful burns if touched. Always exercise caution around the compressor when it is running or has recently been run.(Pg. 2-1, 2-2)

WARNING

The compressor may start at any time when in automatic mode. Before attempting any repairs or adjustments: de-energize the machine by pushing the **STOP** button, disconnect power to the system (to avoid shock hazard), vent pressure by opening hand valves down stream and give the discharge piping time to cool down. Discharge lines are hot and can cause burns.(Pg. 4-1, 6-1)

WARNING

Hot discharge lines can produce painful burns. Be careful to avoid making contact with hot pipes while performing tests and repairs.(Pg. 4-3)

RIX INDUSTRIES'

COMPRESSOR WARRANTY

RIX Industries warrants all 2PS2B-.85 Compressors as follows:

Twelve (12) months of operation or eighteen (18) months from date of shipment or 2,000 hours of operation, whichever occurs first, covering materials and workmanship. Warranty does not cover normal wear or consequential damages.

RIX certifies that all oxygen compressors have been test run on pure oxygen gas at desired pressures and flow rates and that the compressors are oxygen clean at shipment. Purchaser takes full responsibility for all components added to the compressor package that could contaminate the gas stream causing a failure

All warranty work conducted at RIX facilities at Sparks, Nevada, USA or Benicia, California, USA, at RIX's discretion. All freight and/or transportation charges are to be paid by purchaser.

CHAPTER 1

GENERAL INFORMATION

SAFETY PRECAUTIONS

The following safety precautions apply to the **RIX 2PS2B-.85 Compressor**. Proper attention to safety should be maintained whenever operating or servicing this equipment. A complete listing of safety precautions is given in the Safety Summary on Page iv.

Do not operate if safety guards are damaged or removed.

Do not touch discharge gas lines from the cylinders. These are hot and can cause serious burns.

Do not attempt any repair without first cutting off power at the main breaker switch and consulting cleanliness requirements.

Check relief valves for correct operation at regular periods. Do not reset for any pressure other than that stamped on valve body.

Do not bypass pressure switches. This would eliminate safety features and could result in damage to the compressor.

1-1 INTRODUCTION

1-1.1 PURPOSE. The intent of this manual is to provide information pertinent to the operation, maintenance and installation of the high pressure, oil-less, air cooled compressor, RIX Model 2PS2B-.85.

1-1.2 SCOPE. This publication sets forth requirements and procedures for the operation, maintenance and installation of this subject equipment. It also includes descriptive data and tests necessary to achieve a functional understanding of the compressor operation together with its associated flow and control circuitry.

1-2 EQUIPMENT DESCRIPTION

1-2.1 INTENDED USE. The subject compressor system is designed for use to provide high pressure Oxygen for storage or liquification.

1-2.2 OPERATING CHARACTERISTICS**.** Each compressor produces 2250 psig, 30-120 SCFH oil-less Oxygen at a crankshaft speed of 190-390 RPM with 30-70 psig inlet pressure. Each compressor is a reciprocating, two stage opposed, single acting design powered by a 1-1/2 HP motor through a belt drive.

Table 1-1. Reference Data

Descriptive Data	High pressure, air cooled compressor package, RIX Industries oil-less, reciprocating, two stage Oxygen compressor.
Functional Characteristics	1-1/2 HP motor 30-120 SCFH Oxygen output at 2250 psig pressure with low suction pressure, and high discharge pressure safety shutdown features.
Capabilities & Limitations	Continuous duty, air cooled, non-lubricated. Not suitable for wet or explosive gasses.
Rated Outputs	30-120 SCFH Oxygen at 2250 psig pressure, 190 or 390 RPM, 100˚F Oxygen inlet temperature, 30-70 psig inlet pressure, and dry gas. Designed to operate from 35˚ to 105˚F ambient with up to 100 percent relative humidity, and deliver gas at 130˚F maximum.

Power Required	1-1/2 HP	120V	190 RPM	60 Hz	12 Amps	2PS2B-.85-L
	1-1/2 HP	230V	190 RPM	50 Hz	6 Amps	2PS2B-.85-L50
	1-1/2 HP	120V	390 RPM	60 Hz	19 Amps	2PS2B-.85-H
	1-1/2 HP	230V	390 RPM	60 Hz	10 Amps	2PS2B-.85-HH
	1-1/2 HP	230V	390 RPM	50 Hz	14 Amps	2PS2B-.85-H50

Table 1-2. Equipment, Accessories and Documents Supplied

Item Name or Nomenclature	**Overall Dimension**		**Uncrated Weight & Volume**
Compressor	Length	23 in.	Weight - 150 lbs.
	Width	14 in.	Volume - 5.4 cu. ft.
	Height	29 in.	
Operation, Maintenance & Installation Manual	8.5" x 11"		Weight - 1 lb.

1.3 OXYGEN CLEANLINESS

The **RIX 2PS2B-.85 Oxygen Compressor** is specially designed and built to safely process pure Oxygen Gas without oxidation or combustion. All compressor parts have been thoroughly cleaned and inspected. Assembly is done in a special cleaning facility and clean room environment with extreme care taken to prevent any combustibles from entering the system.

WARNING

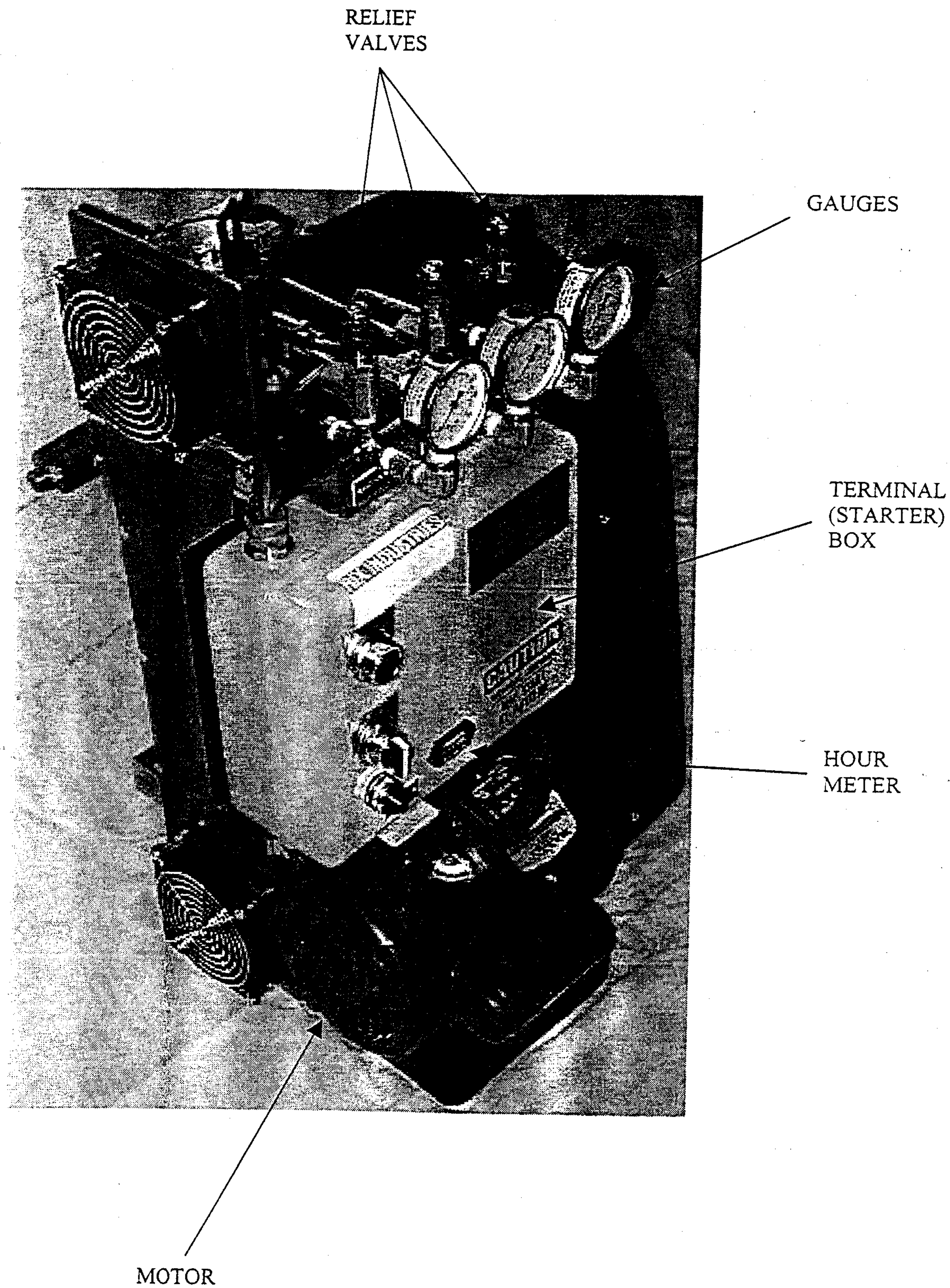
To prevent **FIRE, SERIOUS INJURY, and/or DEATH**, it is the User's responsibility to ensure all parts used in the compression assembly, gas plumbing of this RIX Oxygen compressor and any other existing portions of the gas stream that may be exposed during the installation of new or replacement parts are cleaned for Oxygen Service prior to installation.

Any work to be done on the compressor where the gas stream may be exposed must be done in accordance with **safe Oxygen Equipment handling procedures.**

No attempt should be made to work on the machine without full knowledge of Oxygen equipment handling and the potential hazards of contamination.

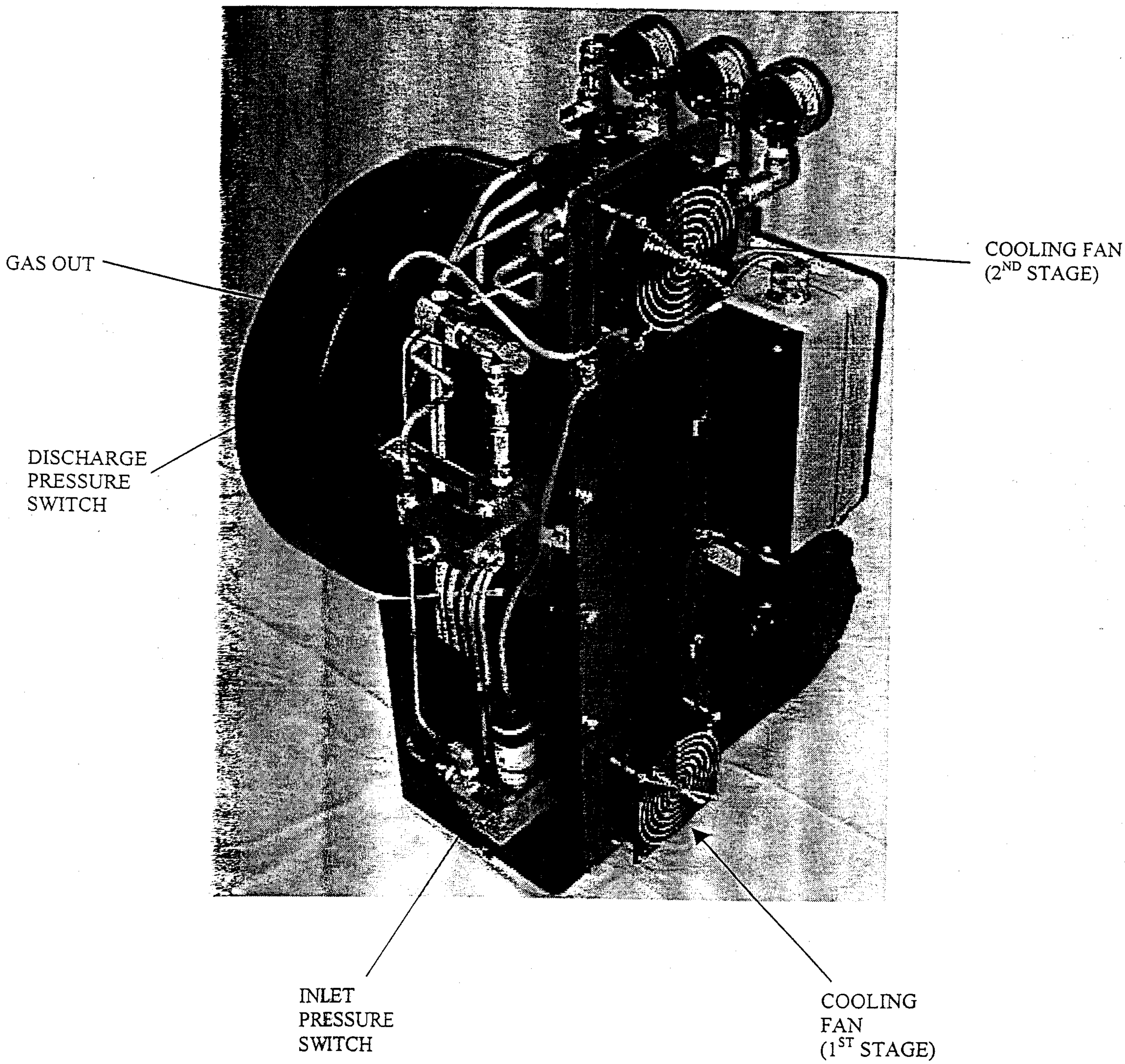
Factory Oxygen cleaned parts are denoted by an "X" prefix at the beginning of the part number. It is the User's responsibility to maintain the cleanliness of factory cleaned parts and any other existing portions of the gas stream that may be exposed during the initial installation, start up, or during installation of replacement parts.

RIX Industries recommends the customer establish a procedure for working with oxygen machinery. Refer to Compressed Gas Association, Inc. publication number CGA G-4.1, Cleaning Equipment for Oxygen Service.



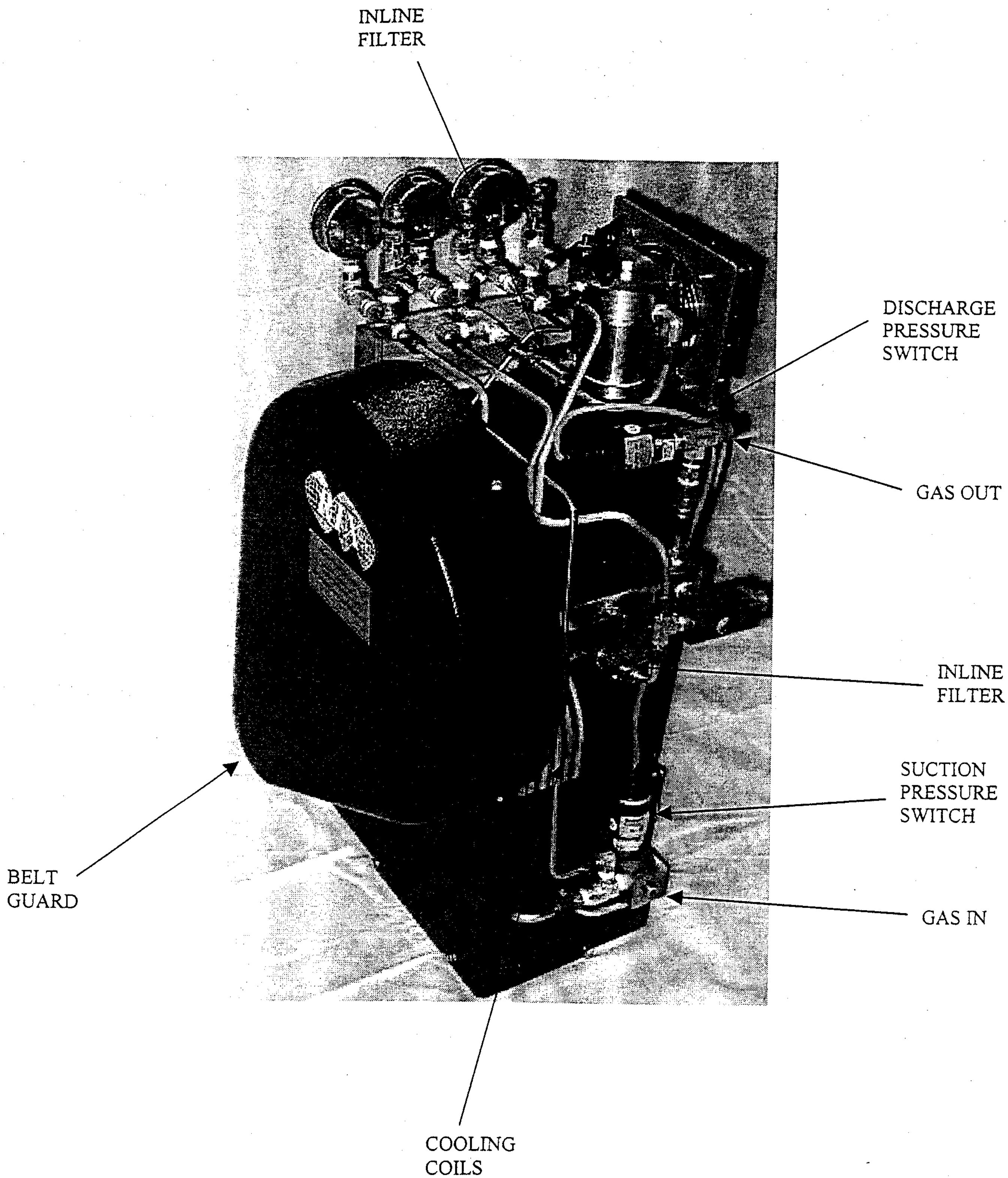
A7780-1 SHEET 1

FIG 1-1
MODEL 2PS2B-.85 OXYGEN BOOSTER



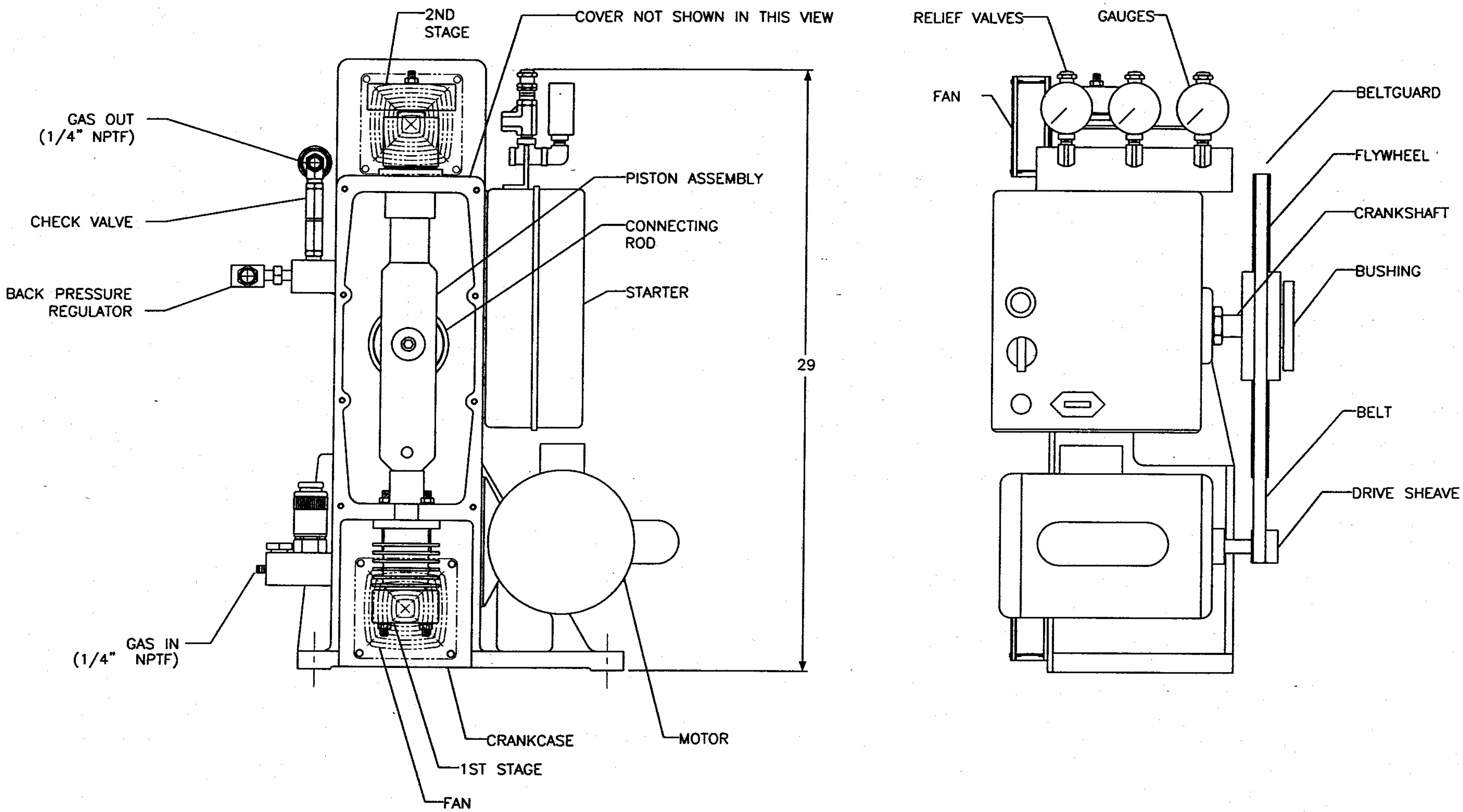
A7780-1 SHEET 2

FIG 1-1A
MODEL 2PS2B-.85 OXYGEN BOOSTER



A7780-1 SHEET 3

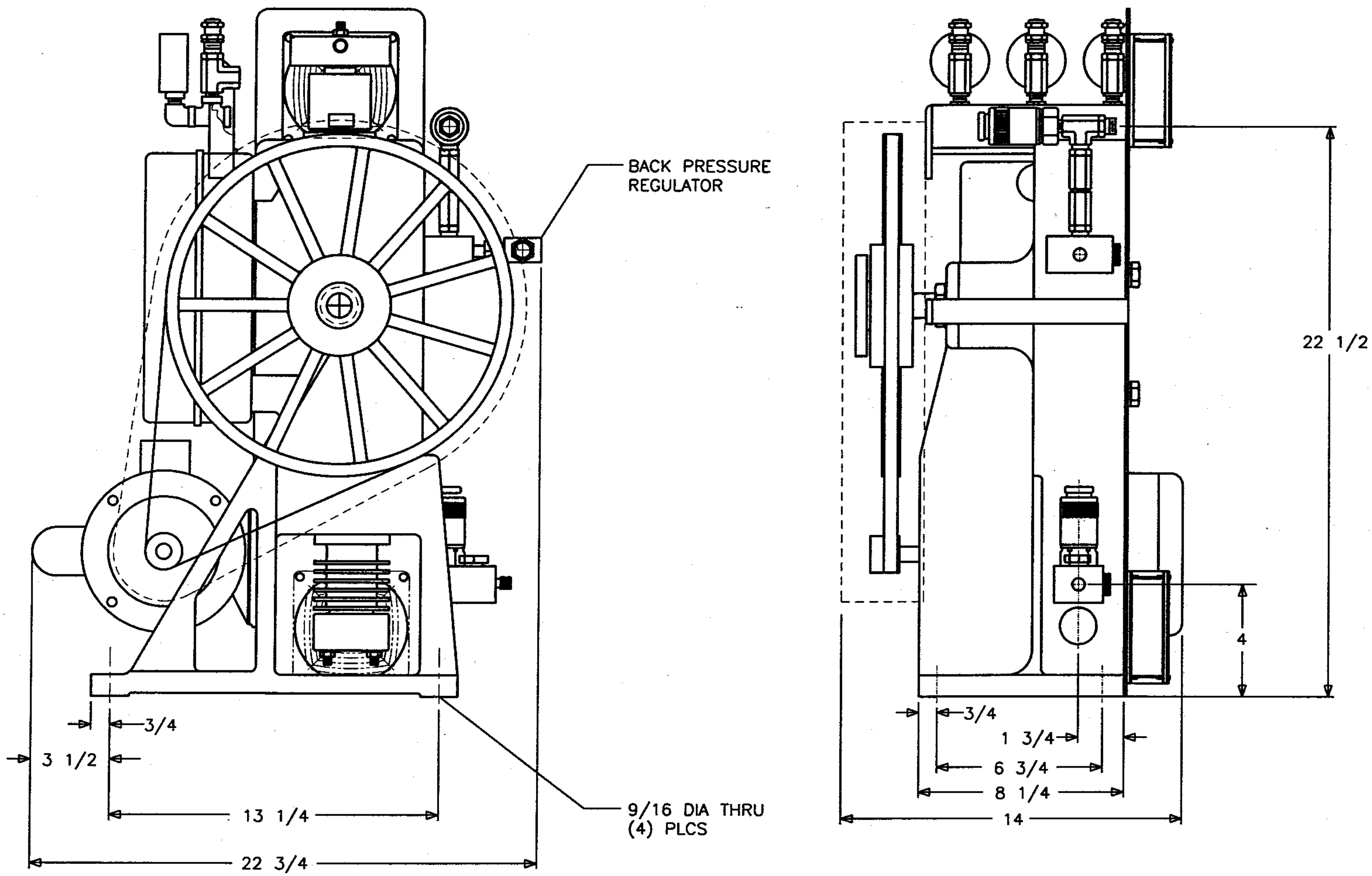
FIG 1-1B
MODEL 2PS2B-.85 OXYGEN BOOSTER



INSTALLATION ARRANGEMENT
2PS2B

B7237-1A Sheet 1 OF 2

FIGURE 1-2



INSTALLATION ARRANGEMENT
2PS2B

FIGURE 1–2A
SHEET 1–8

B7237–1A Sheet 2 OF 2

CHAPTER 2
OPERATION

2-1 INTRODUCTION

2-1.1 GENERAL INFORMATION. Built-In safety features, which automatically shut down the compressor if suction pressure is too low or excessive pressure is reached in the second stage discharge line, are included in the system. The low pressure switch senses the pressure in the suction line. The high pressure switch senses the pressure in the discharge line from the aftercooler. Pressure gauges are utilized to measure suction pressure and first and second stage discharge pressures. The gauges left to right are suction pressure, 1st stage pressure and 2nd stage (or discharge) pressure. See Figure 1-1 and Figure 1-2.

2.2 CONTROLS & INDICATORS

2-2.1 ELECTRIC POWER. The motor controller must be wired to a source of power by a competent electrician in accordance with local and federal codes. Make sure the compressor package is properly grounded. See Electrical Schematic, Figure 3-3.

2-2.2 SAFETY VALVES. Pressure relief valves are provided after each stage. These valves prevent an accidental over-pressurization of the system. The first stage relief valve is set for 700 psig; the second stage is set for 2500 psig. The relief valves are mounted behind their respective gauges. There is an inlet relief valve, set at 75 psig.

WARNING

Discharge pipes, fittings, and port areas can cause painful burns if touched. Always exercise caution around the compressor when it is running or has recently run.

2-2.3 PRESSURE SWITCHES. The compressor will automatically shutdown when the discharge pressure reaches 2250 psig and will restart when it drops (to approximately 1900 psi).

Similarly, when the inlet pressure drops to 30 psig the compressor will stop, and will re-start automatically when it rises again (to approximately 33 psig).

The actuation point of each switch may be adjusted although the re-set dead band, the amount of pressure increase or decrease to reset the switch, is not adjustable.

2-2.4 PRESSURE INDICATORS. Pressure gauges measure the inlet pressure and the first and second stage discharge pressures.

Sensing Point	Normal Pressure Range
Inlet	30-70 Psig
First Stage Discharge	350-600 Psig
Second Stage Discharge	1500-2200 Psig

2-2.5 BACK PRESSURE VALVE. This valve is factory set at 1500 psi and needs no adjustment. If necessary the valve can be adjusted by loosening the jam nut and turning the set screw in or out with a hex wrench. The valve is located in the discharge piping prior to the check valve. See Figure 1-1a.

2-3 OPERATING PROCEDURES

2-3.1 GENERAL. The operator should read and understand the procedures outlined in Table 2-1 through Table 2-4 prior to starting the compressor. The following tables outline the steps necessary for starting and stopping the compressor under both normal and emergency conditions.

WARNING

Discharge pipes, fittings, and port areas can cause painful burns if touched. Always exercise caution around the compressor when it is running or has recently run.

Table 2-1. Operating Procedures - Operator Start

Explanation of Operation	Sequences of Steps Taken to Place
Initial Safety Requirements	Remove beltguard and rotate the compressor flywheel by hand. Visually check to see that there are no obstructions in the way of moving parts or other indications of disorder or disrepair. Replace beltguard.
Connection of Accessory Equipment Necessary for Operations	Permanent installations should have all necessary electrical wiring and piping in place. Piping must be installed in accordance with safe oxygen handling procedures.
Instructions for Obtaining or Confirming Critical Inputs.	Confirm that electrical power is available for running the compressor.
Control Settings and Adjustment Necessary prior to Turn-on	As necessary (customer interfacing). Inlet pressure adjusted and set (minimum 30 psig, maximum 70 psig).
Milestones	Verify inlet pressure on inlet gauge.
Visual or Audible Observations	A slight hissing may occur as inlet gas escapes past the compressor rings.
Operator Checks and Adjustments	Check for leaks.
Operator's Maintenance Actions and Schedules	Service compressor according to guidelines set forth in Chapter 4.

Table 2-2. Operating Procedures - Modes of Operation

Explanation of Operation	Sequences of Steps Taken to Make the Equipment Operational
Initial Safety Requirements	See Table 2-1 for all steps related to normal start-up.
Connection of Accessory Equipment Necessary for Operations	Confirm that compressor is properly connected to suction and discharge piping. (Verify all connections were made in accordance with Safe Oxygen Equipment Handling Procedures).
Instructions for Obtaining or Confirming Critical Inputs	Verify proper power hook up. Verify proper inlet pressure.
Control Settings and Adjustments Necessary Prior to Turn-on	Inlet pressure set 30 psig minimum, 70 psig maximum.
Determination of Operational Readiness	Make sure all safety devices are in place.
Milestones	Put selector switch to AUTO
Visual or Audible Observations	First and 2nd Stage pressures rise. Brief knocking sound lasting less than 10 seconds. Fans (if equipped) start.
Operator Checks & Observations	Verify nominal operating pressures. See Table 6-1.

Table 2-3. Operating Procedures - Operator Stop

Explanation of Operation	Sequences of Steps Taken to Shut the Equipment Down
Initial Safety Requirements	Determine that operation of the compressor is no longer required.
Connection of Accessory Equipment Necessary for Operations	None.
Instructions for Obtaining or Confirming Critical Inputs.	None.
Control Settings and Adjustments Necessary prior to Turn-off.	None.
Determination of Operational Readiness.	Compressor may be shut off at any time.

Milestone	Put selector switch to OFF.
Visual or Audible Observations	Observe that motor and compressor wind down and cease running. Observe fans (if equipped) stop.
Operator's Maintenance Actions and Schedules	Shut off main electrical supply. Service compressor according to guidelines set forth in Chapter 4.

Table 2-4. Operating Procedures - Emergency Stop

Explanation of Operation	**Sequences of Steps Taken to Shut the Equipment Down**
Initial Safety Requirements	None.
Connection of Accessory Equipment Necessary for Operations	None.
Instructions for Obtaining or Confirming Critical Inputs	None.
Control Settings and Adjustments Necessary prior to Shutdown	None.
Determination of Operational Readiness	None.
Milestones	Shut compressor off by putting selector switch to OFF on motor controller.
Visual or Aural Observations	Verify that motor and compressor have stopped. Verify fans (if equipped) have stopped.
Operator Checks and Adjustments	Bleed pressure by loosening a fitting upstream of back pressure valve.
Operator's Maintenance Actions and Schedule.	None. Return unit to normal operation after emergency is over.

CHAPTER 3
FUNCTIONAL DESCRIPTION

3-1 MAJOR COMPONENTS

3-1.1 COMPRESSOR ASSEMBLY. (Figure 3-1) The compressor is an air cooled reciprocating, oil-less, two cylinder, two stage, single-acting, opposed design. The two compression cylinders consist of a 1st stage piston of 1-1/4" diameter, and a 2nd stage 1/2" with a 2" piston stroke. The 1st stage piston assembly is the heart of the compressor. The piston assembly has the 1st stage on the bottom end and the 2nd stage on the top. The pistons for these cylinders use self - lubricating TFE or Teflon® plastic rings. Linear motion is imparted to the piston assembly from the rotary crankshaft by means of a connecting rod attached to the piston which alternately compresses in its respective cylinder. The 1st stage rider rings guide one end of the assembly while the 1-3/4" diameter rider ring on the 2nd stage end guides the other. The main bearings and connecting rod bearings are all sealed, grease packed for life, and self-lubricating. The compressor valves are stainless steel reed type, normally closed and pressure-activated open.

3-1.2 SENSING INDICATORS. Sensing devices are provided for safety and to aid the operator in troubleshooting.

3-1.2.1 PRESSURE GAUGES. Pressure gauges are utilized to monitor suction pressure as well as first and second stage discharge pressures.

3-1.3 RELIEF VALVES. Two pressure relief valves are located in the gas system, one after each stage. There is also be a relief valve set at 75 psi in the suction piping. These serve to prevent damage to the cylinders and gas lines should excessive pressure build up. The relief valves are preset to 700 and 2500 psi. When the pressure of the gas on the area of the relief valve disc exceeds the spring load, the disc is lifted and the gas relieves to atmosphere. When the pressure is below the rating for the valve, the disc remains seated and no gas escapes.

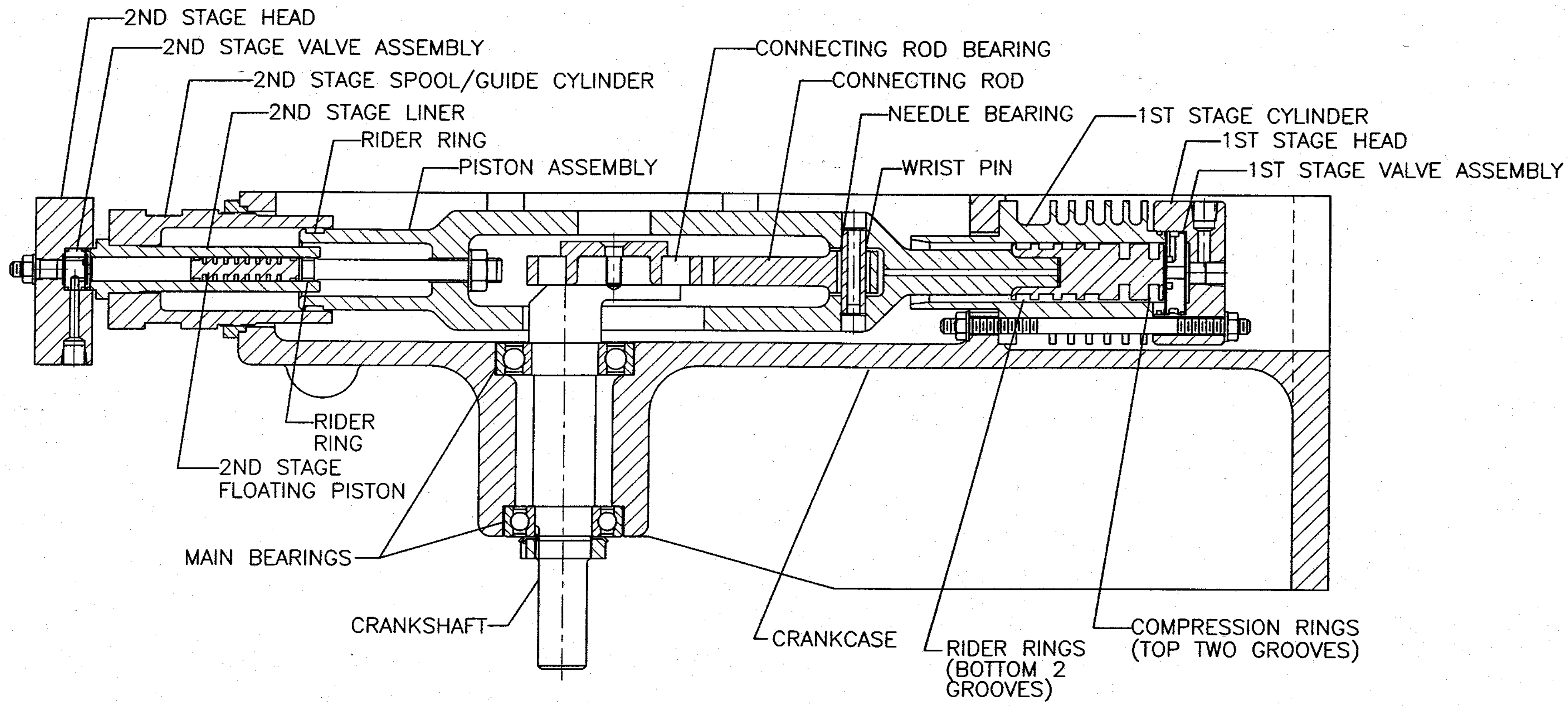
3-1.4 AIR COOLING SYSTEM. The compressor is provided with two stainless steel heat exchangers mounted next to the crankcase: each cools the gas after it has been compressed in its respective stage. Each heat exchanger is made up of stainless steel tubing coils and is sized for passive or forced air cooling depending on compressor horsepower.

3-l.5 DRIVE MOTOR. A 1-1/2 HP motor is used to power the compressor through a belt drive.

3-1.6 BACK PRESSURE VALVE. A back pressure valve is located in the discharge piping. This valve is provided to maintain a minimum pressure of 1500 psi on the 2nd stage floating piston. The pressure is required to hold this free floating piston against its piston rod so that the piston will not hit against the valve stop in the 2nd stage head.

3-1.7 FILTER. An interstage filter keeps the system relatively free from small material particles. The mesh size is 140 micron.

3-1.8 PRESSURE SWITCHES. Two pressure switches are provided. One for low suction pressure, the other for high discharge pressure. The suction pressure switch is normally open and closes when the inlet pressure is above 28 psig. If suction pressure drops below this point the compressor will shutdown. The discharge pressure switch is normally closed. The compressor starts and stops automatically under control of these switches.



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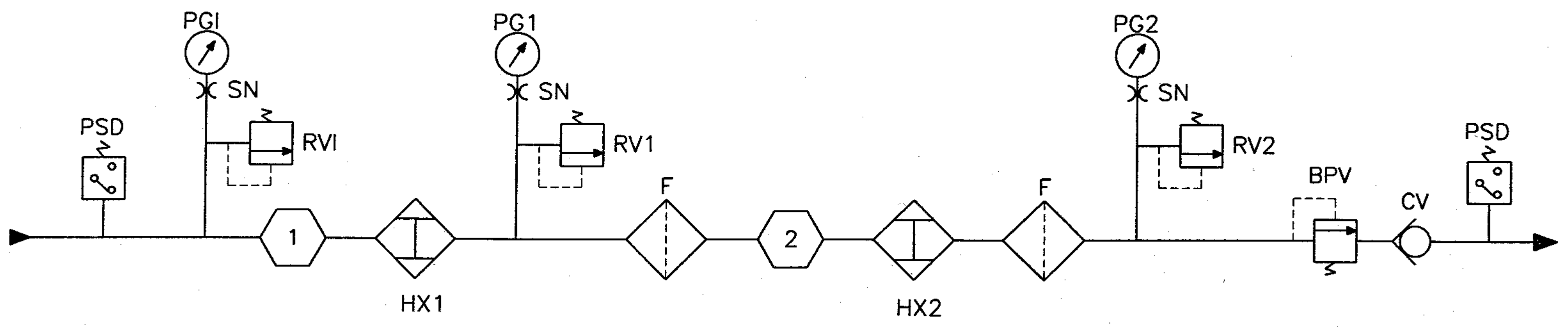
COMPRESSOR ASSEMBLY
2PS2B

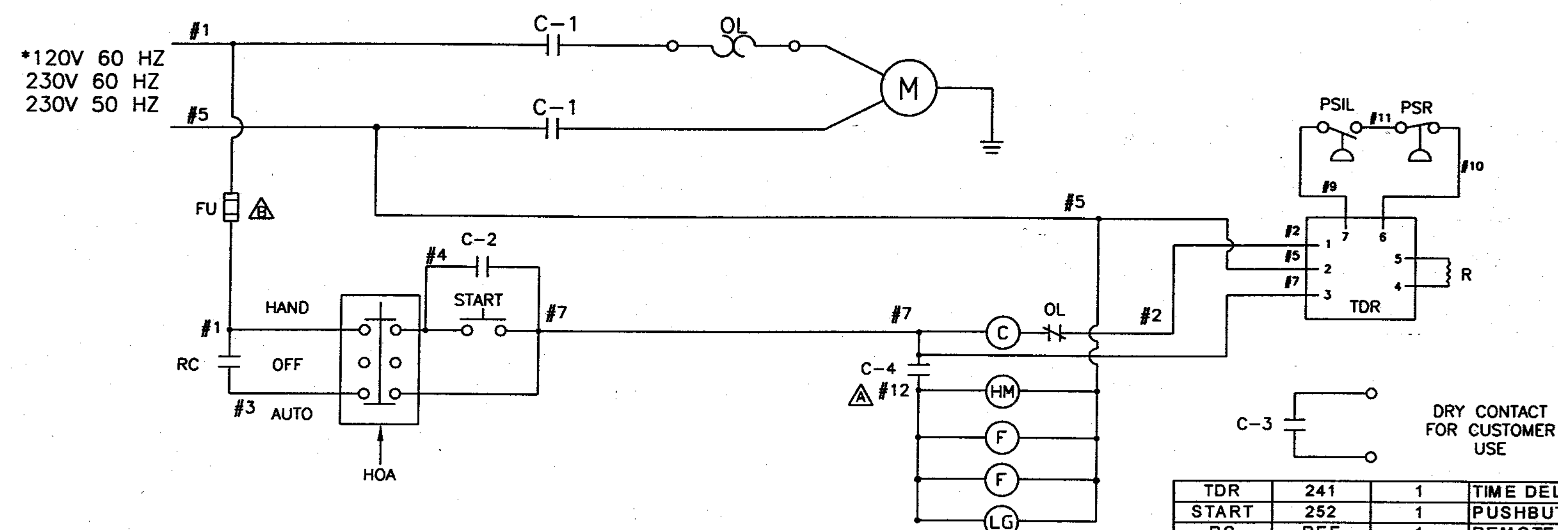
FIGURE 3-1



BPV	1	221	116-464	BACK PRESSURE VALVE
CV	1	222	615-53	CHECK VALVE
F	2	220	A77-505	FILTER
HX1	1	TUBING, 1/4 x .035 W. x 36" L., SST		HEAT EXCHANGER, 1ST STAGE
HX2	1	TUBING, 1/4 x .035 W. x 36" L., SST		HEAT EXCHANGER, 2ND STAGE
PGI	1	207	X60-824	PRESSURE GAUGE, INLET
PG1	1	209	X60-825	PRESSURE GAUGE, 1ST STAGE
PG2	1	212	X60-828	PRESSURE GAUGE, 2ND STAGE
PSD	1	219	X76-705	PRESSURE SWITCH, DISCHARGE
PSI	1	224	X76-704	PRESSURE SWITCH, INLET
RVI	1	208	515-5698	RELIEF VALVE, INLET, SET @ 75 PSI
RV1	1	210	515-5699	RELIEF VALVE, 1ST STAGE, SET @ 700
RV2	1	211	515-5700	RELIEF VALVE, 2ND STAGE, SET @ 2500
SN	3	206	74-401	SNUBBER
SYM.	QTY.	B/M#	P/N	DESCRIPTION

B7564-1A

FLOW SCHEMATIC
2PS2B



SYM	B/M	QTY	DESCRIPTION
TDR	241	1	TIME DELAY RELAY, 1/2 SECOND
START	252	1	PUSHBUTTON, START
RC	REF	1	REMOTE CONTACT (BY CUSTOMER)
RC	242	1	RESISITOR 50K OHMS
PSR	219	1	PRESSURE SWITCH, REGULATING, 2200#
PSIL	224	1	PRESSURE SWITCH, LOW INLET, 30#
OL	205	1	OVERLOAD HEATER
M	201	1	MOTOR, 1 1/2 HP
LG	246	1	LIGHT, RUN, GREEN
HOA	244	1	HAND, OFF AUTO SWIRTCH
HM	202	1	HOUR METER
FU	256	1	FUSE, IN-LINE, 3 AMP
F	226	2	FAN
C-4	245	1	MOTOR STARTER CONTACTOR
C	204	1	MOTOR STARTER

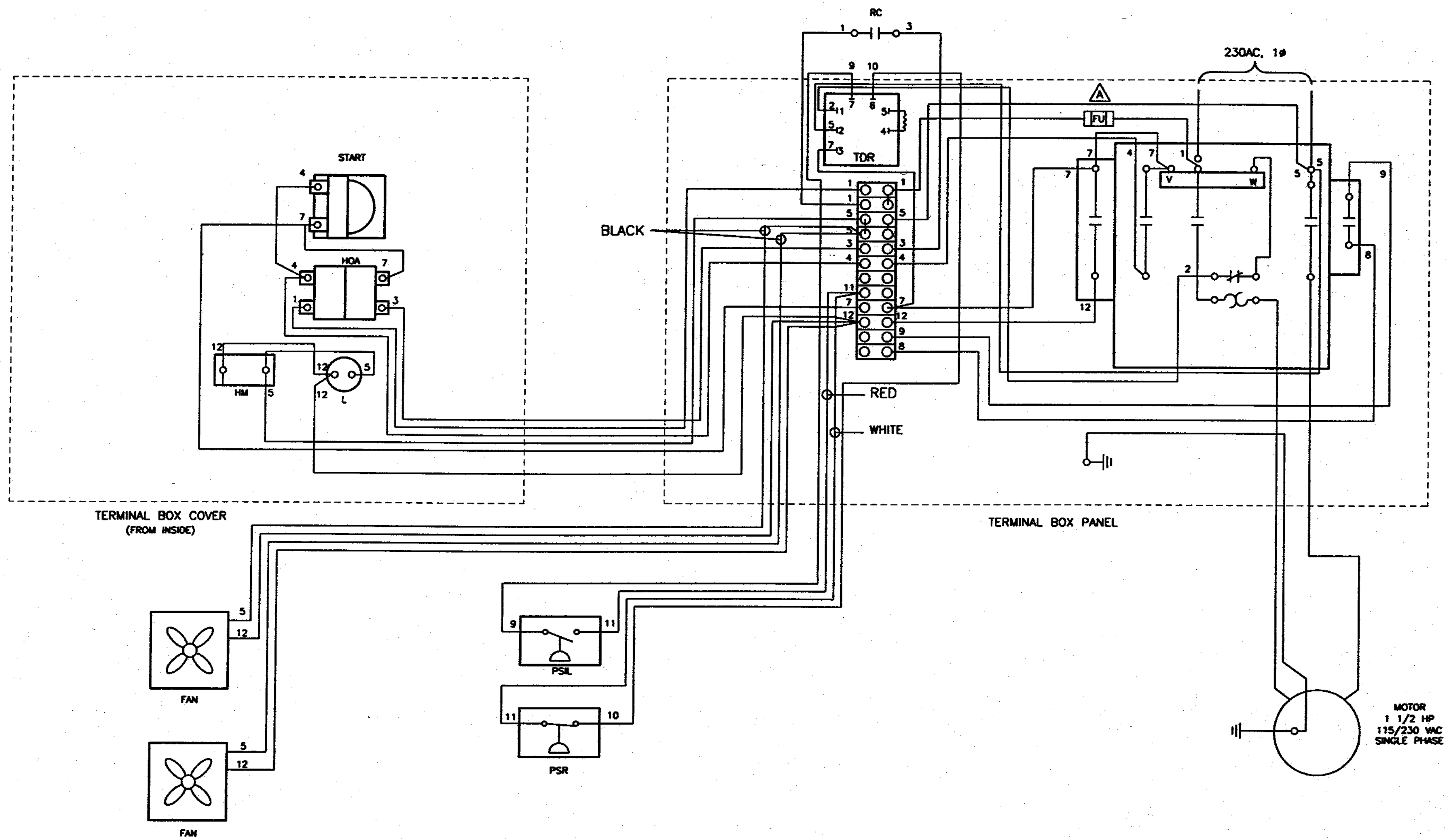
*MOTOR (M) MUST BE WIRED TO MATCH VOLTAGE.
STARTER COIL (C) MUST BE JUMPED TO MATCH VOLTAGE.
HOUR METER (HM), RELAY (R) & FANS (F) MUST MATCH VOLTAGE.
HOUR METER (HM) MUST MATCH FREQUENCY (HZ).
OVERLOAD HEATER (OL) MUST MATCH MOTOR AMPERAGE.

ELECTRICAL SCHEMATIC
2PS2B

REVISED 01/03

B8366B

FIGURE 3-3



WIRING DIAGRAM
2PS2B

NOTE: 1. WIRE, 16 AWG, THHN, COPPER STRANDED.

B8398A

CHAPTER 4
SCHEDULED MAINTENANCE

4-1 INTRODUCTION

The purpose of this chapter is to provide the operator with the scheduled maintenance required to insure a long service life of the RIX Compressor, Model 2PS2B-.85. This chapter covers the procedures for performing examinations, tests, replacements, preventive maintenance tasks, and overhauls. Material and test equipment requirements are covered in the following paragraphs for each specific task. The chart is arranged with the most frequently performed tasks covered first, the less frequent tasks later. Where maintenance tasks require significant disassembly, they are referenced here for scheduling and explained in Chapter 6 - Corrective Maintenance. Also, any corrective maintenance required as a result of any preventative maintenance inspections is covered in Chapter 6. On a daily basis, visually inspect the operating compressor. Check gas pressures, gas, temperatures, and for any leaks or unusual noises.

WARNING

The compressor may start at any time when in automatic mode. Before attempting any repairs or adjustments, de-energize the machine by putting the selector switch to OFF, disconnect power to the system (to avoid shock hazard), vent pressure by opening hand valves and give the discharge piping time to cool down (discharge air lines are hot and can cause burns).

Table 4-1. Preventive Maintenance

		Time Intervals in Hours		
Para.	**Operation**	**2000**	**3000**	**4000**
4-2	Filter Cleaning	X		
4-3	Compressor Valves Inspection and Reconditioning			X
4-4	Pressure Relief Valves			X
4-5	Belt Adjustment	X		
4-6	Gas System Piping	X		
4-7	Bearing Inspection	X		
4-8	Piston Ring Replacement: 1st Stage		X	
	2nd Stage	X		

WARNING

Before performing any of the scheduled maintenance tasks in Chapter 4, the compressor should be shut off and tagged **Out of Service**. This is to prevent an inadvertent start which could cause injury to personnel or damage to the equipment. After completing the maintenance action, the compressor should be restored to full operation and the tags removed.

WARNING

To prevent **FIRE, SERIOUS INJURY, and/or DEATH**, it is the User's responsibility to ensure all parts used in the compression assembly, gas plumbing of this RIX Oxygen compressor and any other existing portions of the gas stream that may be exposed during the installation of new or replacement parts are cleaned for Oxygen Service prior to installation.

Any work to be done on the compressor where the gas stream may be exposed must be done in accordance with **safe Oxygen Equipment handling procedures.**

No attempt should be made to work on the machine without full knowledge of Oxygen equipment handling and the potential hazards of contamination.

Factory Oxygen cleaned parts are denoted by an "X" prefix at the beginning of the part number. It is the User' s responsibility to maintain the cleanliness of factory cleaned parts and any other existing portions of the gas stream that may be exposed during the initial installation, start up, or during installation of replacement parts.

RIX Industries recommends the customer establish a procedure for working with oxygen machinery. Refer to Compressed Gas Association, Inc. publication number CGA G-4.1, Cleaning Equipment for Oxygen Service.

4-2 FILTER CLEANING

4-2.1 FREQUENCY. Every 2000 hours of running time the external interstage filter should be cleaned. Failing to clean the filter as scheduled may result in improper operation of the compressor valves.

4-2.2 PROCEDURE.

a. Remove external filter shown on Figure 1-1b or Figure 3-2.
b. Clean and thoroughly dry filter.
c. Reinstall the filter with the flow in the proper direction.

4-3 COMPRESSION VALVES INSPECTION AND RECONDITIONING.

4-3.1 FREQUENCY. Every 4000 hours the compressor valves should be removed and reconditioned. Step by step procedures for removing and servicing the valves are given in Paragraph 6-4. As a minimum during the 4000 hour maintenance action, the O-rings should be replaced with new parts and the valve seat resurfaced to remove any and all defects.

It is recommended to maintain a stock of spare valves so that servicing can be as simple as possible. This allows the service man to change out the valves and reduce the down time during this maintenance action. The used valves may then be reconditioned as time permits so that they are ready for the next change out.

4-4 PRESSURE RELIEF VALVES.

4-4.1 FREQUENCY. The pressure relief valves should be removed from the compressor and tested for correct set-point every 4000 hours. If a valve fails to lift at its rated pressure, it must be readjusted and if necessary, serviced per Paragraph 6-13.

4-5 BELT ADJUSTMENT.

4-5.1 Belt tension should be checked every 2000 hours of operation or if slipping occurs.

4-5.2 PROCEDURE.

a. Shutdown compressor, disconnect power and bleed off pressure.
b. Remove belt guard.
c. Loosen motor bolts.
d. Push down on motor sheave and tighten motor bolts. Belt should deflect 1/2 - 3/4" at mid span with approximately 10 lb. force. **NOTE: Alignment is critical to ensure proper belt life.**
e. Replace belt guard.

4-6 GAS SYSTEM PIPING.

4-6.1 FREQUENCY. Every 2000 hours of running time or any time the piping system is disturbed, such as during a corrective maintenance action, the piping should be examined for leaks. Any obvious leaks should be dealt with as they are detected. Leak testing the piping requires that the compressor is pressurized, and therefore running.

NOTE

The test is simplified if the compressor is allowed to cool, then restarted, immediately prior to running the leak test, since the hot discharge pipes can boil away the leak test soap solution, making detection of leaks difficult or impossible.

WARNING

Hot discharge lines can produce painful burns. Be careful to avoid making contact with hot pipes while performing tests and repairs.

If a leak is detected, it should be noted or conspicuously marked so that it can be repaired at the next convenient shutdown period.

4-6.2 MATERIALS. A soapy solution in a squirt bottle works best for locating leaks in a gas system. The gaskets and O-rings needed for the specific repair should be on hand prior to attempting to fix a leak.

4-6.3 PROCEDURE.

a. Restart compressor after it has been allowed to cool down. See Chapter 2 - Operation.

b. Systematically move from joint to joint and fitting to fitting in the gas system piping, spraying the leak test solution.

c. Observe for the formation of bubbles. Mark the location of any detected leaks. Large leaks may blow the soap solution away as quickly as it is applied. These may be detected by feel, again being careful of hot discharge lines.

d. Test relief valves by forming a bubble across the outlet opening and observing if the bubble grows.

e. Leaks at fitting joints may, in some cases, be corrected by tightening the joint.

CAUTION

Avoid over-tightening as this can produce distortion and make the problem more severe. If the joint is tight and still leaks, the gasket must be replaced.

f. O-ring joints cannot be corrected by additional tightening. In most every case, the leaking o-ring must be discarded and a new one installed. Always inspect the surfaces that seal against the O-ring for defects and correct them as required.

4-7 BEARING INSPECTION.

4-7.1 FREQUENCY. Every 2000 hours inspect the main ball bearings, connecting rod ball bearing, and connecting rod needle bearing to verify adequate lubrication and smooth rotation. If replacement is necessary, follow the procedures given in Paragraphs 6-8 and 6-9. Failure to replace the bearings could result in a bearing failure which would cause further damage to the compressor.

4-8 PISTON RING REPLACEMENT.

4-8.1 FREQUENCY. Every 2000 hours, the 2nd stage floating piston, including new compression rings, rider rings, and O-rings, should be replaced following the procedures given in Paragraph 6-7. Every 3000 hours the 1st stage rings should be checked and replaced as necessary. If the piston rings are allowed to wear beyond their service life, the compressor output will be reduced, causing more frequent compressor operation and unnecessary wear on other components. There is also the risk of damaging the cylinder walls if the rings wear out completely.

CHAPTER 5

COMPRESSOR TROUBLESHOOTING

5-1 TROUBLESHOOTING

5-1.1 INTRODUCTION. This chapter contains information to allow the technician to locate a malfunction or identify a potential fault with the compressor. The troubleshooting guide is prepared with the most likely and easily diagnosed probable causes listed first. The chart is prepared so that all troubleshooting procedures and diagnostics can be performed on the organizational level. Subsequent repair actions may involve higher levels of maintenance.

Diagrams included elsewhere in this manual may help in diagnosing troubles. For convenience, they are listed here and referenced in the troubleshooting charts.

Table 5-1. Compressor Troubleshooting Guide

TYPE OF PROBLEM	CHART	PAGE
High Pressure Troubles	5-1	5-2
Low Pressure Troubles	5-2	5-2
High Temperature Troubles	5-3	5-3
Reduced Capacity Troubles	5-4	5-3
Unusual Noise Troubles	5-5	5-4
Unusual Vibration Troubles	5-6	5-4
Inability to Start Compressor	5-7	5-5
Inability to Restart Compressor	5-8	5-5
Inability to Stop Compressor	5-9	5-6

CHART 5-1 HIGH PRESSURE TROUBLES

SYMPTOMS	IMMEDIATE ACTION	PROBABLE CAUSE	REMEDY
1. High pressure on 1st Stage.	1. Continue running and monitor pressures.	1. Defective suction or discharge valve in the next higher stage.	1. Remove, clean, repair or replace suspect valves as necessary. (Ref. 6-4)
2. First stage relief valve is "popping".	2. Shutdown the compressor.	2. Defective relief valve.	2. Reset or replace the relief valve. (Ref. 6-13)
3. High pressure on 2nd Stage.	3. Continue running and monitor pressure.	3. Pressure switch improperly set or inoperative.	3. Reset or replace switch.
4. Second stage relief valve is "popping".	4. Shutdown the compressor.	4. Discharge lines or back pressure valve is restricted.	4. Clean back pressure valve and/or lines.
		5. Defective relief valve.	5. Reset or replace the relief valve. (Ref. 6-13)

CHART 5-2 LOW PRESSURE TROUBLES

SYMPTOMS	IMMEDIATE ACTION	PROBABLE CAUSE	REMEDY
1. Low pressure on 1st stage.	1. Continue running and monitor pressures until a convenient time to shut the compressor down.	1. Worn or broken rings in the 1st stage.	1. Replace piston rings and inspect cylinder for wear or scoring. (Ref. 6-5, 6-7).
		Blown valve O-ring in that stage.	Replace O-ring. (Ref. 6-3, 6-4).
		2. Suction or discharge valve on 1st stage is leaking.	2. Clean, repair, or replace suspect valve as necessary. (Ref. 6-4).
		3. Piping leaks.	3. Repair piping leaks.

CHART 5-3 HIGH TEMPERATURE TROUBLES

SYMPTOMS	IMMEDIATE ACTION	PROBABLE CAUSE	REMEDY
1. Compressor over-heats.	1. Shutdown the compressor.	1. Fans inoperative (if equipped). Insufficient cooling.	1. Repair or replace fans.
2. Excessively high temperature on heads or discharge lines.		2. Restriction in piping caused by damage.	2. Inspect piping for kinks and other physical damage and repair.
		3. Faulty compressor valves.	3. Repair or replace. (Ref. 6-4)
		4. High ambient temperature.	4. Ventilate area or shutdown until area cools down.

CHART 5-4 REDUCED CAPACITY TROUBLES

SYMPTOMS	IMMEDIATE ACTION	PROBABLE CAUSE	REMEDY
1. Output of compressor is reduced.	1. Continue running; monitor pressures; service unit at first opportunity.	1. Low inlet pressure.	1. Restore to normal pressure.
2. Longer than normal time required to fill receiver.		2. Leaks in piping heads, heat exchangers or seals.	2. Locate and repair. (Ref. 4-6).
		3. First stage valves leaking.	3. Check and repair as necessary. (Ref. 6-4).
		4. Loose belt.	4. Tighten to correct tension. (Ref. 6-2).
		5. Worn compression rings.	5. Replace rings. (Ref. 6-7).

CHART 5-5 UNUSUAL NOISE TROUBLES

SYMPTOMS	IMMEDIATE ACTION	PROBABLE CAUSE	REMEDY
1. Loud metallic knock.	1. Try to isolate location of noise.	1. Worn connecting rod needle bearing.	1. Replace connecting rod needle bearing. (Ref. 6-10).
2. Clacking noises from one of the cylinder heads.	2. Check pressure gauges. Shut compressor down if pressures vary from normal.	2. Worn or broken valves.	2. Remove suspect valves and repair or replace them (Ref. 6-4)
3. Flat, slapping sound when compressor starts and stops.	3. Try to isolate location of noise.	3. Worn piston and/or cylinder liner. Worn rider rings.	3. Remove suspect pistons and cylinder liners and check for wear. Repair as necessary. Replace rider rings. (Ref. 6-7)

NOTE: A soft to moderate knocking sound is normal during operation of the compressor.

CHART 5-6 UNUSUAL VIBRATION TROUBLES

SYMPTOMS	IMMEDIATE ACTION	PROBABLE CAUSE	REMEDY
1. Entire compressor vibrates.	1. Stop compressor and correct trouble before restarting.	1. Compressor not properly secured.	1. Tighten mounting bolts.
		2. Piston clearances not properly adjusted.	2. Readjust piston clearance (Ref. 6-14).

CHART 5-7 **INABILITY TO START COMPRESSOR**

SYMPTOMS	IMMEDIATE ACTION	PROBABLE CAUSE	REMEDY
1. Compressor fails to start.	1. No immediate action.	1. High pressure switch senses high pressure in receiver.	1. Readjust pressure switch if setting is too low. Otherwise wait until there is a drop in receiver pressure that signals a restart.
		Low pressure switch senses low suction pressure.	Check to see if system has lost pressure. Increase suction pressure or re-adjust pressure switch if setting is too high.
2. Overload tripped.	2. Clear fault, press reset button on the motor controller, then attempt restart. (Ref. 2-3).	2. Voltage too low.	2. Restore power and check voltage to the compressor. Reset circuit breakers. Replace fuses as necessary.
		3. Suction pressure too high.	3. Adjust suction pressure.

CHART 5-8 **INABILITY TO RESTART COMPRESSOR**

SYMPTOMS	IMMEDIATE ACTION	PROBABLE CAUSE	REMEDY
1. Compressor fails to start after recent shutdown.	1. No immediate action.	1. Shutdown was initiated by high pressure switch.	1. Allow pressure at switch to drop, compressor will automatically re-start.
		2. Shutdown was initiated by low pressure switch.	2. Allow inlet pressure to increase. Compressor will automatically re-start.

CHART 5-9 INABILITY TO RESTART COMPRESSOR

SYMPTOMS	IMMEDIATE ACTION	PROBABLE CAUSE	REMEDY
1. Compressor does not stop when high pressure set point is reached.	1. Push STOP pushbutton on controller.	1. Improperly set inoperative pressure switch.	1. Readjust, repair, or replace pressure switch as necessary.
2. Compressor does not stop when selector switch is turned to OFF.	2. Cut power to compressor at main disconnect.	2. Improperly wired or faulty selector switch on controller.	2. Trace circuit wiring in motor controller against wiring diagram.
			Repair or replace faulty selector switch as necessary.

CHAPTER 6
CORRECTIVE MAINTENANCE

6-1 **INTRODUCTION.** This chapter presents instructions for all adjustments and repairs to the compressor and its accessory items. All repairable parts and assemblies are covered in this chapter. Scheduled maintenance items are covered in Chapter 4. Where special tools are required, they are called out in the applicable paragraph. This chapter is divided into two sections: Section I, Adjustments, and Section II, Repair.

WARNING

> The compressor may start at any time when in automatic mode. Before attempting any repairs or adjustments: de-energize the machine by pushing the **STOP** button, disconnect power to the system (to avoid shock hazard), vent pressure by opening hand valves down stream and give the discharge piping time to cool down. Discharge gas lines are hot and can cause burns.

SECTION I ADJUSTMENTS AND ALIGNMENTS

6-2 BELT AND PULLEYS

6-2.1 ALIGNMENT OF DRIVE PULLEYS. Following any repair to the motor or pulleys (i.e. motor sheave or compressor flywheel), it may become necessary to realign the pulleys. The pulleys are either keyed to the shafts and locked in place with a setscrew or keyed to the shaft and locked in place with tapered hubs. First remove the beltguard. The hub and pulley can be separated by removing the three bolts that hold them together. The bolts can then be used as jacking devices by inserting them in the threaded holes in the hub and tightening sequentially until the pulley breaks loose from the hub. When this happens, the pulley and hub can be slid back and forth on the shaft to achieve alignment. Alignment is measured by laying a straight edge across the outside faces of the pulleys.

To tighten the pulleys after aligning, use the three bolts inserted into the assembly holes (a clearance hole in the hub and a tapped hole in the pulley) or the setscrews. Check alignment and repeat procedure if necessary. Replace beltguard.

6-2.2 TIGHTENING DRIVE BELT. To obtain the proper tension on the belt, use the following procedure:

a. Remove the beltguard.

b. Loosen the motor tie-down bolts at least two turns.

c. Push down on the motor sheave and tighten motor bolts.

d. Correct belt tension allows a 1/2 to 3/4" deflection with a 10 lb. force applied across the belt section at mid-span. **NOTE: Alignment is critical to ensure proper belt life.**

e. Verify motor sheave alignment with flywheel.

f. Replace belt guard.

SECTION II REPAIR – OXYGEN UNITS

WARNING

To prevent **FIRE, SERIOUS INJURY, and/or DEATH**, it is the User's responsibility to ensure all parts used in the compression assembly, gas plumbing of this RIX Oxygen compressor and any other existing portions of the gas stream that may be exposed during the installation of new or replacement parts are cleaned for Oxygen Service prior to installation.

Any work to be done on the compressor where the gas stream may be exposed must be done in accordance with **safe Oxygen Equipment handling procedures.**

No attempt should be made to work on the machine without full knowledge of Oxygen equipment handling and the potential hazards of contamination.

Factory Oxygen cleaned parts are denoted by an "X" prefix at the beginning of the part number. It is the User' s responsibility to maintain the cleanliness of factory cleaned parts and any other existing portions of the gas stream that may be exposed during the initial installation, start up, or during installation of replacement parts.

RIX Industries recommends the customer establish a procedure for working with oxygen machinery. Refer to Compressed Gas Association, Inc. publication number CGA G-4.1, Cleaning Equipment for Oxygen Service.

6-3 CYLINDER HEADS.

6-3.1 GENERAL. There is no scheduled maintenance requirement on the cylinder heads. However, removal is necessary to perform other required maintenance. The procedures for removing the 1st and 2nd stage heads are similar and may be accomplished by disconnecting the piping and removing the retaining bolts.

6-3.2 REMOVE HEAD. (Figures 7-1, -3, -4 and -5)

a. Relieve pressure and allow heads to cool.

b. Disconnect the gas system piping from the head being removed.

c. Remove the retaining nuts; carefully lift the head from the cylinder. When removing the 1st stage head, make sure that the cylinder does not come out of the crankcase with the head. Discard the used O-rings. **NOTE:** It may be necessary to lean back the compressor in order to remove 1st stage head.

6-3.3 INSTALL HEAD.

a. Install new O-rings on the cylinder if installing 1st stage head.

b. Carefully position and orient the head on the cylinder and over the mounting bolts. Tighten in 2 or 3 ft-lbs. increments, using a cross sequence, until 15 ft-lbs. torque is reached on the 1st stage and 15 ft-lbs. on the 2nd stage.

6-4 COMPRESSOR VALVES

6-4.1 GENERAL. Each stage has a valve assembly whose main components are a suction reed, discharge reed and a valve seat. A bad valve, either suction or discharge, in the 2nd stage will usually be indicated by higher pressures than normal on the 1st stage. A bad suction or discharge valve in the 1st stage will cause a loss of flow. Severe usage over long periods of time may result in worn or broken valves which may be destructive if the unit is allowed to operate with them in this condition. Worn or broken valves can be evidenced by clacking noises in the cylinder head. Remove, disassemble, inspect and service the valves every 4000 hours of operation. This may readily be accomplished by removing the cylinder heads.

6-4.2 REMOVAL AND INSTALLATION OF 1ST STAGE VALVE ASSEMBLIES (Figure 7-2)

6-4.2.1 REMOVAL OF SUCTION AND DISCHARGE VALVES.

a. Remove inlet and discharge piping from the head.

b. Remove the nuts which hold down the 1st stage head and drop the head off. Make sure the cylinder does not come out of the crankcase with the head. It may be necessary to lean back the compressor in order to remove head.

c. Remove the suction reed and inspect.

d. Remove the valve seat. Remove the discharge reed. Discard pitted, cracked or broken valves. A scratched or pitted valve seat may need to be lapped

e. Inspect and repair as necessary.

6-4.2.2 INSTALLATION OF SUCTION AND DISCHARGE VALVES.

a. Once the valve reeds have been examined or replaced and the seat has been examined, lapped or replaced, reassemble in reverse order of disassembly.

b. Install discharge reeds and O-ring. A light coating of oxygen compatible grease (RIX P/N 45-1006) should be used on the O-ring.

c. Install the valve seat. Push down to engage O-ring properly.

d. Put the suction valve on the valve seat. Install head assembly and torque bolts to 15 ft-lbs.

6-4.3 REMOVAL AND INSTALLATION OF 2ND STAGE VALVE ASSEMBLY. (Figure 7-3)

6-4.3.1 REMOVAL OF THE 2ND STAGE VALVE.

a. Remove the inlet and discharge lines on the 2nd stage head. Remove the two nuts.

b. Lift off head. Remove O-ring, valve stop, suction valve, locating pin and second O-ring. Discard all O-rings.

c. Remove the valve seat from the cylinder head. Removal can be assisted by removing the plug in the head and using an object such as a bolt with a blunt end and putting it through the discharge port in the top of the head and tapping lightly on the seat. Care must be taken not to damage the valve seat.

d. Remove the O-ring, discharge reed and second locating pin.

6-4.3.2 INSTALLATION OF 2ND STAGE VALVES.

CAUTION

When reinstalling valves with O-ring seals, care must be taken to avoid damaging the O-rings. Lubricate the O-ring with oxygen compatible grease. Avoid tilting the valve when installing into the head and apply even finger pressure about the circumference until the valve is completely installed.

a. Apply a light film of oxygen compatible O-ring grease to the new O-rings.

b. Set the discharge valve over the pin in the head and place the first new O-ring in the valve pocket. Refer to Figure 7-4 for proper orientation of the valve.

NOTE: If discharge or suction valves are installed in inverted position, the valve will not be able to open properly.

c. Insert valve seat into head with the pin hole in the discharge side of the seat aligned with the pin in the head. Look through the suction port in the head to check that the locating pin has engaged the hole in the seat and the seat is inserted all the way to the bottom of the head. Be sure valve seat is not inverted (See Figure 7-4).

d. Install O-ring and new pin on suction side of valve seat. Install suction valve, referring to Figure 7-4 for proper orientation.

e. Install valve stop in head and O-ring on valve stop.

f. Reinstall the head using the two nuts and torque to 15 ft-lbs. Reconnect the inlet and discharge lines.

6-4.4 VALVE INSPECTION AND REPAIR. The valve disassembly, inspection and repair instructions here cover all the compressor valve assemblies. Figures 7-3 and 7-4 should be used as guides for assembly.

a. Inspect the reed valves for cracking or pitting. Remove any deposits from the reeds. A thin impression of a circle should be evident where the reed seals over the valve seat ports. Any radial lines or streaks extending outward from these circles indicate valve leakage.

b. Examine the valve seat carefully for cracks or pits and for leakage past the seat. Streaked marks on the seat also indicate leakage. Replace or repair parts as required.

c. Lap the valve seat on a lapping plate or regrind the valve seat, using a very fine valve grinding compound. When lapping or grinding, remove a minimum of material to just clean up the surface. When the trepans or grooves between sealing surfaces on the valve are reduced to less than .100 inches deep, the seat should be replaced (1st stage only).

d. Carefully clean the valve parts to remove the compression residue and valve grinding compound from the seat.

e. Reassemble the valve in the reverse order of disassembly.

6-5 CYLINDERS.

6-5.1 GENERAL. The compression cylinders must be removed to service the rings and pistons. The 2nd stage has a removable liner. There is no scheduled maintenance required on the cylinders or liner.

6-5.2 REMOVE AND INSTALL 1ST AND 2ND STAGE COMPRESSION CYLINDERS. (Figures 7-1)

a. Remove the cylinder head in accordance with Paragraph 6-3.2.

b. Turn the flywheel by hand to position the piston at bottom dead center (1st stage only).

c. Remove retaining nuts.

d. Use caution to prevent side stress on the piston and rod assembly, slide the cylinder off the piston. It may be necessary to lean back the compressor. Remove and discard the used O-rings.

e. Be careful not to damage the shims.

f. Remove 2nd stage guide cylinder and liner.

NOTE: The 2nd stage piston will remain in the liner when liner is removed. See Paragraph 6-7.

g. Reinstall the compression cylinder and liner in the reverse sequence of removal, using
new O-rings.

6-6 CRANKCASE

6-6.1 GENERAL. There is no scheduled maintenance on the crankcase. For crankshaft and main bearing removal, see Paragraph 6-9 and 6-10.

6-7 PISTON RINGS

6-7.1 GENERAL. The compressor is single acting, meaning that in a single crankshaft revolution, suction and compression occur once in each cylinder. In order to accomplish sealing and to deliver oil-less gas, high pressure, non-lubed rings are used. A viton expander is used under the compression rings. In addition to the compression rings, rider rings are used on each piston to keep the piston centered in the cylinder, preventing metal to metal contact with the cylinder wall. Each piston has compression rings and at least one rider ring. The rings should be inspected for wear and replaced as necessary. See Paragraph 4-8. Rings not meeting the tolerances specified in Table 6-6 should be replaced.

6-7.2 REPLACE PISTON RINGS . (Figure 7-1; see also Figures. 7-3 and 7-5)

a. Remove the cylinder head in accordance with Paragraph 6-3.2.

b. Turn the flywheel by hand to position the piston at bottom dead center.

c. For the 1st stage compression area, the 1st stage cylinder must be removed. (See Paragraph 6-5) For the 2nd stage compression area, the liner is lifted out and the floating piston is pushed from the cylinder.

d. Remove and discard the used rings and expanders.

e. Clean the ring grooves, replace expanders and, by hand, carefully spread a new ring and install in the ring groove. Repeat for each ring, being certain the ends of the spiral fit completely into the groove to insure proper sealing.

f. Discard old rider rings.

g. Install new rider rings on pistons and on piston rod (big end) and follower.

h. Clean and inspect the cylinder liner for wear or damage. Wear must be within the tolerance specified in Table 6-6.

i. Reinstall the cylinder head in accordance with Paragraph 6-3.3.

j. Rotate the flywheel by hand several times to be certain that the parts are free. See Section 6-15 for piston clearance adjustment.

6-8 PISTON ASSEMBLY

6-8.1 GENERAL. The 1st stage piston assembly is connected together with the connecting rod and retaining cap. This may only be removed or installed as an assembled unit.

6-8.2 PROCEDURE.

a. Remove both heads and cylinders (Ref. 6-3 and 6-5).

b. Rotate flywheel to position the 2nd stage (upper end) to the lowest point of its stroke (bottom dead center).

6-8.3 Remove hex screw on bearing plate.

6-8.4 Gently slide assembly outward by pulling connecting rod off of crankshaft allowing neck of piston to pass through slot in crankcase.

6-8.5 Remove connecting rod from piston assembly by removing snap rings and pressing out wrist pin.

6-8.6 Inspect bearings. Replace as necessary.

6-8.7 Installation is reverse of disassembly.

NOTE: Connecting rod and retainer cap must be installed prior to installing piston assembly.

6-9 MAIN BEARINGS

6-9.1 GENERAL. The crankshaft is supported in the crankcase by two main bearings. They are radial ball bearing design, consisting of an inner race, outer race, ball bearings, cage and seals.

6-9.2 REMOVE MAIN BEARINGS.

a. Remove piston assembly in accordance with Paragraph 6-8.

b. Remove flywheel, reference Paragraph 4-5.

c. Bend down locking tab on lockwasher and remove bearing nut. Special tool required.

d. Heat bearing housing (piston side) and push out crank.

NOTE: Flywheel side bearing stays in housing.

e. Heat outboard bearing housing and push out bearing from far end using suitable fixture.

6-9.3 INSTALL MAIN BEARINGS.

a. Slide new main bearing onto the crankshaft. Verify that the bearing is pressed up against the shoulder on the crankshaft

b. Slide each crankshaft into the crankcase. (Heating may be required.)

c. Install out board bearing (flywheel side).

d. Install new lockwasher with bearing nut and torque to 50 ft.-lb.

6-10 CONNECTING ROD BEARINGS.

6-10.1 GENERAL. The connecting rod is cast aluminum, with a closed eye at the upper larger and lower ends. The smaller closed eye has a needle bearing around the wrist pin. The larger closed eye has a ball bearing around the crankshaft. These bearings are supplied by RIX grease packed for life with polyurea (RIX P/N 45-110) grease. At specified intervals all the bearings are replaced. If the clearances are not within the tolerances specified in Table 6-6, the wrist pin should be replaced.

6-10.2 REPLACE CONNECTING ROD BEARING SETS. (Figures 7-1)

a. Remove the piston assembly per Paragraph 6-8.

b. With a pair of snap ring pliers, remove snap rings from wrist pin bore.

c. Remove the wrist pin by pushing it through the needle bearings from one side of the piston to the other (may require a press). The piston may have to be heated to allow the wrist pins to slide through.

d. Remove the connecting rod from piston assembly.

e. Remove retaining plate from connecting rod bearing.

f. Press needle bearing out of small end of connecting rod.

g. The large end connecting rod ball bearing has a shrink fit. Therefore, the connecting rod should be heated in an oven to 300°F so that the ball bearings will slip out of the connecting rods.

h. To install new ball bearings, heat connecting rods to 300°F in an oven. Once heated, lay the large end of the connecting rod on a flat surface and slip the ball bearing into the bore in the connecting rod. Allow to cool for a shrink fit.

i. Press a new needle bearing packed with Oxygen compatible grease into the small end of the connecting rod. Be sure to press against the stamped end (end with identification markings) of needle bearing.

j. Assemble the connecting rod into the piston by pushing the wrist pin through the piston and needle bearing in the connecting rod. The piston may have to be heated to allow the wrist pin to slide through.

k. Put snap rings into the grooves in the pistons.

l. Install the retaining plate in the connecting rod bearing.

6-11 BELT DRIVE

6-11.1 GENERAL. There is no scheduled replacement of the belt. Replacement is on an as-required basis when it becomes frayed or broken.

6-11.2 COMPRESSOR DRIVE BELT. The belt is a flat multi-vee ribbon belt. It is suitable for small radius bends such as that around the motor drive sheave.

6-11.2.1 Belt Removal.

a. Loosen the four motor tie-down bolts at least two turns.

b. Slide the motor toward the flywheel by lifting the motor.

c. Roll the belt off the sheaves

6-11.2.2 Belt Replacement.

a. To replace the belt, reverse order of above procedure.

b. Adjust belt tension per Paragraph 6-2.2. **NOTE: Alignment is critical to ensure proper belt life.**

6-12 HEAT EXCHANGERS

6.12.1 GENERAL. There is no scheduled maintenance on the heat exchangers. Should fouling occur, the heat exchangers should be disassembled and cleaned.

6-14 PISTON CLEARANCE ADJUSTMENT

6-14.1 GENERAL. Prior to adjusting each piston, rotate the crankshaft to bring its respective piston to the top of its stroke. **Note:** The 1st stage is at the top of its compression stroke when the piston is all the way down.

6-14-2 ADJUSTMENT. 1st Stage

a. To adjust the 1st stage piston clearance remove the 1st stage head.

b. While holding the cylinder firmly in place rotate crankshaft to assure piston is all the way down.

c. Measure the clearance between the piston and the top of the cylinder. Proper clearance is .011" to .015".

d. Shims can be added or removed to reach the specified clearance.

NOTE: The clearance is factory set and should not need adjustment unless one or more parts are replaced (cylinder, piston assembly, connecting rod, crankshaft or crankcase).

e. Replace head.

6-14-3 ADJUSTMENT. 2nd Stage

a. To adjust the 2nd stage piston clearance remove the 2nd stage head.

b. While holding the cylinder firmly in place rotate crankshaft to assure piston is all the way up.

c. Measure the clearance between the piston and the top of the cylinder liner. Proper clearance is .012" to .016".

d. Rotate the spool/guide cylinder to reach the specified clearance.

NOTE: The clearance is factory set and should not need adjustment unless one or more parts are replaced (cylinder, liner, floating piston assembly, connecting rod, crankshaft or crankcase).

e. Replace head.

Table 6-1. Normal Operating Pressure Ranges

	Pressure
Inlet	30-70 psig
1st Stage	350-600 psig
2nd Stage	1500-2200 psig

If pressures do not fall within the above ranges, check the troubleshooting charts, Chapter 5, for corrective action.

Table 6-2. Relief Valve Settings

	Pressure
Suction	75 psig
1st Stage	700 psig
2nd Stage	2500 psig

Table 6-3. Operating Temperatures

	Normal Range ˚F
1st Stage Discharge Gas	280 - 360
1st Stage Discharge After Cooler	100 - 140
2nd Stage Discharge Gas	180 - 240
2nd Stage Discharge After Cooler	110 - 150

The above operating temperature is for an air temperature range of 50˚F to 100˚F.

Table 6-4. Wrench Torques (Oiled Threads)

	Foot Pounds
Retaining Cap Screw	15
Crankcase Cover Bolts	8
Heat Exchanger Clamps	6
1st Stage Cylinder/ Head Nuts	15
2nd Stage Cylinder Nuts	15
2nd Stage Head Nuts	15
Compressor Mounting Bolts	50
Crankshaft Bearing Nut	50

Table 6-5. Control Switch Settings

Description	**Adjustable Range**	**Shutdown Setting**	**Re-start Setting**
Low Pressure Switch	3 - 100 psig	25 psig	28 psig
High Pressure Switch	275 - 8000 psig	2200 psig	1900 psig

Table 6-6. Clearances and Tolerances
(Refer to Figures 7-1 thru 7-8)

Indicator	Nominal Dimensions	Wear Limit
Bearings		By inspection for knocking or rough running.
Connecting Rod, Lower Bore	3.146 Dia.	.001 in. Dia. Max.
Connecting Rod, Upper Bore	.687 Dia.	.001 in. Dia. Max.
Wrist Pins	.5000 Dia.	.0005 in. Dia. Max.
Pistons: 1st Stage	1.25 Dia.	1.21 Dia. Min.
2nd Stage	0.50 Dia.	.498 Dia. Min.
		(Pistons do not wear under normal conditions. Rider rings are used to prevent the piston from contacting the cylinders.)
Rider Rings:		
1.75 in. Dia.	.110 Thick	.020 in. Radial wear
1.25 in. Dia.	.118 Thick	.010 in. Radial wear
.50 in. Dia.	.057 Thick	.003 in. Radial wear
Piston Rings:		
1st - .125	Radial Thick	When average radial wear is 2/3
2nd - .065	" "	of ring or blow-by occurs
Cylinder Liners	1.251 Dia.	.002 in. Diametral wear
	.501 Dia.	.002 in. Diametral wear
Valve Plates, (see Figures 7-6 thru 7-8)	1st -.025" Thick 2nd-.010" Thick	.002 in. wear or when pitted enough to cause insufficient seating
Valve Seats, (see Figures 7-6 thru 7-8)	Pitted or Streaked	.010 in. wear or when pitted enough to cause insufficient seating

CHAPTER 7

COMPRESSOR PARTS LIST

7.1 INTRODUCTION.

The parts listed here cover all **RIX Model 2PS2B-.85 Compressors** identified by the Serial Numbers shown on the Serial Number Page of this manual. Column 1 gives the figure and index number. The part number is listed in Column 2, followed by a quantity and description in Columns 3 and 4.

An “X” at the beginning of any part number signifies “Oxygen Clean”. Spare parts with this designation are specially cleaned and supplied in oxygen clean sealed plastic bags.

All are supplied through **RIX Industries 4900 Industrial Way, Benicia, CA 94510; Telephone 707-747-5900, FAX 707-747-9200. (Cage code: 28953)**

TABLE 7-1. COMPRESSOR PARTS LIST

Figure & Index No.		Part No.	Qty.	Description
		Omitted numbers not included in this Assembly		
7-1	**1**	X2-B6932	1	Cylinder Head
7-1	**2**	XAO15-A5565	1	Valve Assembly, 2nd Stage (Incls. 1-5)
7-2	-1	X15-B2706	2	Reed Valve
7-2	-2	X123-018-5-90	3	O-ring
7-2	-3	X15-B3570	1	Valve Seat
7-2	-4	X15-A4151	1	Valve Stop
7-2	-5	X17-758	2	Pin
7-1	**3**	X1-B5770	1	Cylinder, Spool/Guide
7-1	**4**	X1-B6931	1	Cylinder, 2nd Stage
7-1	**5**	X18-C1147-14-1G	1	Rider Ring, 1-3/4"
7-1	**6**	XA8-B5778	1	Piston Assembly, 1st Stage (Incls. 1-4)
7-3	-1	XA8-D2974	1	Piston
7-3	-2	X3-B5774	1	Rod, Follower
7-3	-3	X20-691	1	Flat Washer, 1/2 SS
7-3	-4	X53-71	1	Jam Nut, 1/2-20UNF SS
7-1	**10**	X123-030-5	1	O-ring
7-1	**11**	38-A7547	1	Bearing Plate
7-1	**12**	34-746	1	Screw, Flat Head Socket, 5/16-24UNF x 3/4" Lg.
7-1	**13**	181-728	1	Bearing, Rod
7-1	**14**	7-B5625	1	Connecting Rod

TABLE 7-1. COMPRESSOR PARTS LIST (Continued)

Figure & Index No.		Part No.	Qty.	Description
7-1	**15**	181-7	1	Bearing
7-1	**16**	17-A8518	1	Wrist Pin
7-1	**17**	31-10	2	Ring, Snap
7-1	**18**	22-A7797	A/N*	Shim
7-1	**19**	X1-D2574	1	Cylinder, 1st. Stage
7-1	**20**	X2-C2429	1	Head
7-1	**21**	XA15-A7798	1	Valve Assembly, 1st Stage (Incls. 1-4)
7-4	-1	X15-B5840	1	Reed Valve, Suction
7-4	-2	X123-030-5	1	O-ring
7-4	-3	X15-B5831	1	Valve Seat
7-4	-4	X15-B5878	1	Reed Valve, Discharge
7-1	**22**	105-C1993-35	4	Stud
7-1	**23**	53-45	8	Hex Nut, 5/16UNF Stl. Pltd.
7-1	**24**	20-692	8	Washer, Flat, 5/16 NOM. SAE Stl. Pltd.
7-1	**25**	X18-C1791-10G	2	Compression Ring, 1 1/4"
7-1	**26**	X123-313-5	2	O-ring
7-1	**27**	X18-B2117-2G	2	Rider Ring, 1 1/4"
7-1	**28**	100-D2537	1	Crankcase
7-1	**29**	53-610	1	Lock Nut
7-1	**30**	20-606	1	Lock Washer
7-1	**31**	5-C2381	1	Crankshaft
7-1	**32**	181-604	1	Bearing
7-1	**33**	181-26	1	Bearing
7-1	**34**	X18-A2750-5G	1	Rider Ring, 1/2" Dia.
7-1	**35**	64-B5768	1	Ring, Mounting, 2nd Stage
7-1	**36**	XA508-A7783	1	Piston Assembly, 2nd Stage (Incls. 1-5)
7-5	-1	X18-A2750-3G	2	Rider Ring, 1/2"
7-5	-2	X63-A5549	1	Sleeve Tool
7-5	-3	X18-C1791-4G	8	Compression Ring, 1/2"
7-5	-4	X123-011-5	8	O-ring
7-5	-5	X508-B5928	1	Piston

* As needed - quantity 1 to 4 for .012 clearance.

TABLE 7-2. ACCESSORY PARTS LIST

Figure & Index No.		Part No.	Qty.	Description

2PS2B-.85-L Low Speed 120V 60 Hz

(Option Packages begin on Page 7-4)

Using the 2PS2B-.85-L as the common Accessory Parts List, develop Option Packages by making listed substitutions and/or additions to the following list.

Omitted numbers not included in this Assembly.

Figure	Index No.	Part No.	Qty.	Description
7-6	**201**	107-1035	1	Motor 1 ½ HP
7-6	**202**	113-703	1	Hour Meter 120VAC, 60 Hz
7-6	**203**	38-C2384	1	Cover, Crankcase
7-6	**204**	76-1265	1	Electric Starter
7-6	**205**	776-H41	1	Heater, Motor Starter
7-6	**206**	X74-401	3	Gauge Snubber
7-6	**207**	X60-824	1	Gauge, 0-160 Psi
7-6	**208**	X515-851	1	Relief Valve, Set @ 75 Psig
7-6	**209**	X60-826	1	Gauge, 0-1000 Psi
7-6	**210**	X515-852	1	Relief Valve, Set @ 700 Psig
7-6	**211**	X515-855	1	Relief Valve, Set @ 2500 Psig
7-6	**212**	X60-828	1	Gauge, 0-4000 Psi
7-6	**213**	XA40-B7140	1	Bracket, Pressure Gauge
7-6	**214**	A156-D2576	1	Belt Guard
7-6	**215**	36-6J140Q	1	Flywheel
7-6	**216**	11-100Q1	1	Bushing, Flywheel
7-6	**217**	41-520J6	1	Belt
7-6	**218**	36-6J15	1	Motor Sheave
7-6	**219**	X76-705	1	Pressure Switch, High Discharge
7-6	**220**	XA77-505	2	Filter
7-6	**221**	X116-464	1	Back Pressure Regulator
7-6	**222**	X615-53	1	Check Valve
7-6	**223**	40-A7802	1	Bracket, Belt Guard
7-6	**224**	X76-704	1	Pressure Switch, Low Inlet
7-6	**225**	61-164	2	Harness, Fan Plug Chord
7-6	**226**	42-112	1	Fan, Electric
7-6	**227**	156-153	3	Fan Guard

TABLE 7-2. ACCESSORY PARTS LIST (Continued)

Figure & Index No.		Part No.	Qty.	Description
7-6	**228**	62-A7122-1	1	Nameplate
7-6	**229**	62-403	1	Label: RIX WORLD
7-6	**230**	62-A7278-3	1	Label: TRAINED PERSONNEL
7-6	**231**	62-A7507	1	Label: CLEANED FOR 0_2 SERVICE BY TRAINED PERSONNEL
7-6	**232**	62-A7507-1	1	Label: SEE OPERATING INSTRUCTIONS
7-6	**233**	62-A7514	1	Label: RIX Address
7-6	**234**	138-512	1	Terminal Strip
7-6	**235**	62-A7634-3	1	Label: Suction
7-6	**236**	62-A7634-4	1	Label: 1st Stage
7-6	**237**	62-A7634-5	1	Label: 2nd Stage
7-6	**238**	X10-A7947	1	Manifold, Discharge
7-6	**239**	X10-A7946	1	Manifold, Suction
7-6	**240**	40-A8463	1	Bracket, Lifting Eye
7-6	**241**	76-1278	1	TIME Delay Relay
7-6	**242**	167-1005	1	Resistor, 50 k Ohm
7-6	**243**	158-1017	1	Electric Box
7-6	**244**	476-47	1	Electric Switch
7-6	**245**	476-76	2	Starter Contactor
7-6	**246**	A160-321	1	Light Assembly (Incls. 1)
7-6	**-1**	A160-303	1	Light Bulb
7-6	**247**	X315-1005	1	Solenoid Valve
7-6	**248**	40-B6989	1	Bracket, Terminal
7-6	**249**	62-422	1	Label, Automatic
7-6	**250**	62-A7634-17	1	Label, Run
7-6	**251**	61-1023	1	Connector, Electric
7-6	**252**	476-46	1	Push Button, Start
7-6	**253**	61-1020	2ft.	Conduit, Flexible
7-6	**254**	138-425	2	Elbow, Liquid tite
7-6	**255**	61-1026	7	Electric Wire Nut
7-6	**256**	A163-400	1	Fuse, In-Line, 3 AMP

Option Packages

TABLE 7-2. ACCESSORY PARTS LIST (Continued)

Figure & Index No.		Part No.	Qty.	Description

(The 2PS2B-.85-L Accessory List begins on Page 7-3)

Using the 2PS2B-.85-L as the common Accessory Parts List, develop Option Packages by making listed substitutions and/or additions to the “-L” list.

For the **2PS2B-.85-L50 Low Speed 240V 50 Hz,** substitute the following:

7-6	**201**	107-1046	1	Motor 1 ½ HP, 1425 RPM
7-6	**202**	113-711	1	Hour Meter, 240VAC 50 Hz
7-6	**205**	776-H34	1	Overload Heater, Starter
7-6	**218**	36-6J18	1	Sheave, Motor
7-6	**226**	42-113	2	Fan, Electric
7-6	**241**	76-1276	1	Time Delay Relay

For the **2PS2B-.85-H High Speed 120V 60 Hz,** substitute or add the following:

7-7	**201**	107-489	1	Motor 1-1/2 HP, 3450 RPM

For the **2PS2B-.85-H50 High Speed 240V 50 Hz,** substitute or add the following:

7-6	**201**	107-489	1	Motor
7-7	**202**	113-711	1	Hour Meter, 240VAC 50 Hz
7-7	**205**	776-H35	1	Overload Heater, Starter
7-7	**218**	36-6J18	1	Sheave, Motor
7-7	**226**	42-113	2	Fan, Electric
7-7	**241**	76-1276	1	Time Delay Relay

Option Packages *(Continued)*

(The 2PS2B-.85-L Accessory List begins on Page 7-3)

Figure & Index No.		Part No.	Qty.	Description

Using the 2PS2B-.85-L as the common Accessory Parts List, develop Option Packages by making listed substitutions and/or additions to the "-L" list.

For the **2PS2B-.85-HH High Speed 240V 60 Hz,** substitute or add the following:

7-7	**201**	107-489	1	Motor, 3450 RPM
7-7	**202**	113-702	1	Hour Meter 240VAC 60 Hz
7-7	**203**	776-H32	1	Overload Heater, Starter
7-7	**226**	42-113	2	Fan Electric
7-7	**241**	76-1276	1	Time Delay Relay

TABLE 7-3. PLUMBING PARTS LIST

Figure & Index No.		Part No.	Qty.	Description

Omitted numbers not included in this Assembly.

All of the plumbing parts appear on the Plumbing Schematic, Figure 7-8, sheets "a", "b" or "c". Below the only reference made is to the particular letter of Figure 7-8.

Figure &	Index No.	Part No.	Qty.	Description
a,b	**301**	X54P-1/4MROSS	2	Tee Street, 1/4NPT
a	**302**	X55-D2621-2	1	Gauge Line, Inlet Pressure
a	**303**	X55-D2621-4	1	Line, 1st Stage Inlet
a,b,c	**304**	X54P-1/4CDSS	3	Street Elbow, 45°
c	**305**	X54P-1/4FFSS	2	Nipple, 1/4NPT
a,b,c	**306**	X54P-44FBUSS	4	Connector, Male
a,b	**307**	X54P-44CBUSS	3	Elbow 1/4T x 1/4NPT
c	**308**	X54P-4CBUSS	1	Male Elbow
a	**309**	X54P-6FBUSS	2	Connector, Male 3/8T x 1/4
c	**310**	X54P-444SBUSS	1	Tee, Male
b	**311**	X54P-4P5ONSS	2	Plug, Hex Straight Thread
b	**312**	X123-904-3	2	O-ring
b	**320**	XA40-B5871	1	Bracket Assembly
b	**321**	X55-D2621-6	1	Line, Filter Inlet
b	**322**	X55-D2621-5	1	Line, 2nd Stage Inlet
b	**323**	X55-D2621-1	1	Line, 1st Stage Cooling Coil
c	**324**	X55-D2621	1	Line, 2nd Stage Cooling Coil
c	**325**	X55-D2621-3	1	Line, 2nd Stage Gauge
a,c	**326**	X54P-1/4HHPB	2	Plug, Hex. NPT
c	**327**	X455-D2621-7	1	Line, Filter 2nd Stage

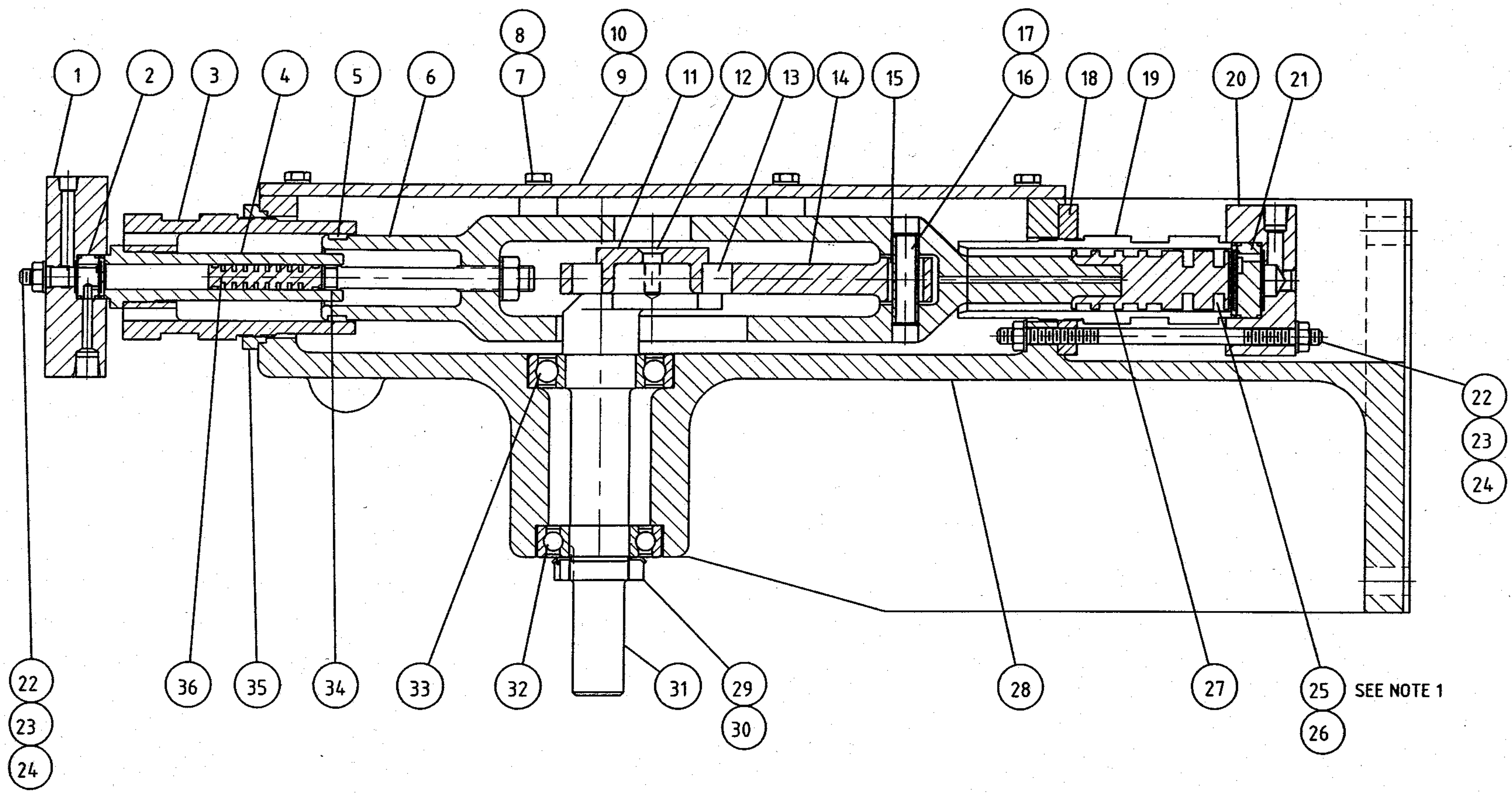
TABLE 7-4. HARDWARE PARTS LIST

Figure & Index No.		Part No.	Qty.	Description

Omitted numbers not included in this Assembly.

2PS2B-.85 ALL Models

7-6/7	**501**	34-715	17	Cap Screw, Hex Head, 1/4-20 x 1/2" Lg. Pltd. Stl.
7-6	**502**	32-1134	2	Bolt, Hex Head
7-6	**503**	34-668	6	Cap Screw, Hex Head, 5/16-18 x 3/4" Lg. Pltd. Stl.
7-6	**504**	20-669	20	Flat Washer, 1/4" Pltd. Stl.
7-6	**505**	53-54	3	Nut, 1/4-20 Pltd. Stl.
7-6	**506**	20-657	6	Flat Washer, 5/16" Pltd. Stl.
7-6	**507**	34-749	16	Phillips Pan Head Self-Drilling Screw, #8-18 x ½" Lg.
7-6	**508**	34-1002	Ref.	Sheet Metal #10 x 1/2", Pan Head, S/S.
7-6	**509**	34-750	2	Screw, Flat Socket Head, 5/16-18NC x 1" Pltd. Stl.
7-6	**510**	34-752	2	Screw, #10-32 X 3/8 Long Pltd. Stl.
7-6	**511**	34-751	1	Ground Screw, Self Tapping Hex Head #10-32 X 3/8 Long Pltd. Stl.
7-6	**512**	319-64	3	Tubing Clamp
7-6	**513**	138-614	2	Elbow, 90°
7-6	**514**	138-449	2	Cord Connector
7-6	**515**	138-606	2	Lock Nut, Conduit
7-6	**516**	34-688	1	Screw
7-6	**517**	34-716	2	Screw
7-6	**518**	32-1148	3	Bolt, Flat Head

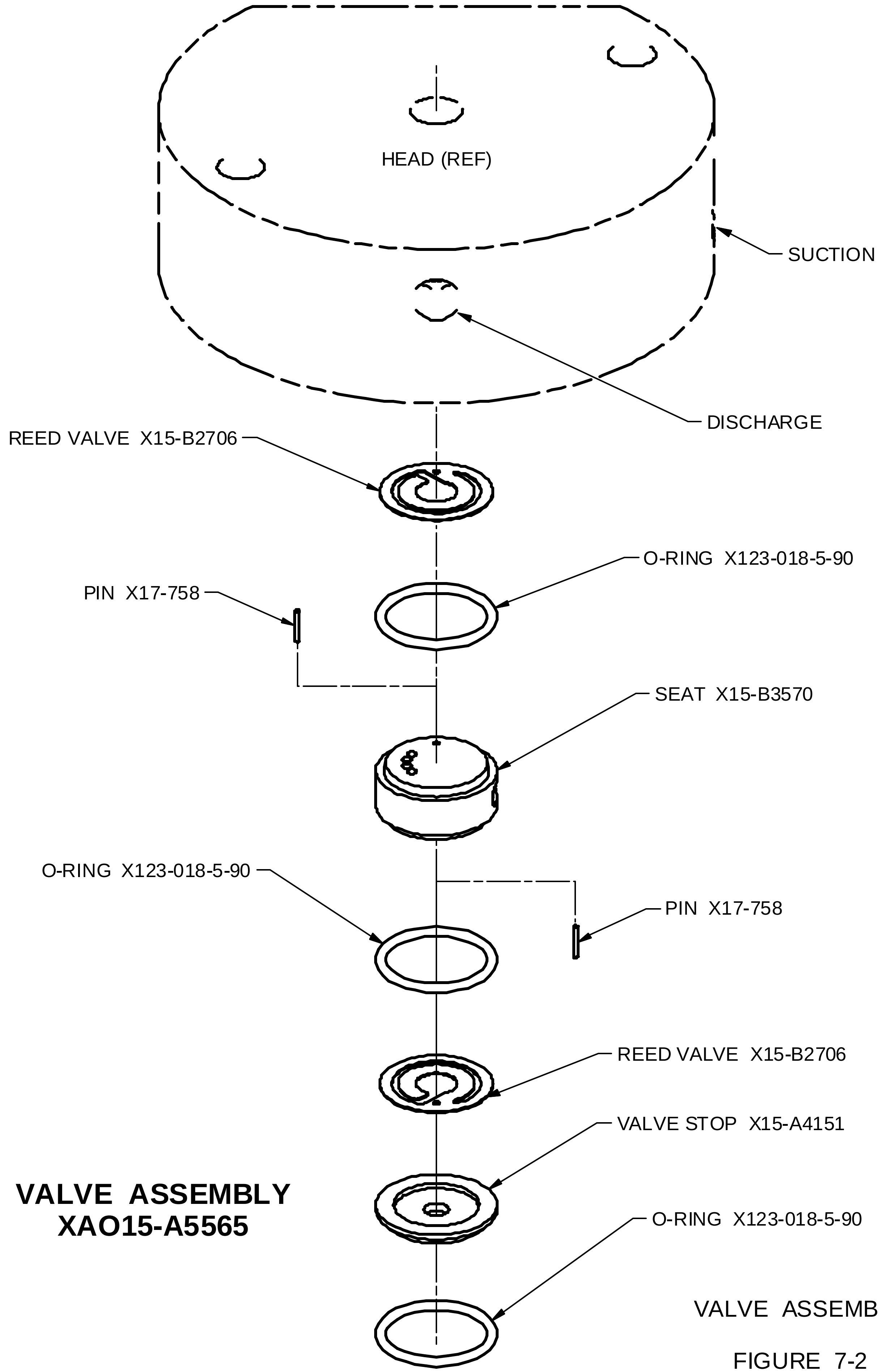


NOTE:
1) INSTALL COMPRESSION RINGS IN TOP TWO GROOVES ONLY.

B5989

CROSS SECTION
2PS2B

FIGURE 7–1
PAGE 7–8



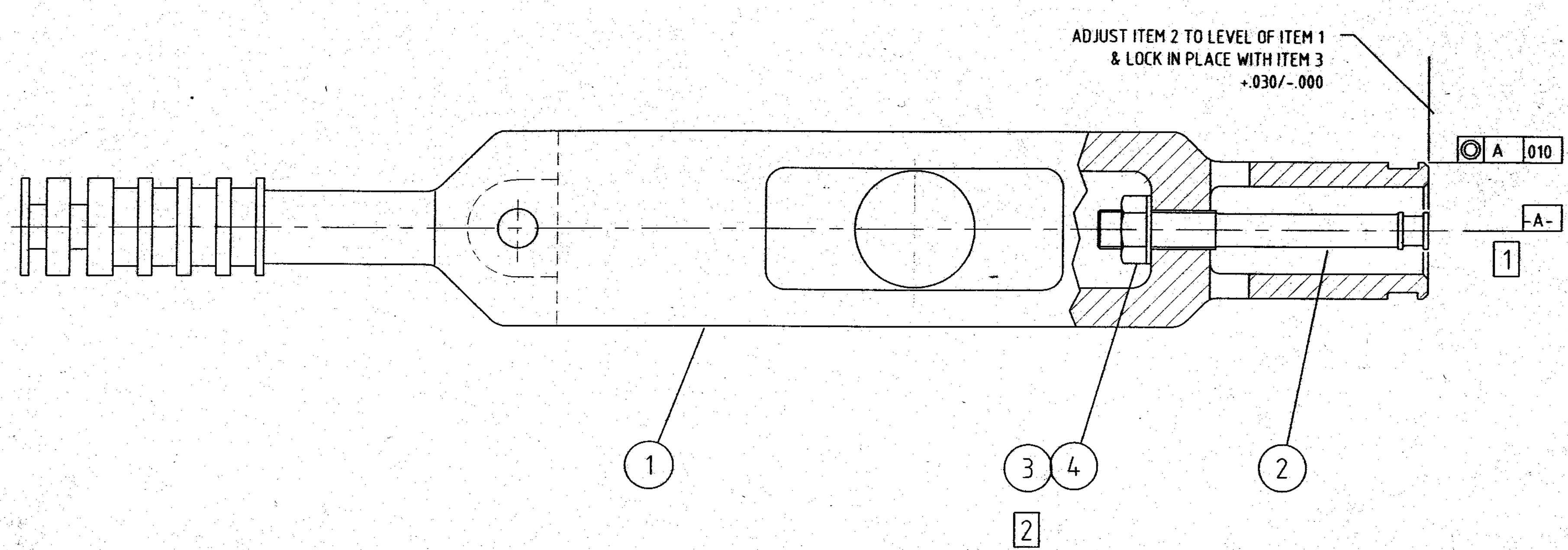
VALVE ASSEMBLY
XAO15-A5565

VALVE ASSEMBLY

FIGURE 7-2

A5565A

Revision History			
LTR	Description	Date	Approved

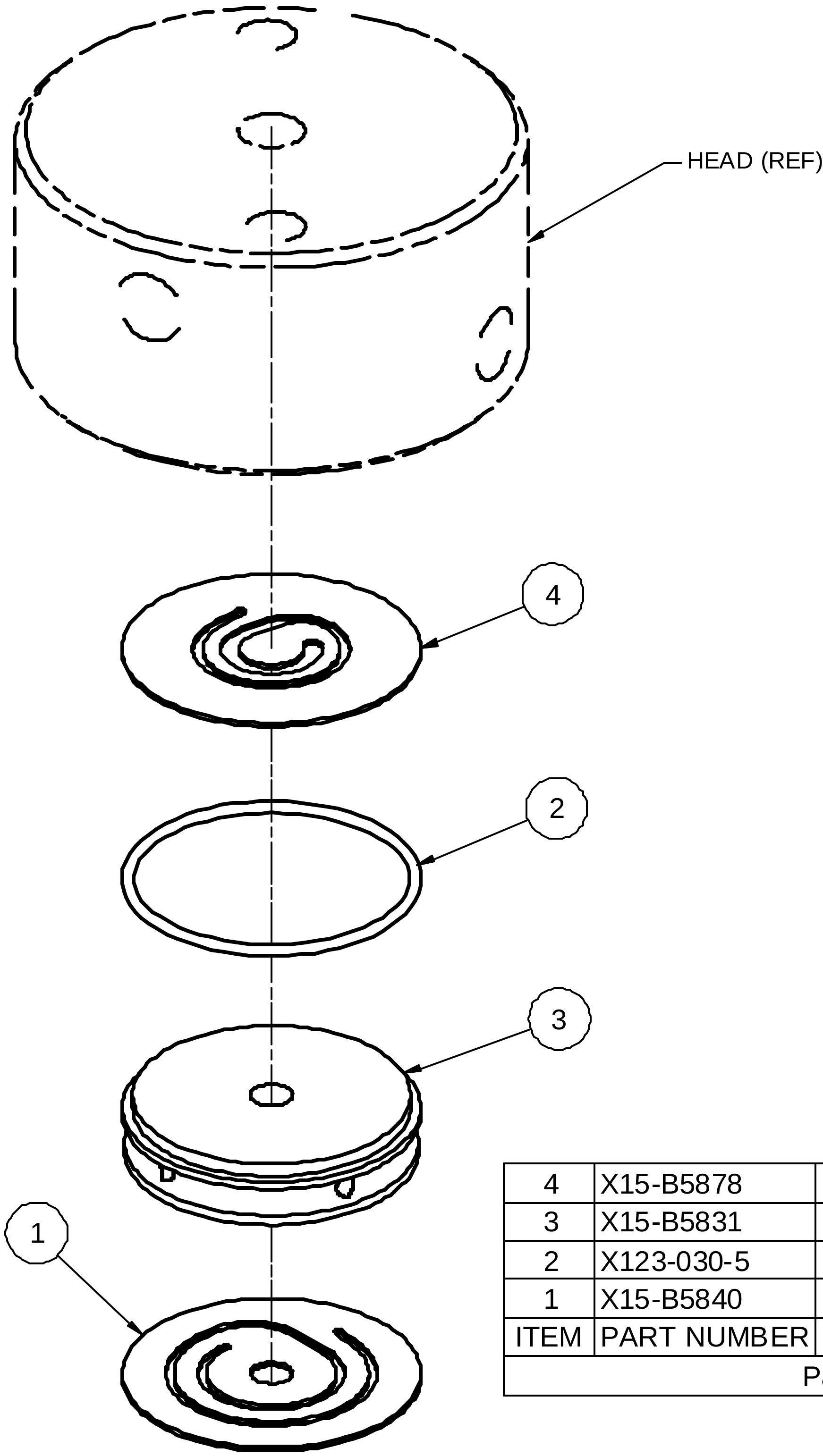


NOTES:
1. Q.C. REFERENCE CALL OUT.

2. USE LOCKTITE #680 AND TORQUE TO 25 FT. LB.

Proprietary Drawing	Tolerances: Decimal .X ± .1; .XX ± .03; .XXX ± .010; .XXXX ± .001; Fractions ± 1/16; Welds ± 1/32; Chamfers ± 5°; Angles ± 2°; Cast ± 1/8; (X.XXX) = Reference Dimension; See Notes For More Information; Do Not Scale; Dims In Inches	Contract No.	RIX INDUSTRIES AIR AND GAS COMPRESSOR MANUFACTURERS ON SAN FRANCISCO BAY SINCE 1878 4900 INDUSTRIAL WAY, BENICIA CA 94510 USA PHONE 707-747-5900 FAX 707-747-9200
Third Angle Projection	Material	Drawn DWR, Date 00-05-31	Title: PISTON ASSEMBLY 2PS2B
		Checked JAC, Date 00-07-13	Size B; Code ID. No. 28953; Drawing No. B5778; Rev. —
		Approved DKF, Date 00-07-13	
	Finish XXX	DESIGN ACTIVITY APPD.	
		SIMILAR TO:	Scale NONE; Part No.; Sheet 1 OF 1

A	Item 2 was 123-130-5	7/21/93	DM
B	Added "X" to Part Numbers	1/16/03	DCB/JAC



ITEM	PART NUMBER	QTY	DESCRIPTION
4	X15-B5878	1	REED VALVE - DISCH.
3	X15-B5831	1	VALVE SEAT
2	X123-030-5	1	O-RING
1	X15-B5840	1	REED VALVE - SUCT.

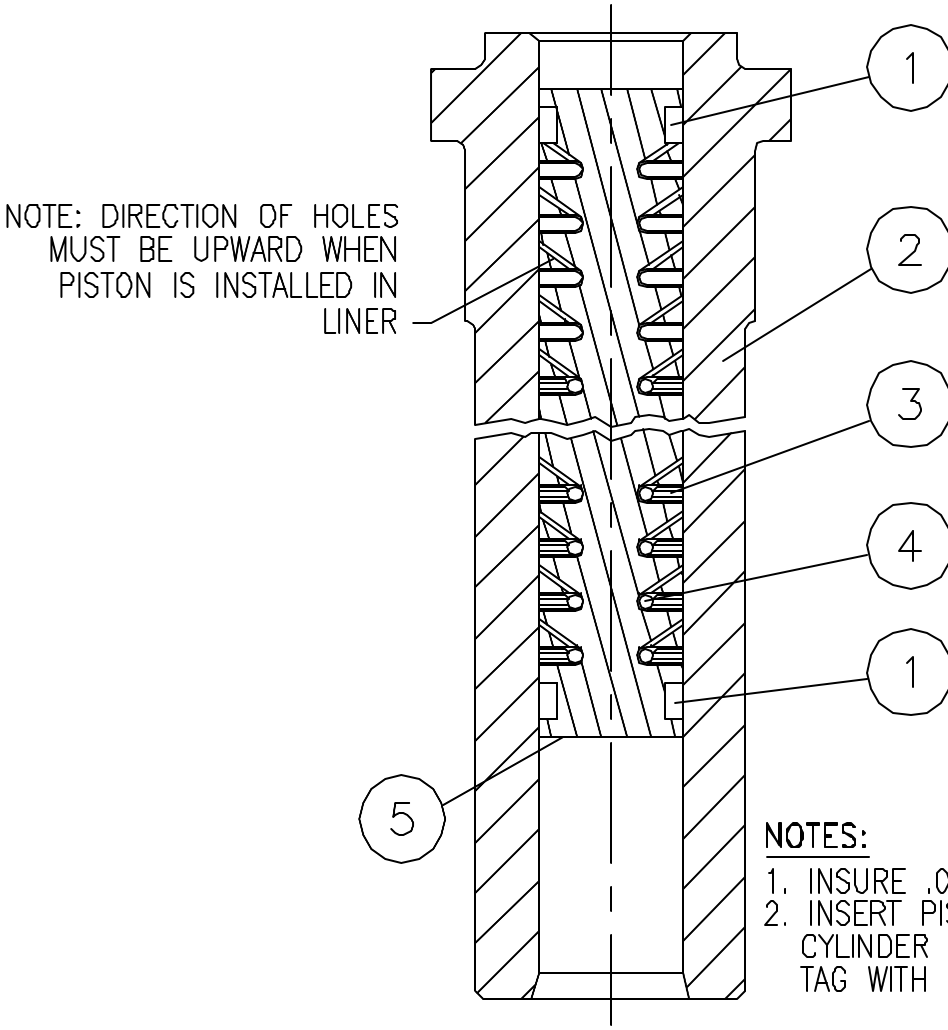
Parts List

Assembly Part Number XA15-A7798

1ST STAGE VALVE ASSEMBLY

FIGURE 7-4

A7798B



NOTES:
1. INSURE .08 TO .15 RIDER RING GAP.
2. INSERT PISTON ASS'Y IN THE CYLINDER AS SHOWN. O2 BAG AND TAG WITH PART NO. XA508-A7783-1.

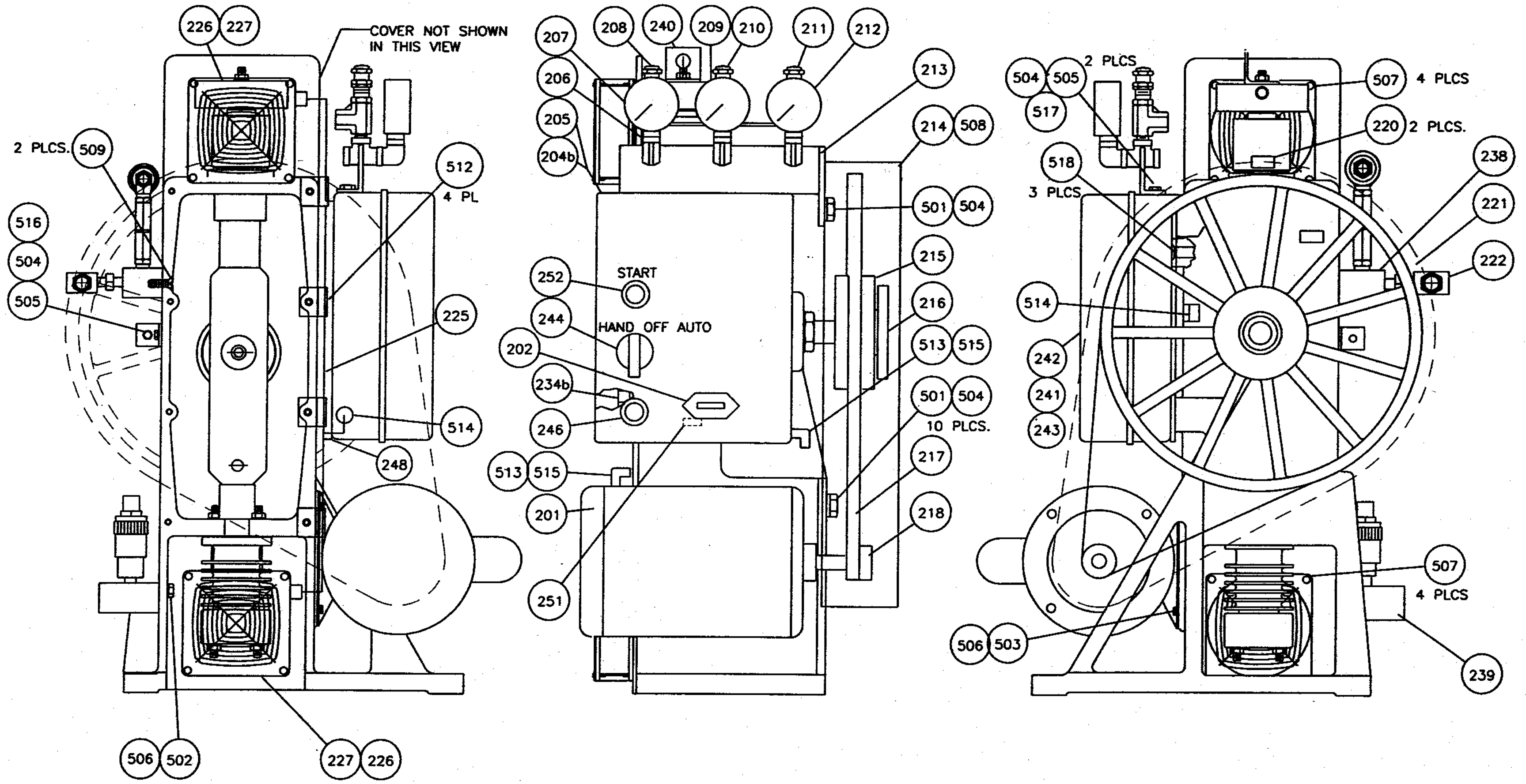
ASSEMBLY PART NUMBER
XA508-A7783-1

5	1	X508-B5928	PISTON
4	8	X123-011-5-90	O" RING
3	8	X18-C1791-4G	COMPRESSION RING
2	1	X1-B5773	CYLINDER, 2ND STAGE
1	2	X18-A2750-3G	RIDER RING
ITEM	**QTY.**	**PART NO.**	**DESCRIPTION**

PISTON ASSEMBLY
1/2" DIA., 2ND STAGE

A7783-1A

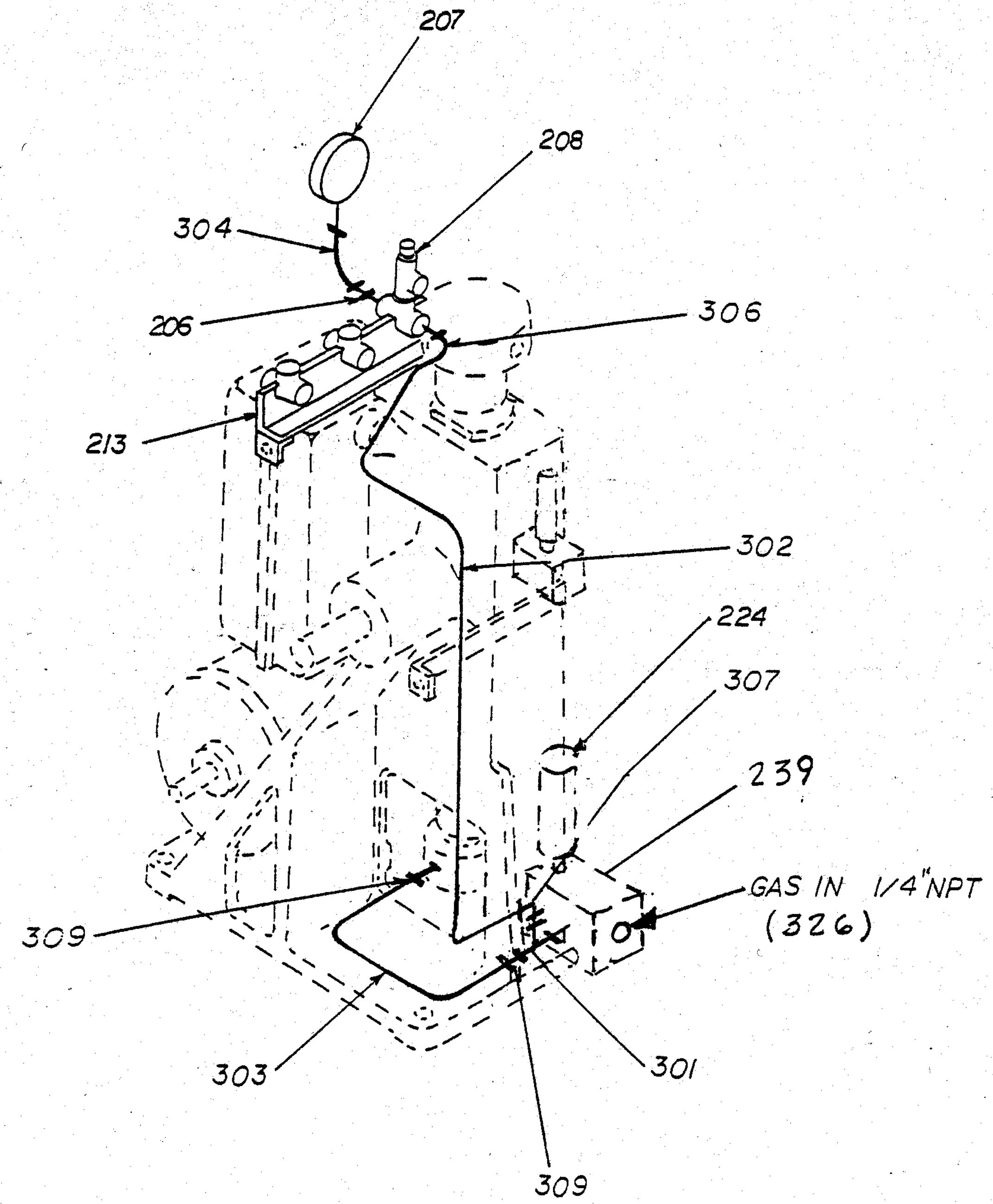
FIGURE 7-5



ACCESSORIES AND FASTENERS
2PS2B

FIGURE 7-6
SHEET 7-14

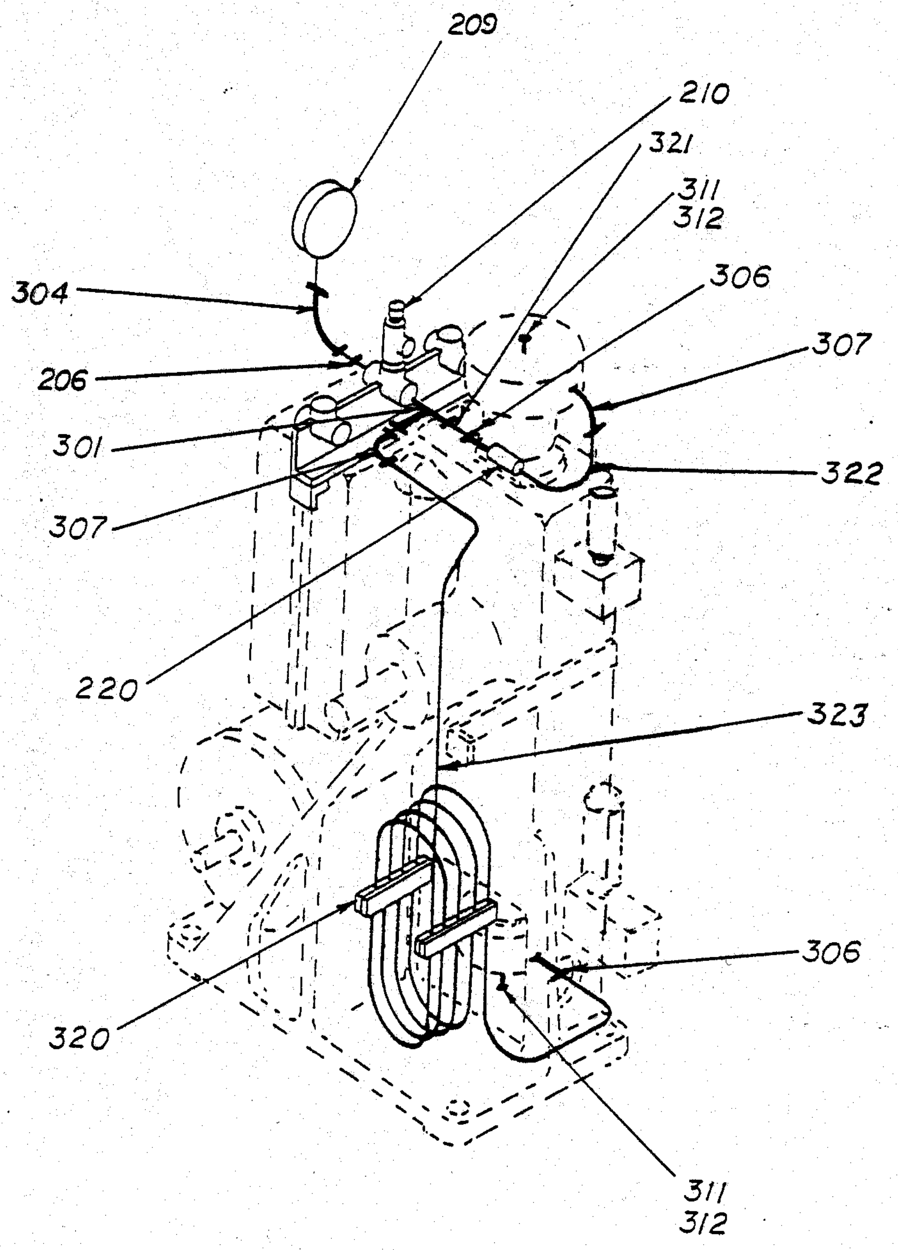
B7567A



2P PLUMBING INSTALLATION
SUCTION

FIGURE 7–7a

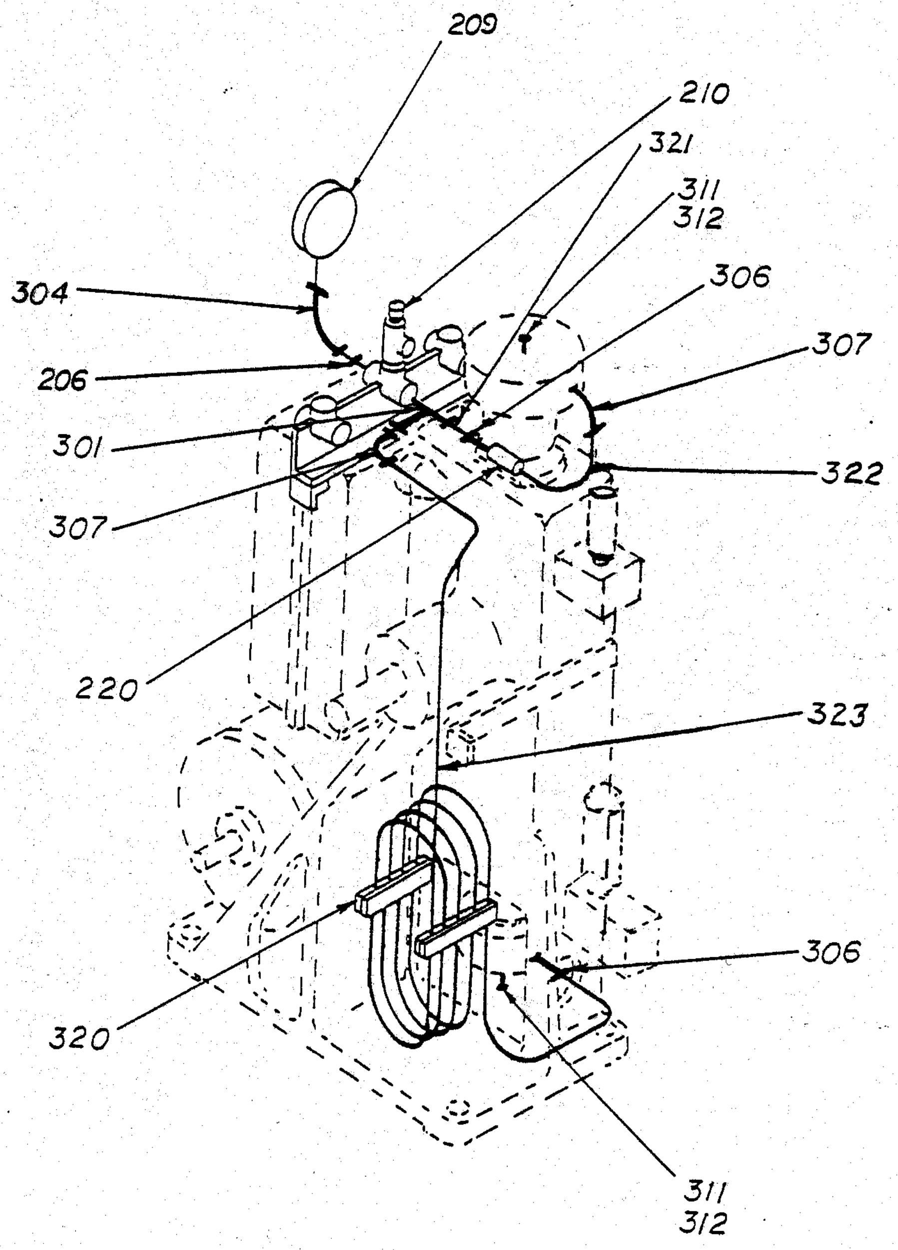
A7750-A
SHT.1 OF 3



2P PLUMBING INSTALLATION
1ST STAGE DISCHARGE

FIGURE 7-7b
PAGE 7-16

A7750A
SHT. 2 OF 3



2P PLUMBING INSTALLATION
1ST STAGE DISCHARGE

FIGURE 7–7b
PAGE 7– 16

A7750A
SHT. 2 OF 3

P/N X76-704

P/N X76-705

Barksdale

Installation And Maintenance Instructions

Pressure/ Vacuum Switches

Pressure Switches
Series 96200, 96201, 96210, 96211
Vacuum Switches
Series 96220, 96221

Description

These switches are miniature size pressure/vacuum switches having factory set or field-adjustable set-points, fixed deadbands (differentials), and have piston or diaphragm piston sensors. The switches are designed to provide long life and maintain excellent set-point accuracy despite environmental conditions. Materials wetted by the process fluid include pressure connections of brass or stainless steel and internal elastomers of Buna-N and Teflon as standard.

Caution: Do not use these switches for hazardous or corrosive service, and do not use for oxygen service without proper degreasing and proper preparation. Check nameplates on switch for maximum proof (overpressure) pressure or vacuum limits.

Installation

Caution: This switch should be installed by a trained service person. A media filter should be in the system to protect the switch.

Mounting: Switch may be mounted in any position.

Piping: Support adequate piping and mount the pressure switch to avoid excessive shock or vibration. To minimize the effect of vibration on switch, mount perpendicular to vibration. Apply pipe compound sparingly to male pipe threads only. Avoid pipe strain on switch by properly supporting and aligning piping.

Tamper Resistant Option: Field-adjustable models with a "T" prefix have two set screws to lock-in the set-point adjustment sleeve. Use a 5/64 allen wrench. Overtightening will result in switch damage.

Set-point adjustment for field-adjustable models

For pressure switch (96201 and 96211 models):

1. After connecting switch, turn adjustment sleeve clockwise to increase the set-point and counter-clockwise to decrease the set-point. The switch can be set either on "increasing pressure" mode or "decreasing pressure" mode.
2. For exact pressure setting, cycle pressure switch and make fine adjustments with sleeve.

For vacuum switch (96221 model):

1. After connecting switch, turn adjustment sleeve counter-clockwise to increase the set-point and clockwise to decrease the set-point. The switch can be set either on "increasing vacuum" mode or "decreasing vacuum" mode.
2. For exact vacuum setting, cycle vacuum switch and make fine adjustments with sleeve.

Switch Number Coding (Example Only)

T 96201-BB3 SS-T2-P1

- Tamper Proof — T
- Series — 96201
- Limit Switch — BB
- Optional Range — 3
- Wetted Material — SS
- Optional Electrical Termination — T2
- Optional Pressure Port — P1

Wiring

Wiring must comply with local and national electric codes.

Caution: Electrical rating must be within range stated on the switch nameplate, Failure to stay within the rating of the switch may result in damage to, or premature failure of, the electrical contacts.

Standard switch rating: 5 amps, 250 VAC/28 VDC SPDT

Standard free leads color code:

Pressure switch	Vacuum switch
purple = COMMON	purple = COMMON
red = NO	red = NC
blue = NC	blue = NO

Optional termination:

-T1: 1/4" male quick connect terminals. C, NO, NC markings are on the switch.

-T2: DIN 43650 type. Use 5 to 8 mm O.D. cable size. After the cable hook-up, tighten the gland squeeze nut to ensure firm environmental seal.

Pressure switch	Vacuum switch
position 1 = C	position 1 = C
position 2 = NC	position 2 = NO
position 3 = NO	position 3 = NC
position 4 = NOT USED	position 4 = NOT USED

-T4: 1/2" NPT male conduit connection with free leads.

-T5: 1/2" NPT female conduit connection with free leads.

Connect applicable conduit to the switch (plastic conduit is recommended). Generally, handtight is adequate for a conduit enclosure. Caution: use conduit hex only when tightening. Do not exceed 80 lb in tightening or bending torque. Failure to follow this instruction may result in switch damage.

Testing of the switch

Testing of the switch may be done before or after final installation. If bench tested, the switch should be re-tested when installed in the final application. Be sure switch can be tested without affecting other equipment. Check nameplates for electrical rating and circuitry (normally closed or normally open) of switch. Cycle switch a few times to check operation.

Troubleshooting

Warning: Disconnect electrical power supply to switch before removal or inspection.

Important: The switch <u>is not field-repairable.</u> In case of damage, replace entire switch.

Causes of improper operation:

1. Incorrect electrical connection: check leads to switch. Be sure they are properly connected. See "Wiring" section for circuitry color code.
2. Faulty control circuit: check electrical power supply to switch Check for loose or blown fuses, open-circuited or grounded wires, loose connections at switch.
3. Incorrect pressure: check pressure in system. Pressure/vacuum must be within range specified on nameplate.
4. External leakage: replace pressure/vacuum switch.
5. Excessive vibration or surges: check for pressure fluctuations in system. Check switch mounting and be sure there is no excessive vibration.

If the operation of the pressure/vacuum switch cannot be corrected by the above means, consult factory or authorized factory representative.

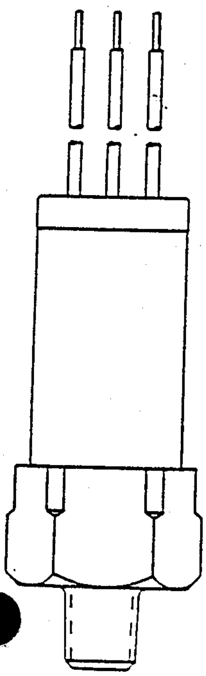
For service or ordering information

Consult factory or authorized factory representative. Specify full catalog number (with any optional modifications) and factory set-point.

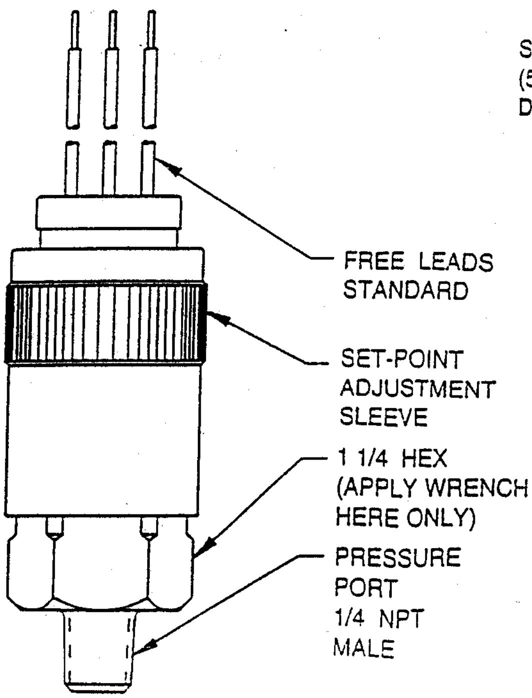
Warranty

All products of the company are sold and all services are offered subject to the company's standard conditions of sale.

STANDARD MODELS

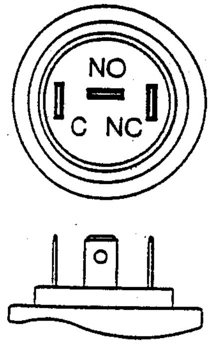


FACTORY SET MODEL
96200, 96210, 96220 SERIES

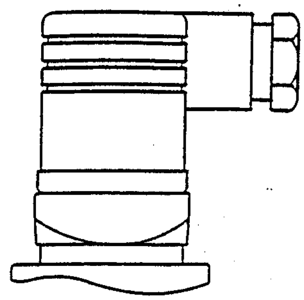


FIELD-ADJUSTABLE MODEL
96201, 96211, 96221 SERIES

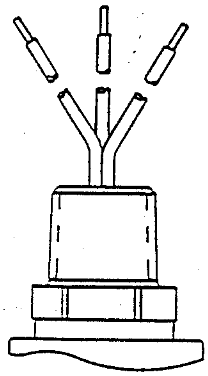
OPTIONAL ELECTRICAL TERMINATIONS



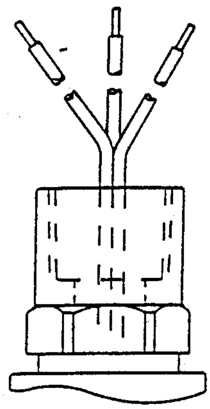
-T1 SUFFIX



-T2 SUFFIX

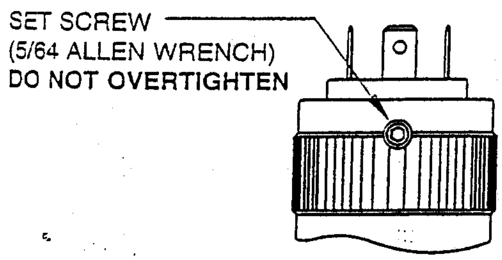


-T4 SUFFIX

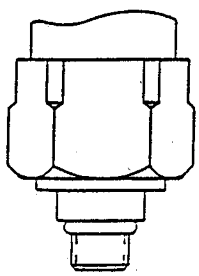


-T5 SUFFIX

OTHER OPTIONS



PREFIX "T"
TAMPER RESISTANT ADJUSTMENT SLEEVE



-P1 SUFFIX
7/16-20UNF MALE PRESSURE PORT WITH O-RING

RIX 2PS2B OXYGEN COMPRESSOR

PARTS LIST, 8000 HOURS SERVICE, 390 RPM

October-02

PART NO.	DESCRIPTION	Figure	Index	QTY Unit	2000 Hour	4000 Hour	6000 Hour	8000 Hour	QTY Total	Cost ea	COST
X15-B2706	Reed Valve, 2nd stage	#7-2	1	2		2		2	4	30.00	120.00
X123-018-5-90	O-ring, 2nd head	#7-2	2	3	3	3	3	3	12	3.00	36.00
X15-B3570	Valve Seat, 2nd stage	#7-2	3	1				1	1	108.50	108.50
X17-758	Pin	#7-2	5	2		2		2	4	3.00	12.00
X1-B5773	Cylinder, 2nd stage*1	#7-1	4	1				1^	1	279.00	
X1-B6931	Cylinder, 2nd stage*2	#7-1	4	1				1^	1	380.00	380.00
X18-C1147-14-1G	Rider Ring, 1-3/4"	#7-1	5	1		1		1	2	37.20	74.40
X123-030-5	O-ring, 1st head	#7-1	10	1	1	1	1	1	4	3.00	12.00
181-728	Bearing, rod	#7-1	13	1				1	1	40.00	40.00
X181-7	Bearing, needle	#7-1	15	1		**		1	1	30.00	30.00
X17-A2104-1	Wrist Pin*3 (1.7")	#7-1	16	1				1	1	48.05	
X17-A8518	Wrist Pin*4 (2.1")	#7-1	16	1				1	1	32.40	32.40
31-10	Snap ring	#7-1	17	2				2	2	2.00	4.00
X1-D2574	Cylinder, 1st stage	#7-1	19	1				1^	1	787.40	787.40
X15-B5840	Reed Valve, Suction	#7-4	1	1		1		1	2	30.00	60.00
X123-030-5	O-ring, 1st stg valve	#7-4	2	1	1	1	1	1	4	3.00	12.00
X15-B5831	Valve Seat, 1st stage	#7-4	3	1				1	1	151.90	151.90
X15-B5878	Reed Valve, Discharge	#7-4	4	1		1		1	2	26.70	53.40
X18-C1791-10G	Compression Ring,1.25"	#7-1	25	2		2		2	4	23.25	93.00
X123-313-5	O-ring	#7-1	26	2		2		2	4	3.75	15.00
X18-B2117-2G	Rider Ring, 1-1/4"	#7-1	27	2		2		2	4	18.60	74.40
20-606	Lock washer, bearing	#7-1	30	1				1	1	2.55	2.55
181-604	Bearing	#7-1	32	1				1	1	10.05	10.05
181-26	Bearing	#7-1	33	1				1	1	34.30	34.30
X18-A2750-5G	Rider Ring, 1/2"	#7-1	34	1	1*	1*	1*	1*	4	10.25	41.00
XA508-A7783	Piston A'ssy, 2nd stage	#7-1	36	1	1*	1*	1*	1*	4	387.85	1551.40
41-520J6	Belt	#7-7	217	1		1		1	2	23.40	46.80
XA77-505	Filter	#7-7	220	1		***			***	222.20	
X123-904-3	O-ring, head plug	#7-8a	312	2	2	2	2	2	8	3.00	24.00
45-1007	O2 Grease (2 oz)			1	1				1	52.50	52.50
										Total	3859.00

*1: Applicable to S/N's prior to 9386
*2: Applicable to S/N 9386 & later (9-98) or use with X1-B6932 head
*3: Applicable to S/N's prior to 9521
*4: Applicable to S/N 9521 & later or use with XA8-B5778 piston assy
*or as needed
**Repack grease
***Clean filter and clean lines between 1st stage head and filter
^ if needed

Engineering and Manufacturing
Premium Oil Free Compressors

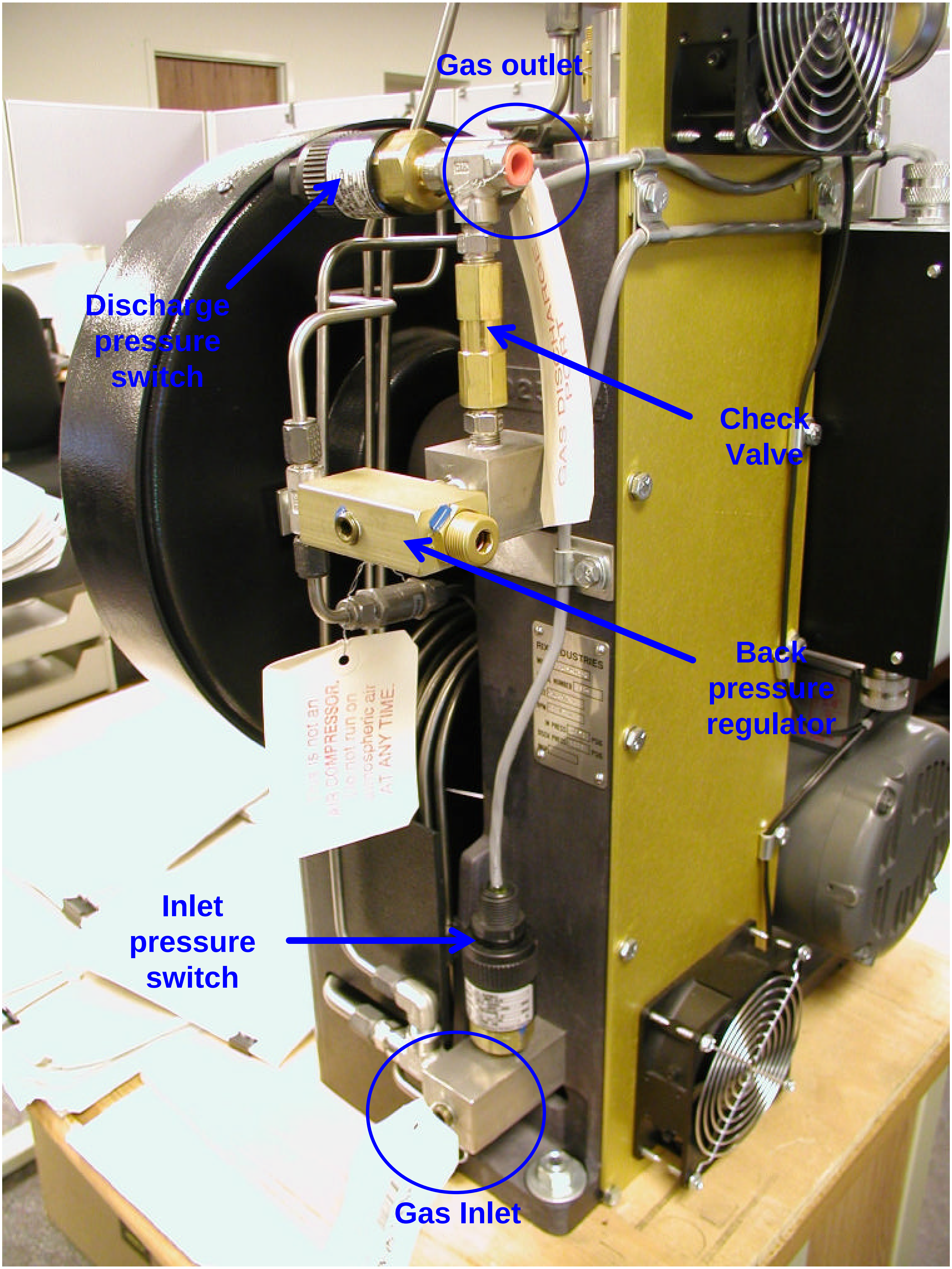
RIX 2PS2B OXYGEN COMPRESSOR
NEW COMPRESSOR SPARES KIT
PART NUMBER 204-6404

PART NO.	DESCRIPTION	Figure	Index	QTY per unit	COST Cost ea	TOTAL COST
41-520J6	Belt	#7-7	217	1	23.40	23.40
45-1006	O2 Grease (2 oz)			1	32.50	32.50
X123-018-5-90	O-ring, 2nd head	#7-2	2	3	3.00	9.00
X123-030-5	O-ring, 1st head	#7-1	10	2	3.00	6.00
X123-313-5	O-ring	#7-1	26	2	3.75	7.50
X123-904-3	O-ring, head plug	#7-8a	312	2	3.00	6.00
X15-B2706	Reed Valve, 2nd stage	#7-2	1	2	30.00	60.00
X15-B5840	Reed Valve, Suction 1st	#7-4	1	1	30.00	30.00
X15-B5878	Reed Valve, Discharge 1st	#7-4	4	1	26.70	26.70
X17-758	Pin	#7-2	5	3	3.00	9.00
X18-A2750-5G	Rider Ring, 1/2"	#7-1	34	1	10.25	10.25
X18-B2117-2G	Rider Ring, 1.25"	#7-1	27	2	18.60	37.20
X18-C1147-14-1G	Rider Ring, 1-3/4"	#7-1	5	1	37.20	37.20
X18-C1791-10G	Piston Ring,1.25"	#7-1	25	2	23.25	46.50
XA508-A7783	Piston A'ssy, 2nd stage	#7-1	36	1	387.85	387.85
					Kit price	729.10

Note #1: Reference, Technical manual 2PS2B

All pricing in U.S. Dollars, FOB RIX. Prices valid thru 12-02.
$75 minimum. $100 expedite fee. $30 wire transfer fee.
$30 export document fee - waived with credit card payment. $500 Letter of Credit fee.

Phone 707-747-5900, Fax 707-747-9200


Gas outlet
Discharge pressure switch
Check Valve
Back pressure regulator
Inlet pressure switch
Gas Inlet

POWEREX

PURE AIR TECHNOLOGY

Scroll Compressor

Service and Maintenance Manual

CONTENTS

MAINTENANCE SCHEDULE

			Operating Hours					
Item	Action needed	Page	500	2,500	5,000	10,000	15,000	Remarks
Intake air filter	Replace	4	●	▲	(Every 2,500 hours or less)			Part #91348550
Cooling fins	Clean	7		●	(Every 2,500 hours or less)			
Blower fan	Clean	10			●	●	●	
Fan duct	Clean	12			●	●	●	
Bearings	Regrease	13	(Every 5,000 hours for high pressure model)			●		Service Center Only
Tip Seal set	Replace	22	(Every 5,000 hours for high pressure model)			▲		

●: Inspect

▲: Replace

NOTES:

1. Inspect and perform maintenance periodically according to maintenance schedule.
2. The maintenance schedule relates to the normal operating conditions. If the circumstances and load condition are adverse, shorten the cycle time and do maintenance accordingly.
3. *The tension of the V-belt should be adjusted during the initial stage and inspected every 2,500 hours afterwards. Proper belt tension for 3 HP unit is 7 lbs./0.16" deflection; for 5 HP units, 7 lbs./0.19" deflection.
4. Air end life is as below.
   Regular pressure model: 20,000 hours,   High pressure model: 15,000 hours

INTAKE AIR FILTER REPLACEMENT

every 2,500 HOURS – MAINTENANCE

1. Remove the Filter Cover.

2. Change the Filter Element (part number 91348550)

CAUTION

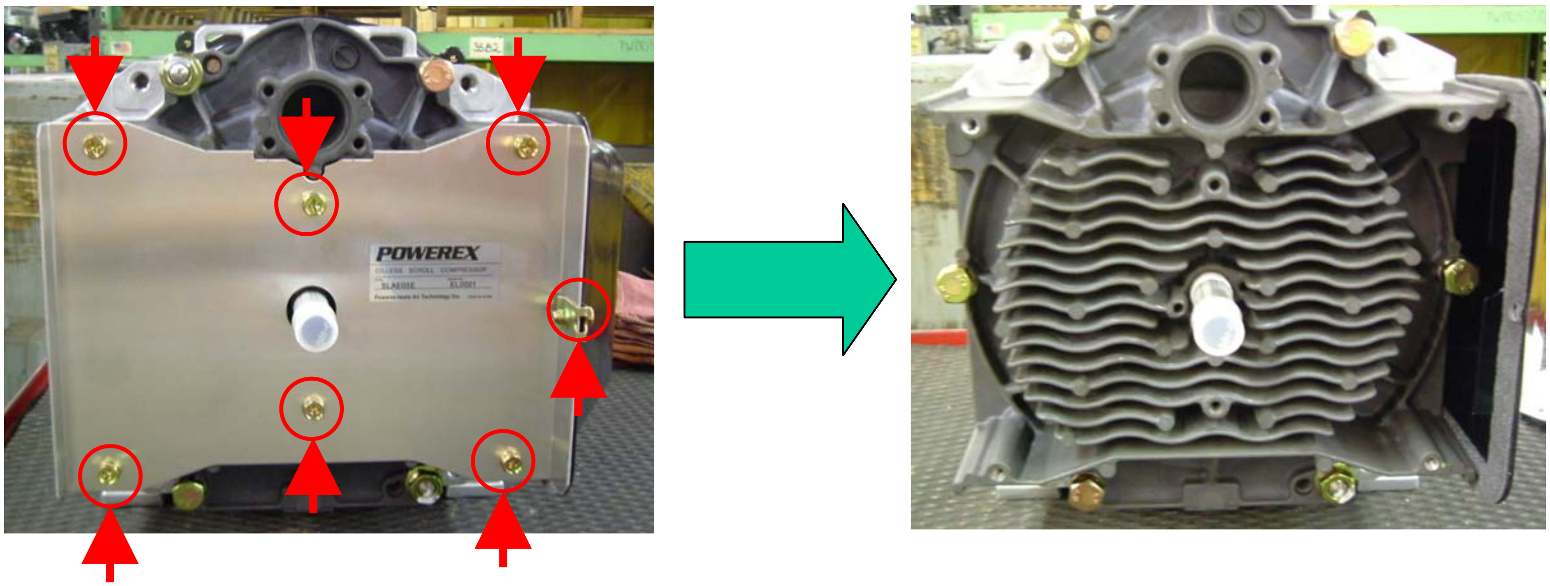
Do not attempt to clean the filter element. This filter requires replacement and is to be replaced when contaminated.

3. Reassemble the Filter Cover.

COOLING FIN CLEANING

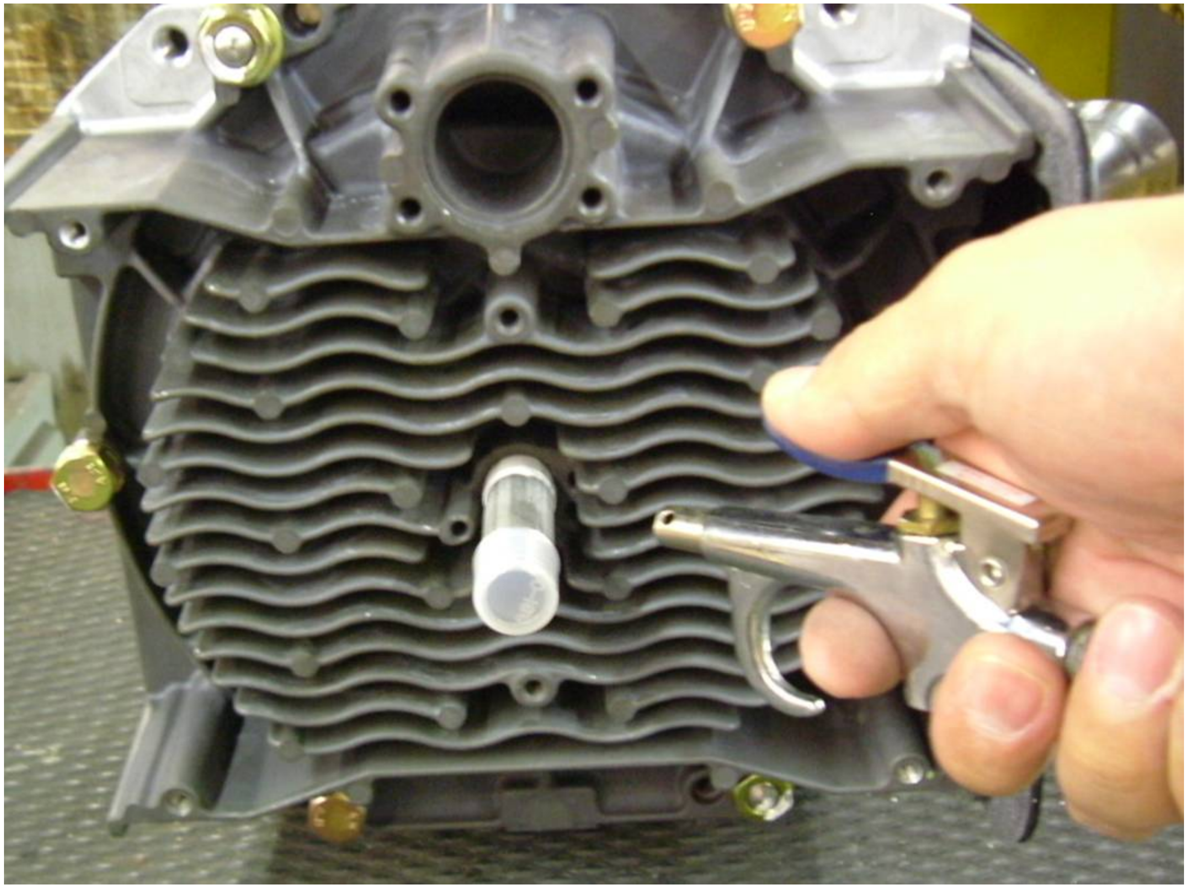
every 2500 HOURS - MAINTENANCE

1. Remove the FS (Fixed Scroll) cover.

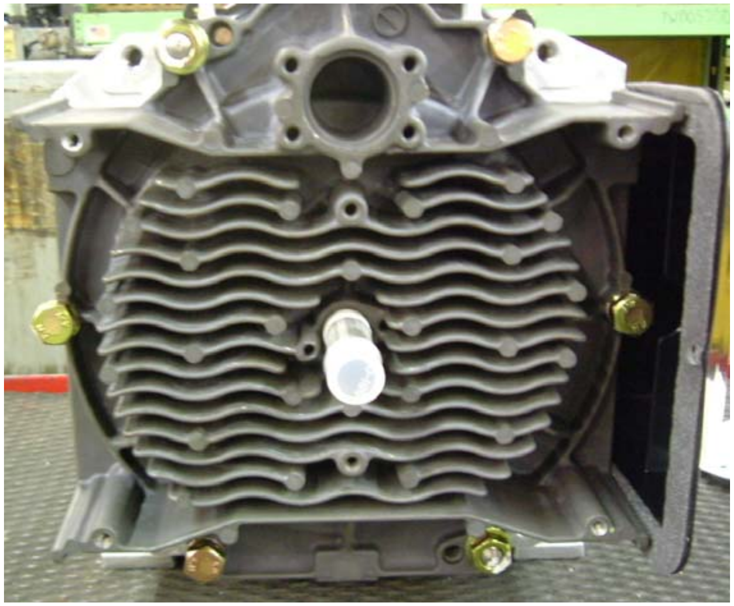


Remove these seven bolts.

2. Clean FS fins with a blow gun.

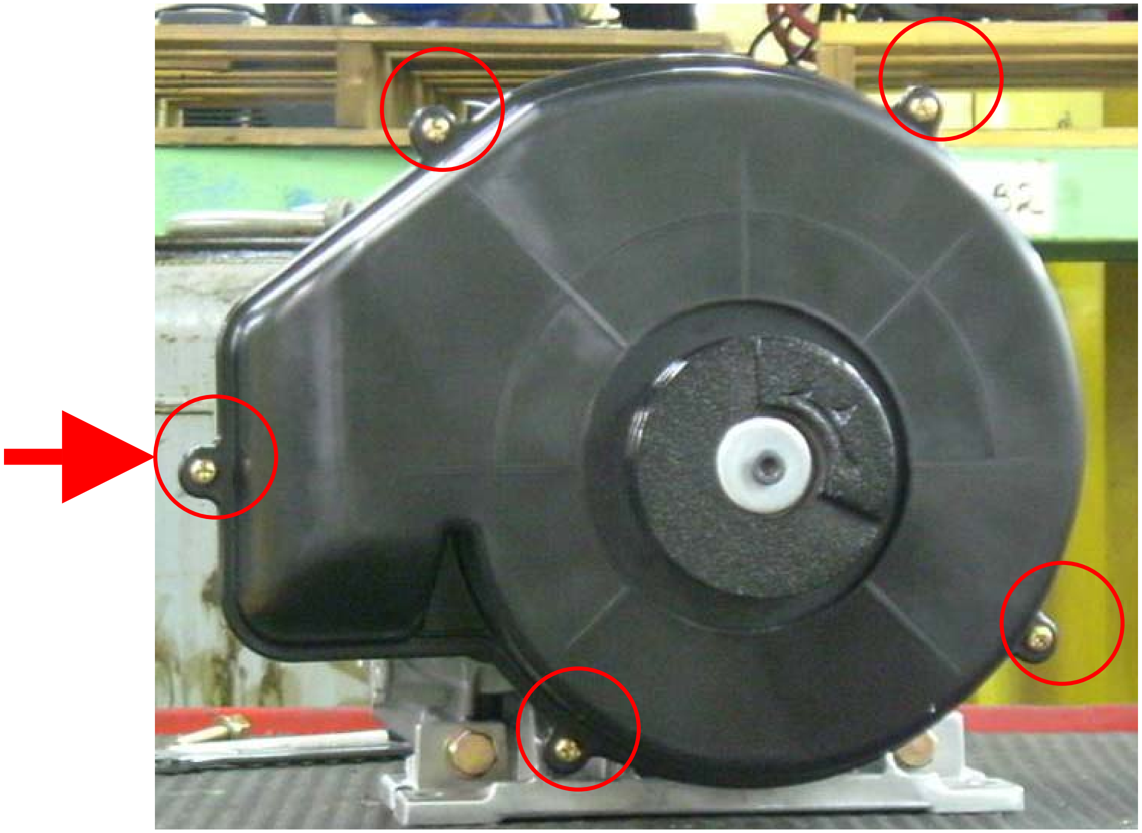


3. Reassemble the FS cover.



BLOWER FAN CLEANING
every 5,000 HOURS – MAINTENANCE

1. Remove five screws and take the Fan Cover off.



2. Blow off dirt and dust

FAN DUCT CLEANING
5,000 HOURS MAINTENANCE

Wipe out dirt and dust

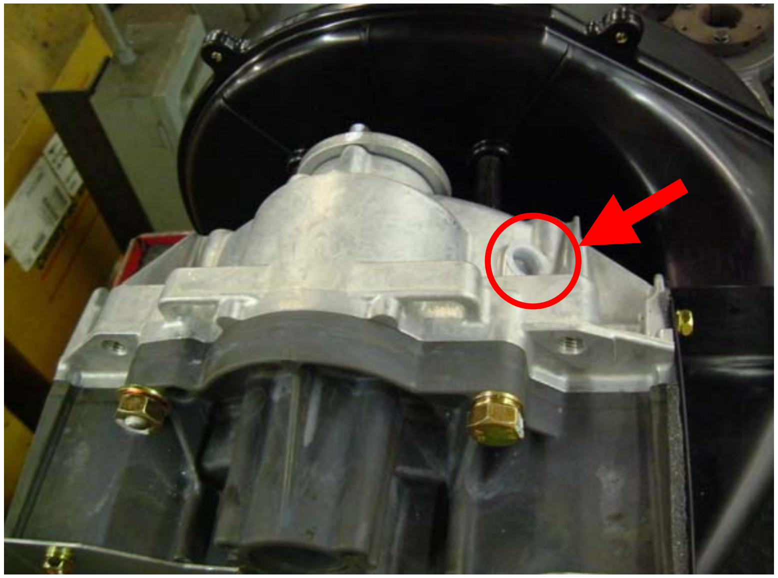
REGREASE BEARINGS

every 5,000 HOURS – MAINTENANCE (High pressure model)
10,000 HOURS – MAINTENANCE (Regular pressure model)

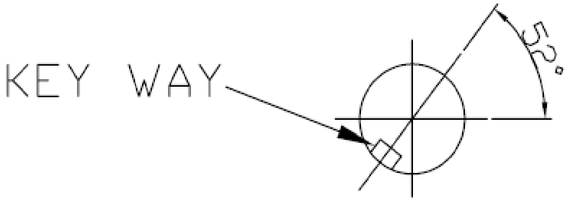
WARNING
Per OSHA regulations, ALL power must be locked out before performing any maintenance.

CAUTION
This service should be performed by an authorized Powerex Service Center to avoid failure.

1. OS BEARING
   i. Remove the Plastic Dust Cap.

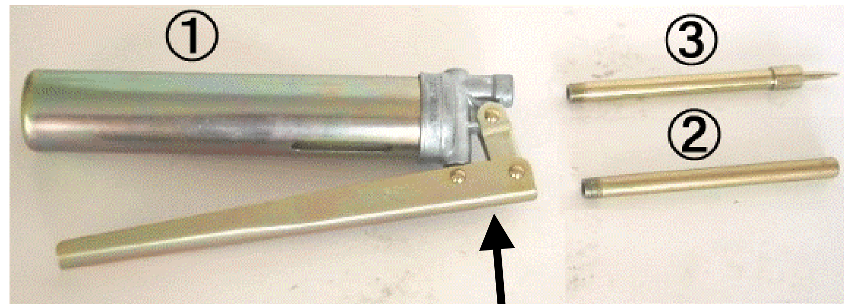


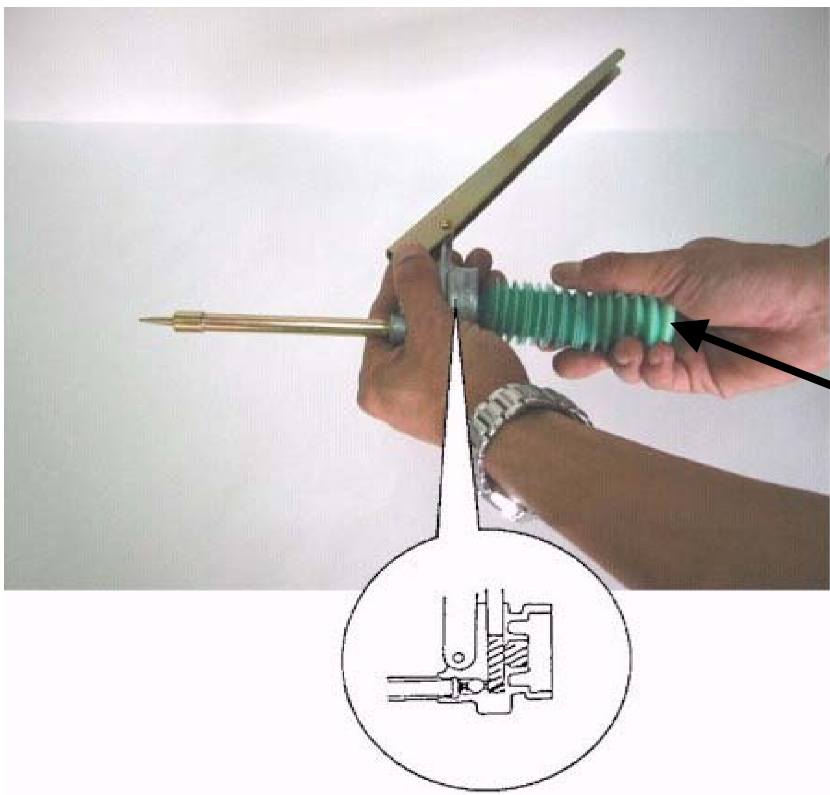
ii. Rotate the Compressor Pulley until the grease fitting is visible through the dust cap hole.



seen from the front

iii. Prepare a grease gun.

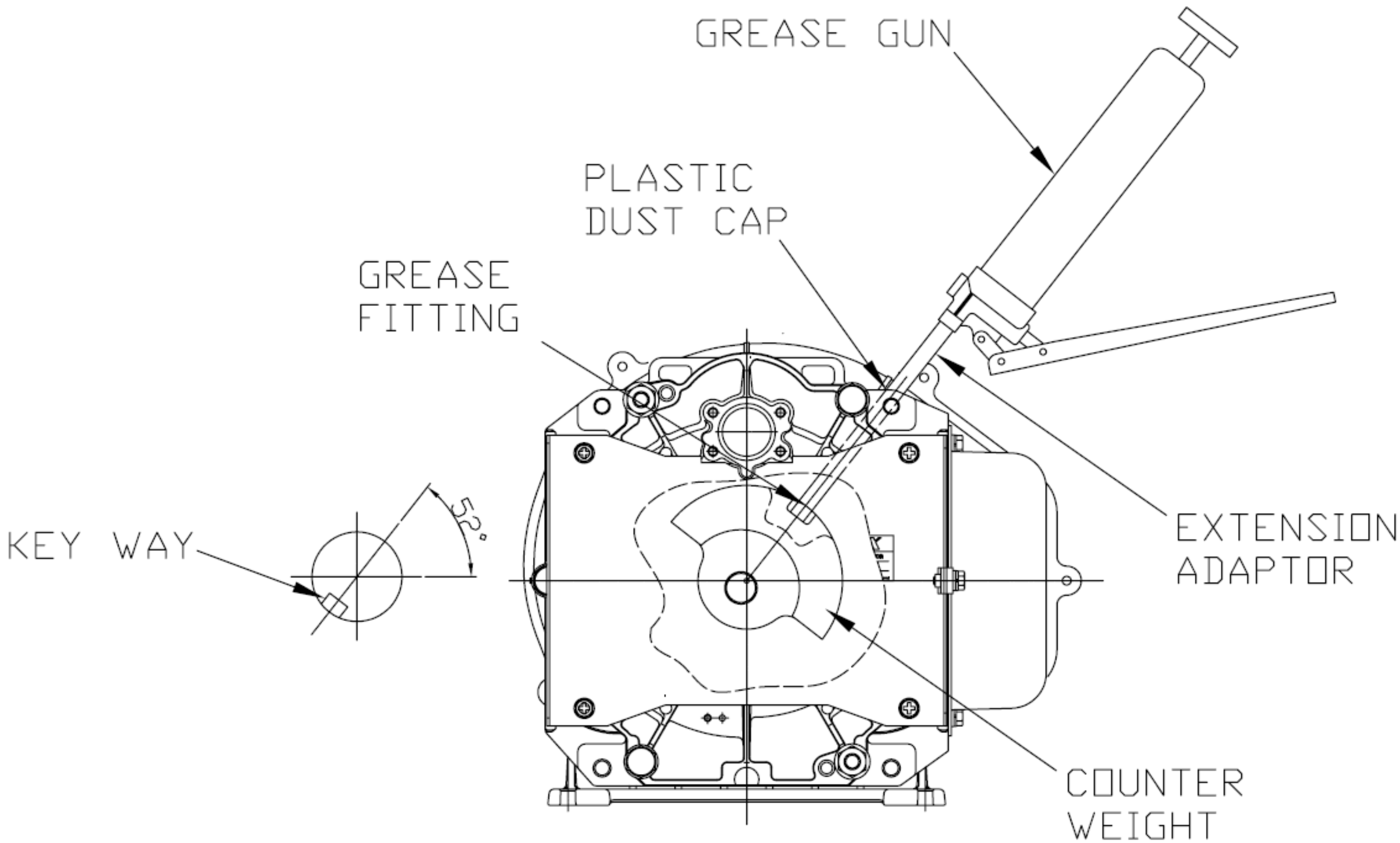




CAUTION

Use only Powerex genuine grease. Pump grease gun before using feeding (this eliminates air from the grease passage of the extension adaptor).
Part Number: IP616200AJ (complete kit), IP600000AV (grease tube)

iv. Use a grease gun extension adaptor to enlarge the grease fitting and supply the power volume of grease as indicated below table.

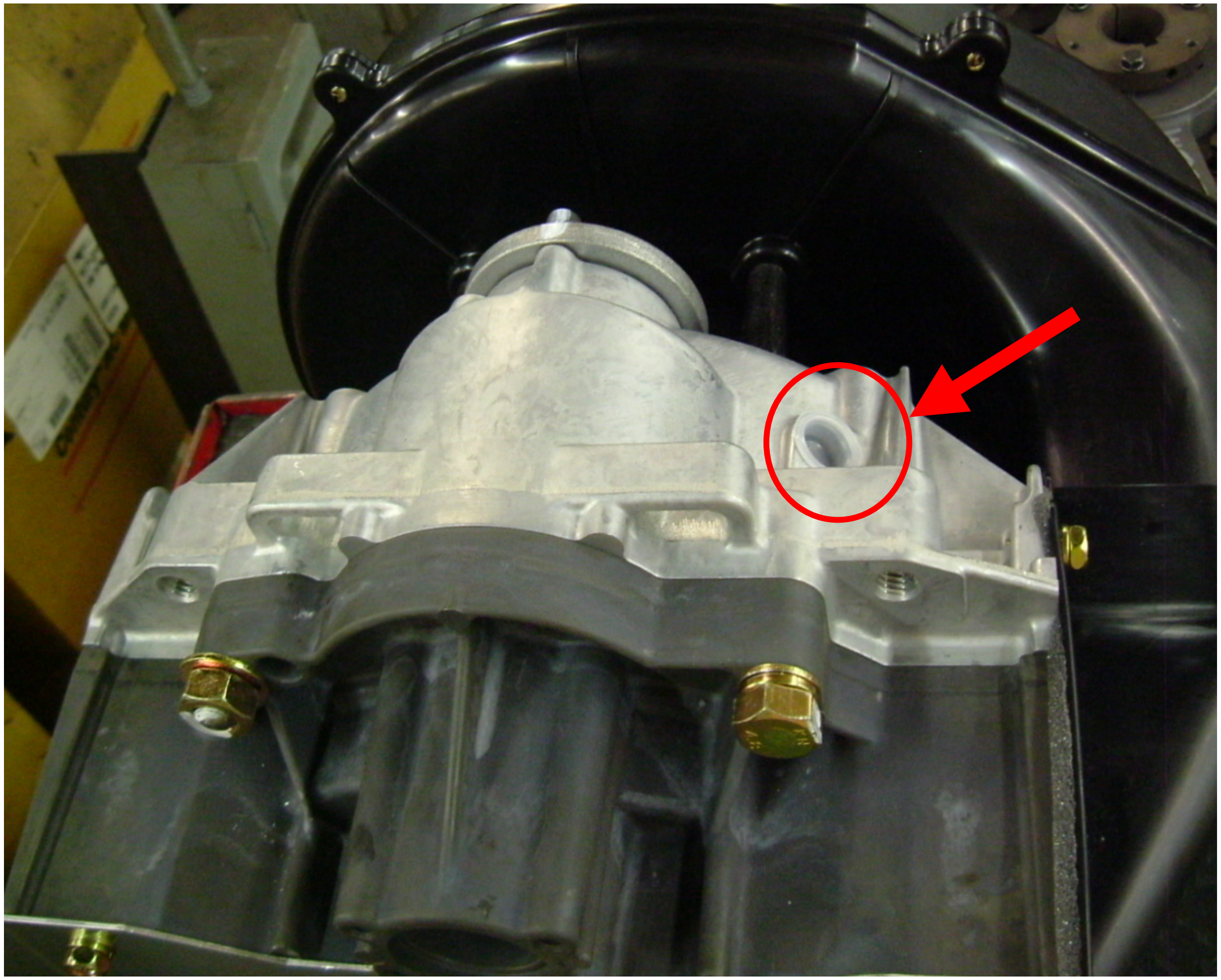


Grease delivery (OS Bearing)

SLAE03E		SLAE05E		SLAE05EHP	
1st time	2nd time	1st time	2nd time	1st time	2nd time
5 times	4 times	7 times	6 times	7 times	6 times

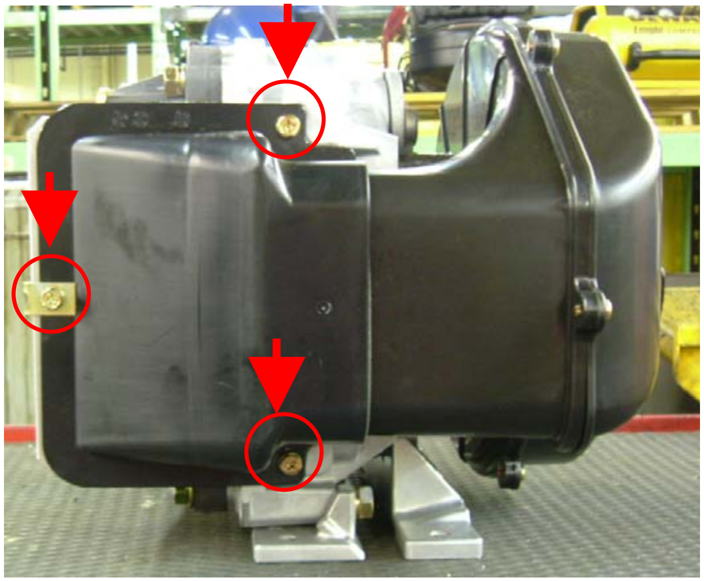
Note: Each pump of the grease gun equals 0.65 g of grease.

v. Put the removed Plastic Dust Cap back.



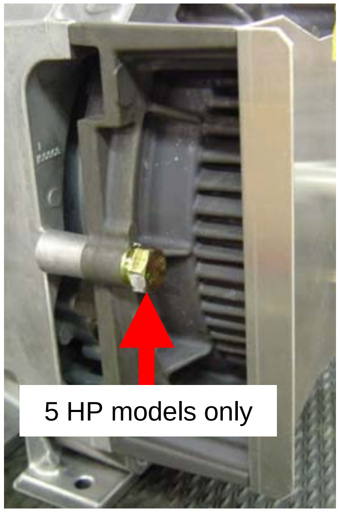
2. PIN CRANK BEARINGS

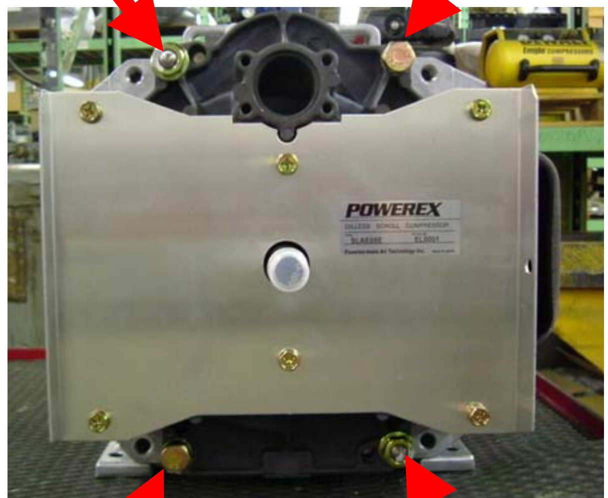
i. Remove the Fan Duct (2)



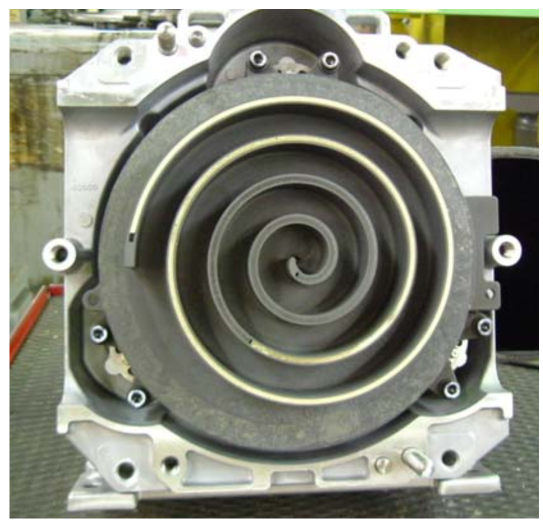
Remove these three bolts.

ii. Remove FS (Fixed Scroll) Set

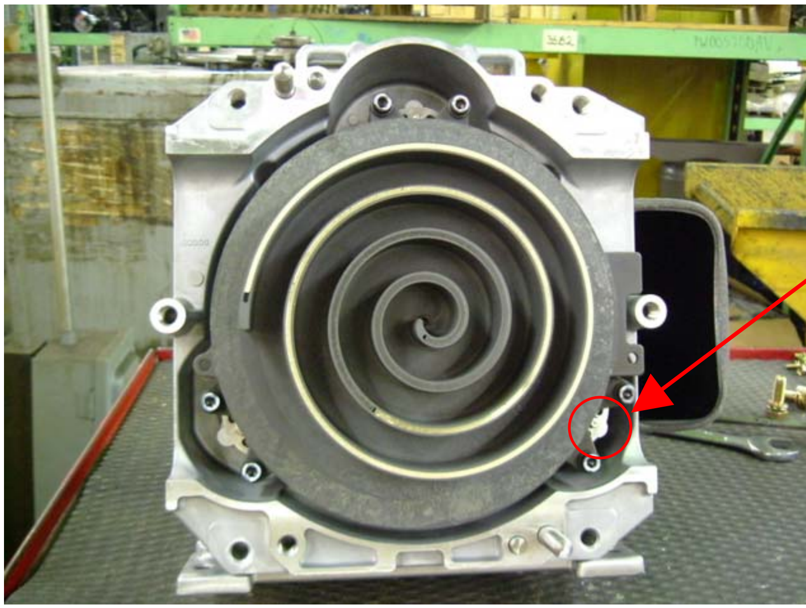




Remove bolts and nuts and remove the FS



iii. Use a grease gun to enlarge the grease fitting and supply the power volume of grease as indicated below table. Grease all three pin crank bearings from the grease fittings.



Grease fitting

Grease delivery (Pin crank bearings)

SLAE03E		SLAE05E		SLAE05EHP	
1st time	2nd time	1st time	2nd time	1st time	2nd time
4 times	4 times	5 times	5 times	7 times	7 times

Notes: Each pump of the grease gun equals 0.65 g of grease.

CAUTION

Use only Powerex genuine grease. Pump grease gun before using feeding (this eliminates air from the grease passage of the extension adaptor).
Part Number: IP616200AJ (complete kit), IP600000AV (grease tube)

iv. Replace the FS set and fan duct (2). Tighten bolts and nuts temporarily and confirm if crankshaft rotates smoothly by hand and tighten them firmly. Tightening torques are as below.

Tightening torque

SLAE03E		SLAE05E / SLAE05EHP	
First	Second	First	Second
17 in-ib	175 in-lb	17 in-ib	265 in-lb

NOTE: Assemble so that dust seal and tip seal will not drop between Orbit (OS) scroll and FS scroll set.

TIP SEAL SET REPLACEMENT

every 5,000 HOURS – MAINTENANCE (High pressure model)
10,000 HOURS – MAINTENANCE (Regular pressure model)

WARNING
Per OSHA regulations, ALL power must be locked out before performing any maintenance.

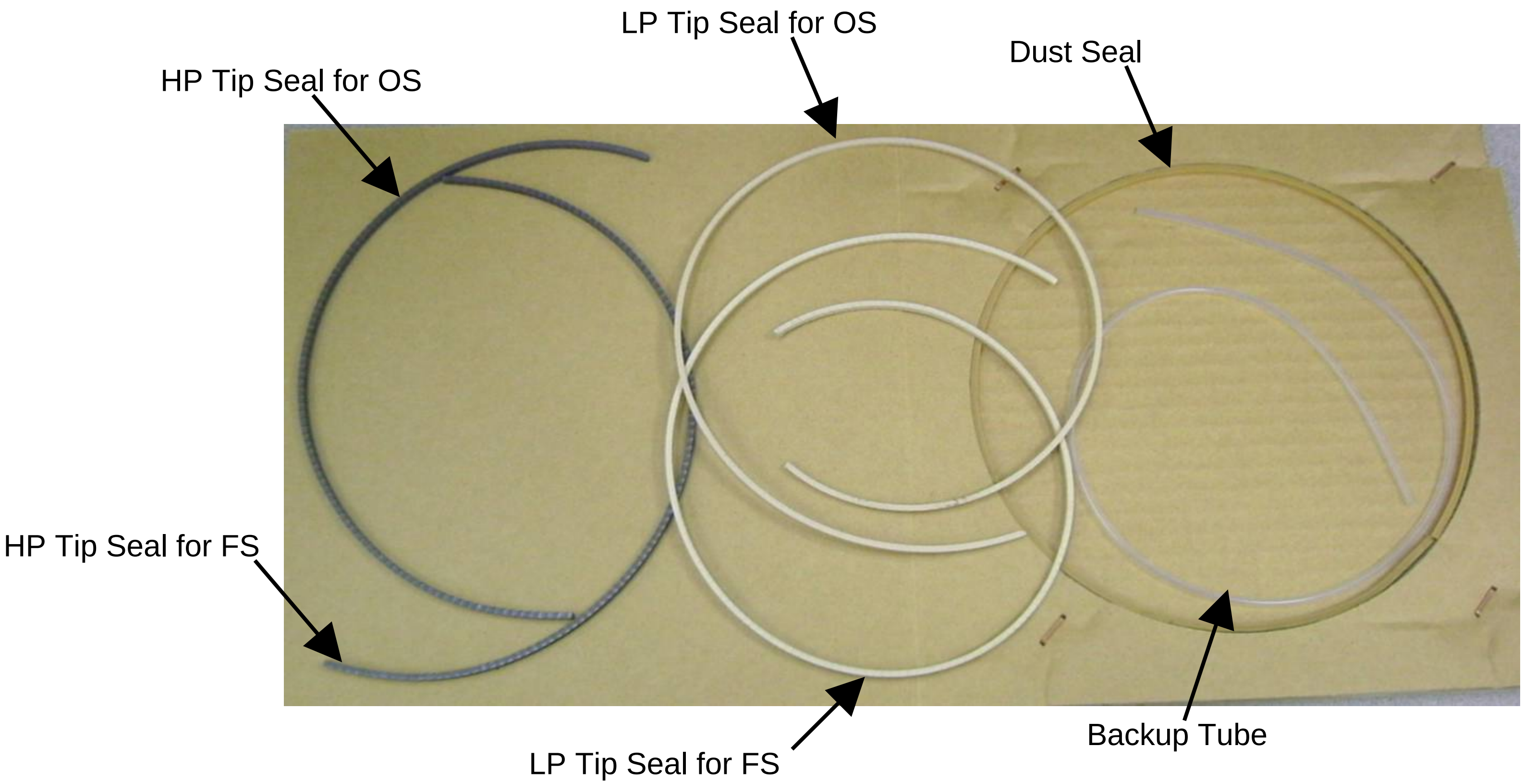
CAUTION
This service should be performed by an authorized Powerex Service Center to avoid failure.

1. CONFIRMATION OF THE PARTS
   i. Confirm if the Tip Seal you purchased is correct for the air end you are replacing (see below parts listing).

Tip Seal Set

SLAE03E	SLAE05E	SLAE05EHP
92834090	92832070	92832080

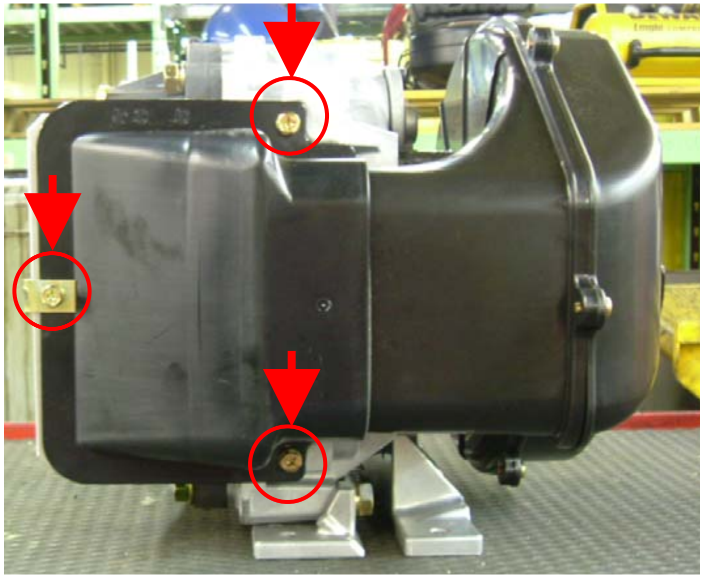
ii. Confirm if the parts are correctly included.



HP = High Pressure	LP = Low Pressure
FS = Fixed Scroll	OS = Orbital Scroll

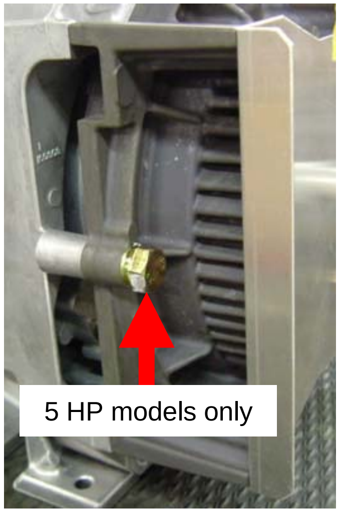
2. REPLACEMENT

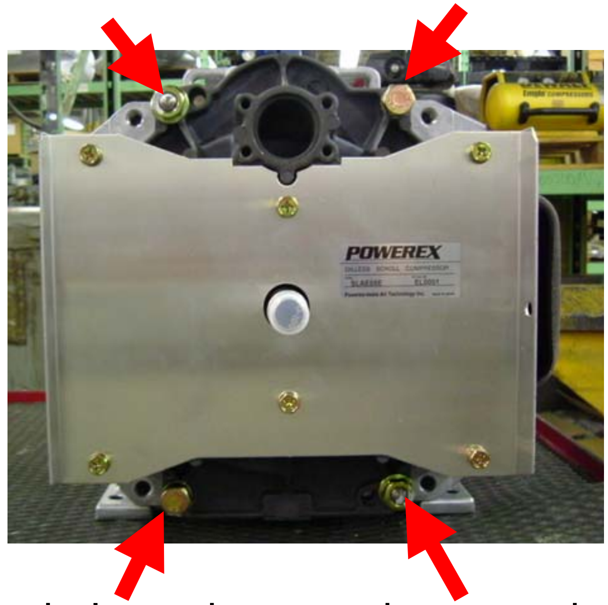
i. Remove the fan duct (2)



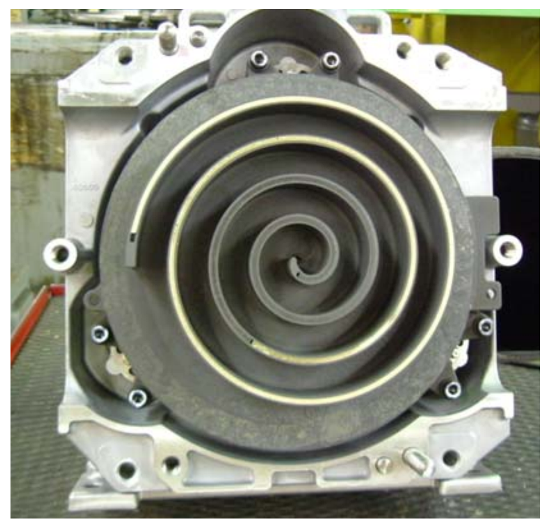
Remove these bolts.

ii. Remove FS (Fixed Scroll) Set





Remove bolts and nuts and remove the FS



iii. Remove the LP and HP Tip Seals, the Dust Seal and the Backup Tube from FS (Fixed Scroll) and OS (Orbital Scroll) sets. Using the tip of a ball-point pen at the start will make it much easier.

LP Tip Seal

HP Tip Seal

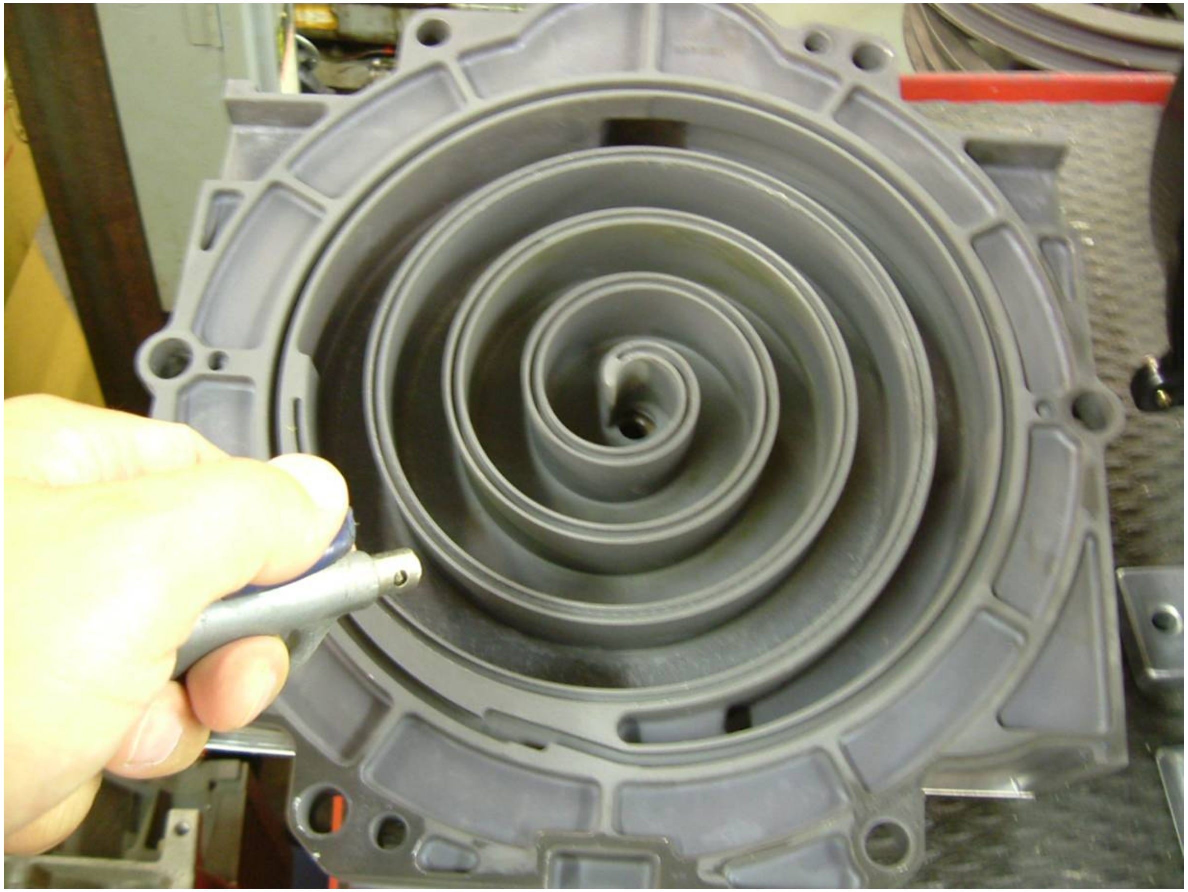
※ You have to remove LP Tip Seal first

Dust Seal

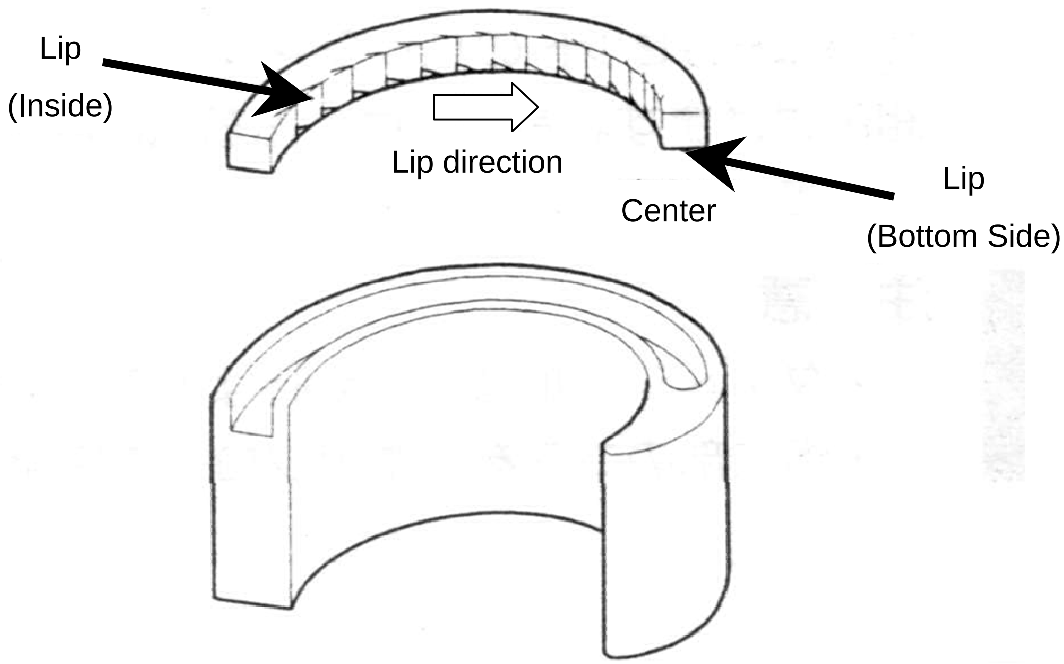
Backup Tube

※ Backup Tube is under the Dust Seal.

iv. Remove dust from both OS and FS plates with clean cloth or air.



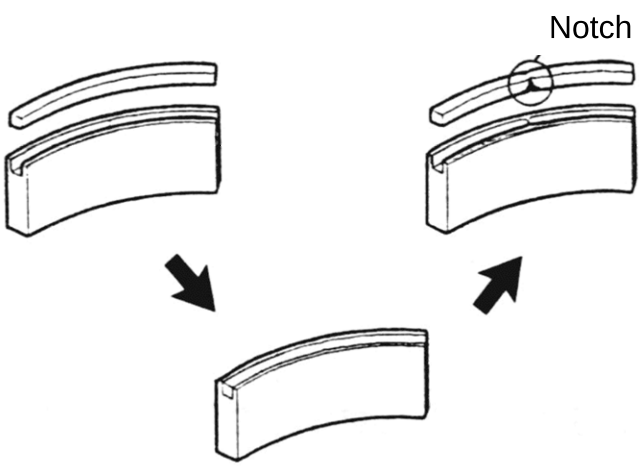
v. Insert new HP Tip Seal from the center section of OS set so that there will be no clearance at the start section.



CAUTION

Tip Seals for OS and FS have opposing seal cut angles. Insert Tip Seal so that the lip seal on the bottom of seal groove and inner side of scroll spiral and the direction of lip faces the center of scroll spiral. This is to be done both OS and FS sets, otherwise, air end cannot make enough air.

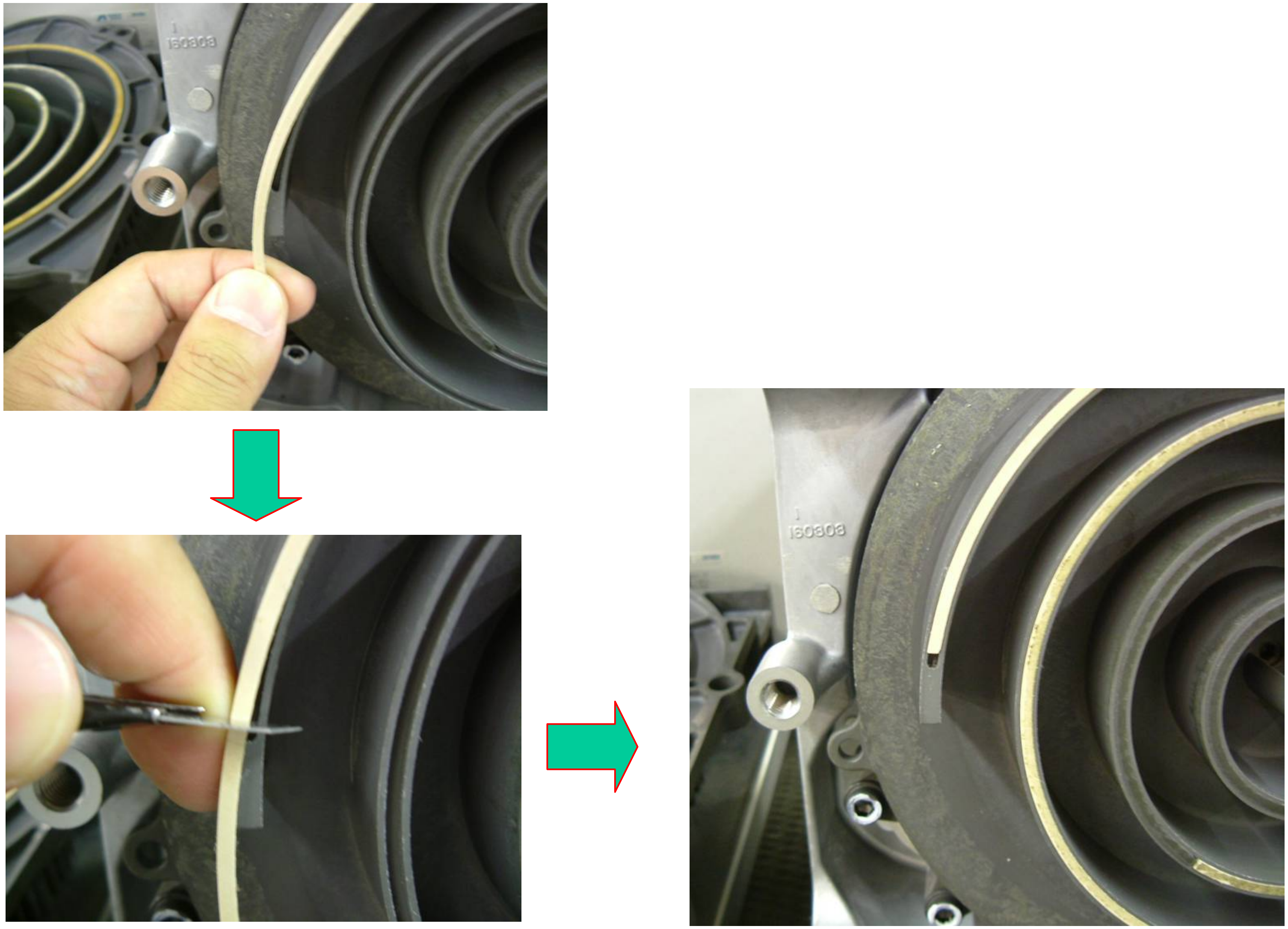
vi. Insert so that new LP Tip Seal will contact closely with HP Tip Seal inside scroll groove.



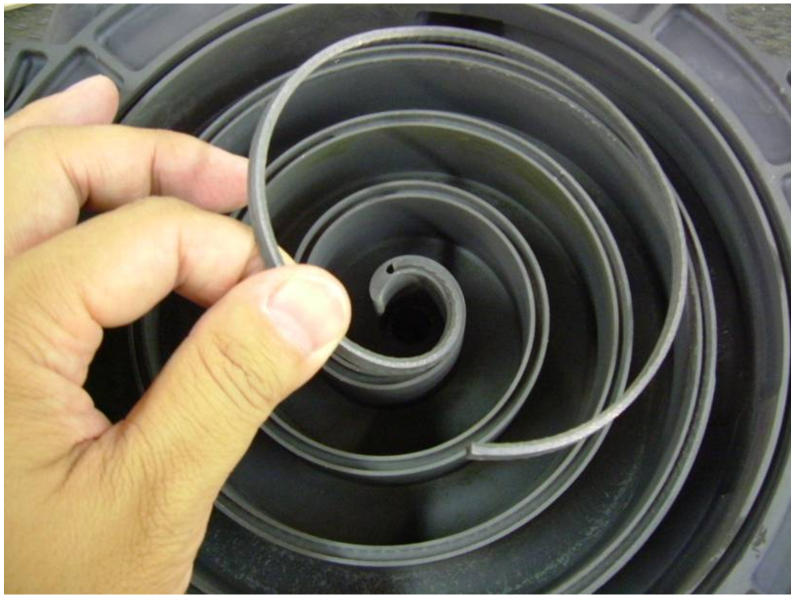
CAUTION

Insert approximately half of the LP Tip Seal and remove the Tip Seal to confirm that a notch in the Tip Seal has been achieved. This will prevent movement during running. Before reinserting, remove dust around the notch.

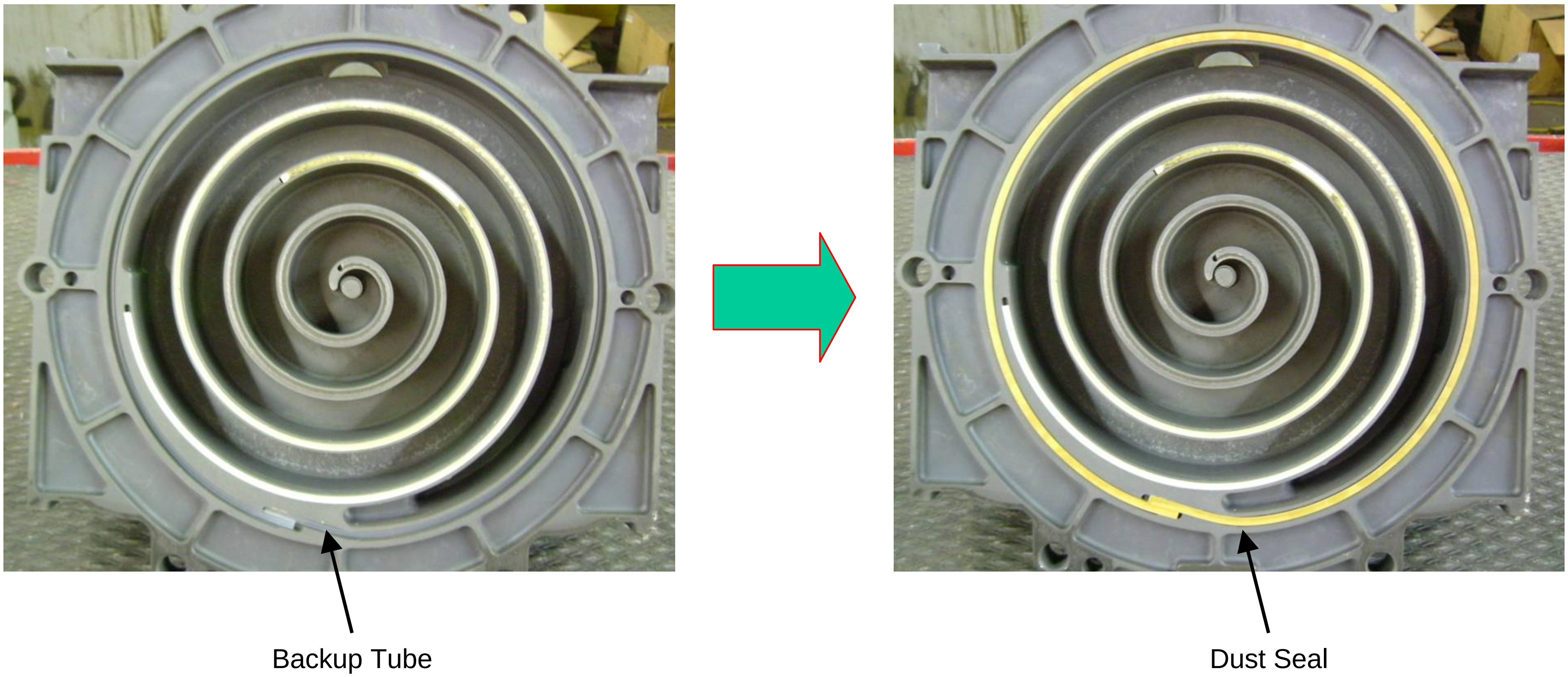
vii. Insert LP Tip Seal all the way and cut excessive material.



viii. Repeat the same procedure for FS Tip Seal set.



ix. Insert new Backup Tube in the FS, then insert new Dust Seal on the Backup Tube.



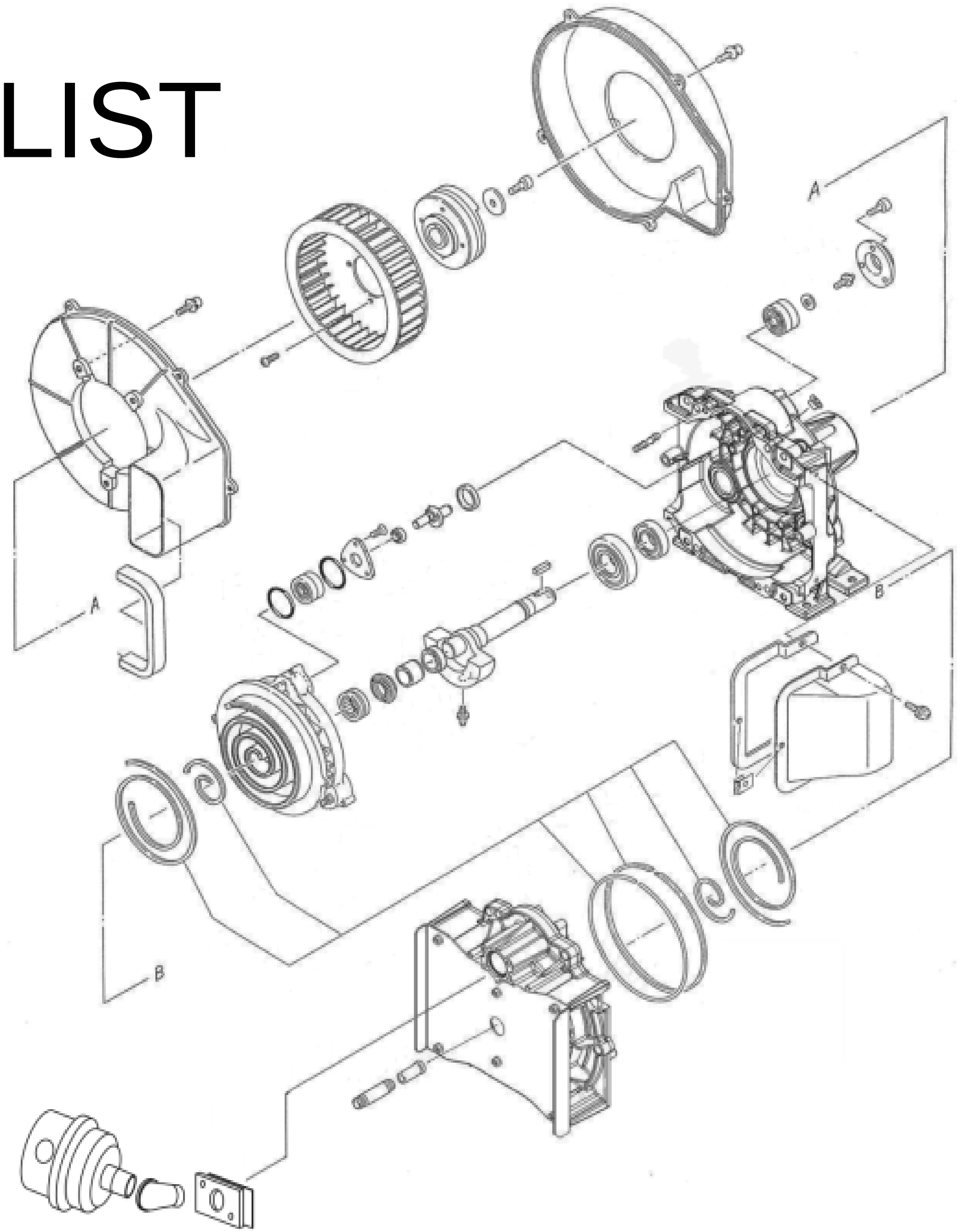
x. After replacing Tip Seal Set, reassemble the FS set and fan duct (2) to the air end. Tighten bolts and nuts temporarily and confirm if crankshaft rotates smoothly by hand and tighten them firmly. Tightening torques are as below.

Tightening torque

SLAE03E		SLAE05E / SLAE05EHP	
First	Second	First	Second
17 in-ib	175 in-lb	17 in-ib	265 in-lb

NOTE: Assemble so that dust seal and tip seal will not drop between Orbit (OS) scroll and FS scroll set.

PARTS LIST



Description	Parts number for models			Quantity
	SLAE03E	SLAE05E	SLAE05EHP	
Air end pulley	92843051	92549110	92549110	1
Key	IP600600AV	IP600600AV	IP600600AV	1
Centrifugal fan	IP601300AV	IP601300AV	IP601300AV	1
Fan Duct (1)	IP601400AV	IP601400AV	IP601400AV	1
Fan Duct (2)	IP601500AV	92519042	92519042	1
Fan Cover	IP601700AV	IP601700AV	IP601700AV	1
Fan Duct Gasket (1)	IP601800AV	IP601800AV	IP601800AV	1
Heat Insulation Pipe	IP602000AV	IP602000AV	IP602000AV	1
Fan Duct Gasket (2)	IP602400AV	IP602400AV	IP602400AV	1
Long Nipple	96647011	96647011	96647011	1
Dust Cap	IP603500AV	IP603500AV	IP603500AV	1
Tip Seal Set	92834090	92832070	92832080	1
Filter Assembly	ST073922AV	ST073922AV	ST073922AV	1
Filter Element	91348550	91348550	91348550	1
Street Elbow	RB90SF34	RB90SF34	RB90SF34	1
Adaptor Plate	IP086100AV	IP086100AV	IP086100AV	1
Intake Gasket	IP088200AV	IP088200AV	IP088200AV	1
Grease Gun Kit	IP616200AJ	IP616200AJ	IP616200AJ	1
Grease Gun	IP616100AJ	IP616100AJ	IP616100AJ	1
Grease (80g)	IP600000AV	IP600000AV	IP600000AV	1