

6.0 PMC PROCEDURE, NARKOMED 2C

The procedures in this section shall be performed in their entirety each time a component is removed, replaced, calibrated, adjusted and during all scheduled Periodic Manufacturer's Certification (PMC) visits. A PMC Checklist form, P/N S010211 is available from Draeger Medical, Inc. and shall be completed by the Technical Service Representative each time a PMC is performed. Steps in the procedure marked with (✓) require a response at the corresponding line on the checklist form.

Space is also provided on the PMC checklist form to record the results of a vapor concentration test. Refer to the current Anesthesia Equipment & Monitoring System Service Information CD-ROM Service Procedures section for vapor concentration verification procedures.

NOTE: Test equipment listed below with an asterisk (*) requires calibration at a maximum interval of one year. Verify the dates on test equipment calibration labels. DO NOT USE any test equipment having an expired calibration date. Notify your supervisor immediately if any equipment is found to be out of calibration. In the space provided at the bottom of the PMC checklist form, record the Model and ID number of all calibrated test equipment used.

In the space provided at the bottom of the PMC checklist form, record the Model and ID number of all calibrated test equipment used. Also record the calibration due dates. Examples are: multimeter, digital pressure meter, Riken gas analyzer, safety analyzer, volumeter, trace gas analyzer, simulators.

Test Equipment Required:

- *Electrical Safety Analyzer (Biotek 501 Pro or equivalent)
- *Pressure Gauge with DISS Adapters (P/N 4114807 or equivalent)
- *Flowmeter 0-250 ml min. (P/N S000081 or equivalent)
- *Volume Meter (P/N 2212300 or equivalent)
- *Digital Pressure Manometer (SenSym PDM 200CD or Equivalent)
- *Riken Gas Indicator (Model 18H, or 1802D or equivalent)
- Stop Watch
- Test Lung (P/N 4115128)
- AC Receptacle Circuit Tester

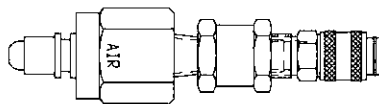
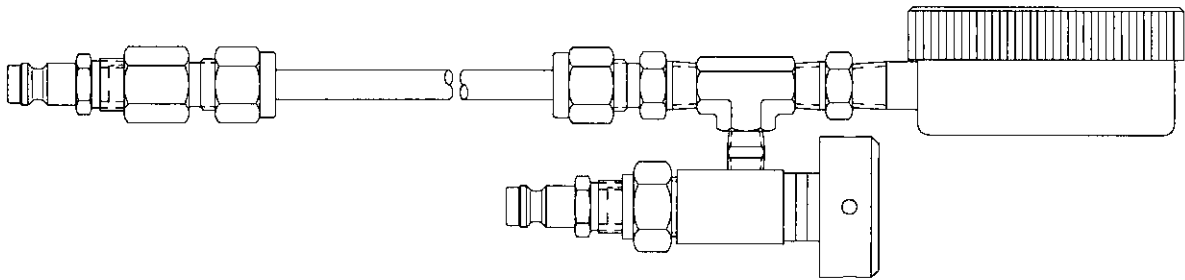
Materials Required:

- Spiromed Lubrication Kit (P/N 2218180)
- Breathing Bag 3 liter (P/N 9995330 or equivalent)
- Patient Circuit: Y-piece, elbow, 2x 32" x 22mm hoses
- Hose 22 mm x 32" (P/N 9995132)
- Fresh Gas Outlet Volume Test Device (P/N S010158 or equivalent)

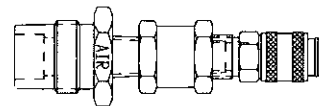
- Fresh Gas Leak Test Adapter (P/N 4115041 or equivalent)
- Volumeter/Fresh Gas Adapter (P/N 4115042)
- Test Terminal 2x (P/N 4104389 or equivalent)
- Breathing System Leak Test Device (P/N S010159 or equivalent)
- PDM/Suction Adapter (P/N 4115038)
- Scavenger Adapter (P/N 4108114)
- NIBP w/Luer Test Adapter (P/N 4116111-001)
- Pressure Monitor Test Adapter (P/N 4115043 or equivalent)

Key test equipment and materials illustrations are shown on the following pages.

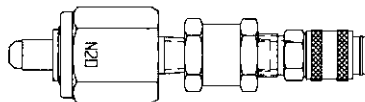
4114807 PRESSURE TEST ASSEMBLY , WITH ADAPTERS



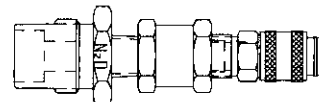
4114830-002



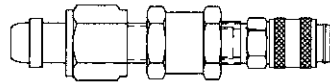
4114830-001



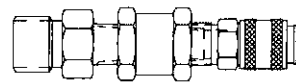
4114830-004



4114830-003



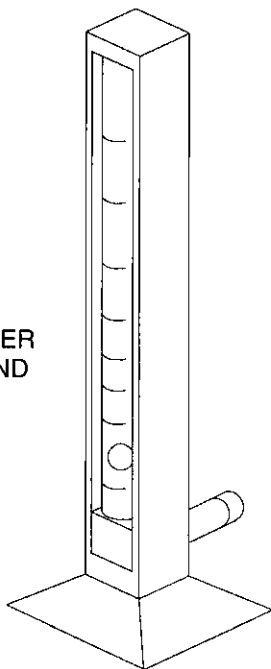
4114830-006



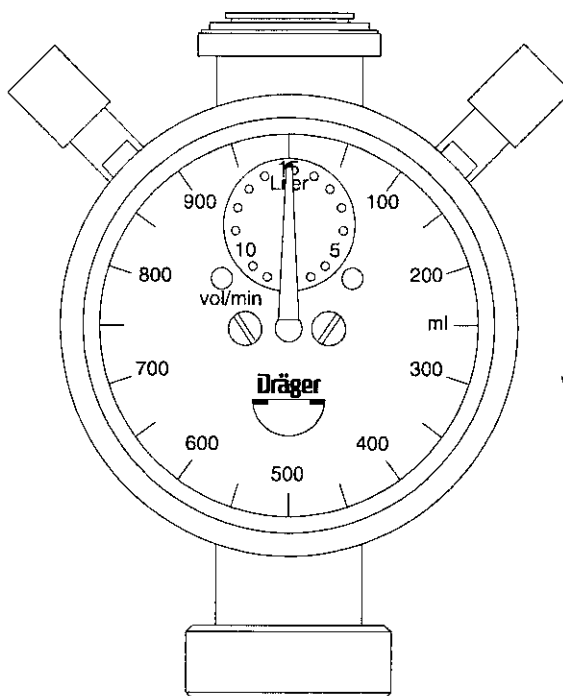
4114830-005

SP15001

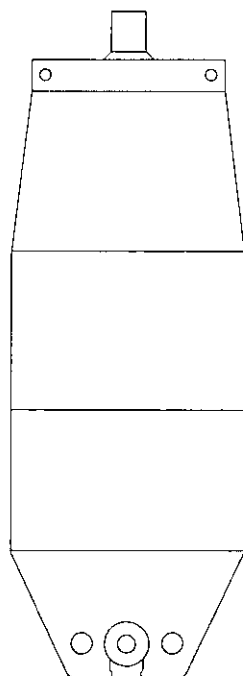
S000081
FLOW METER
TEST STAND



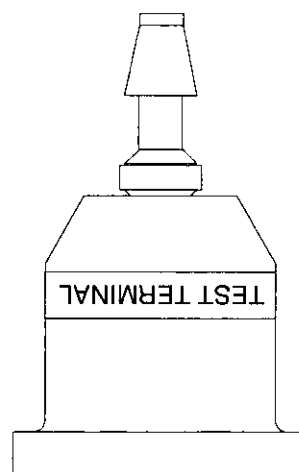
2212300
MINUTE
VOLUMETER



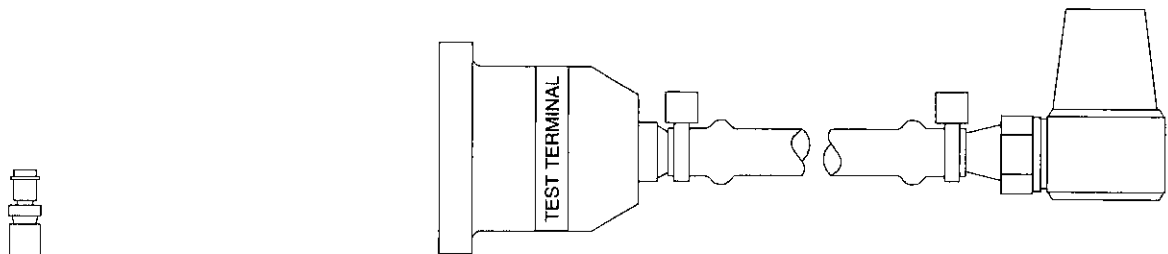
4115128
SIEMENS TEST LUNG



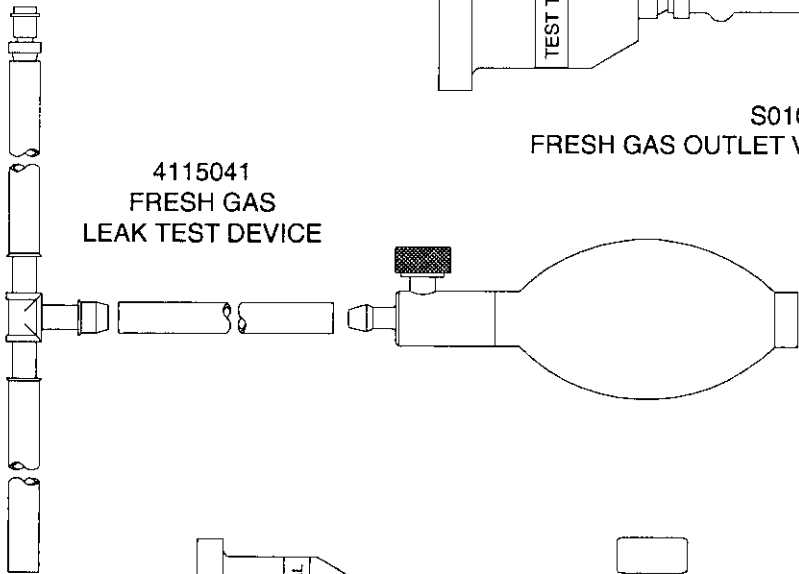
4104389
TEST TERMINAL
ADAPTER



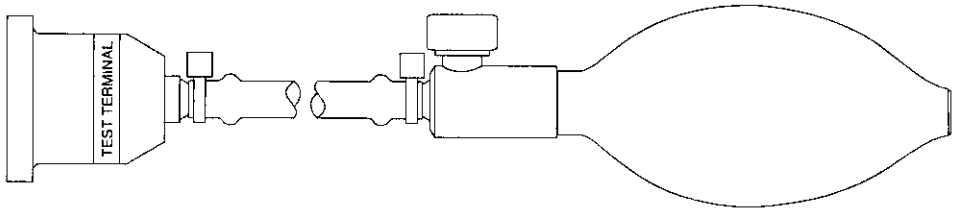
SP15002



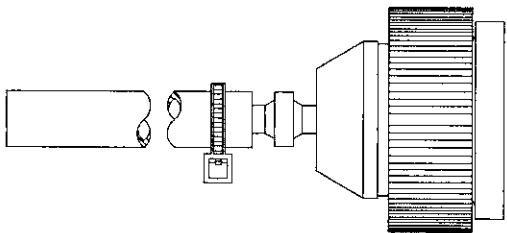
S010158
FRESH GAS OUTLET VOLUME TEST DEVICE



4115041
FRESH GAS
LEAK TEST DEVICE

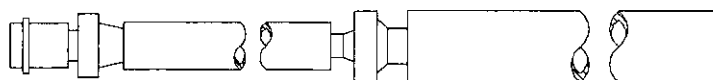


S010159
BREATHING SYSTEM LEAK TEST DEVICE



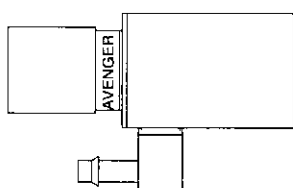
4115042
VOLUMETER/
FRESH GAS HOSE
ADAPTER

SP15003



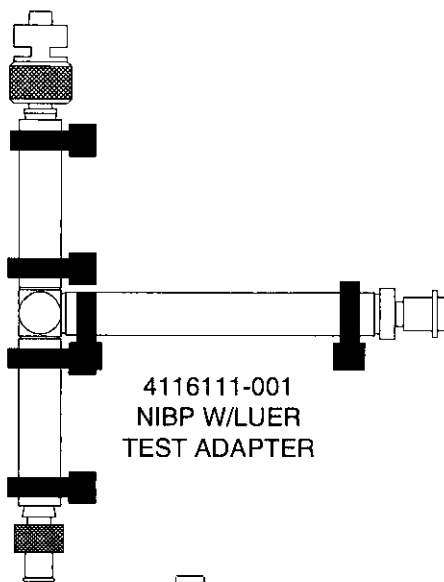
4115038

PDM TO PATIENT SUCTION ADAPTER



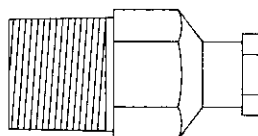
4108114

SCAVENGER ADAPTER

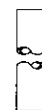


4116111-001
NIBP W/LUER
TEST ADAPTER

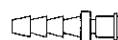
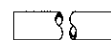
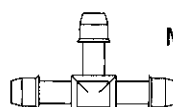
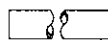
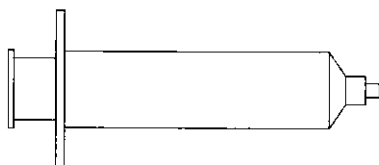
4110709
LUER (F) 1/8 MPT



ADAPTER FOR TOP PORT
ON CAPNOMED FLOW METER



4115043
PDM TO
MONITOR ADAPTER



SP15004

Periodic Manufacturer's Certification General Instructions

The purpose of this manual is to provide detailed instructions for performing a Periodic Manufacturer's Certification (PMC) inspection on a Narkomed 2C Anesthesia machine.

A PMC consists of a complete Periodic Manufacturer's Service procedure and a certification level inspection based on Draeger Medical, Inc. Recommendations and equipment performance. Additional inspections are also performed to insure proper product labeling.

Several additional documents have been created to ensure the success of this new program. Following is a brief description of the purpose of each document.

Field Service Procedure:

Periodic Manufacturer's Certification Forms - Part Number SP00175. This procedure illustrates sample checklists with typical periodic maintenance items filled in, including vapor concentrations verification tests, parts replaced, general comments and certification levels. Also included are sample PMC labels marked to show several levels of certifications, an excerpt from DMI's *Anesthesia System Risk Analysis and Risk Reduction* is included, and also a sample of an Executive Summary to be furnished to the hospital's Risk Manager or Chief of Anesthesia.

Field Service Procedure:

DMI Recommendations Guidelines Index Anesthesia Systems - Part Number S010250. This Guideline was created to provide an assessment of each machine's certification. It contains various comprehensive overviews of possible equipment conditions and their associated certification levels.

The first list in the Recommendation Guidelines is a reference chart for machine certification based on equipment status. The second is an abbreviated summary of all DMI Recommendations and Failure Codes including the Condition Number, Equipment Condition, Recommended Corrections, Certification Code, and Tests Affected when applicable.

There is also a matrix classified as "Failure Codes" which identifies the correct manner in which to document equipment tests that fail, or were unable to be performed due to circumstances beyond the control of the service technician performing the inspection. (Ex: Air cylinder supply is unavailable to perform Air High Pressure Leak test.) The Failure Codes section also indicates suggested resolution of the situation. Failure Code numbers begin at 34 and use the same certification levels strategy, and carry the same weight as DMI Recommendation equipment condition codes.

The final matrix is the most comprehensive index sorted by machine model and includes Equipment Condition, Certification Code, and DMI Recommendations. It also specifies any suggested upgrade path including ordering information that should be taken such as installing a Bellows with Pressure Limit Control 4109664-S01 Kit, after market modification kit to a machine not equipped with pressure limit control.

The letters A, B, C, D and the Roman Numerals I, II are used as codes in the individual matrix for each model of anesthesia machine. The letters A, B, C, and D are used in descending order to indicate the certification level of the equipment. They are as follows:

- A = Certified
- B = Certified with Recommendations
- C = Conditionally Certified
- D = No Certification

Roman Numerals I and II do not affect the certification level but rather are provided to give further instructions to the end user as follows:

I = The system in its present configuration shall only be used with a CO2 monitor incorporating an apnea warning. The operator of the system is advised to frequently scan the CO2 readings and alarm thresholds.

II = The present configuration of equipment requires that the unit operate at all times with an oxygen analyzer that includes a low oxygen warning. The operator of the system is advised to frequently scan the oxygen readings and alarm limits.

Following is an explanation of machine certification levels:

Certified- No DMI Recommendations or Failure Codes apply to machine being inspected. (Only item number 33 - "No Recommendations" shall apply for this certification level.)

Certified with Recommendations- A numbered DMI Recommendation or Failure Code with a code of B applies to the machine being examined.

Conditionally Certified- A numbered DMI Recommendation or Failure Code with a code of BCI or BCII applies to the machine being examined.

No Certification- A numbered DMI Recommendation or Failure Code with a code of D applies to the machine being examined.

When multiple recommendations apply, "No Certification" would take precedence over "Conditionally Certified" and "Certified with Recommendations". "Conditionally Certified" would take precedence over "Certified with Recommendations".

For example:

A **Narkomed 2B** could have DMI Recommendation number 21 and Failure Code 61.1 that apply. 21 - No ventilator pressure limit control. Code is B. 61.1 - Enflurane agent is unavailable to test. Code is BC. Correct certification for this machine is BC, which means **CONDITIONALLY CERTIFIED WITH RECOMMENDATIONS**.

A **Narkomed 4** could have DMI Recommendation numbers 14 and 21 apply.

14 - CO2/Agent monitor exhaust port is not properly connected to the waste gas scavenger. Code B.

21 - No ventilator pressure limit control. Code B.

The correct certification for this machine is B, which means **"CERTIFIED WITH RECOMMENDATIONS"**.

A **Narkomed 2B, 2C or GS** could have DMI Recommendation 30 apply.

30 - Anesthesia machine is equipped with inhalation anesthesia vaporizers without an agent analyzer in the breathing system. Code B.

The correct certification for this machine is B, which means **"CERTIFIED WITH RECOMMENDATIONS"**.

A **Narkomed 6000** could have no DMI Recommendations or Failure Codes apply. The correct certification level for this machine is Code A, **"CERTIFIED"**.

The correct certification for this machine is A, which means **"CERTIFIED"**.

Code, D also means "NO CERTIFICATION", also means the machine shall not receive a Periodic Manufacturer's Certification label. The machine shall receive a "WARNING - This System Is Not Certified" label, P/N 4114857. This label shall be placed at a prominent location on the right side of the machine after all other previous PM and "Vigilance Audit® Validation" labels have been removed.

PM Certification Procedure for Narkomed 2C Anesthesia System

1. Use the PM Certification form for Narkomed 2B/ 2C/ GS Anesthesia Systems (P/N S010211).
2. Completely fill in the header information.
3. All Narkomed 2C are equipped with Humphrey valves, and do not require lubrication. Indicate so with a (H) next to the "Vent Valve Lube Due" line on the Periodic Manufacturer's Certification form.
4. Replace the VENTILATOR RELIEF VALVE DIAPHRAGM every 12 months in accordance with SP00075. Place a check mark and indicate the next replacement date at "Relief Valve Diaphragm Due" line on the Periodic Manufacturer's Certification form.
5. If machine is equipped with a HALOTHANE Dräger Vapor 19 or 19.1 vaporizer, determine if vaporizer must be inspected for soil condition one. Check the serial number plate located on the rear of the vaporizer for a plus (+) preceding the serial number. A HALOTHANE vaporizer serial number not preceded with a (+) must be tested for soil in accordance with SP00073. If vaporizer does not need to be inspected, indicate so with a plus (+) next to the "Vapor Inspection (H)" line on the Vigilance Audit form. If vaporizer is soil condition 0, indicate so with "SOIL 0" written next to the "Vapor Inspection (H)" line on the Vigilance Audit form. If vaporizer is soil condition one, indicate so with "SOIL 1" written next to the "Vapor Inspection (H)" line on the Vigilance Audit form. Place a "CAUTION DO NOT USE" label (part # 4114327) on the vaporizer, and issue a departmental alert. The TSR shall also seek permission from the equipment operator to remove the failed vaporizer from the machine and apply a replacement vaporizer or an adapter block onto the mount. All "SOIL 1" vaporizers must be removed from service for machine to receive certification.
6. Perform the vapor concentration test on all Dräger vapor vaporizers in accordance with SP00073 at a six month maximum interval. Perform the vaporizer concentration test on all Desflurane vaporizers in accordance with SP00091 for fixed mount vaporizers and SP00189 for user removable D-tec vaporizers at a six month maximum interval. For every vaporizer tested, fill out a "VAPOR VAPORIZER CALIBRATION CHECK" label (part # S010016). Information on this label shall include your signature, type of agent, date tested, a No Agent To Test or the test results @ 1%, 2.5%, 4% for H, E, I, or S vaporizers, or @ 4%, 10%, 12%, 16% for Desflurane vaporizers, and a PASS or FAIL indication. This label shall be attached to the upper right side of the vaporizer. If vaporizer fails the concentration verification, internal leak, or exclusion system tests, check "NO" in the "RECOMMENDED FOR USE" section on the PM Certification form. Place a "CAUTION DO NOT USE" label (part # 4114327) on the vaporizer, and issue a departmental alert. The TSR shall also seek permission from the customer to remove the failed vaporizer from the machine and install a replacement vaporizer or an adapter block onto the mount. All nonfunctional vaporizers must be removed from service for machine to receive certification.

PM Certification Procedure for Narkomed 2C Anesthesia System - (continued)

7. Proceed with PM Certification procedure. If any tests fail refer to the "Failure Codes" listing in DMI Recommendations Guidelines Index (P/N S010250) to determine correct certification level starting point. Failure codes shall be documented on the "RECOMMENDATIONS / GENERAL COMMENTS" section of the PM Certification form and on the Executive Summary. If a test fails that has not been identified by the "Failure Codes" list, consult with Draeger Medical, Inc. to assess the proper certification level.
8. Based on the "EQUIPMENT CONDITION" inspect the machine for any "DMI RECOMMENDATIONS" that would apply. Use the Narkomed 2C section of the "RECOMMENDATION GUIDELINES INDEX" (P/N S010250). Note all applicable DMI recommendations on the Executive Summary.

NOTE: If using a carbon form, indicate the Equipment Condition number and to see reverse side under the "RECOMMENDATIONS / GENERAL COMMENTS" section of the form.

9. Determine the correct certification level of the machine based on the combined lowest common denominator of "Equipment Conditions" and "Failure Codes". If the machine is at least conditionally certified fill out the "PM CERTIFICATION" label. Check the box(s) on the validation label where appropriate. Write the month and year, (three months from date of PM Certification) next to "NEXT VISIT DUE:". If certification level is "D", machine shall not receive a "PM CERTIFICATION" label. Any machine not receiving a PM Certification label shall receive a "WARNING NOT CERTIFIED" label, P/N 4114857. This label shall be placed at a prominent location on the left side of the machine after all other previous PMC and Vigilance Audit Validation labels have been removed.
10. In the "CERTIFICATION LEVEL" section of the PM Certification form, record the last visit certification level, the current certification level and the next visit due month and year, (three months from date of PM Certification) in the spaces provided.
11. If applicable, remove the previous PM CERTIFICATION VALIDATION label and attach the new label (P/N S010006 w/phone #, or S010007 w/o phone #) in a prominent location on the rear of the anesthesia machine.
12. Check the appropriate boxes on the "PM CERTIFICATION NOTICE" label, (part # S010011). If the machine is not certified, the last box of this notice label shall be marked. Attach this notice near the flowmeter shield of the anesthesia machine.
13. Have the customer sign each PM Certification form or the Executive Summary, and review any Failure Codes equipment conditions and DMI Recommendations with the customer.
14. Return top copy to Draeger Medical, Inc. Service Department, keep middle copy for service organization records, give bottom copy to customer.

(✓) 6.1 SELF-DIAGNOSTICS

- 6.1.1 Turn the System Power switch to ON and verify the "ON" LED is lighted?
- 6.1.2 Verify all LED's on the ventilator displays and the flowmeter lights are lit.
- 6.1.3 Verify that the following is displayed on the alarm CRT:

**NARKOMED 2C
COPYRIGHT 1993, NAD, INC.
VERSION X.XX NM2C SW
SOFTWARE ID. XXXX**

VIDEO	PASS
FIRMWARE	PASS
STATIC RAM	PASS
TIMER	PASS
A/D CONVERTER	PASS
AUDIO - PRIMARY	PASS
- BACKUP	PASS
SERIAL I/O	PASS
CLOCK	PASS
NON-VOLATILE MEMORY	PASS

FUNCTIONAL

- (✓) 6.1.4 Record the machine software version on the header of the checklist form.

(✓) 6.2 ELECTRICAL SAFETY- One Year Service Interval; Due Date _____

- (✓) 6.2.1 Ground Continuity

- 6.2.1.1 Unplug the AC power cord for all devices mounted to the machine that may provide an alternate path to earth ground, such as a Desflurane vaporizer.
- 6.2.1.2 Unplug the machine's AC power cord and plug the power cord of the safety analyzer into this AC receptacle.

NOTE: Do not plug the safety analyzer power cord into a line isolation monitor circuit, as inaccurate readings may occur.

NOTE: The BIOTECH 501 PRO will automatically test the source outlet for open ground (or ground resistance of 31 Ohms or higher), reverse polarity, open neutral and open line. (The latter two conditions will prevent the analyzer from powering up.)

PMC PROCEDURE (continued)

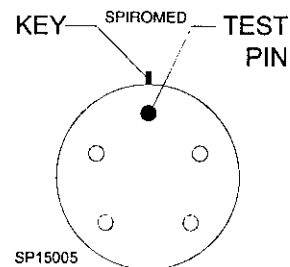
NM2C

- 6.2.1.3 Turn on the safety analyzer and set it's function switch to the GROUND WIRE RESISTANCE position. Attach the test lead to the red SINGLE LEAD connector of the analyzer. Connect the other end of the red test lead to the AC receptacle ground socket on the safety analyzer. Verify a displayed resistance of 0.00 ohms or, if necessary, press the CALIBRATE key on the front panel of the analyzer to zero the device.
- 6.2.1.4 Set the safety analyzer GROUND switch to NORMAL. Set the POLARITY switch to OFF.
- 6.2.1.5 Plug the machine's AC power cord into the safety analyzer.
- 6.2.1.6 Apply the analyzer's test lead to a cylinder yoke bolt.
- 6.2.1.7 What is the value displayed on the safety analyzer? ____ ohm (0-0.1)

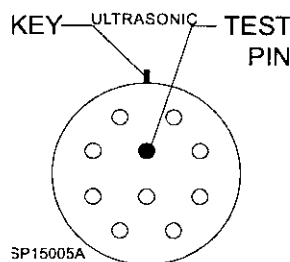
(✓) 6.2.2 Circuit Isolation

- 6.2.2.1 Disconnect the respiratory volume sensor cord from the interface panel.

- 6.2.2.2 Using a multimeter set to its highest resistance range apply the test leads between the yoke bolt and circuit common at the volume interface test pin. Refer to the corresponding illustrations for the proper test pin location. There shall be no continuity between these points.



- 6.2.2.3 Reconnect the respiratory volume sensor cord to the interface panel.



6.2.3 Chassis Leakage Current

- 6.2.3.1 Apply the analyzer test lead to a cylinder yoke bolt.
- 6.2.3.2 Set the safety analyzer to the CHASSIS LEAKAGE CURRENT position.

- (✓) 6.2.3.3 Record the total leakage current with the Polarity and Ground switches set as follows:

<u>Ground</u>	<u>Polarity</u>
Normal	Normal
Open	Normal
Open	Reversed
Normal	Reversed

- 6.2.3.4 Verify that the leakage current is 100* microamps or less in each of the switch positions (110 microamps or less for the 220/240 volt power supply option).

* 300 microamps if external monitors are plugged into convenience receptacles.

- 6.2.3.5 Shut off and unplug the safety analyzer. Remove the anesthesia machine plug from the analyzer and plug it back into the original AC receptacle.

(✓) 6.2.4 Convenience Receptacle and Auxiliary Outlet Strip

NOTE: This test will check the convenience receptacle and the auxiliary strip outlets for fault conditions such as open ground, reverse polarity, open line and open neutral.

- 6.2.4.1 Unplug all power cords from the convenience receptacles and auxiliary outlet strip.

- 6.2.4.2 Plug the Receptacle Tester into the first outlet to be tested. Verify no wiring fault is indicated then remove test plug and move it to the next convenience outlet. Repeat this process until all convenience outlets and auxiliary strip outlets are tested.

- 6.2.4.3 Plug-in all power cords previously removed from the convenience receptacles and auxiliary outlet strip.

(✓) 6.3 CONFIGURATION

- 6.3.1 Press the Datagrip trigger, select SET and enter the SYSTEM CONFIGURE screen.

- 6.3.2 The remote display shall display the Configure screen.

- 6.3.3 Verify the correct Time and Date.

- 6.3.4 Press the exit key to exit the function.

6.4 SERVICE DATA

- 6.4.1 Press and hold the Speaker Disable and LOG DATA or VENT ALARMS OFF keys (simultaneously), and then press the Datagrip trigger (while holding the keys).

- 6.4.2 The Main Service Screen shall appear.

- 6.4.3 Select and enter the Service Log.

- 6.4.4 Verify any pertinent information from the Service Log. Contact the Draeger Medical, Inc. Technical Service Department if necessary.

- 6.4.5 Set the cursor to EXIT and press the trigger to return to the Main Service screen.

- 6.4.6 Select the PMS Service Code and press the trigger.

PMC PROCEDURE (continued)

NM2C

- * 6.4.7 Select and enter your Technical Service Rep. I.D. number.
- (✓) 6.4.8 Set the cursor to RESET and press the trigger. This resets the last service date to the current date and resets the hours run since last service to zero.
- 6.4.9 Set the cursor to PMS CRITERIA and press the trigger.
- (✓) 6.4.10 Select and enter the month of the next service due date and record this information on the report. The internal clock of the machine limits the amount of date advance to a maximum of six months from the current service date.
- 6.4.11 Press the exit key to return the main service screen, If not performing monitor calibrations press the exit key again to return to normal operation mode.

(✓) 6.5 CALIBRATIONS - One Year Service Interval; Due Date ____

- 6.5.1 Set the cursor to MONITORS and press the trigger to bring up the Oxygen Monitor Service Screen.
- 6.5.2 Remove the Oxygen sensor from the valve dome adapter, and remove the Oxygen sensor capsule from the Oxygen sensor housing.
- (✓) 6.5.3 When the CURRENT CELL A and CURRENT CELL B readings have stabilized, set the cursor to STORE ZERO and press the trigger to store the values.
- NOTE:** The higher the offset, the higher the calculated Oxygen concentration appears at high concentrations.
- 6.5.4 Put the Oxygen sensor capsule into the Oxygen sensor housing.
- 6.5.5 Set the cursor PRESSURE MONITOR and press the trigger to enter the pressure monitor service screen.
- 6.5.6 Disconnect the breathing pressure monitor's sensor line from the absorber and expose it to ambient Air.
- 6.5.7 Let the current pressure value stabilize, set the cursor to STORE ZERO and press the trigger.
- 6.5.8 Connect a pressure monitor adapter, (P/N 4115043) and calibrated digital pressure manometer to the breathing pressure sensor line.
- 6.5.9 Pressurize the circuit to 50 cm H₂O and allow the Current Value to stabilize.
- (✓) 6.5.10 Press the SPAN key and verify that the new span values are stored.
- 6.5.11 Release the pressure, disconnect the manometer and test fixture, and reconnect the breathing pressure sensor line to the absorber.
- 6.5.12 Set the cursor to EXIT and press the trigger to return to the Main Service screen.

* JUST ENTER YOUR INITIALS AND 1

- 6.5.13 Set the cursor to EXIT and press the trigger to return to normal operation.

(✓) 6.6 ABSORBER MAINTENANCE

- 6.6.1 Remove the Oxygen sensor or the plug from the inspiratory valve dome adapter and examine the O-rings on each assembly. Replace O-rings as necessary.
- 6.6.2 Remove the inspiratory and the expiratory valve domes.
- 6.6.3 Are all pins on the valve crater undamaged? Inspiratory ___ (Y) Expiratory ___ (Y)
- 6.6.4 Are all pins on the valve domes undamaged? Inspiratory ___ (Y) Expiratory ___ (Y)
- 6.6.5 Is the valve disc in good condition? Inspiratory ___ (Y) Expiratory ___ (Y)
- 6.6.6 Are the valve dome washers in good condition? ___ (Y)
- 6.6.7 Reinstall the inspiratory and expiratory valve domes.
- 6.6.8 Ultrasonic Flow Sensor - If applicable
- 6.6.8.1 Remove the Ultrasonic Flow Sensor connector hose.
- 6.6.8.2 Is the connector hose, connector, and O-ring in good condition? ___ (Y)
- 6.6.8.3 Remove the expiratory valve.
- 6.6.8.4 Is the washer under the valve in good condition? ___ (Y)
- 6.6.8.5 Reattach the expiratory valve.
- 6.6.8.6 Remove the ultrasonic flow sensor from the mounting bracket.
- 6.6.8.7 Remove the flow housing/transducer assembly from the electronics housing.
- 6.6.8.8 Remove both transducers from the flow housing; examine each O-ring and condition of all components, then reassemble the ultrasonic flow sensor.
- 6.6.8.9 Reattach the ultrasonic flow sensor to the mounting bracket.
- 6.6.8.10 Reattach the connector hose between the sensor and expiratory valve.
- 6.6.9 Lubrication, Spiromed Sensor – If applicable
- 6.6.9.1 Remove the expiratory valve.
- 6.6.9.2 Is the washer under the valve in good condition? ___ (Y)
- 6.6.9.3 Remove the Spiromed sensor.
- 6.6.9.4 Is the washer under the sensor in good condition? ___ (Y)
- 6.6.9.5 Locate the four lateral holes at the sides of the Spiromed sensor marked by arrows.

CAUTION: Use only Sensor Lubrication Kit P/N 2218180 for the following procedure.

- 6.6.9.6 Dip the tip of the pipette into the lubricant and draw lubricant into the pipette by pulling the pin backwards.
- 6.6.9.7 Insert the pipette into one of the four holes as far as it will go. Push the pin forward to its stop and inject lubricant into the hole.
- 6.6.9.8 Repeat the previous 2 steps for the lubricating three remaining holes.
- 6.6.9.9 Wipe any lubricant residue from the exterior of the sensor.
- 6.6.9.10 Reattach the sensor to the absorber top dome.
- 6.6.9.11 Reattach the expiratory valve to spiromed sensor.
- 6.6.10 Remove the inspiratory valve assembly.
- 6.6.11 Is the washer under the valve in good condition? ____ (Y)
- 6.6.12 Reinstall the inspiratory valve.
- 6.6.13 Are there two (2) spring clips on the absorber rods? ____ (Y)
- 6.6.14 Inspect the following: canisters, canister gaskets, dust cup and O-ring, and soda lime.
- 6.6.15 Are the canisters, canister gaskets, dust cup and O-ring, and soda lime in good condition? ____ (Y)
- 6.6.16 Verify the cm H₂O gauge at zero (0) and readjust if necessary.
- NOTE:** The small slotted screw is the zero adjust.
- 6.6.17 Reinstall the Oxygen sensor plug into the inspiratory valve dome adapter.
- 6.6.18 Remove the 15-mm connector from the FRESHGAS OUTLET.
- 6.6.19 Is the Freshgas Outlet assembly in good condition? ____ (Y)
- 6.6.20 Reconnect the 15-mm connector to the FRESHGAS OUTLET.
- 6.6.21 Repack MAN/AUTO Selector Valve, If applicable
 - 6.6.21.1 Remove the four screws securing the stick shift block to the selector valve body and remove the block.
 - 6.6.21.2 Remove the spring and valve channel from the valve body.
 - 6.6.21.3 Remove all residual lubricant from the valve channel.
 - 6.6.21.4 Remove all residual lubricant from the valve body.
 - 6.6.21.5 Apply a minimal amount of "stop cock" lubricant (Dow Corning High Vacuum Grease, P/N S4105908) to the tapered surface of the valve channel, and ensure complete coverage of lubricant.

- 6.6.21.6 Insert the valve channel into the valve body.
- 6.6.21.7 Insert the spring into the stick shift block.
- 6.6.21.8 Align the index pins on the stick shift block to the holes in the valve channel.
- 6.6.21.9 Secure the stick shift block to the selector valve body with the four screws that were previously removed.
- 6.6.21.10 Operate the selector valve handle and verify smooth movement.

(✓) 6.7 HIGH PRESSURE LEAK

NOTE: Minimum cylinder pressures required for High Pressure Leak tests are:

O₂, Air, O₂-HE, N₂, HE: 1000 psi \ N₂O, CO₂: 600 psi;

- 6.7.1 Turn the machine to Standby.
- 6.7.2 Verify the Auxiliary Oxygen flow control valve is closed
- 6.7.3 Disconnect all pipeline supply hoses at the wall outlets.
- 6.7.4 Open then close and remove each cylinder and if applicable remove the yoke plug from each additional yoke assembly.
- 6.7.5 Note the reading on each the cylinder pressure gauge and start a stop watch.
- 6.7.6 Are the two (2) yoke index pins installed securely in each yoke? ____ (Y)
- 6.7.7 Is the proper gas I.D. label affixed to each yoke? ____ (Y)
- 6.7.8 After two (2) minutes, is the pressure loss for each gas equal or less than 50 psi? ____ (Y)
- 6.7.9 Verify the presence of only one (1) cylinder washer, then reattach and secure the cylinders to each yoke assembly, then open each cylinder valve.

6.8 BREATHING SYSTEM

- 6.8.1 Breathing System Leak/Exclusion
 - 6.8.1.1 Close all flow control valves.
 - 6.8.1.2 Set the AUTO/MAN selector to BAG.
 - 6.8.1.3 Close the APL valve.
 - 6.8.1.4 Interconnect a 22 mm hose (P/N 9995132) between the inspiratory valve and expiratory valve or expiratory port on the ultrasonic flow sensor, if applicable.
 - 6.8.1.5 Attach a test terminal (P/N 4104389) to the Fresh Gas Leak Test Adapter (P/N 4115041) then attach the test terminal to the bag mount.
 - 6.8.1.6 Apply 50 cm H₂O test pressure to the absorber system and start a stop watch.

PMC PROCEDURE (continued)	NM2C
---------------------------	------

- 6.8.1.7 Is the pressure on the absorber pressure gauge within 47 to 53 cm H₂O? ____ (Y)
- (✓) 6.8.1.8 After thirty (30) seconds, is the breathing system test pressure equal or greater than 40 cm H₂O? ____ (Y)
- 6.8.1.9 If applicable, turn on the left mounted vaporizer to the first graduated marking. Reapply 50 cm H₂O of pressure to the system and start a stopwatch. Using the Datagrip, select AGT. Verify the correct abbreviation for the agent selected appears on the display. Verify it is not possible to turn on either the center or right vapors.
- (✓) 6.8.1.10 After thirty (30) seconds, is the left vaporizer test pressure equal or greater than 40 cm H₂O? ____ (Y) Turn off the left vaporizer.
- 6.8.1.11 If applicable, turn on the center mounted vaporizer to the first graduated marking. Reapply 50 cm H₂O of pressure to the system and start a stopwatch. Using the Datagrip, select AGT. Verify the correct abbreviation for the agent selected appears on the display. Verify it is not possible to turn on either the left or right vapors.
- (✓) 6.8.1.12 After thirty (30) seconds, is the center vaporizer test pressure equal or greater than 40 cm H₂O? ____ (Y) Turn off the center mounted vaporizer.
- 6.8.1.13 If applicable, turn on the right mounted vaporizer to the first graduated marking. Reapply 50 cm H₂O of pressure to the system and start a stopwatch. Using the Datagrip, select AGT. Verify the correct abbreviation for the agent selected appears on the display. Is it possible to turn on either the left or center vapors? ____ (N)
- (✓) 6.8.1.14 After thirty (30) seconds, is the right vaporizer test pressure equal or greater than 40 cm H₂O? ____ (Y) Turn off the right mounted vaporizer.
- (✓) 6.8.1.15 Did all vaporizer exclusion verifications test positive? ____ (Y)
- 6.8.2 APL Valve
 - 6.8.2.1 Open the APL valve to its stop.
 - 6.8.2.2 Turn the System Power switch to ON.
 - 6.8.2.3 Set the Oxygen flow to 8 l/min.
 - (✓) 6.8.2.4 Is the test pressure within 0 to 3 cm H₂O? ____ (Y)
- 6.8.3 O₂ Flush
 - 6.8.3.1 Attach a 33 mm x 22 Female Adapter (P/N 4115087) to the top port of the test volumeter.

NM2C

PMC PROCEDURE (continued)

- 6.8.3.2 Disconnect the hose from the expiratory valve or expiratory hose terminal on the ultrasonic flow sensor, if applicable and attach it to the test volumeter adapter.
- 6.8.3.3 Close the APL valve.
- 6.8.3.4 Press and hold the O₂ FLUSH button for 6 seconds; multiply the value obtained by 10.
- (✓) 6.8.3.5 Is the calculated Oxygen flush flow rate 45 to 65 l/min.? ____ (Y)
- 6.8.3.6 After releasing the flush, does the flow of Oxygen stop immediately? ____ (Y)
- 6.8.3.7 Remove the test equipment.
- 6.8.4 Expiratory Valve Leak
 - 6.8.4.1 Connect a 22 mm hose (P/N 9995132) between the inspiration valve and the bag mount.
 - 6.8.4.2 Connect a test terminal (P/N 4104389) to the expiration valve or expiratory hose terminal on the ultrasonic flow sensor, if applicable.
 - 6.8.4.3 Connect a 0-250 ml/min. flowmeter (P/N S000081) to the test terminal.
 - 6.8.4.4 Turn up the Oxygen flow until the system pressurizes to 30 cmH₂O. Adjust the APL valve as necessary to maintain 30 cmH₂O.
 - (✓) 6.8.4.5 Is the value indicated on the flowmeter within 0 to 60 ml/min.? ____ (Y)
 - 6.8.4.6 Close APL valve.
 - 6.8.4.7 Remove all test equipment.
- 6.8.5 Inspiration Valve Leak
 - 6.8.5.1 Turn the System Power switch to Standby.
 - 6.8.5.2 Connect a test terminal (P/N 4104389) to the inspiratory valve.
 - 6.8.5.3 Connect a Fresh Gas Leak Adapter (P/N 4115041) and calibrated pressure meter to the test terminal on the inspiratory valve.
 - 6.8.5.4 Connect another test terminal to the bag connector.
 - 6.8.5.5 Connect a 0-250 ml/min. flowmeter (P/N S000081) to the test terminal on the bag mount.
 - 6.8.5.6 Pressurize the test circuit to 30 cmH₂O.
 - (✓) 6.8.5.7 Is the value indicated on the flow meter within 0 to 60 ml/min.? ____ (Y)

PMC PROCEDURE (continued)

NM2C

- 6.8.5.8 Turn the system power switch to ON.
- 6.8.5.9 Remove all test equipment.
- 6.8.6 PEEP Valve w/Bypass - If applicable
 - 6.8.6.1 Open the APL valve. If PEEP valve is mounted on the bellows, set the AUTO/BAG valve to AUTO.
 - 6.8.6.2 Interconnect the inspiratory valve and expiratory valve or expiratory port on the ultrasonic flow sensor, if applicable with a 22 mm hose (P/N 9995132).
 - 6.8.6.3 Attach a Breathing System Leak Test Adapter (P/N S010159) to the bag mount.
 - 6.8.6.4 Disconnect the pressure pilot line from the absorber and replace it with a PDM To Monitor Adapter (P/N 4115041).
 - 6.8.6.5 Connect a test gauge to the adapter.
 - 6.8.6.6 Set the Oxygen flow to 5 l/min.
 - 6.8.6.7 * Place the PEEP bypass in the ON position.
 - 6.8.6.8 Adjust the absorber PEEP valve clockwise to the maximum position.
 - 6.8.6.9 Does the PEEP valve adjust smoothly? ____ (Y)
 - (✓) 6.8.6.10 Is the maximum PEEP indicated on the test gauge within 15 to 22 cm H₂O? ____ (Y)
 - 6.8.6.11 * Place the PEEP bypass in the OFF position.
 - 6.8.6.12 * Does the PEEP return to ≤ 3 cm H₂O? ____ (Y)
 - 6.8.6.13 Adjust the absorber PEEP valve counterclockwise to its minimum position.
 - 6.8.6.14 Does the PEEP return to ≤ 3 cm H₂O? ____ (Y)
 - 6.8.6.15 Close the Oxygen flow control valve.
 - 6.8.6.16 Remove the test equipment and reconnect the pilot line to the absorber.
 - 6.8.6.17 If PEEP valve is mounted on the bellows return the AUTO/BAG valve to BAG.
- * These items apply only to machines with a PEEP by-pass.
- 6.8.7 Bain Circuit Adapter - If applicable
 - 6.8.7.1 Close the Bain Circuit APL valve by turning the knob fully clockwise.
 - 6.8.7.2 Verify the cm H₂O gauge at zero (0) and readjust if necessary.
- NOTE:** The small slotted screw is the zero adjust.

- 6.8.7.3 Insert the Oxygen sensor plug into the Oxygen sensor inlet on the Bain Circuit.
- 6.8.7.4 Attach a Breathing System Leak Device (P/N S010159) to the Breathing Bag port on the Bain Circuit.
- 6.8.7.5 Disconnect the pressure pilot line from the Bain Circuit and replace it with a PDM To Monitor Adapter (P/N 4115041).
- 6.8.7.6 Connect a test gauge to the adapter.
- 6.8.7.7 Occlude the expiration port on the Bain Circuit.
- 6.8.7.8 Apply 50cm H₂O test pressure to the Bain Circuit.
- 6.8.7.9 Is the pressure indicated on the cmH₂O gauge within 3 cmH₂O of the digital pressure meter reading? ____ (Y)
- (✓) 6.8.7.10 After 30 seconds, is the test pressure 45 to 50 cmH₂O? ____ (Y)
- 6.8.7.11 Open the APL valve by turning the knob fully counter-clockwise.
- 6.8.7.12 Connect a Fresh Gas Outlet Volume Adapter (P/N S010158) between the fresh gas outlet and the Expiration port of the Bain Circuit.
- 6.8.7.13 Set the Oxygen flow to 8 l/min.
- (✓) 6.8.7.14 Is the test pressure within 0 to 3 cm H₂O? ____ (Y)
- 6.8.7.15 Remove the test equipment and reconnect the pilot line to the Bain Circuit.

6.9 OXYGEN ANALYZER

- 6.9.1 Scroll the Data grip to SET and press the trigger, select SET UP and press the trigger, scroll to OXYGEN SENSOR CAL and press the trigger. Select EXPOSE SENSOR TO AMBIENT AIR YES and press the trigger to perform an O₂ Calibration. After the calibration is complete scroll to exit and press the trigger.

NOTE: Make sure that the sensor has stabilized in ambient Air for several minutes.

- (✓) 6.9.2 After calibration is completed, is the O₂ concentration 21 %? ____ (Y)
- 6.9.3 The warning message INSP O₂ LOW shall appear on the central alarm display, and a continuous alarm shall sound.
- 6.9.4 Press the Alarm Silence key and verify the audio alarm is silenced.
- 6.9.5 Place the Oxygen sensor into the inspiratory valve dome adapter.
- 6.9.6 Set the AUTO/MAN selector to BAG.
- 6.9.7 Close the APL valve.
- 6.9.8 Attach a 22 mm hose (P/N 9995132) to the inspiratory valve.

- 6.9.9 Attach a Breathing System Leak Test Device (P/N S010159) to the bag mount.
- 6.9.10 Press the O2 Flush.
- 6.9.11 After 10 seconds, is the O2 concentration 90 to 100 % O2? ____ (Y)
- 6.9.12 Release the O2 Flush, does the flow cease immediately? ____ (Y)
- 6.9.13 Set the Oxygen flow to 10 l/min.
- (✓) 6.9.14 After 1 minute, is the O2 concentration 97 to 100 %? ____ (Y)

6.10 FLOWMETERS/GAS CONCENTRATIONS

- (✓) 6.10.1 Oxygen Flowmeter
 - 6.10.1.1 Is it possible to adjust the flow of Oxygen over the full range of the flowmeters? ____ (Y)
 - 6.10.1.2 Set the Oxygen flow to 4 l/min.
 - 6.10.1.3 Is the correct flow control knob and label attached to the Oxygen flow control valve? ____ (Y)
- (✓) 6.10.2 Oxygen-Helium Flowmeter -If applicable
 - 6.10.2.1 Set the gas selector to ALL GAS, if applicable. Is it possible to adjust the flow of the Oxygen-Helium over the full range of the flowmeter? ____ (Y)
 - 6.10.2.2 Set the Oxygen-Helium flow to 2 l/min.
 - 6.10.2.3 *After the value stabilizes, is the O2 concentration 72 to 78 % O2 ____ (Y)
 - 6.10.2.4 Close the Oxygen-Helium flow valve.
 - 6.10.2.5 Is the correct flow control knob and label attached to the Oxygen-Helium flow control valve? ____ (Y)

*Oxygen-Helium specifications are given @ 25% O2. Cylinder content deviations will affect this value. The expected concentration values can be obtained by replacing the '25' % O2 value given for O2-HE with the actual cylinder content as follows:

$$\frac{(2 \text{ l/min O2-HE} \times '25') + (4 \text{ l/min. O2} \times 100)}{6 \text{ l/min - Total Flow}} = \% \text{ O2}$$

- 6.10.3 This Section Intentionally Left Blank
- 6.10.4 This Section Intentionally Left Blank
- (✓) 6.10.5 Carbon Dioxide Flowmeter - If applicable
 - 6.10.5.1 Set the gas selector to ALL GAS, if applicable. Is it possible to adjust the flow of the Carbon Dioxide over its range of 550 ml/min.? ____ (Y)
 - 6.10.5.2 Set the Oxygen flow to 1000 ml/min.

- 6.10.5.3 Set the Carbon Dioxide flow to 500 ml/min.
- 6.10.5.4 After the value stabilizes, is the O₂ concentration 64 to 70 %?
___ (Y)
- 6.10.5.5 Close the Carbon Dioxide flow valve.
- 6.10.5.6 Readjust the Oxygen flow to 4 l/min.
- 6.10.5.7 Is the correct flow control knob and label attached to the Carbon Dioxide flow control valve? ___ (Y)
- (✓) 6.10.6 Air Flowmeter - If applicable
 - 6.10.6.1 If not configured with an Air Cylinder yoke, attach the Air Pipeline hose.
 - 6.10.6.2 Set the gas selector to ALL GAS, if applicable. Is it possible to adjust the flow of the Air over the full range of the flowmeter?
___ (Y)
 - 6.10.6.3 Set the Air flow to 2 l/min.
 - 6.10.6.4 After the value stabilizes, is the O₂ concentration 71 to 77 %?
___ (Y)
 - 6.10.6.5 Close the Air flow control valve.
 - 6.10.6.6 Is the correct flow control knob and label attached to the Air flow control valve? ___ (Y)
- (✓) 6.10.7 Nitrous Oxide Flowmeter
 - 6.10.7.1 Set the Nitrous Oxide flow to 2 l/min.
 - 6.10.7.2 After the value stabilizes, is the O₂ concentration 64 to 70 %?
___ (Y)
 - 6.10.7.3 Is the correct flow control knob and label attached to the Nitrous Oxide flow control valve? ___ (Y)
 - 6.10.7.4 Is it possible to adjust the flow of Nitrous Oxide over the full range of the flowmeter? ___ (Y)
- 6.10.8 Oxygen Ratio Control
 - 6.10.8.1 Open the Nitrous Oxide flow control valve to the stop position.
 - (✓) 6.10.8.2 After the value stabilizes, is the O₂ concentration 21 to 29 %?
___ (Y)
 - 6.10.8.3 Set the Oxygen flow to 2 l/min.
 - (✓) 6.10.8.4 After the value stabilizes, is the O₂ concentration 21 to 29 %?
___ (Y)
 - 6.10.8.5 Set the Oxygen flow to 1000 ml/min.
 - (✓) 6.10.8.6 After the value stabilizes, is the O₂ concentration 21 to 29 %?
___ (Y)

PMC PROCEDURE (continued)

NM2C

- 6.10.8.7 Reduce the Oxygen flow to 500 ml/min. Verify that the Nitrous Oxide flow is greater than or equal to 600 ml/min.
- 6.10.8.8 Close the Oxygen flow control valve.
- 6.10.8.9 Close the Nitrous Oxide flow control valve.
- 6.10.9 This Section Intentionally Left Blank
- (✓) 6.10.10 Auxiliary Oxygen Flowmeter - If applicable
 - 6.10.10.1 Connect a test pressure monitor to the outlet using a PDM/Suction adapter (P/N 4115038).
 - 6.10.10.2 Increase the test pressure to 50 cm H₂O.
 - 6.10.10.3 After 10 seconds, is the pressure within 40 to 60 cm H₂O? ____ (Y)
 - 6.10.10.4 Remove the test gauge and adapter.
 - 6.10.10.5 Is it possible to adjust the flow over the full range of the flowmeter? ____ (Y)
 - 6.10.10.6 Set the flow rate to 5 l/min.
 - 6.10.10.7 Hold the Oxygen sensor at the flowmeter outlet.
 - 6.10.10.8 After the value stabilizes, is the O₂ concentration within 80 to 100%? ____ (Y)
 - 6.10.10.9 Replace the Oxygen sensor into the Inspiratory valve dome.
 - 6.10.10.10 Close the Auxiliary Oxygen flow control valve.

(✓) **6.11 HIGH PRESSURE REGULATOR - Six Month Service Interval; Due Date ____**

6.11.1 N₂O Regulator

NOTE: Minimum cylinder pressure for N₂O regulator test is 600 psi.

- 6.11.1.1 Configure the test gauge (P/N 4114807) using a N₂O nut/stem DISS connector (P/N 4114830-004) on the hose, and N₂O DISS body connector (P/N 4114830-003) on the valve body side. If the machine is configured with CSA style fittings reverse the position of the connectors.
- 6.11.1.2 Connect the test fixture hose to the machine's Nitrous Oxide pipeline inlet.
- 6.11.1.3 Connect the Nitrous Oxide pipeline supply hose to the test fixture.
- 6.11.1.4 Open the Nitrous Oxide and the Oxygen cylinder valves.
- 6.11.1.5 Set the Oxygen and Nitrous Oxide flows to 4 l/min.
- 6.11.1.6 Depress the push button on the test device.
- (✓) 6.11.1.7 Release the push button. After the pressure decay stabilizes, is the regulator output pressure 40 to 49 psi? ____ (Y)

6.11.1.8 Remove the test fixture.

NOTE: If a pressure decrease does not occur, either the hospital's supply pressure is too low or the regulator pressure is set too high.

6.11.2 Air Regulator - If applicable

NOTE: Minimum cylinder pressure for Air regulator test is 1000 psi.

6.11.2.1 Configure the test gauge (P/N 4114807) using an Air nut/stem DISS connector (P/N 4114830-002) on the hose and a DISS body connector (P/N 4114830-001) on the valve body side. If the machine is configured with CSA style fittings reverse the position of the connectors.

6.11.2.2 Connect the test fixture hose to the machine's Air pipeline inlet.

6.11.2.3 Connect the Air pipeline supply hose to the test fixture.

6.11.2.4 Set the Air flow to 4 l/min.

6.11.2.5 Depress the push button on the test device.

(✓) 6.11.2.6 Release the push button. After the pressure decay stabilizes, is the regulator output pressure within the tolerance given in the following table? ___ (Y)

NOTE: If a pressure decrease does not occur, either the hospital's supply pressure is too low or the regulator pressure is set too high.

Cylinder Pressure psi	USA Compensated Regulator output tolerances	ISO Compensated Regulator output tolerances
2000	38 to 44	41 to 47
1800	39 to 45	42 to 48
1600	40 to 46	43 to 49
1400	41 to 47	44 to 50
1200	42 to 48	45 to 51
1000	43 to 49	46 to 52

6.11.2.7 Remove the test fixture.

PMC PROCEDURE (continued)

NM2C

6.11.3 O₂ Regulator

NOTE: Minimum cylinder pressure for O₂ regulator test is 1000 psi.

- 6.11.3.1 Configure a test gauge (P/N 4114807) using an O₂ nut/stem DISS connector (P/N 4114830-006) on the hose and an O₂ DISS body connector (P/N 4114830-005) on the valve body side. If the machine is configured with CSA style fittings reverse the position of the connectors.
- 6.11.3.2 Connect the test fixture hose to the machine's Oxygen pipeline inlet.
- 6.11.3.3 Connect the Oxygen pipeline supply hose to the test fixture.
- 6.11.3.4 Set the Oxygen flow to 4 l/min.
- 6.11.3.5 Depress the push button on the test device.
- (✓) 6.11.3.6 Release the push button. After the pressure decay stabilizes, is the regulator output pressure within the tolerance given in the following table? ____ (Y)

NOTE: If a pressure decrease does not occur, either the hospital's supply pressure is too low or the regulator pressure is set too high.

Cylinder Pressure psi	USA Compensated Regulator output tolerances	ISO Compensated Regulator output tolerances
2000	38 to 44	*41 to 47
1800	39 to 45	*42 to 48
1600	40 to 46	*43 to 49
1400	41 to 47	*44 to 50
1200	42 to 48	*45 to 51
1000	43 to 49	*46 to 52

(✓) 6.12 LOW O₂ SUPPLY - Six Month Service Interval; Due Date ____

- 6.12.1 Close the Oxygen cylinder valve and drain all Oxygen pressure.
- 6.12.2 Depress the push button on the test device.
- 6.12.3 Adjust the Oxygen flow to 500 ml/min.
- 6.12.4 Release the test device push button.
- 6.12.5 Is the pressure on the test gauge when the LO O₂ SUPPLY message appears on the monitor within 34 to 40 psi? ____ (Y)

NM2C

6.12.6 Remove the test equipment.

6.13 OXYGEN SUPPLY FAILURE PROTECTION

- 6.13.1 Connect all pipeline supplies.
- 6.13.2 Close the Oxygen flow control valve if applicable. Set the Gas Selector switch to O₂ + N₂O if applicable.
- (✓) 6.13.3 *Is the flow of Oxygen 150 to 200 ml/min.? ____ (Y)
- 6.13.4 Open the Nitrous Oxide flow control valve.
- (✓) 6.13.5 *Is the flow of Nitrous Oxide 375 to 750 ml/min.? ____ (Y)
- 6.13.6 Adjust the Oxygen, Nitrous Oxide and additional gas flow to 4 l/min. Set the Carbon Dioxide Flow to 500 ml/min., if applicable.
- 6.13.7 Disconnect the Oxygen pipeline supply and close the Oxygen cylinder valve.
- (✓) 6.13.8 Do all flows cease when the Oxygen pressure is depleted? ____ (Y)
- 6.13.9 Reconnect the Oxygen pipeline supply.
- 6.13.10 Close all cylinder valves and then disconnect the Nitrous Oxide pipeline supply, and Air pipeline if applicable.
- 6.13.11 Drain the cylinder contents then reconnect the pipeline supplies.
- 6.13.12 Close all flow control valves.

* Nitrous Oxide Bypass flow and Minimum Oxygen flow specifications are given @ 50 psi. Pipeline pressure deviations may affect these tests.

6.14 PRESSURE MONITOR

- 6.14.1 Disconnect the breathing pressure sensor line from the absorber.
- 6.14.2 Connect a PDM Adapter (P/N 4115043) and test pressure gauge to the breathing pressure sensor line.
- 6.14.3 Adjust the test pressure to 0 cmH₂O.
- 6.14.4 Simultaneously set AUTO/BAG valve to AUTO, or set the Ventilator switch to the ON position and start a stopwatch.
- (✓) 6.14.5 Does the APNEA PRESSURE alarm appear on the alarm display as a CAUTION within 13 to 17 seconds? ____ (Y)
- (✓) 6.14.6 Slowly increase the test pressure. Does the APNEA PRESSURE alarm deactivate within 10 to 14 cm H₂O? ____ (Y)
- 6.14.7 First decrease the pressure then increase the test pressure above the threshold line shown on the display, and begin timing with a stopwatch.
- (✓) 6.14.8 Does the CONTINUOUS PRES alarm appear as a warning within 13 to 17 seconds? ____ (Y)
- (✓) 6.14.9 Decrease the pressure slowly. Does the CONTINUOUS PRES alarm deactivate within 10 to 14 cmH₂O? ____ (Y)

PMC PROCEDURE (continued)

- (✓) 6.14.10 Increase the test pressure slowly. Does a VENT PRESS HI alarm activate as a warning within 45 to 55 cm H₂O? ___ (Y)
- (✓) 6.14.11 Create a sub-atmospheric test pressure slowly. Does the SUB ATM PRES warning alarm activate within -7 to -13 cm H₂O? ___ (Y)
- 6.14.12 Set the AUTO/BAG valve to BAG, or set the Ventilator switch to the off position.
- 6.14.13 Open APL valve.
- 6.14.14 Remove the test equipment and reconnect the breathing pressure sensor line to the absorber.

6.15 VENTILATOR

NOTE: Readjustment of inspiratory flow to limit the inspiratory plateau may be required to reduce erratic tidal volumes and breath rates caused by artifact volumes.

- 6.15.1 Remove the bellows hose and the scavenger hose at the ventilator relief valve. Remove the bellows sub-assembly and remove bellows.
- 6.15.2 Visually inspect the bellows for deterioration particularly at its seams and corrugations.
- 6.15.3 Verify the presence of it's sealing O-ring and reassemble the components.
- 6.15.4 Turn on the ventilator on using the ON/OFF knob.
- 6.15.5 If applicable, does the FAULT indicator turn on? ___ (Y)
- 6.15.6 Set the AUTO/MAN selector switch to AUTO.
- 6.15.7 If applicable, does the FAULT indicator turn off? ___ (Y)
- 6.15.8 Set the FREQUENCY to 10 BPM.
- (✓) 6.15.9 If applicable, press and hold the EXTENDED RANGE switch and set the I:E ratio to 2:1. Using a stopwatch, time the extended I:E ratio. Is the inspiratory time within 3.6 to 4.4 seconds? Is the expiratory time within 1.8 to 2.2 seconds? ___ (Y)
- (✓) 6.15.10 Set the I:E RATIO to 1:2. Using a stopwatch, time the I-E ratio. Is the inspiratory time within 1.8 to 2.2 and the expiratory time within 3.4 to 4.4 seconds? ___ (Y)
- 6.15.11 Adjust the Oxygen flow to 500 ml/min.
- 6.15.12 Set the Tidal Volume to 1200, or if testing an external pediatric bellows set the tidal volume to approximately 300 ml.
- 6.15.13 Attach a patient circuit to the absorber system.
- 6.15.14 Set the pressure limit control to MAX, if applicable.
- 6.15.15 Adjust the Inspiratory Flow to the bottom of the LOW zone.
- 6.15.16 Occlude the Y-piece.
- 6.15.17 Press the O₂ Flush momentarily to inflate the bellows.

- 6.15.18 Adjust the Inspiratory Flow until a peak pressure of 80 cm H₂O is achieved.
- (✓) 6.15.19 Set the Pressure Limit Control to within the 30 range. Readjust within the band as necessary to achieve proper value. Is the peak pressure within 27 to 33 cm H₂O? ____ (Y)
- (✓) 6.15.20 Set the Pressure Limit Control to the MIN position. Is the peak pressure at the MIN range 0 to 15 cm H₂O? ____ (Y) Return the Pressure Limit control to MAX.
- 6.15.21 Loosen the expiratory valve dome, or if equipped with an ultrasonic flow sensor Open the Y-piece and disconnect the hose attached to the exhalation valve and blow into it.
- (✓) 6.15.22 Does the Reverse Flow message appear on the display? ____ (Y)
- 6.15.23 Tighten the expiratory valve dome if applicable, or if equipped with an ultrasonic flow sensor reconnect the hose between the expiratory valve and the flow sensor.
- 6.15.24 Insert a test minute volumeter in between absorber dome and Spiromed, or exhalation valve and absorber dome if the system is equipped with the ultrasonic flow sensor.
- 6.15.25 Open the Y-piece.
- 6.15.26 Turn the ventilator off and press the ALL STBY key to clear alarms.
- 6.15.27 Turn the ventilator on and start a stop watch.
- (✓) 6.15.28 Does APNEA-VOLUME appear as a Caution within 13 to 17 seconds? ____ (Y)
- 6.15.29 Attach a 3 liter breathing bag to the Y-piece.
- NOTE:** Bag should be placed on a flat horizontal surface to reduce artifact volume.
- 6.15.30 Press the O₂ Flush momentarily to inflate the bellows.
- 6.15.31 Set the Inspiratory Flow to the MED and readjust as necessary to fully collapse the bellows.
- (✓) 6.15.32 Observe the operation of each unidirectional valve disc at eye level. Does the inspiratory valve disc raise only during the inspiration phase, and the expiratory valve raise only during the exhalation phase? ____ (Y)
- (✓) 6.15.33 Is the tidal volume on the volume monitor and on the test volumeter within 20 % of each other? ____ (Y)
- 6.15.34 Does the volume monitor display 10 BPM? ____ (Y)
- 6.15.35 Does the display correctly track the Breathing Pressure waveform? ____ (Y)

6.16 BELLOWS ADULT - If applicable

- (✓) 6.16.1 Is the tidal volume indicated on the test volumeter 960 to 1440 ml? ____ (Y)

- (✓) 6.14.10 Increase the test pressure slowly. Does a VENT PRESS HI alarm activate as a warning within 45 to 55 cm H₂O? ____ (Y)
- (✓) 6.14.11 Create a sub-atmospheric test pressure slowly. Does the SUB ATM PRES warning alarm activate within -7 to -13 cm H₂O? ____ (Y)
- 6.14.12 Set the AUTO/BAG valve to BAG, or set the Ventilator switch to the off position.
- 6.14.13 Open APL valve.
- 6.14.14 Remove the test equipment and reconnect the breathing pressure sensor line to the absorber.

6.15 VENTILATOR

NOTE: Readjustment of inspiratory flow to limit the inspiratory plateau may be required to reduce erratic tidal volumes and breath rates caused by artifact volumes.

- 6.15.1 Remove the bellows hose and the scavenger hose at the ventilator relief valve. Remove the bellows sub-assembly and remove bellows.
- 6.15.2 Visually inspect the bellows for deterioration particularly at its seams and corrugations.
- 6.15.3 Verify the presence of its sealing O-ring and reassemble the components.
- 6.15.4 Turn on the ventilator on using the ON/OFF knob.
- 6.15.5 If applicable, does the FAULT indicator turn on? ____ (Y)
- 6.15.6 Set the AUTO/MAN selector switch to AUTO.
- 6.15.7 If applicable, does the FAULT indicator turn off? ____ (Y)
- 6.15.8 Set the FREQUENCY to 10 BPM.
- (✓) 6.15.9 If applicable, press and hold the EXTENDED RANGE switch and set the I:E ratio to 2:1. Using a stopwatch, time the extended I:E ratio. Is the inspiratory time within 3.6 to 4.4 seconds? Is the expiratory time within 1.8 to 2.2 seconds? ____ (Y)
- (✓) 6.15.10 Set the I:E RATIO to 1:2. Using a stopwatch, time the I-E ratio. Is the inspiratory time within 1.8 to 2.2 and the expiratory time within 3.4 to 4.4 seconds? ____ (Y)
- 6.15.11 Adjust the Oxygen flow to 500 ml/min.
- 6.15.12 Set the Tidal Volume to 1200, or if testing an external pediatric bellows set the tidal volume to approximately 300 ml.
- 6.15.13 Attach a patient circuit to the absorber system.
- 6.15.14 Set the pressure limit control to MAX, if applicable.
- 6.15.15 Adjust the Inspiratory Flow to the bottom of the LOW zone.
- 6.15.16 Occlude the Y-piece.
- 6.15.17 Press the O₂ Flush momentarily to inflate the bellows.

- 6.15.18 Adjust the Inspiratory Flow until a peak pressure of 80 cm H₂O is achieved.
- (✓) 6.15.19 Set the Pressure Limit Control to within the 30 range. Readjust within the band as necessary to achieve proper value. Is the peak pressure within 27 to 33 cm H₂O? ___ (Y)
- (✓) 6.15.20 Set the Pressure Limit Control to the MIN position. Is the peak pressure at the MIN range 0 to 15 cm H₂O? ___ (Y) Return the Pressure Limit control to MAX.
- 6.15.21 Loosen the expiratory valve dome, or if equipped with an ultrasonic flow sensor Open the Y-piece and disconnect the hose attached to the exhalation valve and blow into it.
- (✓) 6.15.22 Does the Reverse Flow message appear on the display? ___ (Y)
- 6.15.23 Tighten the expiratory valve dome if applicable, or if equipped with an ultrasonic flow sensor reconnect the hose between the expiratory valve and the flow sensor.
- 6.15.24 Insert a test minute volumeter in between absorber dome and Spiromed, or exhalation valve and absorber dome if the system is equipped with the ultrasonic flow sensor.
- 6.15.25 Open the Y-piece.
- 6.15.26 Turn the ventilator off and press the ALL STBY key to clear alarms.
- 6.15.27 Turn the ventilator on and start a stop watch.
- (✓) 6.15.28 Does APNEA-VOLUME appear as a Caution within 13 to 17 seconds? ___ (Y)
- 6.15.29 Attach a 3 liter breathing bag to the Y-piece.
- NOTE:** Bag should be placed on a flat horizontal surface to reduce artifact volume.
- 6.15.30 Press the O₂ Flush momentarily to inflate the bellows.
- 6.15.31 Set the Inspiratory Flow to the MED and readjust as necessary to fully collapse the bellows.
- (✓) 6.15.32 Observe the operation of each unidirectional valve disc at eye level. Does the inspiratory valve disc raise only during the inspiration phase, and the expiratory valve raise only during the exhalation phase? ___ (Y)
- (✓) 6.15.33 Is the tidal volume on the volume monitor and on the test volumeter within 20 % of each other? ___ (Y)
- 6.15.34 Does the volume monitor display 10 BPM? ___ (Y)
- 6.15.35 Does the display correctly track the Breathing Pressure waveform? ___ (Y)

6.16 BELLOWS ADULT - If applicable

- (✓) 6.16.1 Is the tidal volume indicated on the test volumeter 960 to 1440 ml? ___ (Y)

PMC PROCEDURE (continued)

NM2C

- (✓) 6.16.2 Does the bellows remain fully inflated during the expiratory pause phase? ____ (Y)
- 6.16.3 Remove the ventilator hose from the VENTILATOR HOSE terminal.
- 6.16.4 Attach a test terminal to the bellows assembly ventilator hose terminal.
- 6.16.5 Connect a 0-250 ml/min. flowmeter (P/N S000081) to the test terminal.
- 6.16.6 Set the FREQUENCY to 1 BPM.
- (✓) 6.16.7 Is the drive gas leakage indicated during the inspiratory phase 0 to 50 ml/min.? ____ (Y)
- 6.16.8 Remove the test equipment from the ventilator hose terminal and reconnect the ventilator hose to the VENTILATOR HOSE terminal.
- 6.16.9 Set the FREQUENCY to 10 BPM.
- 6.16.10 Adjust the Oxygen flow to 10 l/min.
- 6.16.11 Adjust the Tidal Volume to maximum.
- 6.16.12 Press the O₂ Flush momentarily to inflate the bellows.
- 6.16.13 Adjust the INSPIRATORY FLOW to fully compress the bellows.
- (✓) 6.16.14 Is the Tidal Volume on the test volumeter greater than 1400 ml? ____ (Y)
- (✓) 6.16.15 Is the PEEP value displayed on the monitor 0 to 3 cm H₂O?
- 6.16.16 Remove the breathing bag from the Y-piece and replace it with a test lung.
- 6.16.17 Adjust the Oxygen flow to 300 ml/min.
- 6.16.18 Adjust the Tidal Volume to 200 ml.
- 6.16.19 Does the bellows stop adjust smoothly and engage properly? ____ (Y)
- 6.16.20 Adjust the INSPIRATORY FLOW to fully compress the bellows.
- (✓) 6.16.21 Is the Tidal Volume on the test volumeter 125 to 250 ml? ____ (Y)
- 6.16.22 Close the Oxygen flow control valve.
- 6.16.23 Remove the test lung, set the AUTO/BAG selector valve to BAG and set the ventilator switch to the off position if applicable.
- 6.16.24 Press the Ventilation Alarms off key.

6.17 BELLOWS PEDIATRIC EXTERNAL - If applicable

- 6.17.1 Adjust the fine flow control of the pediatric bellows attachment fully clockwise.
- 6.17.2 Remove the breathing bag from the Y-piece and replace it with a test lung (P/N 4115128).
- 6.17.3 Press the O₂ Flush momentarily to inflate the bellows.
- (✓) 6.17.4 Does the bellows remain fully inflated during the expiratory pause phase? ____ (Y)

NM2C

PMC PROCEDURE (continued)

- 6.17.5 Set the ventilator frequency to 20 BPM.
- 6.17.6 Adjust the Oxygen flow to 3 l/min.
- (✓) 6.17.7 Is the tidal volume on the test volumeter greater than 250 ml? ____ (Y)
- 6.17.8 Adjust the tidal volume to the 100 ml mark on the pediatric bellows assembly.
- (✓) 6.17.9 Is the tidal volume on the test volumeter 65 to 135 ml? ____ (Y)
- 6.17.10 Verify that with the Pediatric Bellows Fine Flow Control turned fully counter-clockwise the bellows does not collapse during inspiration. Readjust the knob to the fully clockwise position.
- 6.17.11 Adjust the Oxygen flow to 10 l/min.
- (✓) 6.17.12 Is the PEEP displayed on the monitor 0 to 3 cm H₂O? ____ (Y)
- 6.17.13 Close the Oxygen flow control valve.
- 6.17.14 Remove the ventilator hose from the VENTILATOR HOSE terminal.
- 6.17.15 Attach a test terminal (P/N 4104389) to the bellows assembly ventilator hose terminal.
- 6.17.16 Connect a 0-250 ml/min. flowmeter (P/N S000081) to the test terminal.
- 6.17.17 Set the FREQUENCY to 1 BPM.
- 6.17.18 Set the I:E RATIO to 1:1.
- 6.17.19 Set the Inspiratory Flow to MAX.
- (✓) 6.17.20 Is the drive gas leakage indicated during the inspiratory phase 0 to 50 ml/min.?
- 6.17.21 Remove the test equipment and reattach the ventilator hose to the VENTILATOR HOSE terminal.
- 6.17.22 Set AUTO/BAG valve to BAG and set the ventilator switch to the off position if applicable.
- 6.17.23 Press the Ventilation Alarms Off key.

6.18 BELLOWS PEDIATRIC INTERNAL - If applicable

- 6.18.1 Remove the breathing bag from the Y-piece and replace it with a test lung (P/N 4115128).
- 6.18.2 Press the O₂ Flush momentarily to inflate the bellows.
- (✓) 6.18.3 Does the bellows remain fully inflated during the expiratory pause phase? ____ (Y)
- 6.18.4 Set the ventilator frequency to 20 BPM.
- 6.18.5 Set the Oxygen flow to 3 liters.
- (✓) 6.18.6 Is the tidal volume on the test volumeter greater than 250? ____ (Y)

PMC PROCEDURE (continued)

NM2C

- 6.18.7 Adjust the inspiratory flow and Pressure limit control if applicable control until the bellows collapses to the 100 ml mark on the pediatric bellows assembly.
- (✓) 6.18.8 Is the tidal volume on the test volumeter 65 to 135ml? ____ (Y)
- 6.18.9 Adjust the Oxygen flow to 10 l/min.
- (✓) 6.18.10 Is the PEEP displayed on the monitor within 0 to 3 cm H₂O? ____ (Y)
- 6.18.11 Close the Oxygen flow control valve.
- 6.18.12 Remove the ventilator hose from the ventilator hose terminal.
- 6.18.13 Attach a test terminal to the bellows assembly ventilator hose terminal.
- 6.18.14 Connect a flowmeter test stand (P/N S000081) to the test terminal.
- 6.18.15 Set the frequency to 1 BPM.
- 6.18.16 Set the I:E RATIO to 1:1.
- (✓) 6.18.17 Is the flow indicated during the inspiratory phase less than 50 ml? ____ (Y)
- 6.18.18 Remove the test equipment and reattach the ventilator hose to the VENTILATOR HOSE terminal.
- 6.18.19 Return pressure limit control to MAX.
- 6.18.20 Set AUTO/BAG valve to BAG and set the ventilator switch to the off position if applicable.
- 6.18.21 Press the Ventilation Alarms Off key.

(✓) 6.19 OPEN RESERVOIR SCAVENGER - Six Month Service Interval; Due Date ____, If applicable

NOTE: If the ambient air in the local environment contains a significant amount of dust and lint, the cleaning frequency must be increased to compensate for these conditions.

6.19.1 OPEN RESERVOIR SCAVENGER CLEANING

- 6.19.1.1 Remove the scavenger hoses and drain all accumulated moisture. Inspect all scavenger hoses for deterioration and replace as needed.
- 6.19.1.2 Disconnect the hospital vacuum source from the scavenger.
- 6.19.1.3 Cleaning procedure for assemblies with 2 large relief ports. If configured with many small vent ports, skip to next step.
 1. Remove the four screws securing the reservoir tube to the main block. Examine the two sealing O-rings and replace as necessary.
 2. Remove the screws securing the access panel at the bottom of the scavenger canister.
 3. Remove and inspect the silencer; replace if needed.

4. Clean the reservoir tube with compressed air if necessary.
 5. Remove the flowmeter from its housing by turning it counterclockwise.
 6. Inspect the tube and clean with compressed air if needed.
 7. Apply vacuum to the port at top of the flowmeter housing.
 8. Go to step 6.19.1.5.
- 6.19.1.4 Cleaning procedure for assemblies with many small vent ports.
1. Remove the scavenger mounting screws.
 2. Remove the scavenger flow control needle valve assembly. Inspect the needle valve and seat for lint or dust accumulation. Clean with compressed air if necessary.
 3. Remove the hardware securing the flowmeter. Remove the brass retainer at the bottom of the assembly. Inspect the for lint or dust accumulation. Clean with compressed air if necessary.
 4. Unthread the reservoir canister from the body.
 5. Remove the hardware securing the tube assembly to the block. Inspect for lint or dust accumulation. Clean with compressed air if necessary and replace O-rings if necessary.
 6. Probe all gas passages of the block to ensure there are no occlusions. Clean with compressed air if necessary.
- 6.19.1.5 Reassemble the scavenger assembly, attach the scavenger hoses and reactivate the vacuum source.
- 6.19.2 OPEN RESERVOIR PRESSURE TESTING
- 6.19.2.1 Activate the Scavenger vacuum supply.
 - 6.19.2.2 Turn the scavenger needle valve fully clockwise (closed).
 - 6.19.2.3 Uncap the hose barb adapter at the rear of the scavenger and connect a test pressure monitor to the hose barb on the adapter using a PDM/Suction Adapter (P/N 4115038). If the scavenger does not contain a hose barb adapter install a scavenger adapter (P/N 4108114) between the 19-mm hose terminal on the scavenger and the scavenger hose.
 - 6.19.2.4 Interconnect the inspiratory and expiratory valves or expiratory port on the ultrasonic flow sensor, if applicable with a 22-mm hose (P/N 9995132).
 - 6.19.2.5 Attach a Breathing System Leak Test Device (P/N S010159) to the bag mount.
 - 6.19.2.6 Set the AUTO/BAG valve to the BAG position.
 - 6.19.2.7 Open the APL valve.

PMC PROCEDURE (continued)

NM2C

- 6.19.2.8 Set the Oxygen flow on the anesthesia machine to 8 l/min.
- 6.19.2.9 Does the test pressure gauge indicate a pressure of less than 1.0 cm H₂O? ____ (Y)
- 6.19.2.10 Close all flow control valves on the anesthesia machine.
- 6.19.2.11 Adjust the scavenger needle valve until the flowmeter indicates within the white lines.
- 6.19.2.12 Is the pressure on the test gauge within 0 to 0.5 cm H₂O? ____ (Y)
- 6.19.2.13 Remove the test equipment, re-cap the scavenger adapter port or remove the scavenger adapter and reconnect the scavenger hose.

(✓) 6.20 A/C SCAVENGER - Six Month Service Interval; Due Date _____, If applicable

NOTE: If the ambient air in the local environment contains a significant amount of dust and lint, the cleaning frequency must be increased to compensate for these conditions.

6.20.1 A/C SCAVENGER CLEANING

- 6.20.1.1 Remove the scavenger hoses and drain any accumulated moisture. Inspect all hoses for deterioration, then reinstall or replace as needed.
- 6.20.1.2 Remove the safety relief valve housing by unscrewing it in a counter-clockwise direction.
- 6.20.1.3 Inspect the O-ring and replace it if needed.
- 6.20.1.4 Remove the safety relief valve from its housing by twisting it out in a counter-clockwise direction. The tips of needle nose pliers can be used to turn the valve. Be careful not to damage the valve's fragile disk.
- 6.20.1.5 Remove any accumulated lint or dust from the valve with a soft brush. The valve may be further cleaned with a low flow of Air or Oxygen. The scavenger body can be cleaned with a moist cloth.
- 6.20.1.6 Reinstall the valve into the housing, making sure that it is threaded all the way into the housing and that the plastic washer is properly seated on its upper surface.
- 6.20.1.7 Reinstall the valve housing onto the scavenger body, making sure that the O-ring is properly seated.

6.20.2 AC SCAVENGER TESTING

- 6.20.2.1 Set the AUTO/BAG valve to the BAG position.
- 6.20.2.2 Open the APL valve.
- 6.20.2.3 Occlude the bag mount connector with a Breathing System Leak Test Device (P/N S010159).

- 6.20.2.4 Interconnect the inspiratory and expiratory valves or expiratory port on the ultrasonic flow sensor, if applicable with a 22-mm hose.
- 6.20.2.5 Set the Oxygen flow on the anesthesia machine to 8 l/min.
- 6.20.2.6 Install a scavenger adapter (P/N 4108114) between the 19-mm hose terminal on the scavenger and the scavenger hose.
- 6.20.2.7 Connect a test pressure monitor to the hose barb on the adapter using a PDM/Suction Adapter (P/N 4115038).
- 6.20.2.8 Remove the transfer hose from the bottom of the scavenger and occlude this port.
- 6.20.2.9 Is the pressure on the test gauge within 5 to 10 cm H₂O? ____ (Y)
- 6.20.2.10 Remove the test equipment and reconnect the scavenger hose and the transfer hose.
- 6.20.2.11 Close the Oxygen flow control valve.

(✓) 6.21 BAG SCAVENGER - Six Month Service Interval; Due Date ____, If applicable

NOTE: If the ambient air in the local environment contains a significant amount of dust and lint, the cleaning frequency must be increased to compensate for these conditions.

6.21.1 BAG SCAVENGER CLEANING

- 6.21.1.1 Remove the scavenger hoses and drain any accumulated moisture. Inspect all hoses for deterioration, then reinstall or replace as needed.
- 6.21.1.2 Remove the reservoir bag and drain any accumulated moisture and inspect it for deterioration, then reinstall or replace as needed. All under sized or single use bags must be replaced with 5-liter reusable style reservoir bag.
- 6.21.1.3 Remove the plastic valve cover on the front surface of the scavenger body by turning it in a counter-clockwise direction.
- 6.21.1.4 Remove the valve and washer from the scavenger body by turning it counter-clockwise. A needle-nose pliers may be used to turn the valve, but use care not to damage the valve's fragile disk.
- 6.21.1.5 Brush any accumulated lint or dust off the valve with a soft brush. The valve may be further cleaned with a low flow of clean Air or Oxygen.
- 6.21.1.6 Reinstall the plastic washer and valve into the scavenger body. Replace the valve cover.
- 6.21.1.7 Unscrew the valve housing on the left side of the scavenger body by turning its fitting counter-clockwise with a wrench.

- 6.21.1.8 Unscrew the valve from the housing by turning it in a counterclockwise direction.
- 6.21.1.9 Brush any accumulated lint or dust off the valve with a soft brush. The valve may be further cleaned with a low flow of clean Air or Oxygen.
- 6.21.1.10 Reinstall the valve in the housing, and then reinstall the housing into the scavenger body.
- NOTE:** This valve does not require washers or O-rings.
- 6.21.1.11 Remove the valve housing on the right side of the scavenger body by turning it counter-clockwise.
- 6.21.1.12 Inspect the rubber O-ring and replace if worn.
- 6.21.1.13 Remove the valve from the housing by turning it counterclockwise. A needle-nose pliers may be used to turn the valve, but use care not to damage the valve's fragile disk.
- 6.21.1.14 Brush any accumulated lint or dust off the valve with a soft brush. The valve may be further cleaned with a low flow of clean Air or Oxygen.
- 6.21.1.15 Reinstall the valve and plastic washer into the housing.
- 6.21.1.16 Reinstall the valve housing onto the scavenger body, making sure that the O-ring is properly seated.
- 6.21.2 BAG SCAVENGER TESTING
 - 6.21.2.1 Activate the Scavenger vacuum supply.
 - 6.21.2.2 Turn the scavenger needle valve fully clockwise (closed).
 - 6.21.2.3 Install a scavenger adapter (P/N 4108114) between the 19-mm hose terminal on the scavenger and the scavenger hose.
 - 6.21.2.4 Connect a test pressure monitor to the hose barb on the adapter using a PDM/Suction Adapter (P/N 4115038).
 - 6.21.2.5 Set the AUTO/MAN valve to the BAG position.
 - 6.21.2.6 Connect a 22mm breathing hose between the absorber's inspiratory valve and expiratory valve or expiratory hose terminal on the ultrasonic flow sensor, if applicable.
 - 6.21.2.7 Open the APL valve.
 - 6.21.2.8 Occlude the bag mount connector.
 - 6.21.2.9 Press the O₂ Flush button to inflate the scavenger reservoir bag.
 - 6.21.2.10 Open the Oxygen flow control valve to 8 l/min.
 - 6.21.2.11 Does the reading on the test gauge indicate a pressure less than or equal to 10 cm H₂O? ____ (Y)

- 6.21.2.12 Adjust the scavenger needle valve to allow typical suction through the scavenger.
- 6.21.2.13 Close all flow control valves on the machine.
- 6.21.2.14 Does the gauge indicate a pressure less than or equal to -1.0 cm H₂O? ____ (Y)
- 6.21.2.15 Remove the test equipment and reconnect the scavenger hose.
- 6.21.2.16 Close the Oxygen flow control valve.

(✓) **6.22 SUCTION REGULATOR - Six Month Service Interval; Due Date _____, If applicable**

- 6.22.1 Set the vacuum on/off valve to the ON position.
- 6.22.2 Set the regulator to indicate 250 mmHg.
- 6.22.3 Connect a digital pressure meter to the collecting inlet stem of the suction bottle.
- 6.22.4 Set the digital pressure meter to the mmHg scale.
- 6.22.5 Is the vacuum indicated on the digital pressure meter within 200 to 300 mm Hg? ____ (Y)
- 6.22.6 Set the vacuum on/off valve to the OFF (vertical) position.
- 6.22.7 Turn the vacuum control knob fully counter-clockwise.

(✓) **6.23 MANUAL SPHYGMOMANOMETER - Six Month Service Interval; Due Date _____, If applicable**

- 6.23.1 Insert the male Luer fitting of the Sphygmomanometer squeeze bulb hose assembly into the female Luer fitting labeled BP BULB on the front of the machine.
- 6.23.2 Insert a NIBP-Luer Test Adapter (P/N 4116111-001) inline between the blood pressure cuff and the extension hose.
- 6.23.3 Wrap the blood pressure cuff around an "E" cylinder.
- 6.23.4 Hand-pump the squeeze bulb until pressure of 200 mm Hg is indicated on the test gauge and start a stop watch.
- 6.23.5 Does the Sphygmomanometer indicate within 180 to 220 mm Hg? ____ (Y)
- 6.23.6 After thirty (30) seconds, is the pressure on the Sphygmomanometer gauge within 190 to 200 mm Hg? ____ (Y)
- 6.23.7 Remove test equipment.
- 6.23.8 Remove the blood pressure cuff from the "E" cylinder.
- 6.23.9 Does the Sphygmomanometer indicate within the band? ____ (Y)

6.24 FINAL TESTS

- (✓) 6.24.1 Is the machine's Operator's Instruction manual in close proximity of the machine? ____ (Y)

6.0 PMC PROCEDURE, NARKOMED 4

The procedures in this section shall be performed in their entirety each time a component is removed, replaced, calibrated, adjusted and during all scheduled Periodic Manufacturer's Certification (PMC) visits. A PMC Checklist form, P/N S010052, available from the Draeger Medical, Inc. Technical Service Department, shall be completed by the TSR each time a PMC is performed. Steps in the procedure marked with (✓) require a response at the corresponding line on the checklist form.

Space is also provided on the PMC checklist form to record the results of a vapor concentration test.

Test equipment listed below with an asterisk (*) require calibration at a maximum interval of one year.

NOTE: Verify the dates on test equipment calibration labels. DO NOT USE any test equipment having an expired calibration date. Notify your supervisor immediately if any equipment is found to be out of calibration.

In the space provided at the bottom of the PMC checklist form, record the Model and ID number of all calibrated test equipment used. Also record the calibration due dates.

Test Equipment Required:

- Nellcor PT2500 pocket tester (for SpO2 cal check)
- *-- Novamatrix TB500B sensor simulator (for SpO2 cal check)
- *-- Multi-Meter (Fluke or equivalent)
- *-- Electrical Safety Analyzer (Biotek 501 Pro or equivalent)
- *-- Regulator Test Pressure Gauge, P/N S000063 or equivalent
- Fresh Gas Outlet Volume Test Device, P/N S010158 or equivalent
- Fresh Gas Leak Test Device, P/N 4113119 or equivalent
- Adapter Assembly, Test Terminal, P/N 4104389 or equivalent: two are required
- *-- Flowmeter Test Stand (Capnomed), P/N S000081 or equivalent
- Breathing System Leak Test Device, P/N S010159 or equivalent
- Baromed Pressure Test Fixture or equivalent
- *-- Test Minute Volume Meter, P/N 2212300 or equivalent
- *-- Digital Pressure Manometer (SenSym PDM 200CD or Equivalent)
- *-- Riken Gas Indicator, Model 18H, or 1802D or equivalent
- Stop Watch
- Service Test Lung, P/N 4115128

Materials Required:

- Dow Corning High Vacuum Grease, P/N S4105908
- Spiromed Sensor Lubrication Kit, P/N 2218180
- Breathing Bag, 3 liter, P/N 9995330
- Tube, Corrugated, 22 mm x 12 in. long, P/N 9995112

Test equipment illustrations are shown on following pages.

NOTE: The following calibrations must be performed before beginning the PMC Procedure (refer to Section 5 in the Narkomed 4 Service Manual, Adjustment and Calibration Procedures):

Oxygen Sensor Zero Calibration

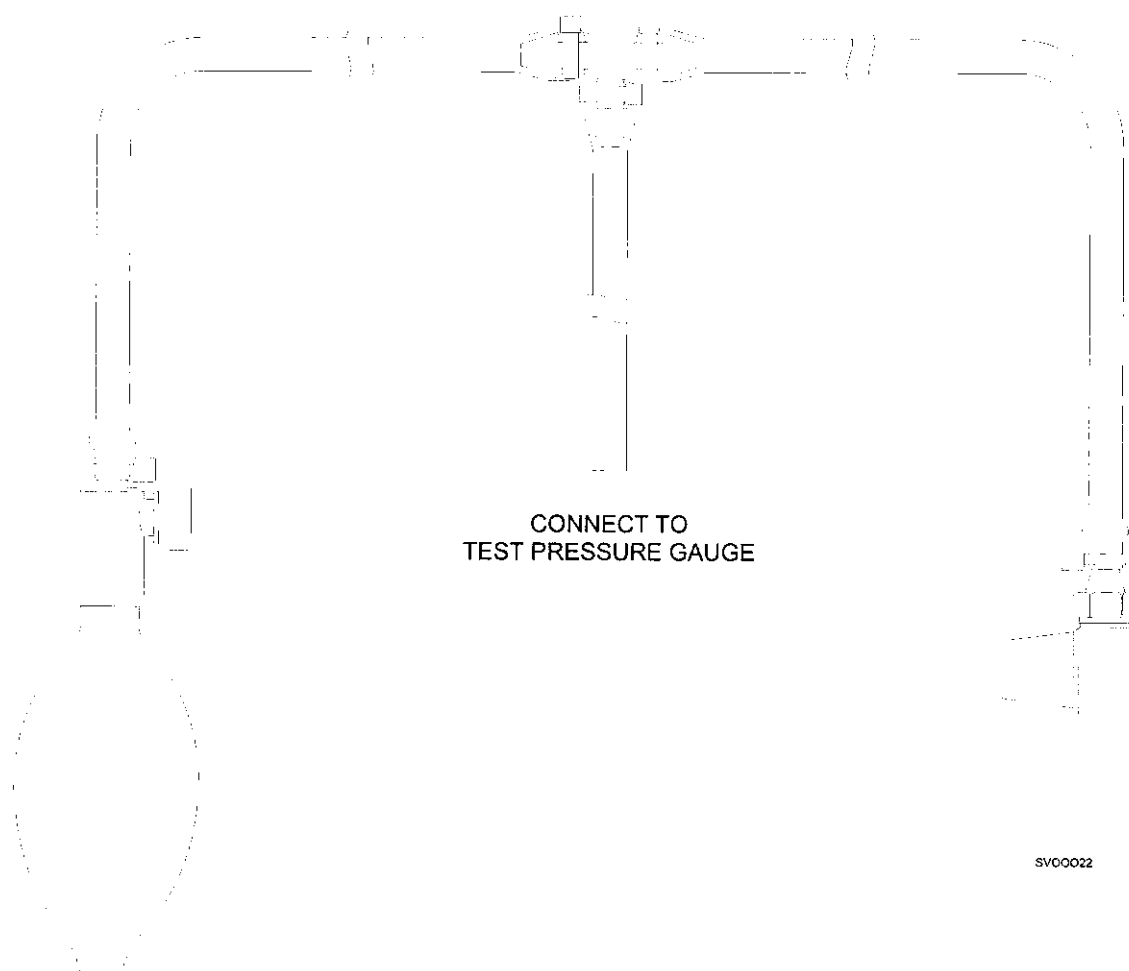
Breathing Pressure Monitor Calibration

Respiratory Flow Monitor Calibration

SpO₂ Monitor Calibration Check

NIBP Inflation Pressure Calibration Check

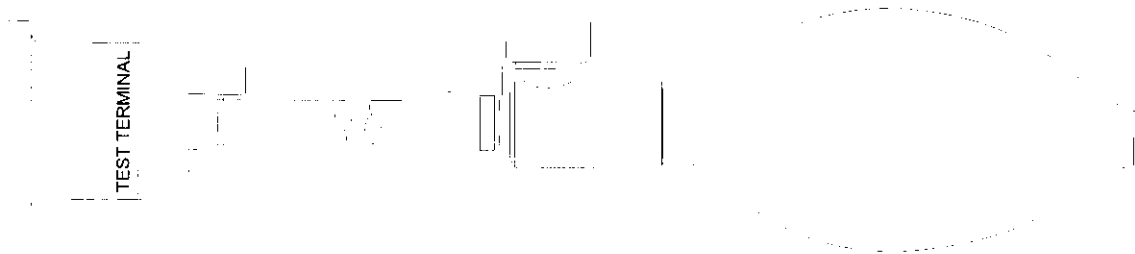
4113119
FRESH GAS LEAK TEST DEVICE





4115128
SIEMENS TEST LUNG

SV00025

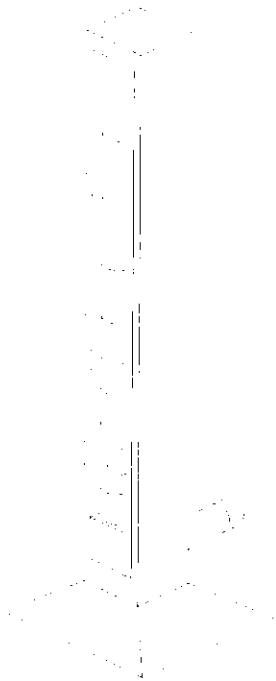


S010159
BREATHING SYSTEM LEAK TEST DEVICE

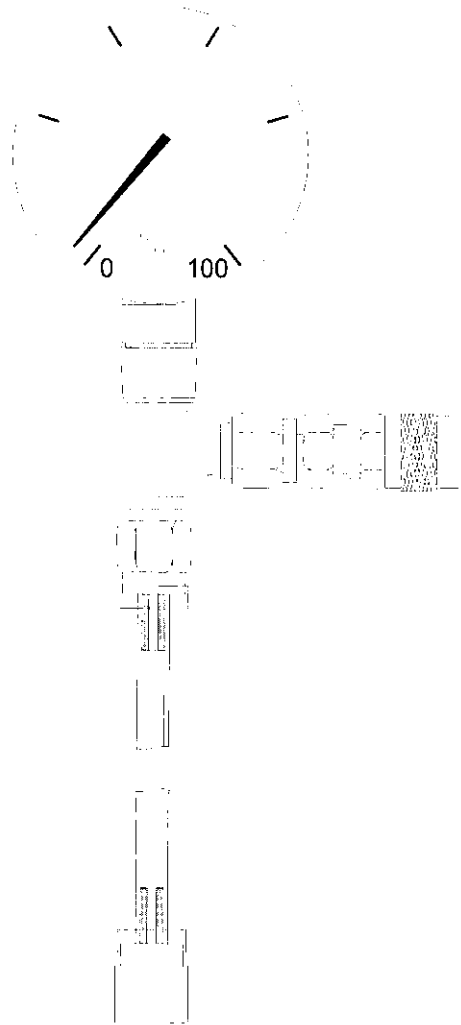


S010158
FRESH GAS OUTLET VOLUME TEST DEVICE

SV00027



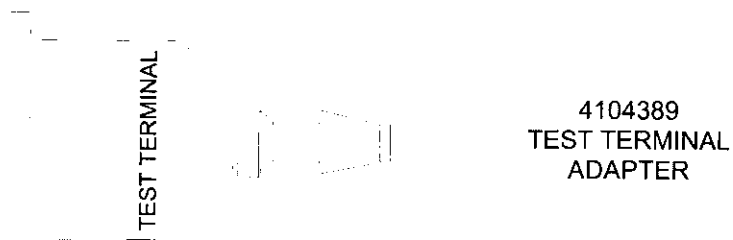
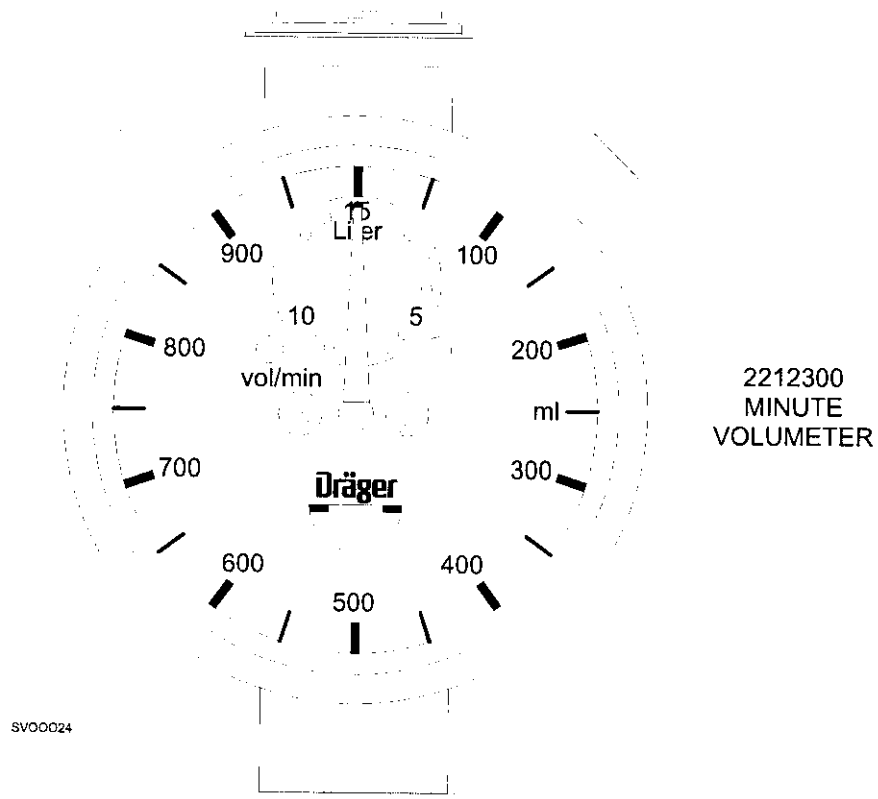
S000081
FLOW METER
TEST STAND

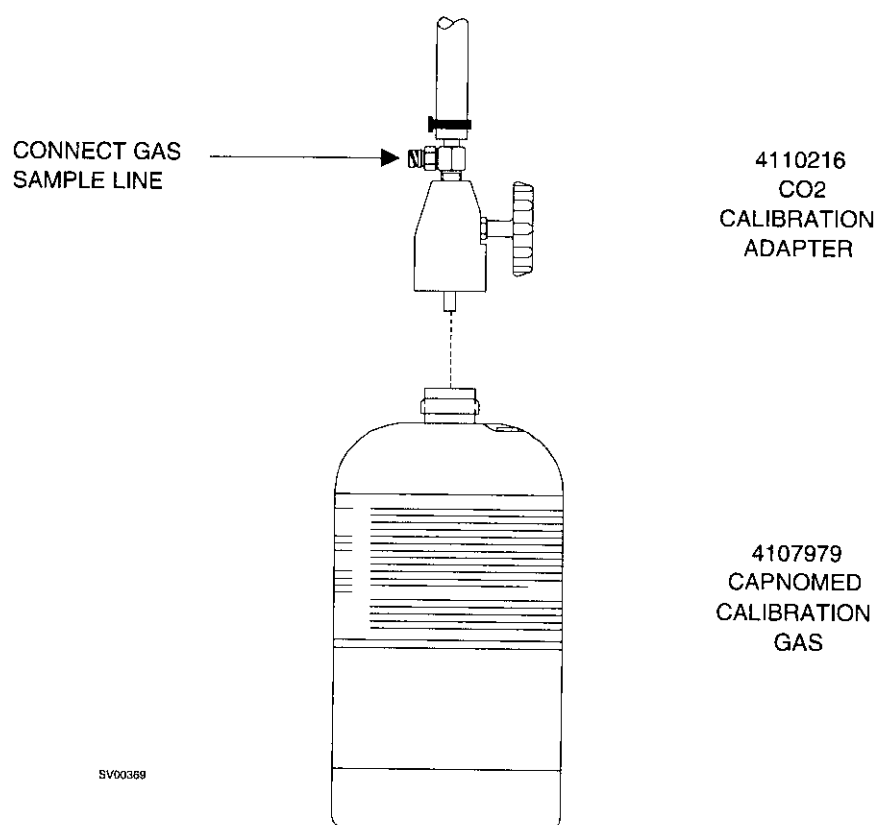


S000063
REGULATOR TEST
PRESSURE GAUGE

NM4

PMC PROCEDURE (continued)



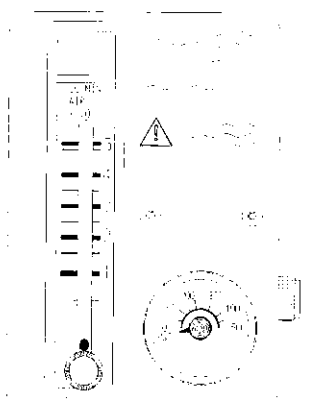


SV00389

TEST EQUIPMENT FOR AGENT
ANALYZER ACCURACY TEST

NM4

PMC PROCEDURE (continued)



4110716
MULTISPEC CALIBRATION ADAPTER



4110599 OR 4110599-001
MULTISPEC CALIBRATION
GAS CYLINDER

SV00026

4110683
MULTISPEC CALIBRATION KIT

This page intentionally left blank

Periodic Manufacturer's Certification General Instructions

The purpose of these procedures is to provide detailed instructions for performing a Periodic Manufacturer's Certification (PMC) inspection on the Narkomed 4 anesthesia machine.

A PMC consists of a complete Periodic Manufacturer's Service procedure and a new certification level inspection based on Draeger Medical, Inc. Recommendations and equipment performance. Additional inspections are also performed to insure proper product labeling.

Several additional documents have been created to ensure the success of this new program. Following is a brief description of the purpose of each document.

Field Service Procedure:

Periodic Manufacturer's Certification Forms - Part Number SP00175.

This procedure illustrates sample checklists with typical periodic maintenance items filled in, including vapor concentrations verification tests, parts replaced, general comments and certification levels. Also included are sample PMC labels marked to show several levels of certifications. An excerpt from Draeger Medical, Inc.'s *Anesthesia System Risk Analysis and Risk Reduction* is included, and also a sample of an Executive Summary to be furnished to the hospital's Risk Manager or Chief of Anesthesia.

Field Service Procedure:

DMI Recommendations Guidelines Index Anesthesia Systems - Part Number S010250.

This Guideline was created to provide an assessment of each machine's certification. It contains various comprehensive overviews of possible equipment conditions and their associated certification levels.

The first list in the Recommendation Guidelines is a reference chart for machine certification based on equipment status. The second is an abbreviated summary of all DMI Recommendations and Failure Codes including the Condition Number, Equipment Condition, Recommended Corrections, Certification Code, and Tests Affected when applicable.

There is also a matrix classified as "Failure Codes" which identifies the correct manner in which to document equipment tests that fail, or were unable to be performed due to circumstances beyond the control of the service technician performing the inspection. (Ex: Air cylinder supply is unavailable to perform Air High Pressure Leak test.) The Failure Codes section also indicates suggested resolution of the situation. Failure Code numbers begin at 34 and use the same certification levels strategy, and carry the same weight as DMI Recommendation equipment condition codes.

The final matrix is the most comprehensive index sorted by machine model and includes Equipment Condition, Certification Code, and DMI Recommendations. It also specifies any suggested upgrade path including ordering information that should be taken such as installing a Bellows with Pressure Limit Control 4109664-S01 Kit, after market modification kit to a machine not equipped with pressure limit control.

The letters A, B, C, D and the Roman Numerals I, II are used as codes in the individual matrix for each model of anesthesia machine. The letters A, B, C, and D are used in descending order to indicate the certification level of the equipment. They are as follows:

- A = Certified
- B = Certified with Recommendations
- C = Conditionally Certified
- D = No Certification

Roman Numerals I and II do not affect the certification level but rather are provided to give further instructions to the end user as follows:

- I = The system in its present configuration shall only be used with a CO2 monitor incorporating an apnea warning. The operator of the system is advised to frequently scan the CO2 readings and alarm thresholds.
- II = The present configuration of equipment requires that the unit operate at all times with an oxygen analyzer that includes a low oxygen warning. The operator of the system is advised to frequently scan the oxygen readings and alarm limits.

Following is an explanation of machine certification levels:

Certified- No recommendations apply to machine being inspected. (Only item number 33 - "No Recommendations" shall apply for this certification level.)

Certified with Recommendations- A numbered recommendation with a code of B applies to the machine being examined.

Conditionally Certified- A numbered recommendation with a code of BCI or BCII applies to the machine being examined.

No Certification- A numbered recommendation with a code of D applies to the machine being examined.

When multiple recommendations apply, "No Certification" would take precedence over "Conditionally Certified" and "Certified with Recommendations". "Conditionally Certified" would take precedence over "Certified with Recommendations".

For example:

A **Narkomed 3** could have recommendation number 21 and failure code 61.1 apply.

21 - No ventilator pressure limit control. Code is B.

61.1 - Enflurane agent is unavailable to test. Code is BC.

Correct certification for this machine is BC, which means **CONDITIONALLY CERTIFIED WITH RECOMMENDATIONS**.

A **Narkomed 4** could have recommendation numbers 14 and 21 apply.

14 - CO₂/Agent monitor exhaust port is not properly connected to the waste gas scavenger.
Code B.

21 - No ventilator pressure limit control. Code B.

The correct certification for this machine is B, which means **CERTIFIED WITH RECOMMENDATIONS**.

A **Narkomed 2B, 2C or GS** could have recommendation 30 apply.

30 - Anesthesia machine is equipped with inhalation anesthesia vaporizers without an agent analyzer in the breathing system. Code B.

The correct certification for this machine is B, which means **CERTIFIED WITH RECOMMENDATIONS**.

A **Narkomed 6000** could have no DMI recommendations or failure codes apply. The correct certification level for this machine is Code A, **CERTIFIED**.

Code D, which means NO CERTIFICATION, also means the machine shall not receive a Periodic Manufacturer's Certification label. The machine shall also receive a 'WARNING - This System is Not Certified' label, P/N 4114857. This label shall be placed at a prominent location on the right side of the machine after all other previous PM and 'Vigilance Audit® Validation' labels have been removed.

PM Certification Procedure for Narkomed 4 Anesthesia System

1. Use the PM Certification form for Narkomed 4 Anesthesia Systems (P/N S010052).
2. Completely fill in the header information.
3. Determine if the ventilator has an MJV-2 square Clippard valve. If ventilator has an MJV-2, perform the lubrication procedure in accordance with SP00062. Write in the date of lubrication next to the "MJV-2 LUBRICATION" line on the Periodic Manufacturer's Certification form. If the ventilator has a Humphrey valve, indicate so with a (H) next to the "MJV-2 LUBRICATION" line on the Periodic Manufacturer's Certification form.
4. Replace the VENTILATOR RELIEF VALVE DIAPHRAGM in accordance with SP00075. Place a check mark and the replacement date at "VENT RELIEF VALVE REPLACEMENT" line on the Periodic Manufacturer's Certification form.
5. If a TEC 6 DESFLURANE vaporizer is mounted to the machine, a label stating: "WARNING THE ADMINISTRATION OF DESFLURANE ANESTHESIA MAY REQUIRE FRESH GAS CONCENTRATIONS HIGHER THAN COMMONLY USED WITH OTHER VOLATILE ANESTHETIC AGENTS. O2 FRESH GAS CONCENTRATION OF LESS THAN 21% MAY BE OBTAINED WITH HIGH VAPORIZER SETTINGS. CONTINUOUS MONITORING OF THE O2 CONCENTRATION IN THE BREATHING SYSTEM IS THEREFORE REQUIRED. DRAEGER MEDICAL, INC. RECOMMENDS THE CONTINUOUS MONITORING OF THE CONCENTRATION OF ANESTHETIC VAPORS IN THE BREATHING SYSTEM DURING THE ADMINISTRATION OF INHALATION ANESTHESIA."(part # 4112737-001) Shall be attached to the vapor box immediately above the TEC 6 vaporizer.
6. Check all vapor 19 and 19.1 vaporizers for correct labeling. All vaporizers must have a label stating "THE CONCENTRATION OUTPUT OF THIS VAPORIZER SHALL BE VERIFIED AFTER IT HAS BEEN ATTACHED TO THE ANESTHESIA MACHINE" (part # S010015). This label shall be attached to the rear of the vaporizer directly below the mount.
7. All Key Index Safety Systems vaporizers, (K.I.S.S.) must have a label stating "CAUTION: AFTER FILLING HAS BEEN COMPLETED, REINSERT PLUG INTO UPPER FILLER PORT AND TIGHTEN LOCKING SCREW" (part # 4112520-001). This label shall be attached to the vaporizer directly above the keyed filler. Place a check mark at "K.I.S.S. LABEL" on the PM Certification form.
8. If machine is equipped with a HALOTHANE Dräger Vapor 19 or 19.1 vaporizer, determine if vaporizer must be inspected for soil condition one. Check the serial number plate located on the rear of the vaporizer for a plus (+) preceding the serial number. A HALOTHANE vaporizer serial number not preceded with a (+) must be tested for soil in accordance with SP00073. If vaporizer does not need to be inspected, indicate so with a plus (+) next to the "Vapor Inspection (H)" line on the Vigilance Audit form. If vaporizer is soil condition 0, indicate so with "SOIL 0" written next to the "Vapor Inspection (H)" line on the Vigilance Audit form. If vaporizer is soil one, indicate so with "SOIL 1" written next to the "Vapor Inspection (H)" line on the Vigilance Audit form. Place a "CAUTION DO NOT USE" label (part # 4114327) on the vaporizer, and issue a departmental alert. The TSR shall also seek permission from the equipment operator to remove the failed vaporizer from the machine and apply a replacement vaporizer or an adapter block onto the mount. All "SOIL 1" vaporizers must be removed from service for machine to receive certification.
9. Perform the vapor concentration test on all Dräger vapor vaporizers in accordance with SP00073 at a six month maximum interval. Perform the vaporizer concentration test on all Desflurane vaporizers in accordance with SP00091 for fixed mount vaporizers and SP00189 for user removable D-tec vaporizers at a six month maximum interval. For every vaporizer tested, fill out a "VAPOR VAPORIZER CALIBRATION CHECK" label (part # S010016). Information on this label shall include your signature, type of agent, date tested, test results @ 1%, 2.5%, 4% for H, E, I, or S vaporizers, or @ 4%, 10%, 12%, 16% for Desflurane vaporizers, and a PASS or FAIL indication. This label shall be attached to the upper right side of the vaporizer. If vaporizer fails the concentration verification, internal leak, or exclusion system tests, check "NO" in the "RECOMMENDED FOR USE" section on the PM Certification form.

PM Certification Procedure for Narkomed 4 Anesthesia System

Place a "CAUTION DO NOT USE" label (part # 4114327) on the vaporizer, and issue a departmental alert. The TSR shall also seek permission from the equipment operator to remove the failed vaporizer from the machine and install a replacement vaporizer or an adapter block onto the mount. All nonfunctional Draeger vapor vaporizers must be removed from service for machine to receive certification.

10. Proceed with PM Certification procedure. If any tests fail refer to the "Failure Codes" listing in DMI Recommendations Guidelines Index (P/N S010250) to determine correct certification level starting point. Failure codes shall be documented on the "RECOMMENDATIONS / GENERAL COMMENTS" section of the PM Certification form and on the Executive Summary. If a test fails that has not been identified by the "Failure Codes" list, consult with Draeger Medical, Inc. to assess the proper certification level.
11. Based on the "EQUIPMENT CONDITION" inspect the machine for any "DMI RECOMMENDATIONS" that would apply. Use the Narkomed 4 section of the "RECOMMENDATION GUIDELINES INDEX" (P/N S010250). Note all applicable DMI recommendations on the Executive Summary. NOTE: If using a carbon form, indicate the Equipment Condition number and to see reverse side under the "RECOMMENDATIONS / GENERAL COMMENTS" section of the form.
12. Determine the correct certification level of the machine based on the combined lowest common denominator of "Equipment Conditions" and "Failure Codes". If the machine is at least conditionally certified fill out the "PM CERTIFICATION" label. Check the box(s) on the validation label where appropriate. Write the month and year, (three months from date of PM Certification) next to "NEXT VISIT DUE:" If certification level is "D", machine shall not receive a "PM CERTIFICATION" label. Any machine not receiving a PM Certification label shall receive a "WARNING NOT CERTIFIED" label. This label shall be placed at a prominent location on the left side of the machine after all other previous PMC and Vigilance Audit Validation labels have been removed.
13. In the "CERTIFICATION LEVEL" section of the PM Certification form, record the last visit certification level, the current certification level and the next visit due month and year, (three months from date of PM Certification) in the spaces provided.
14. If applicable, remove the previous PM CERTIFICATION VALIDATION label and attach the new label (P/N S010006 w/phone #, or P/N S010007 w/o phone #) in a prominent location on the rear of the anesthesia machine.
15. Check the appropriate boxes on the "PM CERTIFICATION NOTICE" label, (part # S010011). If the machine is not certified, the last box of this notice label shall be marked. Attach this notice to the flow shield of the anesthesia machine.
16. Have the customer sign each PM Certification form or the Executive Summary, and review the equipment conditions and the recommendations with the customer.
17. Return top copy to Draeger Medical, Inc. Service Department, keep middle copy for service organization records, give bottom copy to customer.

6.1 Safety Testing

6.1.1 Protective Ground Continuity Test

6.1.1.1 Turn the System Power switch to STANDBY.

CAUTION: Do not plug or unplug the remote display cable with power applied.

Disconnect the remote display cable, NIBP hose, gas sample line, and SpO₂ cable.

Remove the monitor box cover and re-connect the remote display cable, NIBP hose, gas sample line, and SpO₂ cable.

NOTE: Do not plug the safety analyzer power cord into a line isolation monitor, as inaccurate readings may occur.

Plug the unit into the safety analyzer, and plug the power cord of the safety analyzer into a 115 V receptacle.

6.1.1.2 Set the safety analyzer function switch to the "GROUND WIRE RESISTANCE" position. Attach the test lead to the "SINGLE LEAD" connector.

6.1.1.3 Set the safety analyzer "GROUND" switch to the "NORMAL" position. Set the "POLARITY" switch to the "OFF" position.

6.1.1.4 The safety analyzer shall indicate 0.1 ohms or less with its test lead applied to the following points:

- Cylinder yoke
- Blood pressure pump mounting bracket (inside monitor chassis)

6.1.2 Circuit Isolation Test

6.1.2.1 Apply the safety analyzer and check for continuity between the monitor box chassis and the circuit common at backplane connector J29, Pin 13. There shall be no continuity between these points.

6.1.3 Chassis Leakage Current Test

- 6.1.3.1 Turn the NM4 System Power switch to ON and set the safety analyzer to the "CHASSIS LEAKAGE CURRENT" position.
- 6.1.3.2 Attach the safety analyzer test lead to a yoke assembly.
- 6.1.3.3 Record the total leakage current with the polarity and ground switches set to the following positions:

<u>Ground</u>	<u>Polarity</u>
Open	Normal
Normal	Normal
Open	Reversed
Normal	Reversed

Verify that the leakage current is 75 microamps* or less in each of the positions (110 microamps or less for 220/240 volt power supply option).

* 100 microamps if external monitors are plugged into convenience outlets.

6.2 Battery Circuit Test

- 6.2.1 Is "ON" LED lighted? __ (Y)
- 6.2.2 With the System Power switch ON, unplug the AC power cord.
- 6.2.3 Is yellow "AC PWR FAIL" LED lighted as long as the power cord is unplugged? __ (Y)
- 6.2.4 Does the "AC PWR FAIL" message appear in the Advisory display? __ (Y)
- 6.2.5 Press and hold the "BATTERY TEST" button.
- 6.2.6 Is green Battery Test LED lighted as long as "BATTERY TEST" button is depressed? __ (Y)
- 6.2.7 Release the "BATTERY TEST" button.
- 6.2.8 Restore AC power to the machine.

6.3 Manual Sphygmomanometer

- 6.3.1 Insert the male Luer fitting of the Sphygmomanometer squeeze bulb-hose assembly into the female Luer fitting adjacent to the BLOOD PRESSURE label on the machine.
- 6.3.2 Wrap the blood pressure cuff around an "E" cylinder.
- 6.3.3 Hand pump the squeeze bulb until pressure of 200 mm Hg is indicated on the Sphygmomanometer gauge on the machine. Pinch the hose adjacent to the Luer fitting to assure that the hose-bulb is not the source of any leak.
- 6.3.4 After thirty (30) seconds, what is the pressure on the Sphygmomanometer gauge? ___ mm Hg (190-200)
- 6.3.5 Bleed the pressure.
- 6.3.6 The Sphygmomanometer should indicate within the band.
- 6.3.7 Attach a test Sphygmomanometer in series with the gauge being tested.
- 6.3.8 Hand pump the squeeze bulb until the machine gauge indicates 100mm Hg.
- 6.3.9 What does the test gauge indicate? ___ mm Hg (90-110).
- 6.3.10 Hand pump the squeeze bulb until the machine gauge indicates 200mm Hg.
- 6.3.11 What does the test gauge indicate? ___ mm Hg (180-220).
- 6.3.12 Hand pump the squeeze bulb until the machine gauge indicates 300mm Hg.
- 6.3.13 What does the test gauge indicate? ___ mm Hg (> 290).
- 6.3.14 Remove the test gauge.
- 6.3.15 Remove the blood pressure cuff from the "E" cylinder.
- 6.3.16 Record the Sphygmomanometer serial number on the check list.

6.4 Vapor Exclusion System and Agent Indicator Lamp Test

- 6.4.1 Set all vapors to zero (0).
- 6.4.2 Adjust the handwheel on the left position vapor to any concentration above zero (0).
- 6.4.3 Verify that only the correctly labeled indicator lamp above the left vaporizer illuminates during full rotation of the hand wheel.
- 6.4.4 Allow the "CO2 CALIBRATION IN PROGRESS" to complete on the remote display.
- 6.4.5 Verify that the correct abbreviation for the agent selected appears on the display.
- 6.4.6 Is it possible to turn on the center position vapor? __ (N)
- 6.4.7 Is it possible to turn on the right position vapor? __ (N)
- 6.4.8 Set the handwheel on the left position vapor to zero (0).
- 6.4.9 Adjust the handwheel on the center position vapor to any concentration above zero (0).
- 6.4.10 Verify that only the correctly labeled indicator lamp above the center vaporizer illuminates during full rotation of the hand wheel.
- 6.4.11 Allow the "CO2 CALIBRATION IN PROGRESS" to complete on the remote display.
- 6.4.12 Verify that the correct abbreviation for the agent selected appears on the display.
- 6.4.13 Is it possible to adjust the left position vapor? __ (N)
- 6.4.14 Is it possible to adjust the right position vapor? __ (N)
- 6.4.15 Set the handwheel on the center position vapor to zero (0).
- 6.4.16 Adjust the handwheel on the right position vapor to any concentration above zero (0).
- 6.4.17 Verify that only the correctly labeled indicator lamp above the right vaporizer illuminates during full rotation of the hand wheel.

PMC PROCEDURE (continued)

NM4

- 6.4.18 Allow the "CO2 CALIBRATION IN PROGRESS" to complete on the remote display.
- 6.4.19 Verify that the correct abbreviation for the agent selected appears on the display.
- 6.4.20 Is it possible to adjust the left position vapor? ____ (N)
- 6.4.21 Is it possible to adjust the center position vapor? ____ (N)
- 6.4.22 Set the handwheel on the right position vapor to zero (0).
- 6.4.23 Verify that all vaporizer indicator lamps are off.

6.5 High Pressure Leak Test

Before performing this test, ensure that cylinder pressures are: N2O & CO2: 600 psi; O2, Air, He, He/O2, N2: 1000 psi.

Set cylinder regulators at: N2O: 40 - 49 psi; O2 and Air: 43 - 49 psi.

6.5.1 Yoke Verification

- 6.5.1.1 Turn the System Power switch to STANDBY, and close all cylinder valves.
- 6.5.1.2 Disconnect the pipeline supply hoses at the wall outlets.
- 6.5.1.3 Remove the closed cylinder or yoke plug from each yoke assembly.
- 6.5.1.4 Do all the yoke handles adjust smoothly? ____ (Y)
- 6.5.1.5 Are the two (2) yoke pins installed securely in each yoke? ____ (Y)
- 6.5.1.6 Is there only one (1) cylinder washer on each yoke assembly? ____ (Y)
- 6.5.1.7 Is there a yoke plug attach to each yoke assembly? ____ (Y)
- 6.5.1.8 Is the proper gas identification label affixed to each yoke assembly? ____ (Y)
- 6.5.1.9 Attach a cylinder to each yoke assembly, open the cylinder valve, let the pressure stabilize, close the cylinder valve, remove the cylinder from the yoke assembly.
- 6.5.1.10 Does the yoke check valve assembly prevent the escape of excessive pressure? ____ (Y)
- 6.5.1.11 Attach the cylinders to the yokes.

6.5.2 Nitrous Oxide High Pressure Leak Test

- 6.5.2.1 Open one (1) oxygen cylinder valve and one (1) nitrous oxide cylinder valve.
- 6.5.2.2 Let the pressure stabilize.
- 6.5.2.3 Close the nitrous oxide cylinder valve and remove the cylinder.
- 6.5.2.4 Observe the nitrous oxide cylinder pressure gauge.
- 6.5.2.5 After two (2) minutes, what is the pressure loss? ____ PSI (<50)
- 6.5.2.6 Attach the cylinder.

6.5.3 Oxygen High Pressure Leak Test

- 6.5.3.1 Open one (1) oxygen cylinder valve.
- 6.5.3.2 Let the pressure stabilize.
- 6.5.3.3 Close the oxygen cylinder valve and remove the cylinder.
- 6.5.3.4 Observe the oxygen cylinder pressure gauge.
- 6.5.3.5 After two (2) minutes, what is the pressure loss? ____ PSI (<50)
- 6.5.3.6 Attach the cylinder.

6.5.4 Air High Pressure Leak Test - If Applicable

- 6.5.4.1 Open the air cylinder valve.
- 6.5.4.2 Let the pressure stabilize.
- 6.5.4.3 Close the air cylinder valve and remove the cylinder.
- 6.5.4.4 Observe the air cylinder pressure gauge.
- 6.5.4.5 After two (2) minutes, what is the pressure loss? ____ PSI (<50)
- 6.5.4.6 Attach the air cylinder.

6.5.5 Oxygen-Helium High Pressure Leak Test - If Applicable

- 6.5.5.1 Open the oxygen-helium cylinder valve.
- 6.5.5.2 Let the pressure stabilize.
- 6.5.5.3 Close the oxygen-helium cylinder valve and remove the cylinder.
- 6.5.5.4 Observe the oxygen-helium cylinder pressure gauge.
- 6.5.5.5 After two (2) minutes, what is the pressure loss? ____ PSI (<50)
- 6.5.5.6 Attach the oxygen-helium cylinder.

6.6 Oxygen Supply Failure Protection

6.6.1 Nitrous Oxide O.F.P. Device

- 6.6.1.1 Turn the System Power switch to "ON".
- 6.6.1.2 Open and close the oxygen cylinder valve.
- 6.6.1.3 Open the nitrous oxide cylinder valve.
- 6.6.1.4 Adjust the O₂ and N₂O flow to 4 l/min.
- 6.6.1.5 Does the flow of nitrous oxide cease when the oxygen pressure is depleted? ____ (Y)
- 6.6.1.6 Close the N₂O cylinder valve and bleed the pressure from the circuit.
- 6.6.1.7 Connect the N₂O pipeline hose to the wall outlet.
- 6.6.1.8 Close the O₂ pipeline supply.
- 6.6.1.9 Does the flow of nitrous oxide cease when the oxygen pressure is depleted? ____ (Y)
- 6.6.1.10 Close the nitrous oxide flow control valve.

6.6.2 Air O.F.P. Device - If Applicable

- * 6.6.2.1 Set the LOCK OUT device to "ALL GASES".
- 6.6.2.2 Open the oxygen cylinder valve.

* These items do not apply to machines with later design (P/N 4113229) ORC.

- 6.6.2.3 Open the air cylinder valve.
- 6.6.2.4 Set the air flow to 4 l/min; set the oxygen flow to 4 l/min.
- 6.6.2.5 Close the oxygen cylinder valve.
- 6.6.2.6 Does the flow of air cease when the O₂ pressure is depleted? ____
(Y)
- 6.6.2.7 Close the air flow control valve.
- * 6.6.2.8 Set the LOCK OUT device to "O₂+N₂O".
- 6.6.3 Oxygen-Helium O.F.P. Device - If Applicable
 - * 6.6.3.1 Set the LOCK OUT device to "ALL GASES".
 - 6.6.3.2 Open the oxygen-helium cylinder valve.
 - 6.6.3.3 Open one (1) oxygen cylinder valve.
 - 6.6.3.4 Set the oxygen-helium flow to 4 l/min; set the oxygen flow to 4 l/min.
 - 6.6.3.5 Close the oxygen cylinder valve.
 - 6.6.3.6 Does the flow of oxygen-helium cease when the oxygen pressure is depleted? ____ (Y)
 - 6.6.3.7 Close the oxygen-helium flow control valve.
- 6.6.4 Oxygen Supply Pressure Alarm
 - 6.6.4.1 Remove the table top.
 - 6.6.4.2 Remove the plug from the tee fitting on the O₂ regulator output line and connect a test gauge.
 - 6.6.4.3 Open and close the oxygen cylinder valve.
 - 6.6.4.4 Set the oxygen flow to 2 l/min.
 - 6.6.4.5 What is the pressure on the test gauge when the "O₂ SUPPLY PRESSURE" LED turns on? ____ PSI (34-40)
 - 6.6.4.6 Does the "LO O₂ SUPPLY" message appear in the CAUTION column? ____ (Y)

* These items do not apply to machines with later design (P/N 4113229) ORC.

6.7 Flowmeter Test

6.7.1 Oxygen Flowmeter Test

- 6.7.1.1 Open the oxygen cylinder valve.
- 6.7.1.2 Is it possible to adjust the flow of oxygen over the full range of the flowmeters? ____ (Y)
- 6.7.1.3 Close the O₂ cylinder valve and bleed the pressure from the system.
- 6.7.1.4 Connect the O₂ pipeline hose.
- 6.7.1.5 Is it possible to adjust the flow of oxygen over the full range of the flowmeters? ____ (Y)
- 6.7.1.6 Is the correct flow control knob and label attached to the oxygen flow control valve? ____ (Y)
- 6.7.1.7 Close the oxygen flow control valve.
- 6.7.1.8 What is the minimum flow of oxygen? ____ ml (125-175) ml/min (150-200 for machines with later design (P/N 4113229) ORC). *(0 ml for 4107615A (Minimum O₂ Flow Elimination))

6.7.2 Nitrous Oxide Flowmeter Test

- 6.7.2.1 Set the oxygen flow to 4 l/min.
- 6.7.2.2 Open the nitrous oxide cylinder valve.
- 6.7.2.3 Is it possible to adjust the flow of nitrous oxide over the full range of the flowmeter? ____ (Y)
- 6.7.2.4 Close the nitrous oxide cylinder valve and bleed the pressure from the system.
- 6.7.2.5 Connect the N₂O pipeline hose.
- 6.7.2.6 Is it possible to adjust the flow of nitrous oxide over the full range of the flowmeters? ____ (Y)

* These items do not apply to machines with later design (P/N 4113229) ORC.

NM4**PMC PROCEDURE (continued)**

6.7.2.7 Is the correct flow control knob and label attach to the N₂O flow control valve? ____ (Y)

6.7.2.8 Close the oxygen and nitrous oxide flow control valves.

6.7.3 Air Flowmeter Test - If Applicable

* 6.7.3.1 Set the LOCK OUT device to "ALL GASES".

6.7.3.2 Open the air cylinder valve.

6.7.3.3 Is it possible to adjust the flow of the air over the full range of the flowmeter? ____ (Y)

6.7.3.4 Close the air flow control valve.

6.7.3.5 Is the correct flow control knob and label attached to the air flow control valve? ____ (Y)

* 6.7.3.6 What is the minimum flow of oxygen? ____ ml (0)

* 6.7.3.7 Set the LOCK OUT device to "O₂+N₂O".

6.7.4 Oxygen-Helium Flowmeter Test - If Applicable

* 6.7.4.1 Set the LOCK OUT device to "ALL GASES".

6.7.4.2 Open the oxygen-helium gas cylinder valve.

6.7.4.3 Is it possible to adjust the flow of the oxygen-helium over the full range of the flowmeter? ____ (Y)

6.7.4.4 Close the oxygen-helium flow control valve.

6.7.4.5 Is the correct flow control knob and label attach to the oxygen-helium flow control valve? ____ (Y)

* 6.7.4.6 Set the LOCK OUT device to "O₂+N₂O".

* These items do not apply to machines with later design (P/N 4113229) ORC.

6.7.5 Auxiliary Oxygen Flowmeter Test

- 6.7.5.1 Connect a test cm H₂O gauge to the outlet.
- 6.7.5.2 Bleed any pressure from the system.
- 6.7.5.3 Is there an increase in pressure? ____ (N)
- 6.7.5.4 Increase the pressure to 50 cm H₂O.
- 6.7.5.5 After 30 seconds, what is the pressure ____ cm H₂O (30-50)
- 6.7.5.6 Remove the test gauge.
- 6.7.5.7 Is it possible to adjust the flow over the full range of the flowmeter? ____ (Y)
- 6.7.5.8 Set the flow rate to 5 l/min.
- 6.7.5.9 Hold the sensor from a calibrated O₂Med at the flowmeter outlet.
- 6.7.5.10 What is the oxygen concentration? ____ % (97-100)
- 6.7.5.11 Remove the O₂Med sensor.
- 6.7.5.12 Close the flowmeter flow control valve.

6.8 NAD O₂ Monitor

- 6.8.1 Disconnect the O₂ sensor cord at the VPO panel. The Advisory messages "O₂ SENSOR DISC" and "O₂ NOT CAL" shall appear on the central alarm display, and a single-tone audible alarm shall sound.
- 6.8.2 Reconnect the O₂ Med sensor.
- 6.8.3 Touch "O₂ CAL" box. **NOTE: Make sure the sensor is exposed to only 21% O₂ (room air).**
- 6.8.4 After the calibration is completed, what is the displayed oxygen concentration? ____% (21)

NOTE: Set system alarms to factory defaults.

- 6.8.5 The Warning message "INSP O₂ LOW" shall appear on the central alarm display, and a continuous audible alarm shall sound.
- 6.8.6 What is the oxygen LO alarm default? ____ (30)
- 6.8.7 Touch the oxygen LO alarm box. Does the box illuminate? ____ (Y)
- 6.8.8 Verify that the oxygen LO alarm limit has a range from 18 to 99%.
- 6.8.9 Set the LO limit to 18.
- 6.8.10 Touch the oxygen HI alarm box. Does the box illuminate? ____ (Y)
- 6.8.11 What is the HI oxygen alarm default? ____ (100)
- 6.8.12 Verify that the oxygen HI alarm limit has a range from 100 to 19%.
- 6.8.13 Set the HI limit to 19.
- 6.8.14 Expose the O₂ Med sensor to room air (21% O₂).
- 6.8.15 The Advisory message "INSP O₂ HIGH" shall appear on the central alarm display, and a single-tone audible alarm shall sound.
- 6.8.16 Adjust the HI limit to 51%.
- 6.8.17 The "INSP O₂ HIGH message shall be extinguished.
- 6.8.18 Return the HI limit to 100.
- 6.8.19 Place the sensor into the valve dome, set the oxygen flow to 10 l/min., set the Man/Auto to BAG, close the APL valve, attach a 12 inch hose to the inspiratory valve and occlude the bag mount.
- 6.8.20 After 3 minutes, what is the oxygen concentration? ____%(97-100)
- 6.8.21 Close the oxygen flow control valve.

6.9 Oxygen Concentration Tests

6.9.1 Oxygen + Nitrous Oxide Concentration Test

- 6.9.1.1 Turn the System Power switch to ON.
- 6.9.1.2 Connect a 12 inch hose to the inspiratory valve.
- 6.9.1.3 Set the Manual/Automatic to BAG.
- 6.9.1.4 Close the APL valve.
- 6.9.1.5 Occlude the bag mount.
- 6.9.1.6 Insert the sensor from a calibrated O₂ Med into the valve dome adapter on the inspiratory valve.
- 6.9.1.7 Close all the flow control valves.
- 6.9.1.8 Open one (1) cylinder valve for each gas.
- 6.9.1.9 Depress the "O₂ FLUSH" for 15 seconds.
- 6.9.1.10 Set the oxygen flow to 4 l/min.
- 6.9.1.11 Does the O₂ Med read 97-100% within 3 minutes? ____ (Y)
- 6.9.1.12 Set the nitrous oxide flow to 2 l/min.
- 6.9.1.13 What is the oxygen concentration? ____ % (64-70)
- 6.9.1.14 Set the nitrous oxide flow to 4 l/min.
- 6.9.1.15 What is the oxygen concentration? ____% (47-53)
- 6.9.1.16 Close all flow control valves.

6.9.2 Oxygen + Air Concentration Test - If Applicable

- 6.9.2.1 Depress the "O₂ FLUSH" for 15 seconds.
- 6.9.2.2 Does the O₂ Med read 97-100% within 3 minutes? ____ (Y)
- * 6.9.2.3 Set the LOCK OUT device to "ALL GASES".
- 6.9.2.4 Set the oxygen flow to 4 l/min.

* These items do not apply to machines with later design (P/N 4113229) ORC.

- 6.9.2.5 Set the air flow to 2 l/min.
 - 6.9.2.6 What is the oxygen concentration? ____ % (71-77)
 - 6.9.2.7 Close the air flow valve.
 - * 6.9.2.8 Set the LOCK OUT device to "O₂+N₂O".
 - 6.9.3 Oxygen + Helium and Oxygen Concentration Test - If Applicable
 - 6.9.3.1 Depress the "O₂ FLUSH" for 15 seconds.
 - 6.9.3.2 Does the O₂ Med read 97-100% within 3 minutes? ____ (Y)
 - * 6.9.3.3 Set the LOCK OUT device to "ALL GASES".
 - 6.9.3.4 Set the oxygen flow to 4 l/min.
 - 6.9.3.5 Set the oxygen-helium flow to 2 l/min.
 - 6.9.3.6 What is the oxygen concentration? ____ % (72-78)
 - 6.9.3.7 Close the oxygen-helium flow control valve.
 - * 6.9.3.8 Set the LOCK OUT device to "O₂+N₂O".
 - 6.9.4 Oxygen + Carbon Dioxide Concentration Test - If Applicable
 - * 6.9.4.1 Set the gas selector switch to ALL GASES.
 - 6.9.4.2 Depress the O₂FLUSH button for 15 seconds.
 - 6.9.4.3 Does the O₂MED read 97-100% within 3 minutes?____ (Y)
 - 6.9.4.4 Set the oxygen flow to 1000 ml/min.
 - 6.9.4.5 Set the carbon dioxide flow to 500 ml/min.
 - 6.9.4.6 What is the oxygen concentration? ____ % (64-70)
 - 6.9.4.7 Close the carbon dioxide flow control valve.
 - 6.9.4.8 Close the oxygen flow control valve.
 - * 6.9.4.9 Set the gas selector switch to O₂+N₂O.
- * These items do not apply to machines with later design (P/N 4113229) ORC.

6.10 Gauges

6.10.1 Cylinder Gauges

- 6.10.1.1 Are the pressure gauges correct for the gases indicated by the flowmeters and yoke assemblies? ____ (Y)
- 6.10.1.2 Are the gauges closest to the table top for cylinder supply pressure? ____ (Y)
- 6.10.1.3 Bleed all the pressure from the cylinder circuit.
- 6.10.1.4 Are the cylinder gauges at zero "0" PSI? ____ (Y)
- 6.10.1.5 Open the cylinder valves.
- 6.10.1.6 Do the cylinder pressure gauges respond properly? ____ (Y)
- 6.10.1.7 Close the cylinder valves.
- 6.10.1.8 Bleed all pressure from the cylinder circuits.

6.10.2 Pipeline Gauges

- 6.10.2.1 Are the pipeline gauges right below the flowmeters for pipeline supply pressure? ____ (Y)
- 6.10.2.2 Are the pipeline pressure gauges at "0" PSI? ____ (Y)
- 6.10.2.3 Connect the pipeline supply.
- 6.10.2.4 Do the pipeline pressure gauges respond properly? ____ (Y)
- 6.10.2.5 Are the correct gas identification labels affixed at each of the pipeline inlets? ____ (Y)
- 6.10.2.6 Does the back panel identify each of the pipeline inlets properly? ____ (Y)

6.11 Freshgas Leak Test

- 6.11.1 Turn the System Power switch to STANDBY.
- 6.11.2 Remove the 15 mm connector from the FRESHGAS OUTLET.
- 6.11.3 Is the common gas outlet assembly in good condition? ____ (Y)
- 6.11.4 Connect a digital pressure manometer and Fresh Gas Leak Test Device to the freshgas outlet.
- 6.11.5 Apply 50 cm H₂O of pressure to the system.
- 6.11.6 After thirty (30) seconds, what is the pressure on the manometer? ____ (>40 cm H₂O)
- 6.11.7 Turn on the left mounted vaporizer to the first graduated marking.
- 6.11.8 Apply 50 cm H₂O of pressure to the system.
- 6.11.9 After thirty (30) seconds, what is the pressure on the manometer? ____ (>40 cm H₂O)
- 6.11.10 Turn off the vaporizer.
- 6.11.11 Remove the test equipment from the Fresh Gas Outlet.
- 6.11.12 Turn the System Power switch to ON.
- 6.11.13 Open the O₂ flow control valve to 5 l/min., purge the system for 5 seconds, then close the O₂ flow control valve.
- 6.11.14 Turn the System Power switch to STANDBY.
- 6.11.15 Turn on the center mounted vaporizer to the first graduated marking, repeat Steps 6.11.4 and 6.11.8 thru 6.11.14. ____ (>40 cm H₂O)
- 6.11.16 Turn on the right mounted vaporizer to the first graduated marking, repeat Steps 6.11.4 and 6.11.8 thru 6.11.14. ____ (>40 cm H₂O)
- 6.11.17 Remove the manometer and Fresh Gas Leak Test Device.
- 6.11.18 Reconnect the 15 mm connector from the absorber system to the FRESHGAS OUTLET.
- 6.11.19 Is the FRESHGAS OUTLET label on the freshgas outlet? ____ (Y)

6.12 Absorber System

6.12.1 Repack MAN/AUTO Selector Valve S/N _____

[Does not apply to machines with later design selector valve.]

6.12.1.1 Remove the four screws securing the stick shift block to the selector valve body and remove the block.

6.12.1.2 Remove the spring and valve channel from the valve body.

6.12.1.3 Remove all residual lubricant from the valve channel.

6.12.1.4 Remove all residual lubricant from the valve body.

6.12.1.5 Apply a minimal amount of "stop cock" lubricant to the tapered surface of the valve channel, and ensure complete coverage of lubricant.

6.12.1.6 Insert the valve channel into the valve body.

6.12.1.7 Insert the spring into the stick shift block.

6.12.1.8 Align the index pins on the stick shift block to the holes in the valve channel.

6.12.1.9 Secure the stick shift block to the selector valve body with the four screws that were previously removed.

6.12.2 Lubrication, Spiromed Sensor S/N _____

6.12.2.1 Remove the expiratory valve.

6.12.2.2 Remove the Spiromed Sensor.

6.12.2.3 Locate the four lateral holes at the sides of the Spiromed sensor marked by printed arrows.

CAUTION: Use only Sensor Lubrication Kit P/N 2218180 or sensor lubricant P/N S010104 for the following procedure.

6.12.2.4 Remove the protective cover from the pipette and open the lubricant bottle.

6.12.2.5 Dip the tip of the pipette into the lubricant and draw one drop of lubricant into the pipette by pulling the pin upwards.

6.12.2.6 Insert the pipette into one of the four holes as far as it will go. Push the pin forward to its stop to inject lubricant into the hole.

6.12.2.7 Repeat the procedure on the three remaining holes.

6.12.2.8 Wipe any lubricant residue from the exterior of the sensor.

6.12.2.9 Reattach the sensor to the absorber top dome.

6.12.2.10 Reattach the expiratory valve to the sensor.

- 6.12.3 Absorber System Inspection S/N _____
- 6.12.3.1 Remove the inspiratory and the expiratory valve domes.
- 6.12.3.2 Is there a broken or bent pin on the valve assembly
Inspiratory? ____ (N) Expiratory? ____ (N)
- 6.12.3.3 Is there a broken pin on the valve domes
Inspiratory? ____ (N) Expiratory? ____ (N)
- 6.12.3.4 Is the valve disc in good condition
Inspiratory? ____ (Y) Expiratory? ____ (Y)
- 6.12.3.5 Are the valve dome washers in good condition? ____ (Y)
- 6.12.3.6 Reinstall the inspiratory and expiratory valve domes.
- 6.12.3.6A Remove the ultrasonic flow sensor connector hose - if applicable.
- 6.12.3.6B Is the connector hose, connector, and O-ring in good condition?
____(Y) - if applicable.
- 6.12.3.6C Remove the ultrasonic flow sensor from the mounting bracket
- if applicable.
- 6.12.3.6D Remove the flow housing/transducer assembly from the
electronics housing - if applicable.
- 6.12.3.6E Remove both transducers from the flow housing; examine each
O-ring and condition of all components, then reassemble - if
applicable.
- 6.12.3.7 Remove the inspiratory and expiratory valve assemblies.
- 6.12.3.8 Remove the Spiromed sensor.
- 6.12.3.9 Are all three washers in good condition? ____ (Y)
- 6.12.3.10 Reinstall the Spiromed sensor - if applicable, and the
inspiratory valve.
- 6.12.3.11 Reinstall the expiratory valve and the connector hose between
the expiratory valve and the ultrasonic flow sensor - if
applicable.
- 6.12.3.12 Are there two (2) spring clips on the absorber rods? ____ (Y)
- 6.12.3.13 Inspect the following: Canisters and Gaskets, Dust Cup and
O-ring, condition of soda lime

- 6.12.3.14 Is the cm H₂O gauge at zero (0)? ____ (Y)
- 6.12.3.15 Check for proper seating of the O-ring at the gauge mount.
- 6.12.3.16 Remove the O₂Med sensor plug from the inspiratory valve dome adapter and examine the two O-rings at the bottom of the plug.
- 6.12.3.17 Uncap the O₂Med sensor and examine the two O-rings at the bottom of the sensor.
- 6.12.3.18 Reinstall the O₂Med sensor into the inspiratory valve dome adapter.
- 6.12.4 Breathing System Leak Test
 - 6.12.4.1 Short circuit the inspiratory and expiratory valves with a 12 inch hose.
 - 6.12.4.2 Attach a test terminal with a cuff inflation bulb to the bag mount.
 - 6.12.4.3 Set the Man/Auto selector valve to BAG.
 - 6.12.4.4 Close the APL valve.
 - 6.12.4.5 Presssurize the absorber system to 50 cm H₂O.
 - 6.12.4.6 After 30 seconds, what is the pressure in the absorber system? ____ cm H₂O (≥ 30)
- 6.12.5 APL Valve Test
 - 6.12.5.1 Open the APL valve to its stop.
 - 6.12.5.2 Turn the System Power switch to ON.
 - 6.12.5.3 Set the oxygen flow to 8 l/min.
 - 6.12.5.4 What is the pressure on the absorber pressure gauge? ____ cm H₂O (≤ 3)
 - 6.12.5.5 Close the oxygen flow control valve.
 - 6.12.5.6 Turn the System Power switch to STANDBY.
 - 6.12.5.7 Remove the test terminal and cuff inflation bulb from the bag connector.

6.12.6 Absorber Flow Direction and Leak Test

6.12.6.1 Expiration Valve Leak Test

- 6.12.6.1.1 Close the APL valve.
- 6.12.6.1.2 Connect a 22mm hose between the inspiration valve and the bag mount.
- 6.12.6.1.3 Connect a test terminal to the expiration valve or the expiratory hose terminal on the ultrasonic flow sensor, if applicable.
- 6.12.6.1.4 Connect a Capnomed flowmeter to the test terminal.
- 6.12.6.1.5 Turn the System Power switch to ON, turn up the oxygen flow until the system pressurizes to 30 cmH₂O.
- 6.12.6.1.6 Verify that the value indicated on the flowmeter is ≤60ml/min.
- 6.12.6.1.7 Turn the System Power switch to STANDBY and remove all test equipment.

6.12.6.2 Inspiratory valve leak test

- 6.12.6.2.1 Connect a test terminal to the inspiratory valve.
- 6.12.6.2.2 Connect a tee adapter and calibrated pressure meter to the test terminal.
- 6.12.6.2.3 Connect a pressure bulb to the open port of the tee adapter.
- 6.12.6.2.4 Connect another test terminal to the bag connector.
- 6.12.6.2.5 Connect a Capnomed flowmeter to the test terminal on the bag mount.
- 6.12.6.2.6 Pressurize the system to 30 cmH₂O.
- 6.12.6.2.7 Verify that the flow meter indicates ≤60 ml/min.
- 6.12.6.2.8 Remove all test equipment.
- 6.12.6.2.9 Open the APL valve.

6.12.6.3 Flow Direction Test

- 6.12.6.3.1 Attach a breathing circuit with a 3-liter bag at the Y-piece to the inspiration and expiration valve or the expiratory hose terminal on the ultrasonic flow sensor, if applicable.
- 6.12.6.3.2 Attach a 3-liter bag to the swivel bag mount.
- 6.12.6.3.3 Turn the System Power switch to ON and set the O₂ flow to 4 l/min.
- 6.12.6.3.4 Inflate the simulated lung by briefly using the O₂ Flush.
- 6.12.6.3.5 Partially close the APL valve.
- 6.12.6.3.6 Squeeze the breathing bag attached to the bag mount at a rate of approximately 10 BPM. Readjust the APL valve if required to properly ventilate the simulated lung.
- 6.12.6.3.7 Observe the operation of each unidirectional valve disc at eye level and make sure the inspiratory valve disc raises only during the inspiration phase, and the expiratory valve raises only during the exhalation phase. Watch the valves until satisfied that both valves operate correctly, and move freely without sticking.
- 6.12.6.3.8 Open the APL valve.

6.12.7 PEEP Bypass Valve - If applicable. S/N _____

- 6.12.7.1 Set the O₂ flow to 5 l/min.
- 6.12.7.2 Adjust the PEEP valve clockwise to the maximum position.
- 6.12.7.3 Raise the bypass valve to the "PEEP ON" position.
- 6.12.7.4 What is the maximum PEEP? ____ cm H₂O (15-22 cm H₂O).
- 6.12.7.5 Does the PEEP valve adjust smoothly? ____ (Y)
- 6.12.7.6 Adjust the PEEP valve counter-clockwise to its minimum position.
- 6.12.7.7 What is the minimum PEEP? ____ cm H₂O (2-3 cm H₂O).
- 6.12.7.8 Adjust the PEEP valve clockwise to its maximum position.
- 6.12.7.9 Lower the bypass valve to the "PEEP OFF" position.
- 6.12.7.10 What is the maximum PEEP? ____ cm H₂O (2-3 cm H₂O)

6.12.7.11 Adjust the PEEP valve counter-clockwise to its minimum position.

6.12.7.12 Close the O₂ flow control valve.

6.13 Ventilator Test

6.13.1 Ventilator

NOTE: Set the Pressure Limit control to MAX, and the PEEP valve to the minimum position, if applicable. Readjustment of INSPIRATORY FLOW to limit the inspiratory plateau may be required to reduce erratic tidal volumes and breath rates caused by artifact volume.

** 6.13.1.1 Set the Man/Auto selector to BAG.

6.13.1.2 Set the FREQUENCY to 10 BPM.

6.13.1.3 Set the I:E Ratio to 1:2.

6.13.1.4 Set the Tidal Volume to 1000 ml.

6.13.1.5 Attach a patient circuit to the absorber system.

6.13.1.6 Adjust the O₂ flow to 3 l/min.

6.13.1.7 Is the APNEA-P OFF message displayed in the Advisory column? (Y) (if no, touch "APNEA ALARM ON")

6.13.1.8 Is the VOL-ALARMS OFF message displayed in the Advisory column? (Y) (if no, touch "VOLUME ALARM ON")

6.13.1.9 Turn the ventilator on.

** 6.13.1.10 Verify the FAULT indicator turns on (Y)

6.13.1.11 Set the Man/Auto selector switch to AUTO.

** 6.13.1.12 Verify the FAULT indicator turns off (Y)

6.13.1.13 Do the APNEA-P ALARM OFF and VOL-ALARMS OFF messages disappear from the Advisory column? (Y)

6.13.1.14 Adjust the INSPIRATORY FLOW to the maximum of the LOW zone.

6.13.1.15 Occlude the Y-piece with your thumb.

** These items only apply to machines with an AV2+ ventilator.

- 6.13.1.16 Inflate the bellows by momentarily pressing the O₂ Flush.
- 6.13.1.17 What is the peak inspiratory pressure? ____ cm H₂O (>30 cm H₂O)

6.13.2 I:E Ratio and Frequency Test

- 6.13.2.1 Attach a test 3-liter bag to the Y-piece.
- 6.13.2.2 Using a stopwatch, time the inspiratory phase.
- 6.13.2.3 What is the inspiratory time? ____ seconds (1.8 - 2.2)
- 6.13.2.4 Using a stopwatch, time the expiratory phase.
- 6.13.2.5 What is the expiratory time? ____ seconds (3.6 - 4.4)
- ** 6.13.2.6 Press and hold the EXTENDED RANGE switch and scroll the I:E ratio dial counter clockwise and verify the extended I:E ratio values increment (2:1, 3:1 and 4:1); return the I:E ratio to 2:1.
- ** 6.13.2.7 Using a stopwatch time the inspiratory phase.
- ** 6.13.2.8 What is the inspiratory time? ____ seconds (3.6 - 4.4)
- ** 6.13.2.9 Using a stopwatch, time the expiratory phase.
- ** 6.13.2.10 What is the expiratory time? ____ seconds (1.8 - 2.2)
- 6.13.2.11 Adjust the frequency and I:E Ratio through the following settings and verify that the ventilator cycles properly:

<u>FREQ.</u>	<u>I:E RATIO</u>	<u>FREQ.</u>	<u>I:E RATIO</u>
11	1:1	66	1:3.5
22	1:1.5	77	1:4
33	1:2	88	1:4.5
44	1:2.5	99	1:4.5
55	1:3		

** These items apply to machines with an AV2+ ventilator.

6.14 Bellows Drive Gas Leak Test

- 6.14.1 Remove the ventilator hose from the bellows assembly.
- 6.14.2 Attach a test terminal to the bellows assembly.
- 6.14.3 Attach a Capnomed flowmeter test stand to the test terminal.
- 6.14.4 Set the BPM to 1.
- 6.14.5 Set the I:E Ratio to 1:1.
- 6.14.6 Set the flow to the maximum.
- 6.14.7 What is the volume that is registered during the inspiratory plateau phase? ____(<50 ml)
- 6.14.8 Remove the test terminal and flowmeter test stand. Connect the ventilator hose to the VENTILATOR HOSE terminal.

6.15 "F" Bellows Test S/N _____

- 6.15.1 Insert a calibrated volumeter between the absorber dome and the expiratory valve, and set the BPM to 10.
- 6.15.2 Set the I:E Ratio to 1:2.
- 6.15.3 Adjust the O₂ flow to 300 ml.
- 6.15.4 Adjust the inspiratory flow to "MED".
- 6.15.5 Adjust the Tidal Volume to 200 ml.
- 6.15.6 What is the Tidal Volume on the test volumeter? ____ ml (125-250 ml)
- 6.15.7 Adjust the Tidal Volume to 1000 ml.
- 6.15.8 What is the Tidal Volume on the test volumeter? ____ ml (900-1100 ml)
- 6.15.9 Adjust the inspiratory flow to "HIGH".

6.15.10 Adjust the O₂ flow to 5 l/min.

6.15.11 this step intentionally left blank.

6.15.12 Adjust the Tidal Volume to maximum.

6.15.12A Remove the test lung and attach a 3 liter breathing bag.

6.15.12B Adjust the Inspiratory Flow to fully compress the bellows.

NOTE: The bag should be placed on a flat horizontal surface to reduce artifact volume.

6.15.13 What is the Tidal Volume on the test volumeter? ____ ml (≥ 1400)

6.16 Pressure Limit Control Test - If Applicable

6.16.1 Set the Inspiratory Flow to the bottom of the LOW range.

6.16.2 Set the oxygen flow rate to 4 l/min.

6.16.3 Set the pressure limit control to the MAX position.

6.16.4 Occlude the Y-piece with your thumb.

6.16.5 Slowly increase the Inspiratory Flow setting until a peak pressure of 80 cm H₂O is achieved.

6.16.6 Set the pressure limit control to 30.

6.16.7 What is the peak pressure? ____ cm H₂O (27-33)

6.16.8 Set the pressure limit control to the MIN position.

6.16.9 What is the peak pressure? cm H₂O (9-15)

6.16.10 Remove your thumb from the Y-piece.

6.16.11 Set the inspiratory flow to the maximum of the LOW zone.

6.16.12 Turn the ventilator OFF.

NOTE: The inspiratory flow gauge will not return to the stop position when the ventilator is turned off.

PMC PROCEDURE (continued)

NM4

6.17 Ventilator Relief Valve Test

- 6.17.1 Adjust the O₂ flow to 10 l/min.
- 6.17.1A Adjust the inspiratory flow to fully compress the bellows.
- 6.17.2 Adjust the inspiratory flow to "MED".
- 6.17.3 Adjust the I:E Ratio to 1:3.
- 6.17.4 Adjust the Tidal Volume to 1200 ml.
- 6.17.5 What is the PEEP? ___ cm H₂O (≤3 cm H₂O)
- 6.17.6 Adjust the O₂ flow to 500 ml.
- 6.17.7 What is the Tidal Volume on the test volumeter? ___ml (1080-1320)
- 6.17.8 Does the bellows stop adjust smoothly? ___ (Y)

6.18 SPIROMED or Ultrasonic Flow Sensor Test

- 6.18.1 Touch the MONITOR SET UP key. Does the box illuminate the "MIN VOL" alarm limit? ___ (Y)
- 6.18.2 What is the "LO" MIN VOL alarm default? ___ (1.0)
- 6.18.3 Verify that the MIN VOL has a "LO" alarm limit range from 0.5 to 10.0 by increments of 0.1.
- 6.18.4 Adjust the "LO" MIN VOL alarm to 2.0 liters.
- 6.18.5 Touch the volume "ALARMS ON" to enable the volume alarms and start a stopwatch.
- 6.18.6 What is the time when the "APNEA-VOLUME" is activated under the CAUTION column? ___ sec (13-17)
- 6.18.7 What is the time when the "APNEA-VOLUME" is activated under the WARNING column? ___ sec (26-34)
- 6.18.8 Insert a calibrated volumeter in between the Spiromed sensor (or absorber, if the system is equipped with an ultrasonic flow sensor) and the exhalation valve.
- 6.18.9 Attach a patient circuit to the absorber system.
- 6.18.10 Turn the ventilator ON.

- 6.18.11 Adjust the frequency to 6.
- 6.18.12 Adjust the I:E Ratio to 1:2.
- 6.18.13 Adjust the flow to the maximum of the LOW zone.
- 6.18.14 Adjust the oxygen flow to 2 l/min.
- 6.18.15 Adjust the Tidal Volume to 200 ml.
- 6.18.16 After the first breath is detected, does the "APNEA-VOL" in the WARNING column and the "MIN VOL LOW" in the CAUTION column deactivate? ____ (Y)
- 6.18.17 After one (1) minute, does the "MIN VOL LOW" message appear in the CAUTION column? ____ (Y)
- 6.18.18 Adjust the "LO" alarm limit 0.1 liter below the indicated minute volume.
- 6.18.19 Does the "MIN VOL LOW" in the CAUTION column deactivate? ____ (Y)
- 6.18.20 Increase the tidal volume to 1000 ml and the frequency to 10 BPM. Readjust the inspiratory flow as necessary to fully collapse the bellows.
- 6.18.21 Is the "TID VOL" on the Spiromed (or ultrasonic flow sensor) and the volumeter within 20% of each other? ____ (Y)
- 6.18.22 Is the "MIN VOL" on the Spiromed (or ultrasonic flow sensor) and the volumeter within 20% of each other? ____ (Y)
- 6.18.23 Create a reverse flow by loosening the expiratory valve dome. If equipped with an ultrasonic flow sensor, remove the breathing hose from the flow sensor. Connect a test terminal and a Riken aspirator (negative pressure squeeze bulb) to the 22 mm male port of the flow sensor. Disconnect the hose from the expiratory valve. Compress and release the aspirator.
- 6.18.24 Each time a reverse flow of greater than 20 ml is detected, does the "REVERSE FLOW" message appear in the ADVISORY column? ____ (Y)
- 6.18.25 Tighten the expiratory valve dome. If equipped with an ultrasonic flow sensor, remove the test terminal and aspirator from the flow sensor and reconnect the patient circuit hose. Reconnect the hose terminal from the flow sensor to the expiratory valve.
- 6.18.26 Disconnect the volume sensor cord from the "VOLUME SENSOR" interface.

PMC PROCEDURE (continued)

NM4

- 6.18.27 Does the "VOL SEN DISC" and "VOL ALRM OFF" messages appear in the ADVISORY column? ____ (Y)
- 6.18.28 Reconnect the volume sensor cord to the "VOLUME SENSOR" interface.
- 6.18.29 Turn OFF the ventilator.
- 6.18.30 Disable the APNEA-PRESSURE and APNEA-VOLUME alarms.
- 6.18.31 Remove the test volumeter and set the System Power switch to STANDBY.

6.19 Alarm Circuit Delay Test

- 6.19.1 Create any "Warning Alarm" condition.
- 6.19.2 Press the alarm circuit delay button located on the remote display.
- 6.19.3 Verify that the audio portion of the alarm is silenced.
- 6.19.4 Verify a "60" appears at the bottom located on the remote display.
- 6.19.5 Press the Alarm Circuit Delay twice.
- 6.19.6 Verify that a "120" appears at the bottom of the remote display.

6.20 Apnea Pressure Test

- 6.20.1 Disconnect the pressure pilot line from the absorber.
- 6.20.2 Zero a calibrated pressure meter to ambient air pressure.
- 6.20.3 Connect the pilot line to the tee adapter of a calibrated pressure meter and syringe.
- 6.20.4 Adjust the frequency to "00".
- 6.20.5 Adjust the threshold to 8 cm (using the monitor set-up screen and rotating the dial selector).
- 6.20.6 Simultaneously, turn the ventilator ON and start the stopwatch.
- 6.20.7 After 15 +/-3 seconds, an APNEA PRESSURE ALARM will appear in the CAUTION section on the remote display.
- 6.20.8 After another 15 +/-3 seconds have passed, the APNEA ALARM shall upgrade to a WARNING.

6.20.9 Slowly increase the test pressure. The alarm shall deactivate at 8cm \pm 1 cm H₂O.

6.20.10 Repeat steps using 12.0 cm H₂O.

6.20.11 Repeat steps using 26.0 cm H₂O.

6.20.12 Turn the ventilator OFF. Turn all alarms OFF.

6.21 High Pressure Alarm Test

6.21.1 Verify that the HIGH alarm is set at 50 cm H₂O.

6.21.2 Increase the test pressure to 50 cm H₂O. A VENT PRESSURE HIGH alarm shall activate as a warning.

6.22 Sub-Atmospheric Pressure Alarm Test

6.22.1 Apply a negative test pressure of -10 cm H₂O.

6.22.2 A "SUB-ATMOS" warning alarm shall activate.

6.23 Continuing Pressure Alarm Test

6.23.1 Increase the test pressure above the threshold value shown on the display, and begin timing with a stopwatch.

6.23.2 After 15 seconds, a continuous "WARNING" pressure alarm shall activate.

6.23.3 Decrease the pressure to a value below the threshold, and the alarm shall cease.

6.24 Oxygen Ratio Monitor Control (ORMC) Test

NOTE: Refer to 6.24A if machine is equipped with an ORC.

6.24.1 Open the oxygen and nitrous oxide cylinder valves.

6.24.2 Depress the "O₂ FLUSH" for 15 seconds.

6.24.3 Turn the N₂O flow control valve counter-clockwise to its stop position.

6.24.4 Slowly increase the oxygen flow until nitrous oxide begins to flow.

6.24.5 What is the oxygen flow rate? ____ (200-300 ml/min.)

6.24.6 Slowly increase the oxygen flow until the "O₂/N₂O FLOW RATIO" LED on the alarm panel is lighted.

- 6.24.7 What is the nitrous oxide flow rate? ____ (150-300 ml/min.)
- 6.24.8 Set the oxygen flow to 1000 ml/min.
- 6.24.9 Adjust the nitrous oxide flow until the ORMc controls the nitrous oxide.
- 6.24.10 What is the oxygen concentration? ____ % (21-29)
- 6.24.11 Does the "O₂/N₂O FLOW RATIO" LED turn "ON" on the ALARM PANEL? ____ (Y)
- 6.24.12 Does the "O₂/N₂O LOW" message appear in the ADVISORY column? ____ (Y)
- 6.24.13 Open the nitrous oxide flow control valve to the stop position.
- 6.24.14 Adjust the oxygen flow to 1.5 l/min.
- 6.24.15 What is the oxygen concentration? ____ % (21-29)
- 6.24.16 Adjust the oxygen flow to 2 l/min.
- 6.24.17 What is the oxygen concentration? ____ % (21-29)
- 6.24.18 Adjust the oxygen flow to 3 l/min.
- 6.24.19 What is the oxygen concentration? ____ % (21-29)
- 6.24.20 Set the LOCK OUT device to "ALL GASES".
- 6.24.21 Is the "O₂/N₂O FLOW RATIO" alarm activated? ____ (N)
- 6.24.22 Set the LOCK OUT device to "O₂+N₂O".
- 6.24.23 Close the oxygen flow control valve.
- 6.24.24 What is the flow of nitrous oxide? ____ ml/min. (0)
- 6.24.25 Is the "O₂/N₂O FLOW RATIO" alarm activated? ____ (N)
- 6.24.26 Close the nitrous oxide flow control valve.
- 6.24.27 Turn the System Power switch to STANDBY.

6.24A Oxygen Ratio Control (ORC) Test

- * 6.24A.1 Set the Gas Selector switch to O₂ + N₂O.
- 6.24A.2 Open the oxygen and nitrous oxide cylinder valves.
- 6.24A.3 Depress the O₂FLUSH for 15 seconds.
- 6.24A.4 Set the oxygen flow to 1000 ml.
- 6.24A.5 Open the nitrous oxide flow control valve to the stop position.
- 6.24A.6 What is the oxygen concentration? ____ % (22-28)
- 6.24A.7 Adjust the oxygen flow to 1.5 l/min.
- 6.24A.8 What is the oxygen concentration? ____ % (22-28)
- 6.24A.9 Adjust the oxygen flow to 2 l/min.
- 6.24A.10 What is the oxygen concentration? ____ % (22-28)
- 6.24A.11 Adjust the oxygen flow to 3 l/min.
- 6.24A.12 What is the oxygen concentration? ____ % (22-28)
- 6.24A.13 Reduce the O₂ flow to 500 ml/min. Verify that the N₂O flow is greater than or equal to 600 ml/min.
- 6.24A.14 Slowly close the oxygen flow control valve.
- * 6.24A.15 What is the flow of nitrous oxide? ____ ml/min. (0)
- ** 6.24A.16 What is the oxygen concentration with the O₂ flow control valve closed? ____% (22-28)
- 6.24A.17 Close the nitrous oxide flow control valve.

* These items do not apply to machines with later design (P/N 4113329-001) ORC.

** This item does not apply to machines with early design (P/N 4111800) ORC.

6.25 SPO2/Pulse - Nellcor

- 6.25.1 Plug the SpO₂ sensor pre amp cable into the machine interface.
- 6.25.2 Disconnect the Durasensor from the interface cable and pre-amp and attach a Nellcor® pocket simulator Model 2500.
- 6.25.3 The monitor should display a value between 80 and 82 for oxygen saturation and a value between 60 and 62 for a pulse rate if the machine is equipped with a Nellcor MP-202 pulse oximeter module. Record the values on the report.

If the machine is equipped with a Nellcor MP-203 pulse oximeter module, the pulse rate displayed should be between 39 and 41.

- 6.25.4 Disconnect the pocket sensor and re-connect the finger probe.
- 6.25.5 Attach the sensor to the operator's finger and obtain a pulse and oxygen saturation.
- 6.25.6 Disconnect the sensor from the finger.
- 6.25.7 After ten (10) seconds, the Warning message "NO SpO₂ PULSE" shall appear on the central alarm display and a continuous audible alarm shall sound.
- 6.25.8 Re-connect the sensor to the finger.
- 6.25.9 Note the pulse high and low alarm limit settings. After pulse and oxygen saturation readings stabilize, raise the pulse low alarm limit above the actual pulse rate.
- 6.25.10 The Warning message "SpO₂ PULSE LOW" shall appear on the central alarm display and a continuous audible alarm shall sound.
- 6.25.11 Return the pulse low alarm limit to its previous setting.
- 6.25.12 Decrease the pulse high alarm limit below the actual pulse rate.
- 6.25.13 The Caution message "OXI PULSE HIGH" shall appear on the central alarm display and an intermittent audible alarm shall sound.
- 6.25.14 Return the pulse high alarm limit to its previous setting.
- 6.25.15 Note the SpO₂ SAT high and low alarm settings. Raise the SAT low alarm limit above the actual SpO₂ level.

- 6.25.16 The Warning message "SpO2 SAT LOW" shall appear on the central alarm display and a continuous audible alarm shall sound.
- 6.25.17 Return the SAT low alarm to its previous setting.
- 6.25.18 Decrease the SAT high alarm limit below the actual SpO2 level.
- 6.25.19 The caution message "SPO2 SAT HIGH" shall appear on the central alarm display and an intermittent audible alarm shall sound.
- 6.25.20 Return the SAT high alarm to its previous setting.
- 6.25.21 Remove sensor from finger and set SpO2 monitor to Standby.

6.25A SpO2 Monitor Calibration Check - Novametrix

- 6.25A.1 Plug the SpO2 sensor extension cable into the machine interface.
 - 6.25A.2 Disconnect the finger probe from the extension cable and attach a Novametrix TB500B sensor simulator to the extension cable.
 - 6.25A.3 Turn the System Power switch to ON. press and hold the Selection Dial, and simultaneously press the MONITOR and SYSTEM CONFIG keys to enter the main service screen. Touch the MONITORS key to bring up a second column of touch keys.
 - 6.25A.4 Touch the SpO2 key on the screen.
 - 6.25A.5 Set the simulator's Sensor Type switch to 87XX. Set the output signal to 3 and the saturation to 82%. Turn the simulator ON and verify that the monitor's displayed Pulse reading is 60 ± 1 BPM and the SaO2 reading is 82 ± 2 .
- NOTE: Do not rely on the simulator's low battery LED as an indicator of sufficient battery power. Replace the battery with a fresh 9 volt transistor battery if proper measured values are not obtained and the battery measures ≤ 8.5 VDC.
- 6.25A.6 Adjust the simulator's saturation setting to 100 and verify that the monitor indicates 99 ± 1 . Adjust the saturation to 62 and verify that the monitor indicates 62 ± 2 .
 - 6.25A.7 Depress the Open Test RED key and verify that the PULSE LO LED activates, a continuous audible alarm is heard, and a NO OXI PULSE warning alarm is shown on the central alarm display.

- 6.25A.8 Depress both Open Test keys together and verify that the monitors SaO₂ and OXI ALARMS DISABLE indicators activate, a single audible tone is heard, and OXI SEN DISC advisory alarm is shown on the central alarm display. Release the Open Test keys.
- 6.25A.9 Disconnect the simulator and re-connect the finger probe. Attach the sensor to the operator's finger and obtain pulse, and oxygen saturation readings. Disconnect the sensor from the finger. After ten (10) seconds, the Warning message NO OXI PULSE shall appear on the central alarm display and a continuous audible alarm shall sound.
- 6.25A.10 Re-connect the sensor to the finger.
- 6.25A.11 Note the pulse high and low alarm settings. After pulse and oxygen saturation readings stabilize, raise the pulse low alarm limit above the actual pulse rate.
- 6.25A.12 The Warning message OXI PULSE LOW shall appear on the central alarm display and a continuous audible alarm shall sound.
- 6.25A.13 Return the pulse low alarm to its previous settings.
- 6.25A.14 Decrease the pulse high alarm limit below the actual pulse rate.
- 6.25A.15 The caution message OXI PULSE HIGH shall appear on the central alarm display and an intermittent audible alarm shall sound.
- 6.25A.16 Return the pulse high alarm limit to its previous setting.
- 6.25A.17 Note the SpO₂ SAT high and low alarm settings. Raise the SAT low alarm limit above the actual SpO₂ level.
- 6.25A.18 The Warning message SpO₂ SAT LOW shall appear on the central alarm display and a continuous audible alarm shall sound.
- 6.25A.19 Return the SAT low alarm to its previous setting.
- 6.25A.20 Decrease the SAT high alarm limit below the actual SpO₂ level.
- 6.25A.21 The caution message SpO₂ SAT HIGH shall appear on the central alarm display and an intermittent audible alarm shall sound.
- 6.25A.22 Return the SAT high alarm to its previous setting.
- 6.25A.23 Remove finger from sensor and set the SpO₂ monitor to Standby.

6.26 NIBP Alarm and Pressure Tests

- 6.26.1 Install the BP cuff on left arm.
- 6.26.2 Touch the INTERVAL box. Using the selection dial, decrement to one (1) minute.
- 6.26.3 Touch START.
- 6.26.4 When the cuff cycle is complete, touch SYSTOLIC LOW. Adjust to above the actual value. NIBP systolic low appears as a caution. Decrease to below the actual value and the alarm should cease.
- 6.26.5 Adjust the SYSTOLIC HIGH to below the actual value. NIBP systolic high appears as a caution. Readjust to above the actual value. The alarm should cease.
- 6.26.6 Touch STAT. The cuff should inflate. The time between deflation and the next inflation should be three (3) seconds.

For the following tests, access the MONITORS and NIBP Service Screen as outlined in Section 2.

6.26.7 NIBP Inflation Pressure Test

- 6.26.7.1 Wrap an adult BP cuff loosely around a cylindrical object. Attach, in series, a tee fitting with a calibrated manometer between the patient cuff and the hose assembly.
- 6.26.7.2 Bring up the MONITORS service screen and select NIBP.
- 6.26.7.3 Touch the INFLATE key. The cuff shall inflate to 180 to 190 mm Hg. Touch the STOP key to end the test. Record the value on the report.

6.26.8 NIBP Inflation Time Test

- 6.26.8.1 Touch the INFLATION CHECK key. The MEAN value displayed shall not be greater than 73, indicating the time (in x.x seconds), to reach a pressure of 250 mm Hg.
- 6.26.8.2 The PULSE value displayed shall not be greater than 73, indicating the time (in x.x seconds), to reach a pressure of 300 mm Hg.

NOTE: Test failure may be due to cuff wrapped too tightly, or cuff may be too small. Use an adult cuff.

6.26.9 NIBP Leak Test

6.26.9.1 Touch the LEAKAGE CHECK key. After one minute, the SYSTOLIC value displayed shall be between 280 and 300.

6.26.9.2 After four minutes, the DIASTOLIC value displayed shall not be greater than 8 (indicating the amount of pressure drop at the end of the test period).

6.26.10 NIBP Cycle Test

6.26.10.1 Touch the TAKE READING key and begin timing with a stopwatch. The cuff shall inflate, and then deflate within 29 to 31 seconds after the start of inflation.

6.27 Agent Analyzer Accuracy Test

NOTE: Before performing the accuracy test, the Multispec must be in the full accuracy mode. The CO₂ and Agent warm-up messages shall not appear on the advisory display.

NOTE: Before performing the accuracy test, the oxygen analyzer must display 21% FIO₂. The sensor must be exposed to ambient air during the entire Multispec accuracy testing.

6.27.1 Sample Flow Test

6.27.1.1 Verify that an oxygen supply is connected to the machine.

6.27.1.2 Examine the sample circuit consisting of the airway adapter/filter, sample line, and auxiliary water trap. Replace any components as needed.

6.27.1.3 Connect a capnomed flowmeter test stand to the patient sample exhaust port.

6.27.1.4 Verify that the sample flow is within 175 to 225 ml/min.

6.27.2 Line Block Test

- 6.27.2.1 Remove the calibration gas cylinder from the multispec calibration adapter.
- 6.27.2.2 Set both flow control valves on the multispec calibration adapter fully counter-clockwise.
- 6.27.2.3 Attach the patient sample line to the luer lock fitting on the calibration adapter.
- 6.27.2.4 Turn the flow control valve clockwise until the capnomed flowmeter indicates 75 ml/min.
- 6.27.2.5 Verify that a "Line Block" message illuminates on the remote display in approximately 15 seconds.
- 6.27.2.6 Remove the test equipment.

NOTE: Before performing the accuracy test, the vaporizers must be exposed to a constant temperature (preferably 22° C) for at least one hour.

6.27.3 Accuracy Test

- 6.27.3.1 Press the "MONITOR SETUP" key. Touch the "CO2 CAL" soft key on the left monitor display.
- 6.27.3.2 Touch the "SELECT" soft key on the right display, and configure the display to indicate "HAL".
- 6.27.3.3 Press the "DATA" key. Touch the "GAS ANALYSIS" soft key if it is not illuminated.
- 6.27.3.4 Attach the CO₂ calibration adapter assembly (P/N 4110216 A) to the CO₂ calibration cylinder (P/N 4107979 P)
- 6.27.3.5 Turn the flow control valve on the calibration adapter slightly counter-clockwise.
- 6.27.3.6 After the CO₂ waveform peaks on the remote display, turn off the flow and remove the sample line from the calibration adapter.
- 6.27.3.7 Verify that the "EXP" CO₂ display indicates within 36.0 to 40.0 mm Hg.

- 6.27.3.8 Verify that the "EXP" halothane on the agent display indicates within 0 to 0.4%
- 6.27.3.9 Verify that the "EXP" N₂O indicates within 32.0 to 38.0%.
- 6.27.3.10 Press the "MONITOR SETUP" key. Touch the "F GAS" soft key on the agent monitor display.
- 6.27.3.11 Ensure that all vaporizer handwheels are set to the zero, or OFF position.
- 6.27.3.12 Fill each vaporizer with the correct anesthetic agent until the liquid level is within the correct range as indicated on the sight glass. DO NOT OVER FILL.
- 6.27.3.13 Calibrate a Riken gas indicator as per manufacturer's instructions.
- 6.27.3.14 Insert the patient circuit elbow into the fresh gas outlet.
- 6.27.3.15 Connect a sampling "T" between the elbow and the fresh gas hose.
- 6.27.3.16 Turn the APL valve knob fully counter-clockwise to its open position.
- 6.27.3.17 Attach a short 22 mm hose between the inspiratory and expiratory valves.
- 6.27.3.18 Attach a breathing bag to swivel bag mount connector.
- 6.27.3.19 Set the oxygen flow to 10 l/min. to flush the system of residual gases.
- 6.27.3.20 Reduce the oxygen flow to 4.0 l/min.
- 6.27.3.21 Slowly adjust the Halothane vaporizer to 1.0% volume concentration, and wait five minutes for the vaporizer to stabilize.
- 6.27.3.22 Record the current value shown on the Riken gas analyzer.
- 6.27.3.23 Verify that the displayed "EXP HAL" value is within the sum of the tolerances of the vaporizer and the Riken gas indicator.

- 6.27.3.24 Slowly adjust the vaporizer to 2.5% volume concentration, and wait five minutes for the vaporizer to stabilize.
- 6.27.3.25 Repeat Steps 6.27.3.22 and 6.27.3.23.
- 6.27.3.26 Slowly adjust the vaporizer to 4.0% volume concentration, and wait five minutes for the vaporizer to stabilize.
- 6.27.3.27 Repeat Steps 6.27.3.22 and 6.27.3.23.
- 6.27.3.28 Turn the vaporizer OFF.
- 6.27.3.29 Repeat Steps 6.27.3.19 thru 6.27.3.28 for the other two vaporizers. When comparing displayed values with the Riken gas analyzer readings, apply the following conversion factors to the readings obtained with the Riken Model 18H gas analyzer:
- Enflurane x 1.08
Isoflurane x 1.05
Sevoflurane x 1.09

NOTE: If any reading is outside of the Multispec tolerance limits, the Multispec analyzer must be recalibrated in accordance with the procedure given in Section 5, and then Procedure 6.27 must be repeated.

6.28 Open Reservoir Scavenger

- 6.28.1 Remove all scavenger hoses one at a time and drain all accumulated moisture. Inspect all scavenger hoses for deterioration and replace any worn hoses.
- 6.28.2 Disconnect the hospital vacuum source from the scavenger.
- 6.28.3 Remove the scavenger flow control needle valve assembly. Inspect the needle valve and seat for lint or dust accumulation. Clean with compressed air if necessary, and reinstall the needle valve assembly.
- 6.28.4 Remove the scavenger mounting screws.
- 6.28.5 Remove the two screws securing the access panel at the bottom of the scavenger canister.
- 6.28.6 Remove and inspect the silencer; replace if needed.
- 6.28.7 Remove the reservoir canister from the scavenger body by unscrewing the four socket head cap screws located at the top of the canister.
- 6.28.8 Remove the flowmeter from its housing by turning it counter-clockwise. Inspect the tube and clean with compressed air if needed.
- 6.28.9 Reassemble the scavenger assembly, and reactivate the vacuum source.
- 6.28.10 Perform the following negative pressure relief test:
 - 6.28.10.1 Connect a 19 mm scavenger hose between the bottom of the absorber pole and the right-hand port on the scavenger. Connect a 19 mm scavenger hose between the APL valve and the rear port on the absorber pole. The left-hand scavenger port may be capped for this test, or may be connected to the ventilator relief valve. Connect a DISS vacuum hose to the threaded terminal on the left side of the scavenger. Alternatively, an adapter can be used to attach a wall suction hose to the hose barb fitting on the adapter.

- 6.28.10.2 Connect a short 22 mm breathing hose from the inspiratory valve to the expiratory valve on the absorber, or the expiratory hose terminal on the ultrasonic flow sensor, if applicable. Set the Man/Auto selector valve to the BAG position. Turn the APL valve control knob fully counter-clockwise.
 - 6.28.10.3 Verify that the suction waste gas disposal system is active.
 - 6.28.10.4 Adjust the scavenger needle valve until the flowmeter indicates between the white lines. Close all flow control valves on the anesthesia machine. Occlude the absorber breathing bag terminal.
 - 6.28.10.5 Install a scavenger adapter (P/N 4108114) with a hose barb between the 19 mm hose terminal of the scavenger, and the scavenger hose. Connect a test pressure monitor to the hose barb on the adapter and observe the pressure reading on the test gauge. The gauge shall indicate a pressure of 0 to -0.5 cm H₂O.
- 6.28.11 Perform the following positive pressure relief test:
- 6.28.11.1 Perform Steps 6.28.10.1 thru 6.28.10.3.
 - 6.28.11.2 If the absorber system or ventilator bellows are equipped with a PEEP valve, turn the PEEP valve control knob fully counter-clockwise.
 - 6.28.11.3 Turn the scavenger needle valve fully clockwise (closed).
 - 6.28.11.4 Open the oxygen flow control valve on the anesthesia machine to a flow of 10 l/min. and occlude the absorber breathing bag terminal.
 - 6.28.11.5 The flow of oxygen shall now exit the system through the relief ports around the top of the canister. The test pressure gauge shall indicate a pressure less than 1.0 cm H₂O.
 - 6.28.11.6 After the test, adjust the scavenger needle valve for a flowmeter indication halfway between the two white lines.

6.28A Scavenger Interface, A/C

- 6.28A.1 Remove all scavenger hoses one at a time, and drain all accumulated moisture. Inspect all scavenger hoses for deterioration and replace any worn hoses.
- 6.28A.2 Remove the safety relief valve housing by unscrewing it in a counter-clockwise direction.
- 6.28A.3 Inspect the rubber O-ring and replace if worn.
- 6.28A.4 Remove the safety relief valve from its housing by twisting it out in a counter-clockwise direction. The tips of needle-nose pliers can be used to turn the valve. Be careful not to damage the valve disk.
- 6.28A.5 Remove any accumulated lint or dust from the valve with a soft brush. The valve may be further cleaned with a low flow of clean air or oxygen. The scavenger body can be cleaned with a moist cloth.
- 6.28A.6 Reinstall the valve into the housing, making sure that it is threaded all the way into the housing and that the plastic washer is properly seated on its upper surface.
- 6.28A.7 Make sure that the interior of the valve body is completely dry. Reinstall the valve housing onto the scavenger body, making sure that the O-ring is properly seated.
- 6.28A.8 Perform the following Pre-Use Checkout procedure:
 - 6.28A.8.1 Connect a 19 mm scavenger hose between the bottom of the absorber pole and the right-hand port on the scavenger. Connect a short 19 mm scavenger hose between the APL valve and the port on the rear of the absorber pole. Connect a 19 mm scavenger hose between the ventilator relief valve and the left-hand port on the scavenger.
 - 6.28A.8.2 Connect a short 22 mm breathing hose from the inspiratory valve to the expiratory valve on the absorber, or the expiratory hose terminal on the ultrasonic flow sensor, if applicable.
 - 6.28A.8.3 Set the Man/Auto valve to the AUTO position.
 - 6.28A.8.4 If the absorber system or ventilator bellows are equipped with a PEEP valve, turn the PEEP valve control knob fully counter-clockwise.

- 6.28A.8.5 Set the oxygen flow to 10 l/min. and occlude the 19 mm scavenger terminal labeled EXHAUST.
- 6.28A.8.6 After the ventilator bellows inflates, the flow of oxygen will exit the system through the positive pressure safety relief valve. At this point, the absorber system breathing pressure gauge shall indicate a pressure of 10.0 cm H₂O or less.

6.28B Scavenger Interface

- 6.28B.1 Check all scavenger hoses and reservoir bag for deterioration. Replace all worn components.

6.28B.2 Negative Relief Valve Cleaning:

- 6.28B.2.1 Remove the plastic valve cover on the front surface of the scavenger body by turning it in a counter-clockwise direction.
- 6.28B.2.2 Remove the valve and washer from the scavenger body by turning it counter-clockwise. A needle-nose pliers may be used to turn the valve, but use care not to damage the valve's fragile disk.
- 6.28B.2.3 Brush any accumulated lint or dust off the valve with a soft brush. The valve may be further cleaned with a low flow of clean air or oxygen.
- 6.28B.2.4 Reinstall the plastic washer and valve into the scavenger body. Replace the valve cover.

6.28B.3 Negative Relief Safety Valve Cleaning:

- 6.28B.3.1 Unscrew the chrome plated valve housing on the left side of the scavenger body by turning its fitting counter-clockwise with a wrench.
- 6.28B.3.2 Unscrew the valve from the housing by turning it in a counter-clockwise direction.
- 6.28B.3.3 Brush any accumulated lint or dust off the valve with a soft brush. The valve may be further cleaned with a low flow of clean air or oxygen.
- 6.28B.3.4 Reinstall the valve in the housing, and then reinstall the housing into the scavenger body. Note: This valve does not require washers or O-rings.

6.28B.4 Positive Relief Valve Cleaning:

- 6.28B.4.1 Remove the valve housing on the right side of the scavenger body by turning it counter-clockwise.
- 6.28B.4.2 Inspect the rubber O-ring and replace if worn.
- 6.28B.4.3 Remove the valve from the housing by turning it counter-clockwise. A needle-nose pliers may be used to turn the valve, but use care not to damage the valve's fragile disk.
- 6.28B.4.4 Brush any accumulated lint or dust off the valve with a soft brush. The valve may be further cleaned with a low flow of clean air or oxygen.
- 6.28B.4.5 Reinstall the valve and plastic washer into the housing.
- 6.28B.4.6 Reinstall the valve housing onto the scavenger body, making sure that the O-ring is properly seated.

6.28B.5 Negative Pressure Test:

- 6.28B.5.1 Connect a 22mm breathing hose from the inspiratory valve to the expiratory valve on the absorber, or the expiratory hose terminal on the ultrasonic flow sensor, if applicable. Set the Man/Auto valve to the BAG position. Turn the APL valve fully counter-clockwise. Occlude the bag mount connector.
- 6.28B.5.2 Verify that the suction waste gas disposal system is active.
- 6.28B.5.3 Close all flow control valves on the machine. Adjust the scavenger needle valve to allow typical suction through the scavenger.
- 6.28B.5.4 Install a scavenger adapter (P/N 4108114) with a hose barb between the 19mm hose terminal of the scavenger and the scavenger hose. Connect a test monitor to the hose barb adapter and observe the pressure reading on the test gauge. The gauge shall indicate a pressure of $<-1.0 \text{ cmH}_2\text{O}$.

6.28B.6 Positive Pressure Test:

- 6.28B.6.1 Close the scavenger needle valve by turning it fully clockwise.
- 6.28B.6.2 Push the O₂ Flush button to inflate the scavenger reservoir bag. Open the oxygen flow control valve to 10 l/min.
- 6.28B.6.3 Observe the pressure reading on the test gauge. The gauge shall indicate a pressure of <10.0 cmH₂O.
- 6.28B.6.4 Remove the test equipment. Readjust the scavenger needle valve to allow typical suction through the scavenger.

6.29 Service Screens

6.29.1 Main Service Screen

- 6.29.1.1 Power the machine up.
- 6.29.1.2 To access the main service screen, press the MONITOR key, SYSTEM CONFIG key and SELECTION dial simultaneously.
- 6.29.1.3 Record the information given in the appropriate box.
- 6.29.1.4 Enter the I.D. number and a service code on the main screen.
- 6.29.1.5 Touch the first window of the Technical Service Rep. I.D. area on the screen, scroll to the correct number with the selection dial, press DIAL to enter the first digit of the I.D. number. Enter each digit in the same manner, and record at the bottom of the test report.
- 6.29.1.6 Touch the SERVICE CODE area on the screen, scroll through the list of codes with the selection dial, press DIAL to enter the appropriate code.
- 6.29.1.7 Touching the RESET area on the screen resets the last service date to the current date and resets the hours running since last service to zero (0).

6.29.2 Set P.M.S. criteria.

- 6.29.2.1 Touch the PMS CRITERIA key.
- 6.29.2.2 Touch the Month key to advance the display to the next service due date. The internal clock of the machine limits the amount of date advance to a maximum of six (6) months from the current service date.

6.30 Oxygen Flush and 100% O₂ Final Test

- 6.30.1 Close the nitrous oxide pipeline shut off valve and cylinder valve.
- 6.30.2 Set the oxygen flow rate to 5 l/min.
- 6.30.3 Open the nitrous oxide flow control valve to its counter-clockwise stop.
- 6.30.4 After the nitrous oxide flow stops, close the nitrous oxide flow control valve.
- 6.30.5 Close the oxygen flow control valve.
- * 6.30.6 Set the LOCK-OUT device to "ALL GASES".
- 6.30.7 Close the additional gas cylinder and pipeline valves.
- 6.30.8 Bleed the gas from the additional gas circuits.
- * 6.30.9 Set the LOCK-OUT device to "O₂ + N₂O".
- 6.30.10 Turn the System Power switch to STANDBY.
- 6.30.11 Press and release the O₂ FLUSH button.
- 6.30.12 Does the flow of oxygen stop immediately? __ (Y)
- 6.30.13 Connect a test minute volumeter to the common gas outlet.
- 6.30.14 Press the O₂ FLUSH button for 15 seconds; multiply the value by 4.
- 6.30.15 What is the oxygen flush flow rate? __ l/min. (45-65)
- 6.30.16 Remove the test minute volumeter.
- 6.30.17 Turn the System Power switch to ON.
- 6.30.18 Insert the sensor from a calibrated O₂ Med into the inspiratory valve dome.
- 6.30.19 Press the O₂ FLUSH button.
- 6.30.20 What is the O₂ concentration? __ % O₂ (97-100)

* These items do not apply to machines with later design (P/N 4113229) ORC.

- 6.30.21 Remove the O₂ Med sensor from the valve dome.
- 6.30.22 Close the oxygen cylinder valve.
- 6.30.23 Bleed the oxygen circuit by pressing the O₂ FLUSH button.

6.31 Final Check

- 6.31.1 Reinstall the monitor box cover and restore all connections to the patient interface panel.
- 6.31.2 Verify that the pipeline hoses are connected to the hospital pipeline outlets.
- 6.31.3 Verify that the APL valve knob is turned completely counter clockwise, fully open.
- 6.31.4 Verify that the O₂ Med sensor is removed from the valve dome adapter.
- 6.31.5 Verify that the valve dome is plugged.
- 6.31.6 Verify that the machine is plugged into a live outlet.
- 6.31.7 Verify the correct date and time on the service log screen.
- 6.31.8 Return all machine controls and settings to their original state.

3.6.4 Gas Module II/ Gas Module SE Accessories

Gas Module II / Gas Module SE Accessories

