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Operator's Instruction Manual

**Narkomed 2C
Anesthesia System**

Narkomed 2C Operator's Instruction Manual

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Operator's Responsibility for Patient Safety

North American Dräger anesthesia products are designed to provide the greatest degree of patient safety that is practically and technologically feasible. The design of the equipment, the accompanying literature, and the labeling on the equipment take into consideration that the purchase and use of the equipment are restricted to trained professionals, and that certain inherent characteristics of the equipment are known to the trained operator. Instructions, warnings, and caution statements are limited, therefore, to the specifics of the North American Dräger design. This publication excludes references to hazards which are obvious to a medical professional, to the consequences of product misuse, and to potentially adverse effects in patients with abnormal conditions. Product modification or misuse can be dangerous. North American Dräger disclaims all liability for the consequences of product alterations or modifications, as well as for the consequences which might result from the combination of North American Dräger products with products supplied by other manufacturers if such a combination is not endorsed by North American Dräger.

The operator of the anesthesia system must recognize that the means of monitoring and discovering hazardous conditions are specific to the composition of the system and the various components of the system. It is the operator, and not the various manufacturers or suppliers of components, who has control over the final composition and arrangement of the anesthesia system used in the operating room. Therefore, the responsibility for choosing the appropriate safety monitoring devices rests with the operator and user of the equipment.

Patient safety may be achieved through a variety of different means depending on the institutional procedures, the preference of the operator, and the application of the system. These means range from electronic surveillance of equipment performance and patient condition to simple, direct contact between operator and patient (direct observation of clinical signs). The responsibility for the selection of the best level of patient monitoring belongs solely to the equipment operator. To this extent, the manufacturer, North American Dräger, disclaims responsibility for the adequacy of the monitoring package selected for use with the anesthesia system. However, North American Dräger is available for consultation to discuss monitoring options for different applications.

Section 1 Introduction

Limitation of Liability

North American Dräger's liability, whether arising from or related to the manufacture and sale of the products, their installation, demonstration, sales representation, use, performance, or otherwise, including any liability based upon North American Dräger's product warranty, is subject to and limited to the exclusive terms of North American Dräger's limited warranty, whether based upon breach of warranty or any other cause of action whatsoever, regardless of any fault attributable to North American Dräger and regardless of the form of action (including, without limitation, breach of warranty, negligence, strict liability, or otherwise).

North American Dräger shall in no event be liable for any special, incidental, or consequential damages (including loss of profits) whether or not foreseeable and even if North American Dräger has been advised of the possibility of such loss or damage. North American Dräger disclaims any liability arising from a combination of its product with products from another manufacturer if the combination has not been endorsed by North American Dräger. Buyer understands that the remedies noted in North American Dräger's limited warranty are its sole and exclusive remedies.

Furthermore, buyer acknowledges that the consideration for the products, equipment, and parts sold reflects the allocation of risk and the limitations of liability referenced herein.

Restriction

Federal law restricts this device to sale by, or on the order of, a physician.

Symbol Definition

The following symbols appear on the label on the back of the Narkomed 2C and are defined below.



CAUTION: Refer to accompanying documents before operating equipment.
ATTENTION: Consulter les documents ci-joints avant de faire fonctionner l'appareil.



CAUTION: Risk of electric shock, do not remove cover. Refer servicing to a North American Dräger qualified technical service representative.
ATTENTION: Risque de choc électrique, ne pas enlever le couvercle. Ne faire réparer que par un représentant technique autorisé de North American Dräger.



Degree of protection against electric shock: Type B.
Protection contre le risque de choc électrique: Type B.

These additional symbols are used on other locations of the Narkomed 2C to provide quick and easy recognition of product functions.



Oxygen Concentration



Breathing Pressure



Breathing Volume



Audible Alarm Disable

How This Manual Is Organized

All users of the Narkomed 2C must read this manual completely before using the machine. In order to make this document more convenient for future reference, it has been divided into several independent sections.

Section 2 - General Description provides a summary of Narkomed 2C features and functions.

Section 3 - Daily Checkout contains the checkout procedures that must be done on a daily basis.

Section 4 - Preuse Checkout contains the checkout procedures to be performed between successive cases.

Section 5 - Operation has detailed instructions on the use and operation of each functional component of the system.

Section 6 - Routine Maintenance provides cleaning, maintenance, and replacement procedures.

Section 7 - Specifications contains the specifications for all system components.

Conventions Used in This Manual

This manual has been set up with several conventions to help organize the information contained in it. Please read about these conventions carefully so that you understand their significance in the manual.

Typefaces

Different typefaces are used throughout the manual to differentiate between narrative information and machine messages and labels.

Section 1 Introduction

Warnings and Cautions

All parts of this manual contain warning and caution statements about the Narkomed 2C.

- *Warning* statements give important information that, if ignored, could lead directly to a patient's injury.
- *Caution* statements give important information that, if ignored, could lead directly to equipment damage and, indirectly, to a patient's injury.

General Warnings and Cautions

The following list of warnings and cautions apply to general operation and maintenance of the Narkomed 2C. Warnings and cautions about installing and operating specific parts appear with those topics.

WARNING: Any person involved with the setup, operation, or maintenance of the Narkomed 2C anesthesia system must be thoroughly familiar with this instruction manual.

WARNING: This anesthesia system will not respond automatically to certain changes in patient condition, operator error, or failure of components. The system is designed to be operated under the constant surveillance and control of a qualified operator.

WARNING: No third-party components shall be attached to the anesthesia machine, ventilator, or breathing system (except for certain approved exceptions). Contact the North American Dräger technical service department for further information.

CAUTION: When moving the anesthesia machine, remove all monitors and equipment from the top shelf, remove the absorber system, and use only the machine handles. The anesthesia machine should only be moved by people who are physically capable of handling the weight. North American Dräger recommends that two people move the anesthesia machine to aid in maneuverability. Take special care that the machine does not tip when moving up or down ramps and across thresholds.

CAUTION: Although the Narkomed 2C is designed to minimize the effects of ambient radio-frequency interference, machine functions may be adversely affected by the operation of electrosurgical equipment or short wave or microwave diathermy equipment in the vicinity.

CAUTION: Communications with external equipment may be temporarily affected by electromagnetic interference due to the use of electrosurgical equipment.

CAUTION: Do not place sensitive electronic equipment on or adjacent to the display screen.

CAUTION: Do not place more than 100 pounds on top of the Narkomed 2C monitor housing.

Recommendations

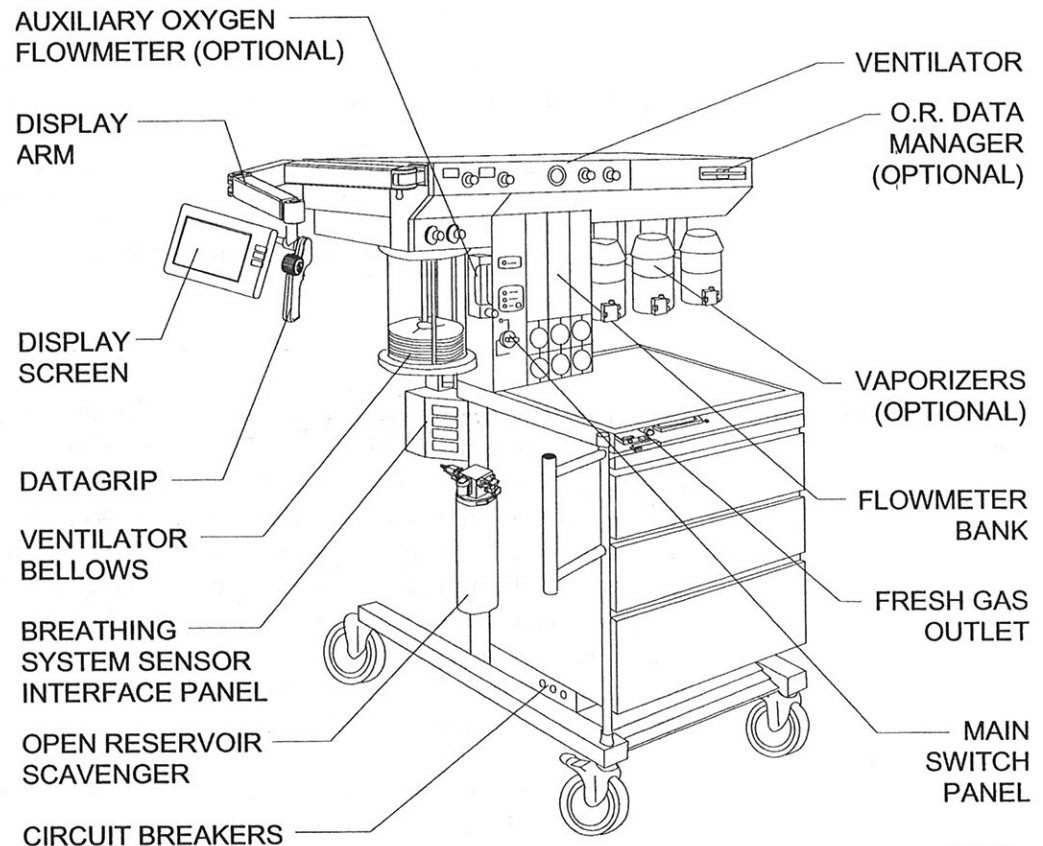
In the interest of patient safety, North American Dräger strongly advocates the use of an oxygen analyzer, pressure monitor, and either a volume monitor or an end-tidal CO₂ monitor in the breathing circuit at all times.

Because of the sophisticated nature of North American Dräger anesthesia equipment and its critical importance in the operating room setting, it is highly recommended that only appropriately trained and experienced professionals be permitted to service and maintain this equipment. Please contact North American Dräger's Technical Service Department at (800) 543-5047 for service of this equipment.

North American Dräger also recommends that its anesthesia equipment be serviced at three-month intervals. Periodic Manufacturer's Service Agreements are available for equipment manufactured by North American Dräger. For further information concerning these agreements, contact the North American Dräger Technical Service Department at (800) 543-5047.

Overview

The Narkomed® 2C is a continuous flow anesthesia system. All Narkomed 2C machines are equipped with a monitoring system and pneumatic circuitry for delivering gases and anesthetic vapor. A front view of the Narkomed 2C is shown in the figure below.



OP20999

Gas Delivery System

The pneumatic system can simultaneously deliver up to four gases and one anesthetic agent (from a selection of up to three). Oxygen and nitrous oxide are standard on all Narkomed 2C machines. Optional gases are air, carbon dioxide, and oxygen-helium. Gas is supplied to the system through pipelines and cylinders. Connections for oxygen and nitrous oxide are standard on all machines, and a pipeline connection for air is also available. Gas cylinder yokes are available for up to two oxygen cylinders and two nitrous oxide cylinders, plus one additional cylinder for a third gas.

Section 2

General Description

Color Coding

Each connection, valve, gauge, and flowmeter is labeled and color-coded for the appropriate gas, as shown in the table below.

GAS SYSTEM COLOR CODING				
GAS	MARKING	USA	GERMANY	ISO
Air	AIR	Yellow	Yellow	Black/White Checkered
Carbon Dioxide	CO ₂	Gray	Black	Gray
Nitrous Oxide	N ₂ O	Blue	Gray	Blue
Oxygen	O ₂	Green	Blue	White
Oxygen-Helium	O ₂ He	Brown/Green	N/A	Brown/White

Gas Entry Through a Pipeline

Gas from the hospital pipelines enters the Narkomed 2C through hoses connected to indexed pipeline inlets located on the side of the flowmeter housing. The indexed connector system reduces the risk of delivering the wrong gas to a patient by preventing incorrect connection of gas pipes. The inlets include check valves, which prevent backflow leakage into the atmosphere (when supply hoses are not connected) or into the attached supply hoses (when reserve cylinders are in use). Each pipeline connection is equipped with a filter to prevent foreign material from entering the internal gas piping of the Narkomed 2C. Pipeline gases should be supplied at 50–55 psi.

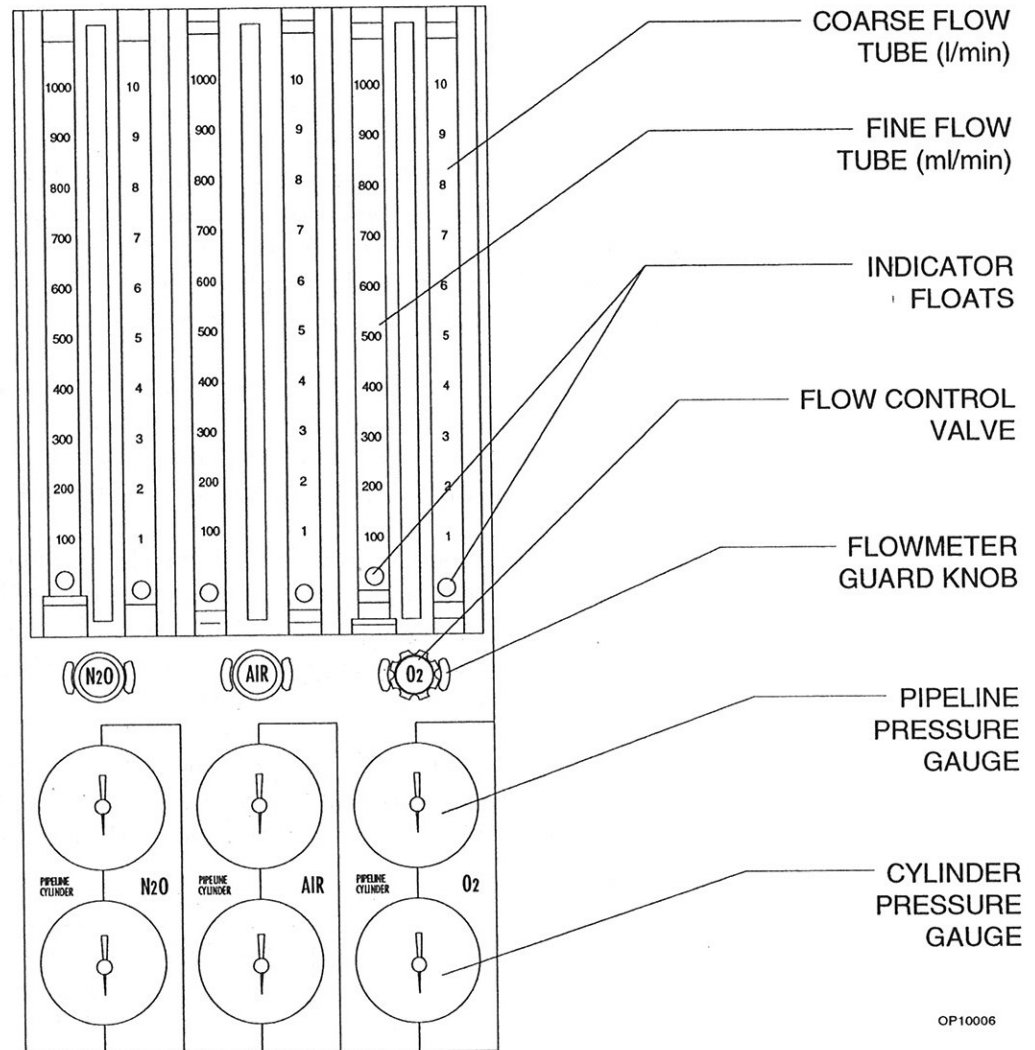
Pipeline Pressure Gauges

Pipeline pressure gauges for oxygen and nitrous oxide are standard. If the anesthesia machine is equipped with air, a pipeline pressure gauge for air is also included. These gauges are located directly below their corresponding flowmeters and flow control valves. They are labeled and color-coded for their respective gases on the flowmeter shield. Concentric scales in psi and kPa indicate the pipeline supply pressure. A typical pressure gauge and flowmeter arrangement is shown in the following figure.

Section 2

General Description

THREE-GAS FLOWMETER
AND PRESSURE GAUGE ASSEMBLY



When the machine is connected to an active pipeline supply, each gauge should indicate 50–55 psi. A deviation from within this range indicates that the pipeline gas supply system is improperly adjusted and may adversely affect the operation of the Narkomed 2C. For example, a fluctuating pipeline supply pressure would cause a corresponding fluctuation of the gas flow delivered from that pipeline. An excessively low pipeline pressure may activate the corresponding reserve cylinder and deplete its contents (if the reserve cylinder valve was left in the open position).

CAUTION: To ensure that gas supplies are at adequate pressure, pipeline pressure gauges should indicate steady pressures of 50–55 psi.

Section 2

General Description

Gas Entry Through Cylinder Yokes

The Narkomed 2C can be equipped with a maximum of two oxygen and two nitrous oxide cylinder hanger yokes. An additional yoke for an optional third gas is also available. To prevent a cylinder from being improperly connected, the yokes are labeled, color-coded, and keyed for gas-specific cylinders using the pin-indexed safety system.

A filter within each yoke prevents foreign material from entering the internal gas piping. A check valve in each yoke prevents leakage into the atmosphere if the cylinder is not mounted on the yoke. When the machine is configured with two yokes for the same gas, the check valve prevents movement of gas from one cylinder to the other. If a cylinder is not mounted to a yoke, the attached yoke plug should be placed between the yoke handle's threaded bolt and the yoke's gas inlet.

When attaching a cylinder, make sure that only one washer is installed between the cylinder and the yoke gas inlet. Using multiple washers may compromise the pin-indexed safety system. Be sure to verify the integrity of both index pins whenever you install a new cylinder.

WARNING: Check cylinder yokes for the presence of two index pins each time you attach a cylinder to the machine. Use only one cylinder gasket per yoke. Using more than one gasket could cause leakage of the cylinder gas and compromise the pin-indexed safety system.

Cylinders attached to the hanger yokes must contain gas at the recommended pressures outlined in the following table. Replace any cylinders with less than the recommended pressure (psi-min) with full cylinders.

GAS	PSI - FULL*	PSI - MIN*
Air	1900	1000
Carbon Dioxide	838	600
Oxygen-Helium	1900	1000
Nitrous Oxide	745	600
Oxygen	1900	1000

*Indicated pressures are for E-size cylinders at 70° F (21° C).

Cylinder Pressure Gauges

Each cylinder gas circuit has a cylinder pressure gauge, located at the bottom of the flowmeter panel on the front of the machine (see the Flowmeter and Pressure Gauge Assembly figure earlier in this section.) Each gauge is labeled and color-coded on the flowmeter housing for its respective gas. When a cylinder's valve is open, its pressure gauge indicates the gas pressure in the cylinder. The dial is marked with concentric scales for psi and kPa. If two reserve cylinders of the same gas are open at the same time, the gauge indicates the pressure in the cylinder having the higher pressure.

For nonliquefied gases (oxygen, air, and oxygen-helium), the indicated pressure is proportional to the gas content of the cylinder. For liquefied gases (nitrous oxide and carbon dioxide), the gauge indicates the vapor pressure of the liquefied gas in the cylinder. This pressure remains constant until all of the liquid in the cylinder has vaporized. When the liquid has vaporized, the cylinder pressure decreases proportionally as gas is removed from the cylinder.

Oxygen Supply Pressure Failure Protection Device (OFPD)

The oxygen failure protection device (OFPD) is a pneumatically operated valve that protects the patient in the event of partial or complete oxygen pressure loss. All gas circuits, except the oxygen circuit, are controlled by these valves. OFPD-controlled valves respond to the gas pressure in the oxygen supply line. When oxygen pressure is adequate, the valves open for unrestricted gas flow. When oxygen pressure is reduced or lost, the valves close proportionally to the loss. Controlled gases are restricted or shut down without affecting the oxygen flow.

Gas flow reductions are indicated on the flowmeters. When oxygen supply pressure drops below about 37 psi, an oxygen supply pressure alarm is activated, resulting in the following:

- The Caution message O₂ SUPPLY LOW appears on the central alarm display.
- The red O₂ SUPPLY PRESSURE indicator on the main switch panel lights.
- An intermittent audible alarm sounds.
- A 7-second whistle may sound, depending on the machine's configuration.

NOTE: When one source of oxygen pressure (either pipeline or reserve cylinders) fails, but the other source maintains proper supply pressure in the oxygen supply lines, the oxygen supply pressure alarms are not activated.

Section 2

General Description

Flowmeters

Flowmeters, located directly above their corresponding flow control valves, indicate the delivered flow rate of each gas in the fresh gas mixture. Dual flowmeter tubes (fine and coarse) are used in tandem for oxygen, nitrous oxide, and air (if provided). When other gases are supplied, single flowmeter tubes are used. All flowmeters are color-coded and labeled at the lower end of the flowtube. A typical flowmeter arrangement is shown in the Flowmeter and Pressure Gauge Assembly figure earlier in this section.

Each flowmeter has a float indicator. To determine the flow rate, read the flowmeter scale at the center of the float.

Low-Flow Flowmeters (Optional)

For low-flow anesthesia, the Narkomed 2C can be configured with low-flow, dual-tube flowmeters for oxygen and nitrous oxide. These flowmeters function the same way as the standard dual-tube flowmeters, but they are calibrated to provide greater resolution for low-flow anesthesia.

Minimum Oxygen Flow

The oxygen dispensing system incorporates a calibrated bypass flow of 150 ± 50 ml/min (at 50 psi pipeline pressure), which delivers this volume of oxygen even if the oxygen flow control valve is fully closed.

Flow Control Valves

A needle valve is located below the fine flowmeter tube for each gas. This valve is used to adjust the flow of gas. Turning the valve knob counterclockwise increases flow. Turning the knob clockwise decreases flow. A zero-stop prevents damage to the flow control valve seats. If necessary, a North American Dräger qualified technical service representative can readjust the stop.

Each flow control knob is identified by its color code and chemical symbol. The oxygen flow control valve is also touch-coded with a deeply fluted knob.

CAUTION: The flow of oxygen cannot be completely shut off (see “Minimum Oxygen Flow” earlier in this section). Do not force the oxygen flow control knob in an effort to shut off the minimum flow. Forcing the knob can damage the valve seat.

Oxygen Flush

A manually operated, self-closing oxygen flush valve is located on the front of the machine. A bezel is mounted around the pushbutton to prevent accidental engagement. When the valve is actuated, it delivers an unmetered oxygen flow of approximately 55 l/min directly to the Narkomed 2C's fresh gas common outlet. The SYSTEM POWER switch does not have to be in the ON position to use the oxygen flush.

Oxygen Ratio Controller (ORC)

The ORC is a pneumatic oxygen/nitrous oxide interlock system designed to maintain a fresh gas oxygen concentration of $25 \pm 4\%$ and independent control of the oxygen and nitrous oxide flows.

The ORC works by proportionally limiting the nitrous oxide flow whenever the selected oxygen and nitrous oxide flow control valve settings would otherwise result in a hypoxic fresh gas mixture. For example, if you open the nitrous oxide flow control valve excessively without making a corresponding increase in the oxygen flow control valve setting, the flow of nitrous oxide will not increase even though its flow control valve setting has been greatly increased. Similarly, if you decrease the oxygen flow without also decreasing the nitrous oxide flow, the nitrous oxide flow will automatically drop in proportion to the oxygen flow.

WARNING: In circle systems, the gas mixture in the patient circuit is not necessarily the same as that in the fresh gas flow. This is particularly true at low fresh gas flow rates when the patient rebreathes a significant portion of previously exhaled gases. It is important that the gas mixture in the patient circuit be monitored and that the fresh gas flow is adjusted to meet the requirements of the patient as well as to compensate for patient uptake, any system leakage, or any gas withdrawn through sample lines and not returned.

WARNING: The ORC interlocks only the flows of oxygen and nitrous oxide. Hypoxic fresh gas concentrations are possible if carbon dioxide is used as an additional gas.

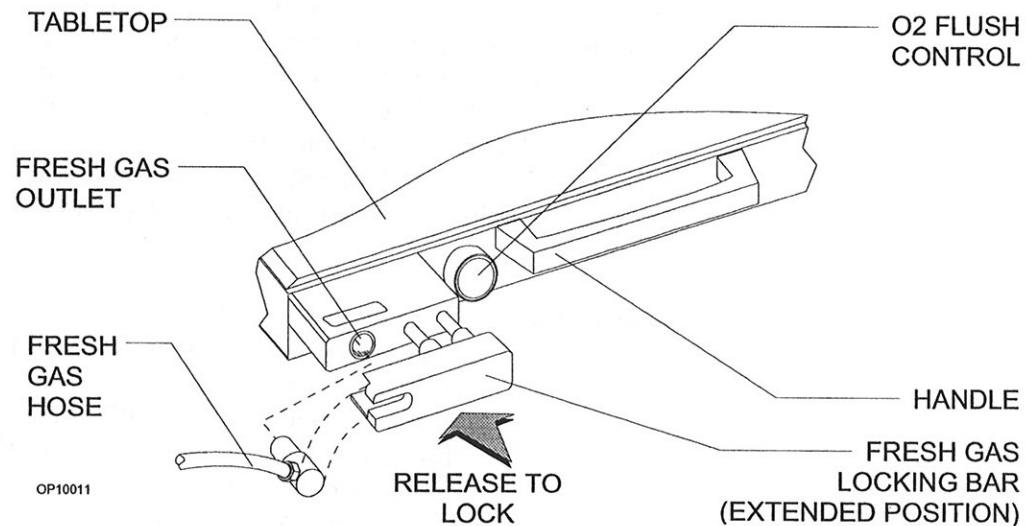
Section 2

General Description

Fresh Gas Outlet

The fresh gas outlet delivers the fresh gas mixture (consisting of oxygen, nitrous oxide, optional gases, and vapors of a liquid anesthetic) to the patient breathing system. It is located on the front of the anesthesia machine.

The outlet's 15 mm cylindrical female fitting is designed to accept a 15 mm male fitting on the absorber fresh gas hose. The male fitting slides into a retaining slot in the spring-loaded safety locking bar to prevent inadvertent disconnection of the fresh gas hose. The 15 mm male fitting on the fresh gas hose is unique to North American Dräger design, and should not be replaced by a hose from any other manufacturer.



Section 2

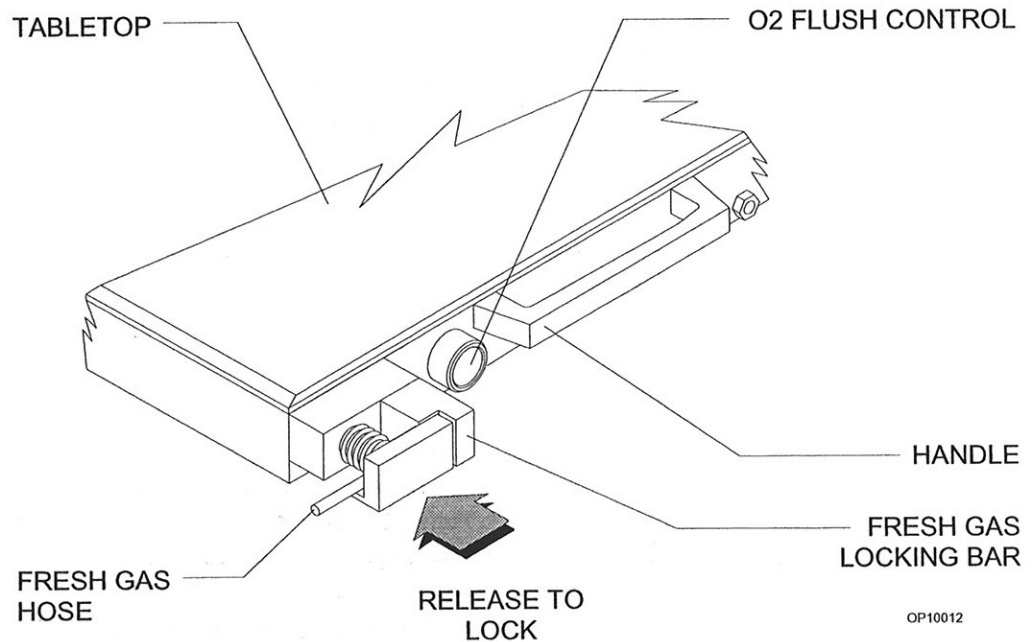
General Description

Fresh Gas Outlet (Canada)

The fresh gas outlet delivers the fresh gas mixture (consisting of oxygen, nitrous oxide, optional gases, and vapors of a liquid anesthetic) to the patient breathing system. It is located on the front of the anesthesia machine.

The outlet has a dual fitting for using gas hoses with these fittings:

- a 15 mm male fresh gas hose fitting, such as those supplied with North American Dräger absorbers and Bain circuit adapters. When using a 15 mm fitting, place the spring-loaded locking bar over the male fitting to secure it to the female fitting.
- a 22 mm female fitting with a load-bearing threaded mount, such as the ones for Magill circuits or ISO-type nonrebreathing adapters. When using an ISO-type nonrebreathing adapter, swing the spring-loaded locking bar to the side to gain access to the threaded load-bearing fitting.

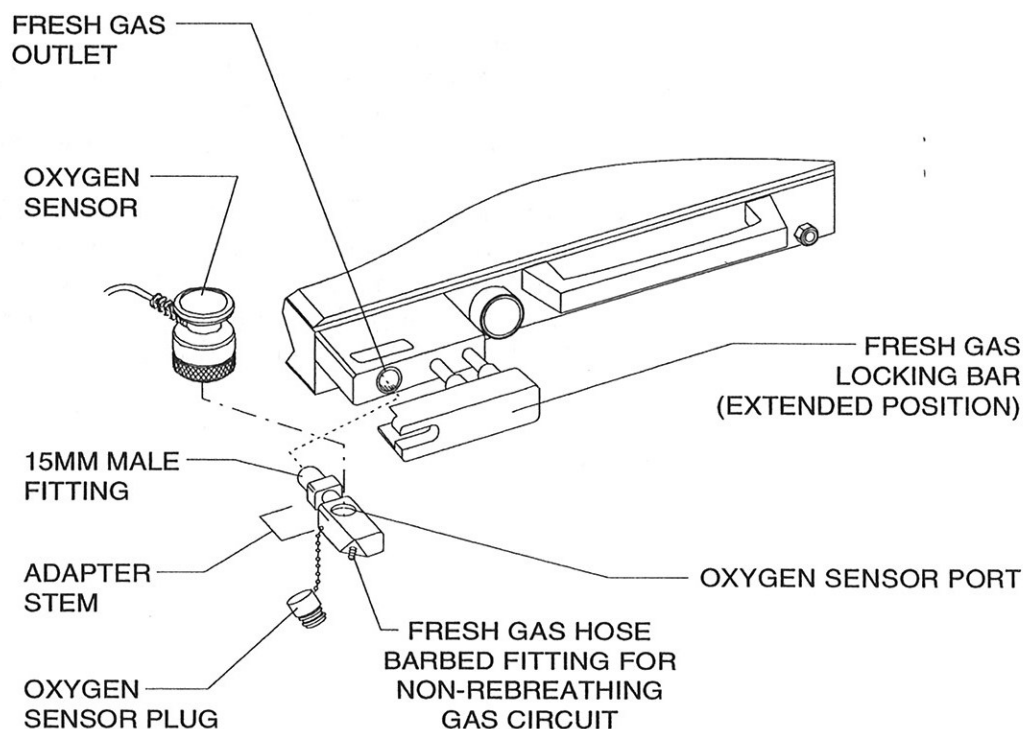


Section 2

General Description

Fresh Gas Oxygen Sensor Adapter

The optional fresh gas adapter allows the Narkomed 2C to monitor the fresh gas oxygen concentration when using a nonrebreathing circuit (other than a Bain circuit). The fresh gas adapter fits securely into the fresh gas outlet of the anesthesia machine. It has a port for an oxygen analyzer sensor and a fitting for a nonrebreathing circuit.



OP20997

WARNING: The fresh gas oxygen sensor adapter measures the fresh gas oxygen concentration, not the inspiratory oxygen concentration. Depending on the fresh gas flow and the respiratory minute volume, the inspiratory oxygen concentration may be lower than fresh gas oxygen concentration due to rebreathing of previously exhaled gases.

Auxiliary Oxygen Flowmeter (Optional)

For the delivery of a metered flow of pure oxygen (for example, delivery of oxygen through a nasal cannula), an optional auxiliary oxygen flowmeter can be mounted on the left side of the flowmeter bank. This flowmeter can be used when the machine is turned off. A zero-stop prevents damage to the flow control valve seat.

Vaporizers

The Narkomed 2C can be equipped with up to three Vapor 19.1 vaporizers for administering liquid anesthetics.

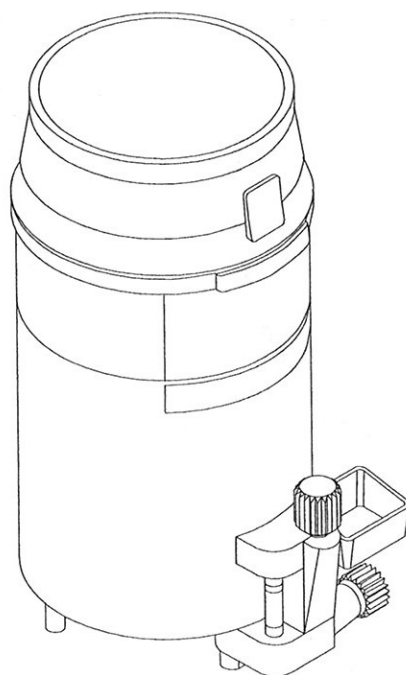
Exclusion System

A cam and lever interlock system, incorporated into the vaporizer bank, prevents more than one vaporizer from being activated at a time. The interlock system requires all unused vaporizers to be locked in their zero-volume percent positions.

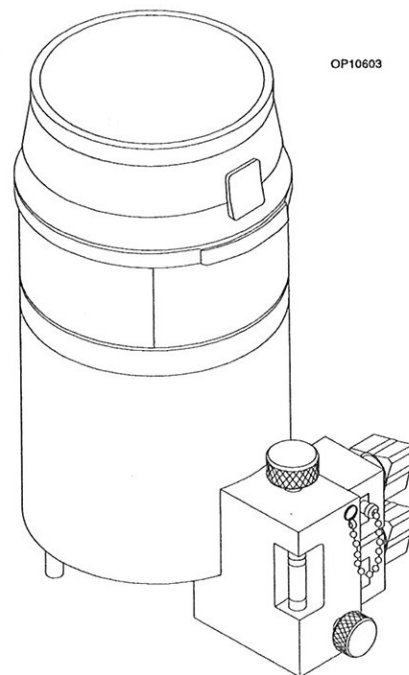
WARNING: Only one vaporizer can be activated at a time. If the exclusion system permits simultaneous activation of more than one vaporizer, do not use the anesthesia machine. Contact a North American Dräger qualified technical service representative for adjustment.

Filling Systems

Two filling systems are available for the Vapor 19.1 vaporizer—the open funnel system and the key-indexed safety system.



OPEN FUNNEL FILLER



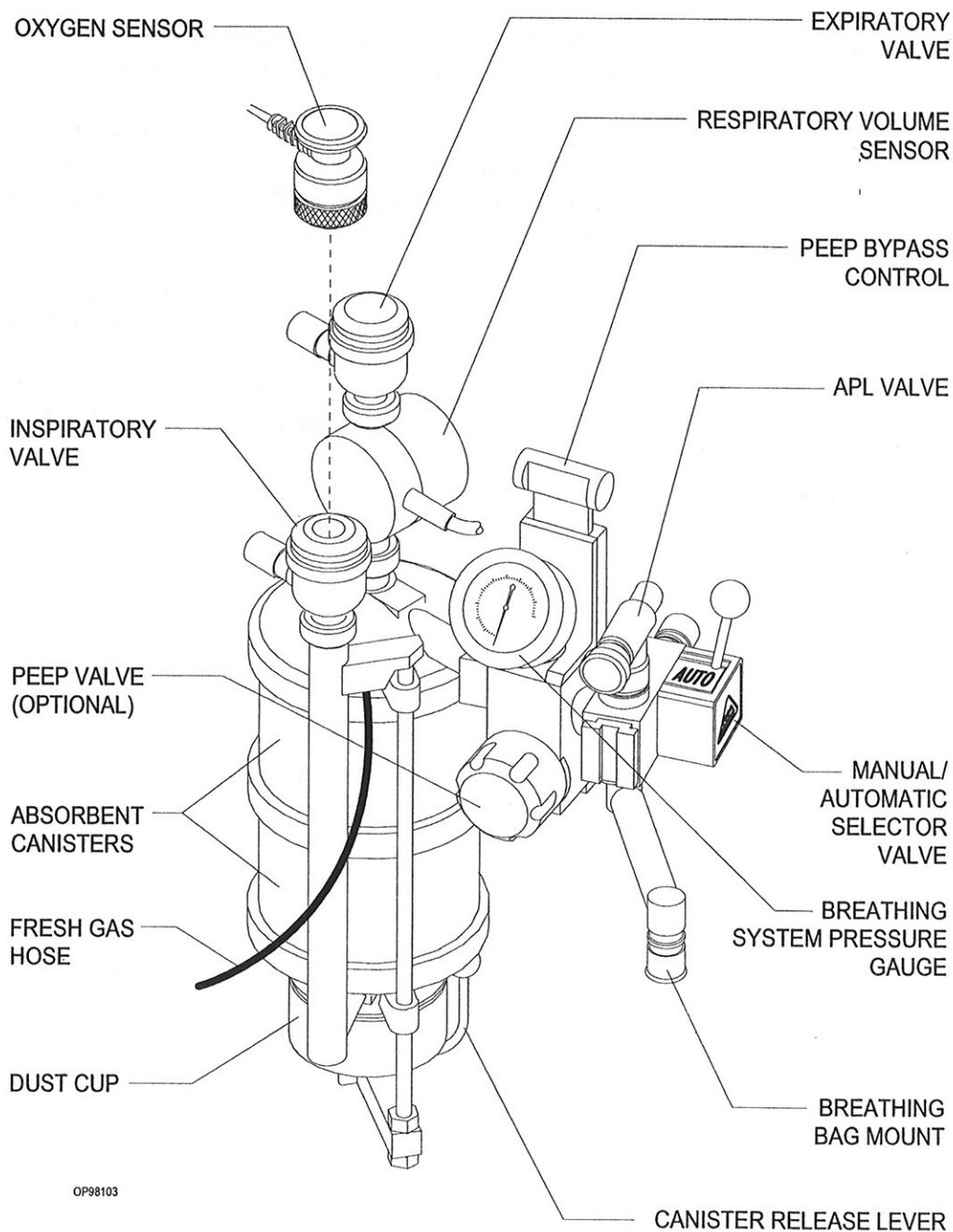
KEY INDEXED
SAFETY SYSTEM

Section 2

General Description

Absorber

The absorber is a dual-canister system for absorbing exhaled carbon dioxide in the rebreathing circuit of the anesthesia machine. It has an adjustable pressure limiter (APL) valve, a breathing system pressure gauge, a fresh gas line, and connections for sensing breathing pressure, respiratory volume, frequency, and oxygen concentration.



The absorber system permits spontaneous, manually assisted, or automatic ventilation of the patient. The absorber incorporates a manual/automatic selector valve, which allows you to select either manual or automatic ventilation. An absorber with a positive end-expiratory pressure (PEEP) valve is also available.

WARNING: Waste gas scavenging systems used with North American Dräger absorber systems must have safety features to ensure that excessive subatmospheric pressure (lower than $-0.5 \text{ cmH}_2\text{O}$) and excessive positive pressure (higher than $+0.5 \text{ cmH}_2\text{O}$) are not possible at the connection point.

Inspiratory and Expiratory Valves

The inspiratory and expiratory valves control the direction of gas flow in the absorber system. The inspiratory valve is labeled INSPIRATION and the expiratory valve is labeled EXPIRATION.

The valves are unidirectional, permitting gas flow in one direction only:

- The inspiratory valve allows gas to flow toward the patient only, with no backflow to the absorber.
- The expiratory valve allows gas to flow into the absorber only, with no backflow to the patient.

The valves are *not* interchangeable. They must be connected to the correct mounts for proper flow direction through the absorber system. Different size mounting threads on each valve prevent connecting a valve to the wrong mount.

WARNING: Do not use the inspiratory or expiratory valves if:

- the pins in the plastic valve domes or in the valve bodies are bent, damaged, or missing,
- valve disks are missing or damaged,
- valve seat is damaged.

Section 2

General Description

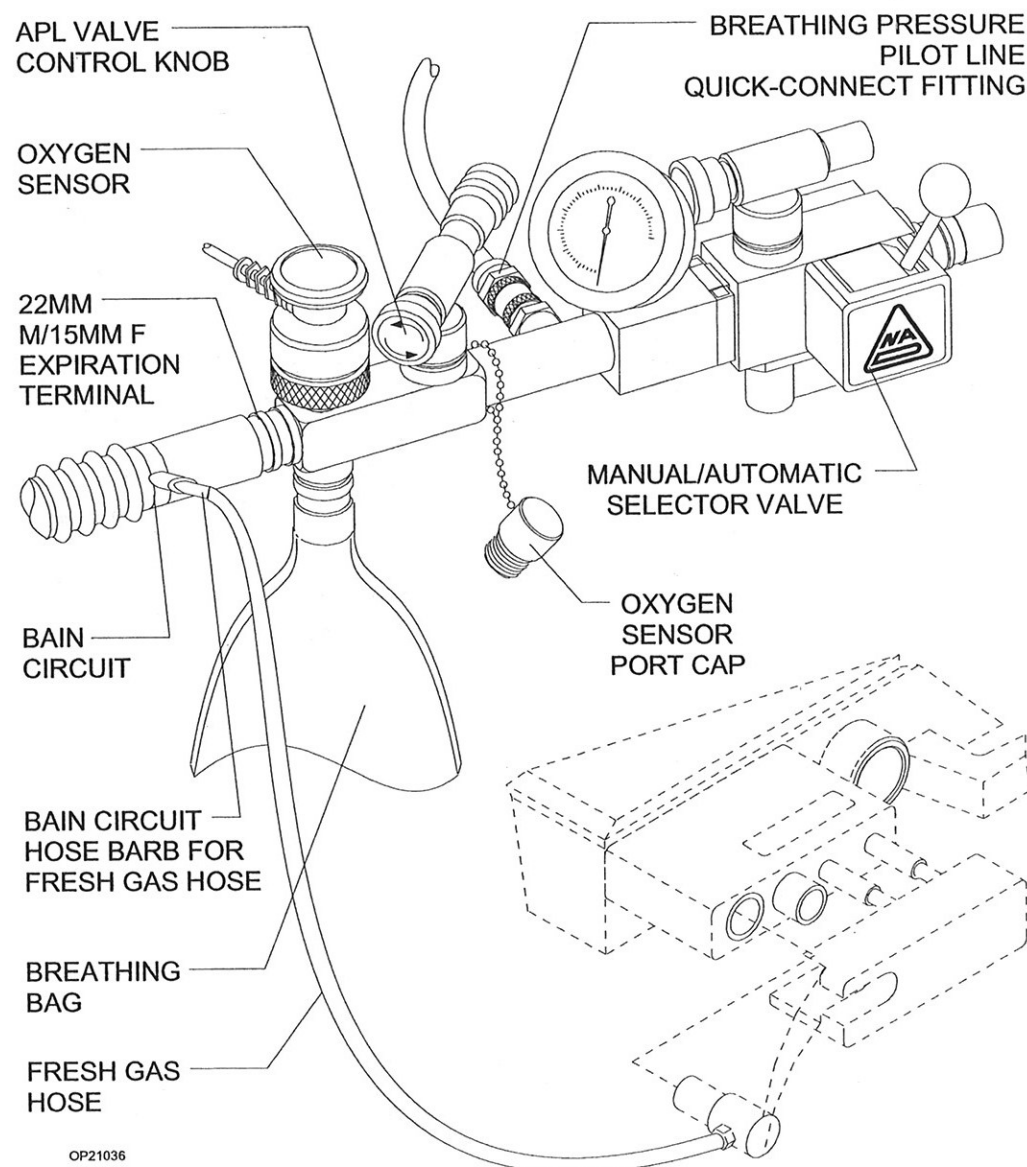
Canisters	Each absorber unit has two transparent plastic canisters that house the absorbent. The absorbent—soda lime or barium hydroxide lime—can be purchased in either loose granular or prepacked cartridge form. The canisters are interchangeable.
Dust Cup	A removable, transparent plastic cup below the bottom assembly collects absorbent dust and excess moisture that could cause increased flow resistance in the system.
Breathing System Pressure Gauge	<p>The absorber system is equipped with a pressure gauge for quick visual checks of breathing circuit pressure. The gauge is marked for measurements from -20 to +80 cmH₂O in increments of 2 cmH₂O.</p> <p>WARNING: You must frequently observe the breathing system pressure gauge to ensure adequate pressure buildup and relief, regardless of the mode of operation.</p>

Bain Circuit Adapters

Two types of Bain circuit adapters are available. One mounts to the absorber. The other mounts to the absorber pole.

Absorber Mount

The absorber-mounted Bain circuit adapter mounts on the manual/automatic selector valve of the absorber system. The adapter has an adjustable pressure limiter (APL) valve, a breathing pressure gauge, a quick-connect fitting for the breathing pressure pilot line, a port for the oxygen sensor, a 15/22 mm port for nonrebreathing circuits, and a connector for the breathing bag.

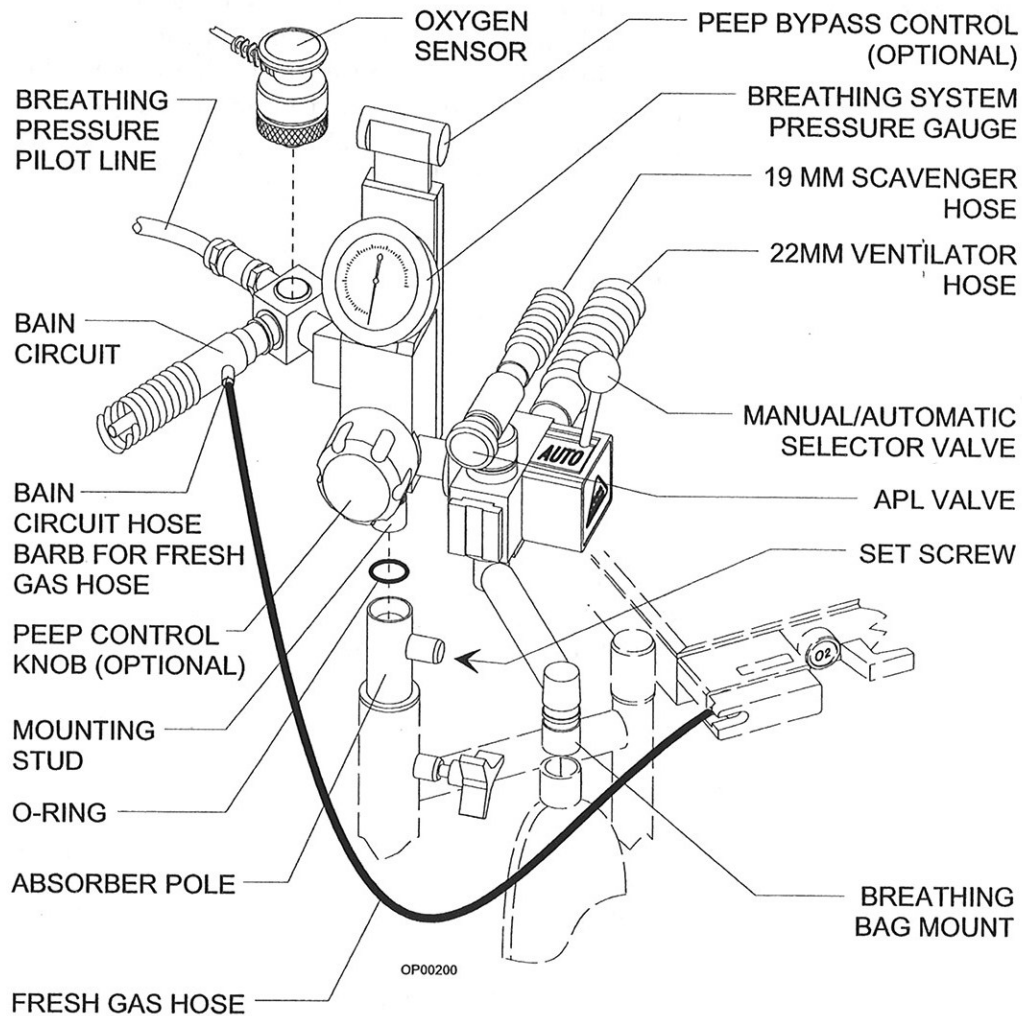


Section 2

General Description

Pole Mount

The pole-mounted Bain circuit adapter mounts on the absorber pole. A positive end-expiratory pressure (PEEP) valve is optional.



Section 2

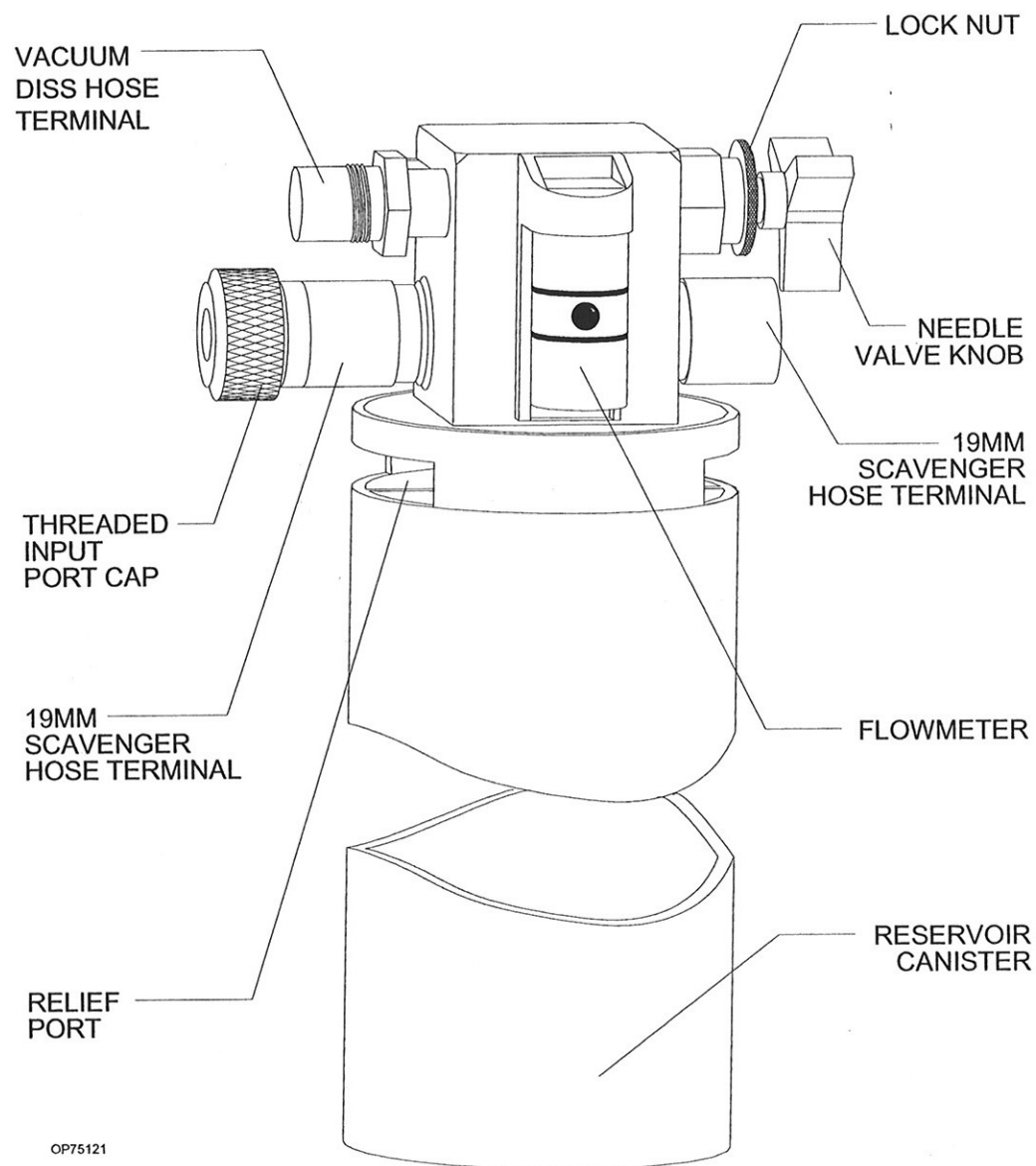
General Description

Scavenger Systems

The Narkomed 2C can be equipped with two kinds of scavenger systems, for the best match with the hospital's waste gas disposal system.

Open Reservoir Scavenger

The open reservoir scavenger is used with suction (vacuum) waste gas disposal systems. This scavenger is an "open" system with continually open ports for positive and negative pressure control.



OP75121

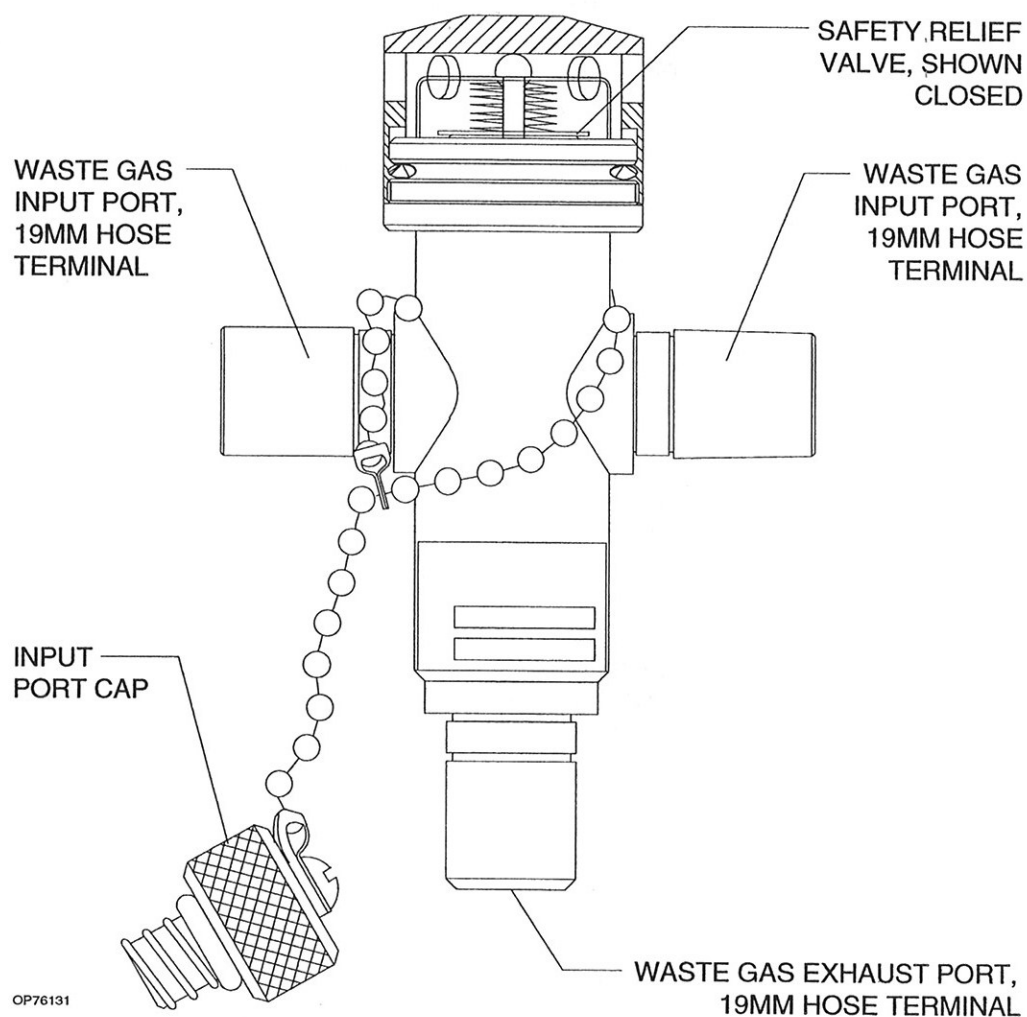
Section 2

General Description

Scavenger Interface for Passive Systems

The scavenger interface for passive systems is used with nonrecirculating HVAC systems (also called exhaust systems). This scavenger is a “closed” system with a spring-loaded valve for positive pressure relief.

WARNING: Do not use this device with a waste gas disposal system capable of applying a negative pressure to the scavenger interface (a suction or vacuum waste gas disposal system).



AV2+ Ventilator

The AV2+ anesthesia ventilator is a volume-preset, time-cycled, pressure-limited ventilator with electronic timing, pneumatic circuitry and independent controls for frequency, inspiratory to expiratory (I:E) ratio, inspiratory flow rate, tidal volume, and inspiratory pressure limit.

Pneumatic power (bellows drive gas) to the ventilator is supplied through the hospital pipeline supply or through reserve cylinders on the anesthesia machine. The pressure of the supply gas must be between 40 and 60 psi. The ventilator will not function properly if this pressure drops below 32 psi. Electrical power is supplied by the AC power source. In event of AC power failure, the backup battery supplies power. A fully charged battery can power the ventilator for about 30 minutes.

The anesthesia ventilator is designed for use with a North American Dräger absorber system that has a manual/automatic selector valve. Use this valve to select the breathing bag and adjustable pressure limiter (APL) valve for manual ventilation or the ventilator bellows for automatic ventilation.

During automatic ventilation, the manual/automatic selector valve isolates the absorber's APL valve from the breathing system. The ventilator has a relief valve mounted behind the bellows chamber to compensate for the continuous introduction of fresh gas into the breathing system.

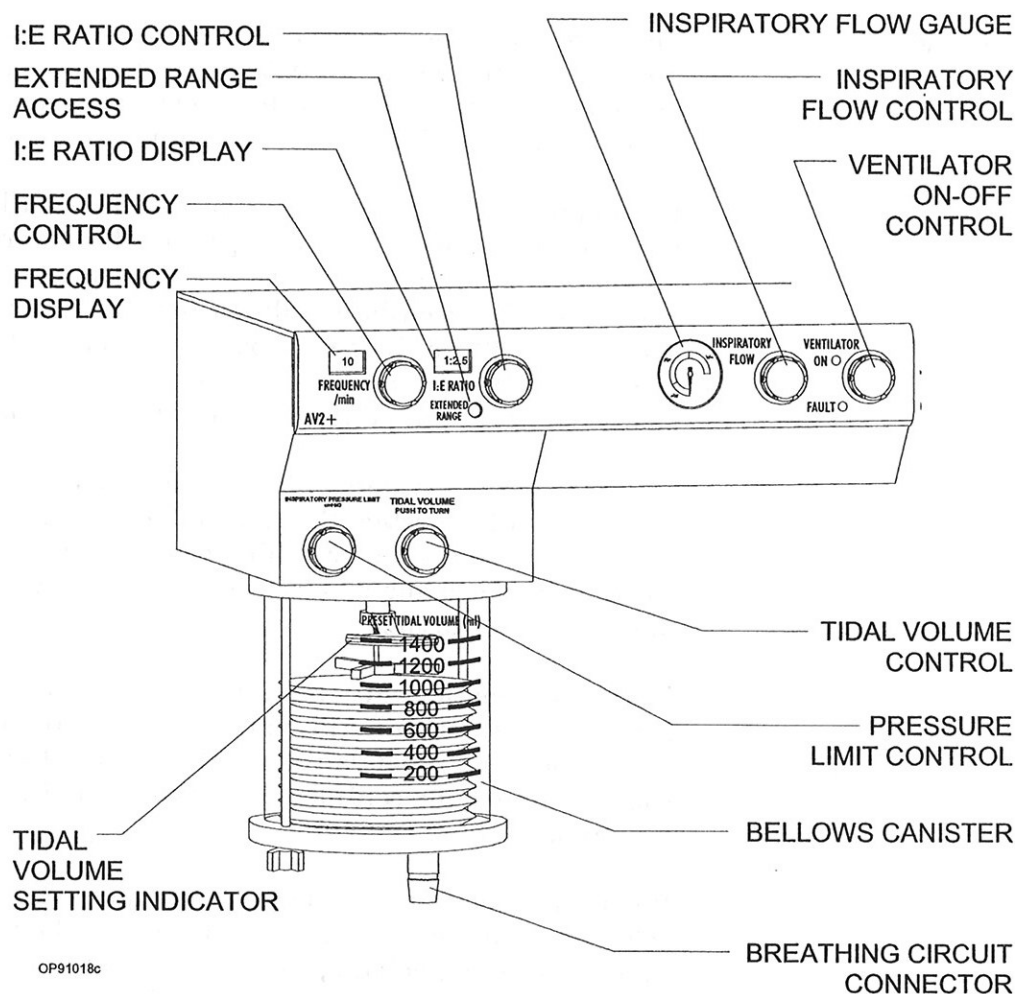
When the bellows is completely filled, any excess gas in the system is released to the scavenging system through the ventilator relief valve. As in any ascending bellows, the force needed to overcome gravity acting on the bellows causes a positive end-expiratory pressure (PEEP) within the breathing system. The PEEP is about 2 cmH₂O.

The pressure-limit control is used to set the peak inspiratory pressure produced by the ventilator to prevent barotrauma. The pressure-limit control can also improve ventilation for patients with reduced lung compliance (neonatal/pediatric patients and patients with adult respiratory distress syndrome), because it limits the peak inspiratory pressure during the inspiratory phase of ventilation.

The AV2+ ventilator is shown in the following drawing.

Section 2

General Description



Main Switch Panel

The main switch panel is located between the ventilator bellows and flowmeter bank.

System Power Switch

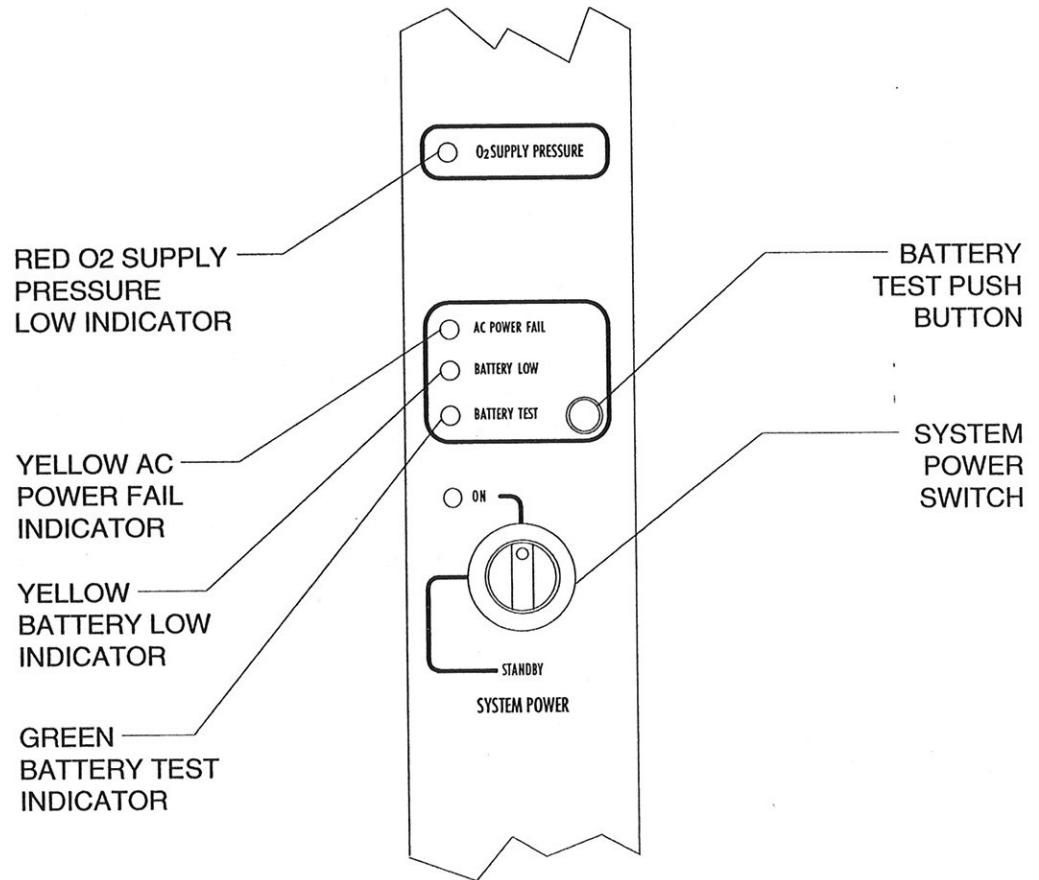
The SYSTEM POWER switch has two positions—ON and STANDBY. In the ON position, the gas (pneumatic) and electric power circuits are on. The green indicator next to the switch lights. In the STANDBY position, the switch shuts down the gas supplies, the monitoring system, and all electrical power to the machine except the convenience receptacles and battery charging circuit.

AC Power Failure Indicator

The yellow AC POWER FAIL indicator signals an AC power disruption. The indicator lights whenever the battery supplies power to the monitoring system and the electronic ventilator. A three-pulse tone also sounds every 30 seconds. If the backup battery is completely discharged, the AC power failure indicator does not have power and will not function.

Section 2

General Description



OP20050

Oxygen Supply Pressure Alarm

The oxygen supply pressure alarm activates if the oxygen supply pressure in the system decreases below about 37 psi. When the alarm is actuated, the red O₂ SUPPLY PRESSURE indicator lights continuously, the Caution message O₂ SUPPLY LOW appears on the central alarm display, and an intermittent audible alarm sounds. Depending on the configuration, a 7-second whistle may also sound.

NOTE: The oxygen supply pressure alarm will not activate if only one source of oxygen supply pressure (either the cylinder or the pipeline) fails and the other maintains proper pressure in the oxygen supply lines.

Section 2

General Description

Power Supply System

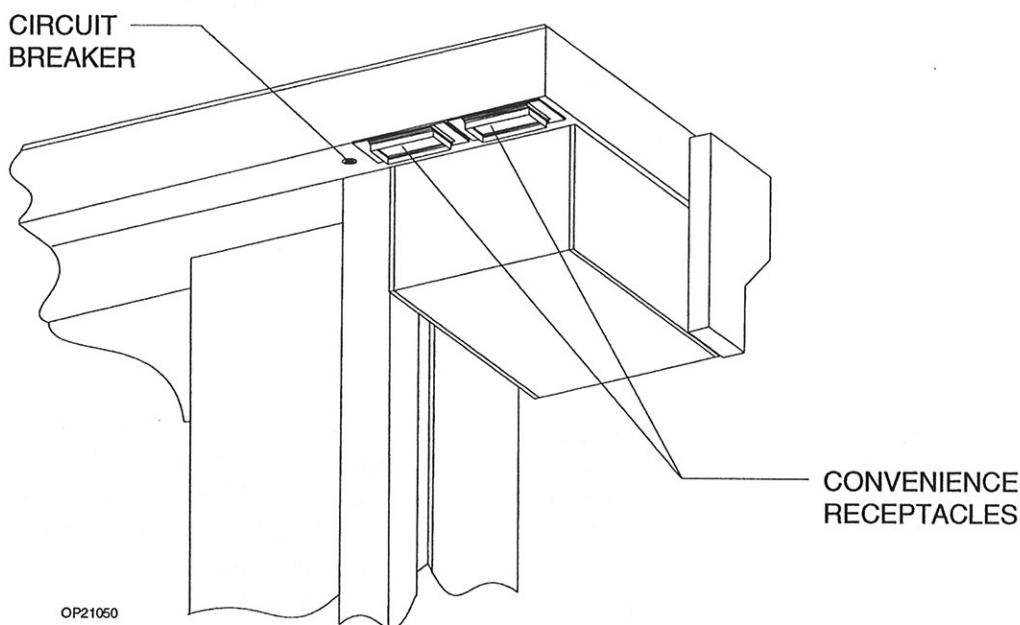
The Narkomed 2C has a central power supply for the ventilator, alarm system, and monitoring system. When in use, the Narkomed 2C must be plugged into an AC outlet.

Convenience Receptacles

The Narkomed 2C has four convenience receptacles located on the upper back area of the anesthesia machine. (This option is not available for the 240 VAC power supply option). The receptacles are active whenever the Narkomed 2C is plugged into an outlet, whether or not the machine is turned on.

The total current for devices plugged into the receptacles must not exceed 7 amps. A 7-amp circuit breaker protects the convenience receptacle circuit. This circuit also has an EMI filter to minimize interference from devices plugged into the convenience receptacles.

CAUTION: Devices plugged into the convenience receptacles contribute to the anesthesia system's total leakage current. The total leakage current must not exceed 100 microamps.



Circuit Breakers

The electrical system has four magnetic circuit breakers to protect machine functions—primary AC power input, convenience receptacles, and backup battery power.

The three circuit breakers located on the lower (absorber) side of the machine are for 117 volt input power, 240 volt input power and backup battery power. The fourth circuit breaker is for the convenience receptacles and is located next to the convenience receptacles.

When the plunger is flush with the surface of its base, the circuit breaker is in its normal, closed position. A circuit breaker is open (tripped) when its plunger extends beyond its base. If a breaker is tripped, the cause must be found and corrected before using the anesthesia system.

Backup Battery System

The backup battery system consists of a rechargeable battery and a built-in battery charging system.

Although most hospitals have emergency generators that provide AC power when line power fails, a delay may occur before generator power comes on. The backup battery system automatically provides power during the period between line power failure and activation of the hospital's emergency generator. The backup battery also provides power if the anesthesia machine's power cord is accidentally unplugged during a case.

When the hospital's emergency generator comes online (or when a disconnected power cord is reconnected), the Narkomed 2C automatically switches back to AC power and recharges its battery. The battery charging system charges the battery any time the power cord is connected to an active AC power source. The charger can recharge a fully discharged battery in about 12 hours.

If the machine is receiving AC power, but the battery voltage level is low due to a problem with the battery charging circuit or similar hardware malfunction, the Advisory message RESERVE BATT LOW appears on the central alarm display.

Machine Functions on Backup Battery Power

If the hospital's primary AC power fails, the backup battery system is activated. If this happens, the following events occur:

- The yellow AC POWER FAIL indicator on the alarm panel comes on.
- The Caution message AC POWER FAIL appears on the central alarm display.
- A three-pulse pattern tone sounds every 30 seconds.

These alarms signify that about 30 minutes of backup battery power remains from the time the alarm is activated if the battery is fully charged. All monitoring functions continue to operate, using the battery for power.

Section 2

General Description

When the battery reserve approaches depletion after an AC power loss:

- The yellow BATTERY LOW indicator lights.

NOTE: The BATTERY LOW indicator only lights during an AC power loss when battery reserves are low.

- The Caution message AC BATTERY FAIL appears on the central display.

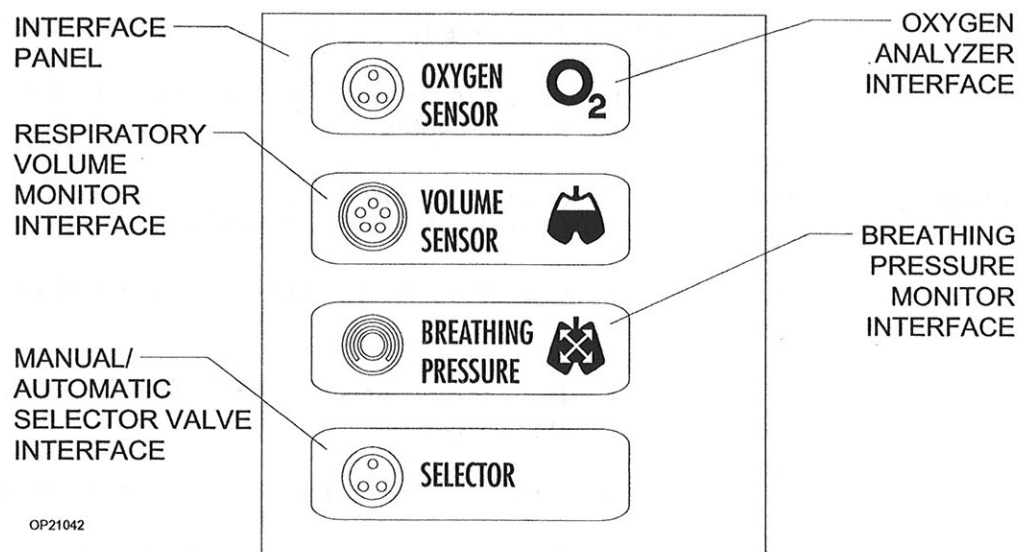
These alarms signify that about 10 minutes of backup battery power remain from the time the alarm was activated.

The gas supply system remains operative. Because the ventilator is inoperative when battery power is cut off, you must perform manual ventilation by bag. The machine cannot provide monitoring or alarm functions until AC power is restored.

NOTE: If the power cord is not plugged into an active AC outlet for a period of 30 days or more, the backup battery can be depleted. Plugging the power cord into an active AC outlet for about 12 hours recharges the battery.

System Interface Panel

The system interface panel is located on the absorber side of the Narkomed 2C. The interface panel has receptacles for the oxygen sensor cord, the breathing pressure pilot line, the respiratory volume sensor cord, and the manual/automatic selector valve interface cable.



Adjustable Display Arm

The adjustable display arm, mounted on the absorber side of the machine, supports the remote display and Datagrip. It is also used to route patient sensor lines from the patient to the anesthesia machine. The arm can be adjusted up and down, side-to-side, and front-to-back, to place the display and sensor lines in the most convenient position. To adjust the arm front-to-back, pull and hold the release knob forward, then move the arm to the preferred position and release the knob.

Monitoring System

The monitoring system integrates the electronic monitors and organizes information from these monitors on the screen. The screen is mounted on the adjustable display arm.

The Narkomed 2C monitors:

- oxygen concentration measurements
- breathing pressure measurements
- respiratory volume measurements

It also monitors key anesthesia system functions such as oxygen supply pressure and backup battery status.

Narkomed 2C Screens

The Narkomed 2C has several screens for viewing monitoring information, adjusting alarms, and customizing the monitoring system. The screens include:

- Machine Monitor
- System Monitor
- Set Up
- System Configuration
- Data Log
- Data Management

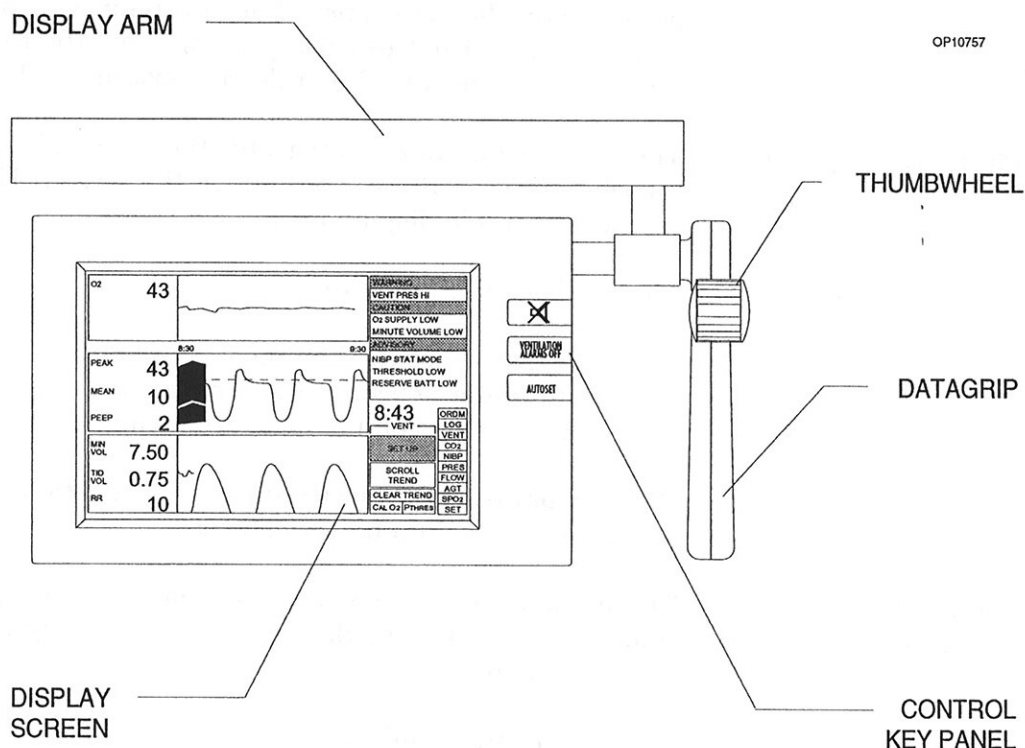
The screens are accessed from a Screen Selection menu. They are described in detail in the *Section 5 Operation - Monitoring System* "Using the Screen Selection Menu."

Section 2

General Description

Display Screen

All numerical data, waveforms, trends and alarms appear on the display screen that is mounted on the display arm. The screen can be tilted up, down, and sideways for optimal viewing.



Control Key Panel

Each of the Control Key Panel keys, located on the right side of the screen, performs a system function:



Silences the continuous audible alarm for 120 seconds. A message indicating the number of seconds remaining in the silence period is displayed in the Advisories window on the central alarm display. If a new alarm occurs during the 120 seconds, a single tone pattern sounds according to the alarm priority. After 120 seconds, the audible alarm reverts to normal operation if no alarm conditions are active at that time.

If any Warning or Caution alarms are active at 120 seconds, the Narkomed 2C enters an extended silence period and a single tone pattern sounds according to the alarm priority. If a new alarm condition occurs during the extended silence period, a single tone pattern sounds. Also, at each one-minute interval of the extended silence period, the highest-priority alarm tone pattern sounds.

The silence period can last up to three minutes. The silence period ends if the Narkomed 2C is clear of Warnings and Cautions for 10 seconds. When the extended silence period ends, audio alarms revert to normal operation.

VENTILATION
ALARMS OFF

Turns off volume and pressure-apnea alarms. If the ventilator is on, the volume alarms are turned off, but the pressure-apnea alarm remains on.

AUTOSET

Function depends on the Datascan Display setting in the System Configure screen.

If the Bar Graph Datascan is selected, pressing the AUTOSET key sets the current measurements at the center line of the Datascan display and resets the endpoints. (See "Bar Graph Datascan Display" presented later in this section.

If the Numeric Datascan is selected, pressing the AUTOSET key resets the alarm limits according to the O2 ALARM AUTOSET value (WIDE, NARROW, or OFF) set in the System Configure screen. If the Narkomed 2C is connected to a Vitalert monitor with Alarm Autoset capability, pressing the AUTOSET key also resets the alarm limits on the Vitalert monitor.

For complete information on selecting the Datascan display and setting the O2 ALARM AUTOSET value, see *Section 5 Operation - Monitoring System* "Invoking the System Configure Screen."

Datagrip



The Datagrip is the user input device. The Datagrip is composed of a trigger and thumbwheel attached to the display arm, next to the screen. It can be tilted up and down for convenience and comfort.

Rotate the Datagrip thumbwheel to move the cursor around in screens, change variables, and scroll through menus, lists, and trends. Rotating the thumbwheel upward moves the cursor forward in a screen or list and increases numbers. Rotating the thumbwheel downward moves the cursor backward in a screen or list and decreases numbers.

Press the Datagrip trigger to invoke screens, choose parameters, enter new values, and select soft keys that appear on the display screen.

Section 2

General Description

An instructional dialog box, located in the lower right corner of certain screens, guides you through the functions performed by Datagrip's trigger and thumbwheel for that specific screen. In the dialog box, the  icon indicates the function performed by rotating the thumbwheel. The  icon indicates the function performed by pressing the Datagrip trigger.

Datascan Display

The Datascan display is located at the top of the Data Log and System Monitor screens. Information is presented in one of two display formats—the Bar Graph display or the Numeric display. The display format is selected in the System Configure screen. (See *Section 5 Operation - Monitoring System* “Invoking the System Configure Screen.”)

Bar Graph Datascan Display

The Bar Graph Datascan display shows of six bar graphs that appear at the top of the System Monitor screens. Use the Bar Graph Datascan to see measurement deviations from a baseline. If information for one or more bar graphs is not supplied, the corresponding display area is blank.

The six bar graphs include:

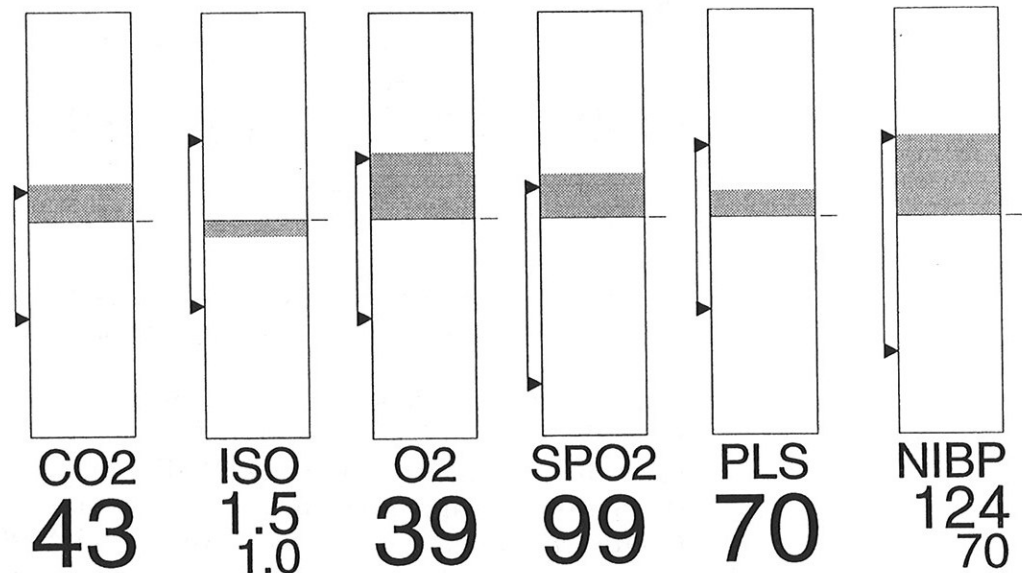
- end-tidal carbon dioxide
- inspiratory/expiratory anesthetic agent
- inspiratory oxygen concentration
- oxygen saturation
- pulse rate
- systolic/diastolic blood pressure

NOTE: The inspiratory agent and the systolic pressure measurements are the larger numbers located below their respective bar graphs.

A baseline measurement setpoint appears at the midpoint of each bar graph, represented by a center line common to all six bar graphs. Pointers along the left side of each bar graph mark the high and low alarm limits. The current value for the measurement appears in numerical form under each bar graph.

Any increase in a patient measurement causes the corresponding bar to rise from the center line. If any patient measurement decreases, its bar descends below the center line. Any deviation from the baseline—whether positive or negative—is immediately apparent.

OP27113



To normalize the current measurements of the Narkomed 2C, press the AUTOSET key on the control key panel. This sets the current measurements at the center line (baseline) and resets the endpoints.

The endpoints of the bar graph boundaries represent values above and below the baseline determined by the scaling factor set in the Datascan Configure screen.

Numeric Datascan Display

The Numeric Datascan displays current values for all patient measurements and shows where those values are in relationship to the current alarm limits. The Numeric Datascan consists of six rectangular display areas for:

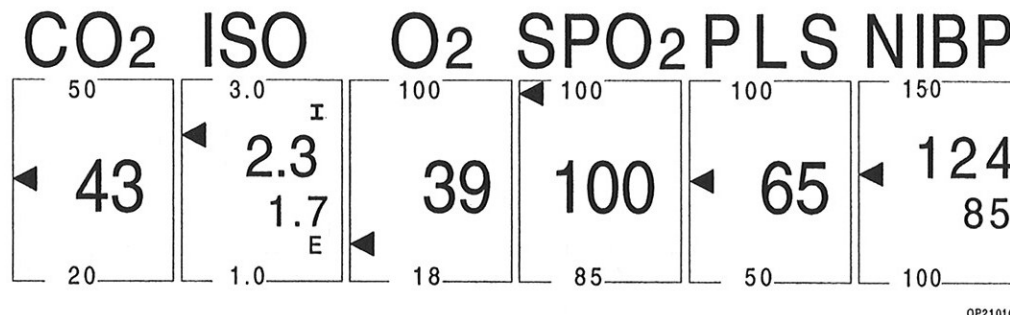
- end-tidal carbon dioxide
- inspiratory and expiratory anesthetic agent
- inspiratory oxygen concentration
- oxygen saturation
- pulse rate
- systolic and diastolic blood pressure

If information for one or more measurements is not supplied, the corresponding display area is blank.

The current values for the measurement are the large numbers located in the middle of each display area. The numbers at the top and bottom are the current alarm limits. The arrow on the left side of each display area shows where the current value lies within the boundaries of the alarm limits. This arrow moves up or down as the values change.

Section 2

General Description



NOTE: The inspiratory agent and the systolic pressure measurements also appear in the display areas.

To automatically adjust the alarm limits around the current values, press the AUTOSET key on the control key panel. This sets the oxygen alarm limits according to the O2 ALARM AUTOSET value specified in the System Configure screen. For complete information, see *Section 5 Operation - Monitoring System* "Invoking the System Configure Screen". If the Narkomed 2C is connected to a Vitalert monitor with Alarm Autoset capability, pressing the AUTOSET key also resets the alarm limits for the monitoring functions provided by the Vitalert monitor.

Central Alarm Display and Audible Alarms

The Narkomed 2C presents active alarms on the central alarm display located at the top of the display screen. Alarms are indicated with keyword phrases and are organized into three categories, depending on their urgency. Alarms are displayed either in a single window or in three separate windows corresponding to each alarm category.

A central speaker produces all audible alarm signals, using three different sound patterns to indicate the three levels of alarm urgency. The Narkomed 2C annunciates only the highest-priority, currently active alarm. Lower-priority alarms are temporarily suppressed to minimize the confusion caused by simultaneous alarms. If the primary speaker on the Narkomed 2C fails, the Advisory message SERVICE SPEAKER appears on the central alarm display and a single tone sounds.

If the number of alarms in any of the three categories exceeds the space provided on the display screen for that category, additional alarm messages are retained in memory until displayed alarm conditions are resolved.

Warnings

Warnings are the highest priority alarms and require an immediate response.

If the Bar Graph Datascan is selected, Warnings appear in a drop-down window in the upper left portion of the System Monitor screens, overlaying the Datascan bar graphs. If no Warning alarm conditions exist, the display is suppressed until an alarm condition occurs. Up to seven Warnings can appear in this window.

If the Numeric Datascan is selected, Warnings appear in the single alarm window in top right corner of the Machine Monitor screen and the System Monitor screens, along with any Caution or Advisory messages. The Warning messages are displayed under a flashing heading labeled WARNING, which is removed from the screen if no Warning alarm conditions exist. The last space at the bottom of the alarm window is reserved for the SILENCE message that indicates the time remaining in the Audio Silence period.

Warnings are announced with a continuously repeating sound pattern consisting of three audio tones. After an initial sound pattern at full volume, there is a 6-second pause. This pause is followed by a pattern at one-third volume, a 5-second pause, a pattern at two-thirds volume, a 4-second pause, and another pattern at full volume. After the second full volume pattern, a 3-second pause occurs, followed by a full volume pattern until the alarm condition is removed.

Cautions

Cautions are second-priority alarms and require a prompt response.

If the Bar Graph Datascan is selected, Cautions appear in a drop-down window in the upper middle portion of the System Monitor screens, overlaying the Datascan bar graphs. If no Caution alarm conditions exist, the display is suppressed until an alarm condition occurs. Up to seven Cautions can appear in this window.

If the Numeric Datascan is selected, Cautions appear in the single alarm window in top right corner of the Machine Monitor screen and the System Monitor screens, along with any Warning or Advisory messages. The Caution messages are displayed under a heading labeled CAUTION, which is removed from the screen if no Caution alarm conditions exist or if all space in the alarm window is needed by the higher-priority Warning messages.

Section 2

General Description

The last space at the bottom of the alarm window is reserved for the SILENCE message that indicates the time remaining in the Audio Silence period.

Cautions are accompanied by a three-pulse sound pattern that is repeated every 30 seconds until the alarm condition is cleared.

Advisories

Advisories are the lowest priority alarms that do not require immediate attention.

If the Bar Graph display is selected, Advisories appear in a display window in the upper right portion of the screen. Up to nine Advisories can appear in this window, in addition to the SILENCE message that indicates the time remaining in the Audio Silence period. The SILENCE message occupies the last place at the bottom of the Advisory window.

If the Numeric Datascan is selected, Advisories appear in a single window in top right corner of the Machine Monitor screen and the System Monitor screens, along with any Warning or Caution messages. The Advisory messages appear under a heading labeled ADVISORY, which is removed from the screen if all space in the alarm window is needed by the higher-priority Warning or Caution messages. The last space at the bottom of the alarm window is reserved for the SILENCE message that indicates the time remaining in the Audio Silence period.

Depending on the urgency, advisories are accompanied by a single tone sounds or no audible alarm is given.

Silencing Alarms

To temporarily silence audible alarms, use the alarm silence key on the control key panel (labeled with a crossed-out speaker).

Ventilation Alarms

When the system power switch is turned from STANDBY to ON, the volume and pressure apnea alarms default to Standby to allow machine setup without nuisance alarms. An interlock with the ventilator ensures that when the ventilator is turned on, the alarms are enabled. The alarms can also be enabled individually in the Set Up screen.

When the ventilator is turned off, the following events occur:

- If the pressure apnea threshold was greater than 15 cmH₂O when the ventilator was turned off, the threshold setting is changed to 15 cmH₂O. (If the pressure apnea threshold was less than 15 cmH₂O when the ventilator was turned off, the threshold retains its setting.)
- The Cautions and Warnings associated with apnea alarms change from activation after 15 and 30 seconds of apnea to 30 and 60 seconds, respectively.

When the ventilator is turned back on, the pressure apnea threshold is restored to its previous set value and the apnea alarms revert to activation after 15 seconds (caution) and 30 seconds (warning) of apnea.

Manual Sphygmomanometer (optional)

Noninvasive blood pressure can be measured with the manual sphygmomanometer. Several cuff sizes are available.

O.R. Data Manager® (optional)

The O.R. Data Manager is an electronic data management system for acquiring, storing, and retrieving information. It consists of a central processing unit with disk drive and a keyboard for entering and editing data. The O.R. Data Manager creates an electronic anesthesia record from information automatically recorded by the monitoring system and from input from the keyboard (such as patient data, events, drugs, and other case-related information), and interfaced monitors such as the Vitalert® 3000.

In addition to creating anesthesia records, the O.R. Data Manager can graphically display case information and send anesthesia records to a disk or laser printer.

**Daily Checkout
Procedure**

Before operating the Narkomed 2C, the following checkout procedure must be performed to make sure the machine is ready for use. This is a recommended procedure. Follow your institution's policies for specific checkout procedures. If the anesthesia system fails any procedures identified by an asterisk (*), do not use the machine. Contact a North American Dräger qualified technical service representative for inspection of the unit.

NOTE: Do not insert any additional components into, or modify, the anesthesia system after the checkout procedure is started.

**Initial Setup and
Verification**

1. Enter the serial number located on the right rear leg into the anesthesia record.
2. Make sure there is a valid inspection sticker on the back of the machine indicating that the anesthesia machine was serviced and inspected by a North American Dräger qualified technical service representative.
3. Verify that a cylinder wrench is tethered to the back of the machine next to one of the cylinders.
4. If the anesthesia machine is not already plugged in, connect the electrical power cable to an active AC outlet that accepts and properly grounds the power cable. **Do not** use "cheater" plugs.

**System Software
Diagnostics**

- *5. Turn the SYSTEM POWER switch to the ON position. Wait for the machine to complete its diagnostic checks. Make sure the system is functional.

**Battery Power
Verification**

- *6. Check the reserve battery power. Remove the power plug from the outlet. Press the BATTERY TEST button on the main switch panel. The green indicator to the left of the test button must light. The yellow BATTERY LOW indicator must remain unlit. Plug the power cable back into the electrical outlet.

NOTE: This test assumes that the anesthesia machine has been plugged in for 12 hours. The battery charging system works only when the machine is connected to an active AC power source. The charging system takes about 12 hours to charge a fully discharged battery.

Section 3

Daily Checkout

Emergency Ventilation Equipment Verification

- *7. Verify that backup ventilation equipment is available and functional.

High Pressure System Verification

- *8. Check the oxygen cylinder supplies.
- A. Disconnect all pipeline gas supply hoses and drain the system.
 - B. Close the oxygen cylinder valve and remove the cylinder from the yoke. Verify that there is one cylinder gasket and there are two index pins. Verify that the cylinder matches the yoke label. Place the cylinder back in its yoke.
 - C. Open an oxygen cylinder and check the cylinder pressure gauge. A full oxygen cylinder registers about 1900 psi. Replace any cylinder with pressure less than 1000 psi. To check for a high pressure leak, close the cylinder and observe the cylinder pressure gauge for a prominent decrease in the pressure.
 - D. If the machine is equipped with dual oxygen yokes, repeat these procedures for the other cylinder yoke.
- *9. Check the nitrous oxide cylinder supplies.
- A. Close the nitrous oxide cylinder valve and remove the cylinder from the yoke. Verify that there is one cylinder gasket and there are two index pins. Verify that the cylinder matches the yoke label. Place the cylinder back in its yoke.
 - B. Open the nitrous oxide flow control valve until the nitrous oxide pipeline and cylinder pressure gauges indicate zero pressure. Open a nitrous oxide cylinder and check the cylinder pressure gauge. A full nitrous oxide cylinder registers about 745 psi. Replace any cylinder with a pressure less than 600 psi. To check for a high pressure leak, close the cylinder and observe the cylinder pressure gauge for a prominent decrease in the pressure.
 - C. If the machine is equipped with dual nitrous oxide cylinder yokes, repeat these procedures for the other cylinder yoke.

*10. Check additional (optional) gas cylinder supplies.

- A. With the cylinder closed, open the flow control valve of the associated gas until the cylinder and pipeline pressure gauges (air only) indicate zero pressure.
- B. Close the cylinder valve and remove the cylinder from the yoke. Verify that there is one cylinder gasket and there are two index pins. Verify that the cylinder matches the associated yoke label. Place the cylinder back in its yoke.
- C. Open the associated flow control valve until the cylinder pressure gauges indicate zero pressure. Open the cylinder and check the cylinder pressure gauge. Replace the cylinder if its contents are insufficient for the intended procedure. To check for a high pressure leak, close the cylinder and observe the cylinder pressure gauge for a prominent decrease in the pressure.

NOTE: After testing all of the gas circuits, drain the oxygen circuit by closing the oxygen cylinder and actuating the oxygen flush button on the front of the anesthesia machine. Hold the button in until the pressure gauges indicate no pressure.

The following table shows the full and minimum pressures (E-size cylinders at 70°F, 21°C) for all gases available for the anesthesia machine.

GAS	PSI - FULL*	PSI - MIN
Air	1900	1000
Carbon Dioxide	838	600
Oxygen-Helium	1900	1000
Nitrous Oxide	745	600
Oxygen	1900	1000

*typical full load

Section 3

Daily Checkout

Pipeline Supply System Verification

*11. Pipeline Supply Verification

- A. Inspect the supply hoses for cracks or wear.
- B. Connect the appropriate hospital pipeline supply hoses from the wall outlet fittings to the pipeline inlet connectors.
- C. Check for sufficient pipeline pressure readings for each gas on the pipeline pressure gauges located below the flow control valves. The pressure for each gas must be between 50–55 psi. Open the flow control valve for each gas to a moderate value. The pressure indicated at the pipeline pressure gauge must not decrease more than 5 psi.
- D. Verify that the correct gases are supplied to the anesthesia machine inlets.

Low Pressure System Verification

*12. Vaporizer Verification

- A. Check for sufficient supply of liquid anesthetic in the vaporizer(s). The liquid level indicated in the vaporizer sight glass must be between the minimum and maximum markings.
- B. Make sure the fill and drain valves are completely closed.
- C. Check the vaporizer exclusion device, which prevents more than one vaporizer from being activated simultaneously. Make sure that when one vaporizer handwheel is turned to a setting greater than 0, the others remain locked in their 0 positions. Test all of the vaporizer positions. Then, turn all vaporizers to the 0 position.

System Gas Circuit Verification

- *13. Check the flowmeters. Adjust the flow control knob for each gas and verify the proper operation of the corresponding flowmeters. The float must move freely over the full range of each flowmeter.

Oxygen Monitor Calibration

- *14. Calibrate the oxygen monitor by exposing the sensor to ambient air and activate the calibration key. (See *Operation - Oxygen Monitoring* “Calibrating the Oxygen Sensor” in Section 5 for more information.)
 - A. Place the oxygen sensor securely in the sensor mount.
 - B. Verify that the correct gas concentrations are supplied to the anesthesia system from the supply cylinders.

- C. Close the cylinder supplies and deplete the pressure from the system.

OFPD Verification

- *15. Check the oxygen failure protection device. With all gases available on the machine set to a flow of about 4 l/min, close the oxygen supply by disconnecting the oxygen pipeline supply hose and closing the oxygen cylinder(s). The flow of all other gases indicated by their flowmeters must decrease in proportion to the decrease in oxygen flow and eventually shut off.

ORC Verification

- *16. Check the function of the ORC. With the nitrous oxide flow control valve open to a flow of 10 l/min, vary the oxygen flow with the oxygen flow control valve. The nitrous oxide flow indicated on the nitrous oxide flowmeter must automatically vary in response to the adjustment of the oxygen flow control valve.

The ORC must maintain a fresh gas oxygen/nitrous oxide flow ratio of at least 25 ± 4 % oxygen.

NOTE: When the nitrous oxide flow control valve is open and oxygen is flowing at a minimum rate (150–200 ml/min), nitrous oxide flows at approximately 500 ml/min.

Oxygen Flush
Verification

- *17. Check the oxygen flush:
- A. Press the oxygen flush button and listen for an audible gas flow sound, accompanied by a marked increase in oxygen concentration in the breathing system.
 - B. Check the delivered oxygen concentration. Repeatedly flush the patient breathing system by pressing the oxygen flush button. Open the oxygen flow control valve to a flow of 8 l/min and close the other flow control valves. The oxygen measurement display area should indicate 97% to 100% oxygen concentration.

Fresh Gas
Verification

- *18. Make sure all vaporizers are closed. Open the oxygen flow control valve to an 8 l/min flow and close all other flow control valves. Sniff the gas coming from the fresh gas common outlet. There should be no noticeable odor.

Bain Circuit Adapter
Verification

- *19. Verify that the inner tube of the Bain circuit is intact and not occluded. First deliver a flow of oxygen to the Bain circuit through the fresh gas hose. Then occlude the inner tube of the Bain circuit. The oxygen flowmeter float should drop in response to the occlusion.

Section 3

Daily Checkout

As an alternate test, press the oxygen flush button with the Bain circuit's patient port open to the atmosphere. The high flow of gas through the Bain circuit's inner tube will draw in gas from the outer tube. As a result, the breathing bag should deflate. If the breathing bag does not deflate or it inflates, the fresh gas hose or inner tube may be improperly connected.

Absorber System Verification

- *20. To check the absorber system:
- A. Check the hose connections in the breathing system.
 - B. Make sure the fresh gas hose of the breathing system is securely connected to the fresh gas outlet.
 - C. Make sure a 22 mm patient breathing circuit is connected between the inspiratory and expiratory valves on the absorber.
 - D. Make sure a 22 mm breathing hose is connected between the ventilator hose terminal and the manual/automatic selector valve breathing hose terminal.
 - E. Make sure a breathing bag of proper capacity and appropriate construction is connected to the breathing bag terminal of the breathing system.
 - F. Make sure the breathing pressure pilot line is properly connected between the BREATHING PRESSURE interface and either the absorber quick-connect fitting or the appropriate fitting at or near the patient Y-piece.
 - G. Make sure the oxygen sensor and respiratory volume sensor are properly installed.
- *21. Make sure the absorber canisters are filled with CO₂ absorbent. Consult the absorbent manufacturer's literature for information on what signs to expect when the absorbent is exhausted. Replace the absorbent when it appears exhausted. Make sure that the color change represents the absorbent's true state of depletion and is not due to regeneration after a rest period. Flushing the anesthesia machine continuously with 100% oxygen for at least one minute before the first case of the day is recommended.

Remove accumulated absorbent dust and water from the absorber dust cup.

WARNING: Absorbent is caustic and is a strong eye, skin, and respiratory tract irritant. When emptying the absorber dust cup, take care not to spill its caustic contents.

NOTE: When changing the CO₂ absorbent, take care not to chip or crack the absorbent canister. Check the canister for signs of damage, especially along the rim, before reinstallation.

22. Close all vaporizers and flow control valves. Check for free gas passage in the patient breathing system. Wear a surgical mask to inhale and exhale through the breathing system (each limb individually, if possible). Verify the unidirectional flow in each limb and then reconnect the tubing.

APL Valve

- *23. Check the APL valve to be sure it can relieve excess gas from the breathing system into the scavenger system.

To check the APL valve's flow resistance:

- A. Set the manual/automatic selector valve to BAG.
- B. Remove the bag from the swivel arm bag mount.
- C. Interconnect the 22 mm ports of the inspiratory and expiratory valves with a 22 mm hose.
- D. Completely open the APL valve by turning the control knob fully counterclockwise to its stop position.
- E. Turn the SYSTEM POWER switch to ON.
- F. Open the oxygen flow control valve to a flow of 8 l/min.
- G. Occlude the bag mount opening and watch for a pressure increase on the breathing system pressure gauge. This pressure increase must not exceed 3 cmH₂O.

Breathing System
Leak Test

24. Perform a breathing and fresh gas delivery system pressure test. This test detects leaks from the patient breathing system and fresh gas delivery system.

To perform the test:

- A. Close all flow control valves on the anesthesia machine.

Section 3

Daily Checkout

- B. Turn the SYSTEM POWER switch to the STANDBY position.
- C. Turn the vaporizers to 0% concentration.
- D. Interconnect the 22 mm ports of the inspiratory and expiratory valves with a 22 mm breathing hose.
- E. Set the manual/automatic selector valve to BAG.
- F. Close the APL valve by turning the knob fully clockwise to its stop position.
- G. Check that the breathing pressure gauge is on 0.
- H. Attach the supplied test terminal to the breathing bag mount.
- I. Connect a sphygmomanometer squeeze bulb (available from North American Dräger) to the hose barb on the test terminal.
- J. Pump the squeeze bulb by hand until the breathing system pressure gauge indicates pressure of at least 50 cmH₂O (not to exceed 80 cmH₂O).
- K. Observe the pressure drop at the breathing system pressure gauge. When the pressure is at 50 cmH₂O, begin counting seconds. The pressure must not drop more than 20 cmH₂O in 30 seconds.

Scavenger System

- *25. Verify the performance of the scavenger system.

To test the open reservoir scavenger system:

- A. Make sure a 19 mm scavenger hose is connected between the ventilator relief valve and the scavenger interface.
- B. Make sure a 19 mm scavenger hose is connected between the APL valve on the absorber and the 19 mm hose terminal on the back of the absorber pole.
- C. Make sure a 19 mm scavenger hose is connected between the bottom of the absorber pole and the scavenger interface.

- D. Check for moisture accumulation in the breathing and scavenger hoses. Remove any moisture found.
- E. Verify the safe performance of the open reservoir scavenging system. With the scavenging system properly installed and operating, test for positive and negative pressure relief.

To test for negative pressure relief:

- F. Connect a vacuum hose to the DISS threaded terminal on the left-hand side of the scavenger (or attach a wall suction hose onto the adapter's hose-barb fitting).
- G. Short-circuit the absorber's inspiratory and expiratory valves with a 22 mm breathing hose.
- H. Set the absorber's manual/automatic selector valve to BAG.
- I. Turn the APL valve control knob fully counterclockwise.
- J. Verify that the suction waste gas disposal system is active.
- K. Adjust the scavenger needle valve to a flowmeter indication between the two white lines.
- L. Close all flow control valves on the anesthesia system.
- M. Occlude the absorber breathing bag terminal and observe the breathing pressure gauge on the absorber. The gauge should indicate only a negligible negative pressure (no lower than -0.5 cmH₂O).

To test for positive pressure relief:

- N. Perform steps A through E.
- O. If the system is equipped with a PEEP valve, turn the PEEP valve control knob fully counterclockwise to its lowest setting.
- P. Adjust the scavenger needle valve to a completely closed position by turning it fully clockwise.
- Q. Open the oxygen flow control valve to a flow of 10 l/min and occlude the absorber breathing bag terminal.

Section 3

Daily Checkout

- R. The flow of oxygen must now exit through the relief ports located on top of the canister. The absorber system's breathing pressure gauge must indicate a pressure less than 5 cm H₂O.
- S. After the test, adjust the scavenger needle valve to a flowmeter indication halfway between the two white lines.

To test the scavenger interface for passive systems:

- A. Make sure a 19 mm scavenger hose is connected between the ventilator relief valve and the scavenger interface.
- B. Make sure a 19 mm scavenger hose is connected between the APL valve on the absorber and the 19 mm hose terminal on the back of the absorber pole.
- C. Make sure a 19 mm scavenger hose is connected between the bottom of the absorber pole and the scavenger interface.
- D. Check for moisture accumulation in the breathing and scavenger hoses. Remove any moisture found.
- E. Short circuit the absorber's inspiratory and expiratory valves with a 22 mm breathing hose.
- F. Set the absorber's manual/automatic selector valve to AUTO.
- G. If the system is equipped with a PEEP valve, turn the PEEP valve control knob fully counterclockwise to its lowest setting.
- H. Open the oxygen flow control valve to a flow of 10 l/min and occlude the 19 mm scavenger terminal labeled EXHAUST.
- I. After the ventilator bellows inflates, the flow of oxygen exits the system through the positive pressure safety relief valve. At this point, the absorber system's breathing pressure gauge must indicate a pressure of less than 10 cmH₂O.

Manual and
Automatic Ventilation
Systems

***26. Test the ventilator.**

- A. Check for proper pressure and flow at the Y-piece during the inspiratory and expiratory phases. Turn the SYSTEM POWER switch and ventilator power switch to their ON positions. Place the manual/automatic selector valve in the AUTO position. Adjust the oxygen flow control valve to a 3 l/min flow. Set the ventilator frequency to 3 BPM, the I:E ratio to 1:2, and the tidal volume to about 1 liter. (If testing the Pediatric Bellows or Adult/Pediatric Bellows, adjust the tidal volume to 200 ml.)

Adjust the ventilator flow control to the maximum of the "low" zone on the flow gauge. Occlude the patient side of the Y-piece. Fill the ventilator bellows by pressing the oxygen flush button. Observe the breathing system pressure gauge as the ventilator cycles.

The pressure gauge must indicate a pressure over 30 cmH₂O when the bellows completes its downward travel. The pressure should not exceed 3 cmH₂O at the end of the expiratory phase when the bellows completes its upward travel.

- B. If the system is equipped with a PEEP valve, verify the PEEP valve's performance. Attach a breathing bag to the patient Y-piece with an appropriate adapter such as an NAD combination mask elbow with a 22 mm male fitting for the breathing bag and 15 mm male fitting for the Y-piece. With the manual/automatic selector valve in the AUTO position, set the ventilator to the preferred frequency.

Then adjust the PEEP valve to different values and observe the breathing system pressure gauge to verify performance. Turn the PEEP valve control knob fully counterclockwise to its lowest setting after the test is completed. Set the PEEP bypass switch to the PEEP OFF position.

Monitors

27. Check the alarm limit settings. The monitor alarm limits are automatically set to a default configuration when the SYSTEM POWER switch is turned on. Check these settings and adjust them if necessary. Alarm limits can be adjusted at the beginning of—or during—a procedure. Also, make sure that any external monitors (if any) are connected properly and that the alarms sound through the anesthesia machine's central audio annunciator.

Section 3

Daily Checkout

- *28. Test the alarm functions for all monitors. Simulate alarm conditions and check for appropriate alarm signals.
- System Flush 29. Flush the system with 100% oxygen by pressing the oxygen flush button.
- Fresh Gas Oxygen Sensor Adapter Option Verification 30. If the optional fresh gas oxygen sensor adapter is installed, make sure the fresh gas hose connection is intact and not occluded. Verify that the oxygen analyzer is properly calibrated. (See *Operation - Oxygen Monitoring* "Calibrating the Oxygen Sensor" in Section 5 for more information.) When removing the oxygen sensor during calibration, insert the oxygen sensor port plug into the fresh gas adapter port.
- Final Position 31. When the daily checkout procedure is complete, verify that:
 - A. all vaporizers are off (the handwheels are set to zero)
 - B. the APL Valve is open (fully counterclockwise)
 - C. the manual/automatic switch is set to BAG
 - D. all flowmeters indicate 0 (or minimum)
 - E. the patient suction is level adequate
 - F. the breathing system is ready to use (the bag is in place and all hoses are connected properly)

**Preuse Checkout
Procedure**

Perform the following abbreviated checkout procedure when the Narkomed 2C is used in successive cases. It may be performed only after the initial daily checkout procedure given in Section 3 was performed. This is a recommended procedure. Follow your institution's policies regarding specific checkout procedures. If the anesthesia system fails any procedures identified by an asterisk (*), do not use the machine. Contact a North American Dräger qualified technical service representative for inspection of the unit.

NOTE: Do not insert any additional components into or modify the anesthesia system after the checkout procedure is started.

**Reserve Power
Verification**

- *1. Check the reserve battery power. Make sure that the SYSTEM POWER switch is turned to the ON position. Remove the power plug from the outlet. Press the BATTERY TEST button on the main switch panel. The green indicator to the left of the test button must light. The yellow BATTERY LOW indicator must remain unlit. Plug the power cable back into the electrical outlet.

NOTE: This test assumes that the anesthesia machine has been plugged in for 12 hours. The battery charging system works only when the machine is connected to an active AC power source. The charging system takes about 12 hours to charge a fully discharged battery.

**Bain Circuit Adapter
Verification**

- *2. Verify that the inner tube of the Bain circuit is intact and not occluded. First deliver a flow of oxygen to the Bain circuit through the fresh gas hose. Then occlude the inner tube of the Bain circuit. The oxygen flowmeter float should drop in response to the occlusion.

As an alternate test, press the oxygen flush button with the Bain circuit's patient port open to the atmosphere. The high flow of gas through the Bain circuit's inner tube will draw in gas from the outer tube. As a result, the breathing bag should deflate. If the breathing bag does not deflate or it inflates, the fresh gas hose or inner tube may be improperly connected.

**Absorber System
Verification**

- *3. To check the absorber system:
- A. Check the hose connections in the breathing system.
 - B. Make sure the fresh gas hose of the breathing system is securely connected to the fresh gas outlet.

Section 4

Preuse Checkout

- C. Make sure a 22 mm patient breathing circuit is connected between the inspiratory and expiratory valves on the absorber.
- D. Make sure a 22 mm breathing hose is connected between the ventilator hose terminal and the manual/automatic selector valve breathing hose terminal.
- E. Make sure a breathing bag of proper capacity and appropriate construction is connected to the breathing bag terminal of the breathing system.
- F. Make sure the breathing pressure pilot line is properly connected between the BREATHING PRESSURE interface and either the absorber quick-connect fitting or the appropriate fitting at or near the patient Y-piece.
- G. Make sure the oxygen sensor and respiratory volume sensor are properly installed.

- *4. Make sure the absorber canisters are filled with CO₂ absorbent. Consult the absorbent manufacturer's literature for information on what signs to expect when the absorbent is exhausted. Replace the absorbent when it appears exhausted. Make sure that the color change represents the absorbent's true state of depletion and is not due to regeneration after a rest period. Flushing the anesthesia machine continuously with 100% oxygen for at least one minute before the first case of the day is recommended.

Remove accumulated absorbent dust and water from the absorber dust cup.

WARNING: Absorbent is caustic and is a strong eye, skin, and respiratory tract irritant. When emptying the absorber dust cup, take care not to spill its caustic contents.

NOTE: When changing the CO₂ absorbent, take care not to chip or crack the absorbent canister. Check the canister for signs of damage, especially along the rim, before reinstallation.

5. Close all vaporizers and flow control valves. Check for free gas passage in the patient breathing system. Wear a surgical mask to inhale and exhale through the breathing system (each limb individually, if possible). Verify the unidirectional flow in each limb and then reconnect the tubing.

APL Valve

- *6. Check the APL valve to be sure it can relieve excess gas from the breathing system into the scavenger system.

To check the APL valve's flow resistance:

- A. Set the manual/automatic selector valve to BAG.
- B. Remove the bag from the swivel arm bag mount.
- C. Interconnect the 22 mm ports of the inspiratory and expiratory valves with a 22 mm hose.
- D. Completely open the APL valve by turning the control knob fully counterclockwise to its stop position.
- E. Turn the SYSTEM POWER switch to ON.
- F. Open the oxygen flow control valve to a flow of 8 l/min.
- G. Occlude the bag mount opening and watch for a pressure increase on the breathing system pressure gauge. This pressure increase must not exceed 3 cmH₂O.

**Breathing System
Leak Test**

7. Perform a breathing and fresh gas delivery system pressure test. This test detects leaks from the patient breathing system and fresh gas delivery system.

To perform the test:

- A. Close all flow control valves on the anesthesia machine.
- B. Turn the SYSTEM POWER switch to the STANDBY position.
- C. Turn the vaporizers to 0% concentration.
- D. Interconnect the 22 mm ports of the inspiratory and expiratory valves with a 22 mm breathing hose.
- E. Set the manual/automatic selector valve to BAG.
- F. Close the APL valve by turning the knob fully clockwise to its stop position.
- G. Check that the breathing pressure gauge is on 0.

Section 4

Preuse Checkout

- H. Attach the supplied test terminal to the breathing bag mount.
- I. Connect a sphygmomanometer squeeze bulb (available from North American Dräger) to the hose barb on the test terminal.
- J. Pump the squeeze bulb by hand until the breathing system pressure gauge indicates pressure of at least 50 cmH₂O (not to exceed 80 cmH₂O).
- K. Observe the pressure drop at the breathing system pressure gauge. When the pressure is at 50 cmH₂O, begin counting seconds. The pressure must not drop more than 20 cmH₂O in 30 seconds.

Scavenger System

- *8. Verify the performance of the scavenger system.

To test the open reservoir scavenger system:

- A. Make sure a 19 mm scavenger hose is connected between the ventilator relief valve and the scavenger interface.
- B. Make sure a 19 mm scavenger hose is connected between the APL valve on the absorber and the 19 mm hose terminal on the back of the absorber pole.
- C. Make sure a 19 mm scavenger hose is connected between the bottom of the absorber pole and the scavenger interface.
- D. Check for moisture accumulation in the breathing and scavenger hoses. Remove any moisture found.
- E. Verify the safe performance of the open reservoir scavenging system. With the scavenging system properly installed and operating, test for positive and negative pressure relief.

To test for negative pressure relief:

- F. Connect a vacuum hose to the DISS threaded terminal on the left-hand side of the scavenger (or attach a wall suction hose onto the adapter's hose-barb fitting).
- G. Short-circuit the absorber's inspiratory and expiratory valves with a 22 mm breathing hose.

- H. Set the absorber's manual/automatic selector valve to BAG.
- I. Turn the APL valve control knob fully counterclockwise.
- J. Verify that the suction waste gas disposal system is active.
- K. Adjust the scavenger needle valve to a flowmeter indication between the two white lines.
- L. Close all flow control valves on the anesthesia system.
- M. Occlude the absorber breathing bag terminal and observe the breathing pressure gauge on the absorber. The gauge should indicate only a negligible negative pressure (no lower than $-0.5 \text{ cmH}_2\text{O}$).

To test for positive pressure relief:

- N. Perform steps A through E.
- O. If the system is equipped with a PEEP valve, turn the PEEP valve control knob fully counterclockwise to its lowest setting.
- P. Adjust the scavenger needle valve to a completely closed position by turning it fully clockwise.
- Q. Open the oxygen flow control valve to a flow of 10 l/min and occlude the absorber breathing bag terminal.
- R. The flow of oxygen must now exit through the relief ports located on top of the canister. The absorber system's breathing pressure gauge must indicate a pressure less than 5 cm H_2O .
- S. After the test, adjust the scavenger needle valve to a flowmeter indication halfway between the two white lines.

To test the scavenger interface for passive systems:

- A. Make sure a 19 mm scavenger hose is connected between the ventilator relief valve and the scavenger interface.
- B. Make sure a 19 mm scavenger hose is connected between the APL valve on the absorber and the 19 mm hose terminal on the back of the absorber pole.

Section 4

Preuse Checkout

- C. Make sure a 19 mm scavenger hose is connected between the bottom of the absorber pole and the scavenger interface.
- D. Check for moisture accumulation in the breathing and scavenger hoses. Remove any moisture found.
- E. Short circuit the absorber's inspiratory and expiratory valves with a 22 mm breathing hose.
- F. Set the absorber's manual/automatic selector valve to AUTO.
- G. If the system is equipped with a PEEP valve, turn the PEEP valve control knob fully counterclockwise to its lowest setting.
- H. Open the oxygen flow control valve to a flow of 10 l/min and occlude the 19 mm scavenger terminal labeled EXHAUST.
- I. After the ventilator bellows inflates, the flow of oxygen exits the system through the positive pressure safety relief valve. At this point, the absorber system's breathing pressure gauge must indicate a pressure of less than 10 cmH₂O.

Manual and Automatic Ventilation Systems

- *9. Test the ventilator.
 - A. Check for proper pressure and flow at the Y-piece during the inspiratory and expiratory phases. Turn the SYSTEM POWER switch and ventilator power switch to their ON positions. Place the manual/automatic selector valve in the AUTO position. Adjust the oxygen flow control valve to a 3 l/min flow. Set the ventilator frequency to 3 BPM, the I:E ratio to 1:2, and the tidal volume to about 1 liter. (If testing the Pediatric Bellows or Adult/Pediatric Bellows, adjust the tidal volume to 200 ml.)

Adjust the ventilator flow control to the maximum of the "low" zone on the flow gauge. Occlude the patient side of the Y-piece. Fill the ventilator bellows by pressing the oxygen flush button. Observe the breathing system pressure gauge as the ventilator cycles.

The pressure gauge must indicate a pressure over 30 cmH₂O when the bellows completes its downward travel. The pressure should not exceed 3 cmH₂O at the end of the expiratory phase when the bellows completes its upward travel.

- B. If the system is equipped with a PEEP valve, verify the PEEP valve's performance. Attach a breathing bag to the patient Y-piece with an appropriate adapter such as an NAD combination mask elbow with a 22 mm male fitting for the breathing bag and 15 mm male fitting for the Y-piece. With the manual/automatic selector valve in the AUTO position, set the ventilator to the preferred frequency.

Then adjust the PEEP valve to different values and observe the breathing system pressure gauge to verify performance. Turn the PEEP valve control knob fully counterclockwise to its lowest setting after the test is completed. Set the PEEP bypass switch to the PEEP OFF position.

Monitors

10. Check the alarm limit settings. The monitor alarm limits are automatically set to a default configuration when the SYSTEM POWER switch is turned on. Check these settings and adjust them if necessary. Alarm limits can be adjusted at the beginning of—or during—a procedure. Also, make sure that any external monitors (if any) are connected properly and that the alarms sound through the anesthesia machine's central audio annunciator.
- *11. Test the alarm functions for all monitors. Simulate alarm conditions and check for appropriate alarm signals.

System Flush

12. Flush the system with 100% oxygen by pressing the oxygen flush button.

Fresh Gas Oxygen Sensor Adapter Option Verification

13. If the optional fresh gas oxygen sensor adapter is installed, make sure the fresh gas hose connection is intact and not occluded. Verify that the oxygen analyzer is properly calibrated. (See *Operation - Oxygen Monitoring* "Calibrating the Oxygen Sensor" in Section 5 for more information.) When removing the oxygen sensor during calibration, insert the oxygen sensor port plug into the fresh gas adapter port.

Section 4

Preuse Checkout

Final Position

14. When the daily checkout procedure is complete, verify that:
 - A. all vaporizers are off (the handwheels are set to zero)
 - B. the APL Valve is open (fully counterclockwise)
 - C. the manual/automatic switch is set to BAG
 - D. all flowmeters indicate 0 (or minimum)
 - E. the patient suction is level adequate
 - F. the breathing system is ready to use (the bag is in place and all hoses are connected properly)

Overview

The Narkomed 2C is a continuous flow anesthesia system with pneumatic circuitry for mixing and delivering gases and anesthetic agent vapor. The pneumatic system can deliver up to four gases and one anesthetic agent simultaneously. Oxygen and nitrous oxide are standard on all machines. Available optional gases include air, carbon dioxide, and oxygen-helium (heliox). Up to three vaporizers can be mounted on the machine. Available vaporizers are for halothane, enflurane, isoflurane, sevoflurane, and desflurane.

Connecting the Pipeline Gas Supply

Gas from the hospital pipelines enters the Narkomed 2C through hoses connected to indexed inlets located on the side of the flowmeter housing. Depending on the country's standards and regulations, the available inlets are Diameter-Indexed Safety System (DISS) inlets (body or nut fitting), or National Institute for Standards and Technology (NIST) inlets.

To connect a pipeline supply:

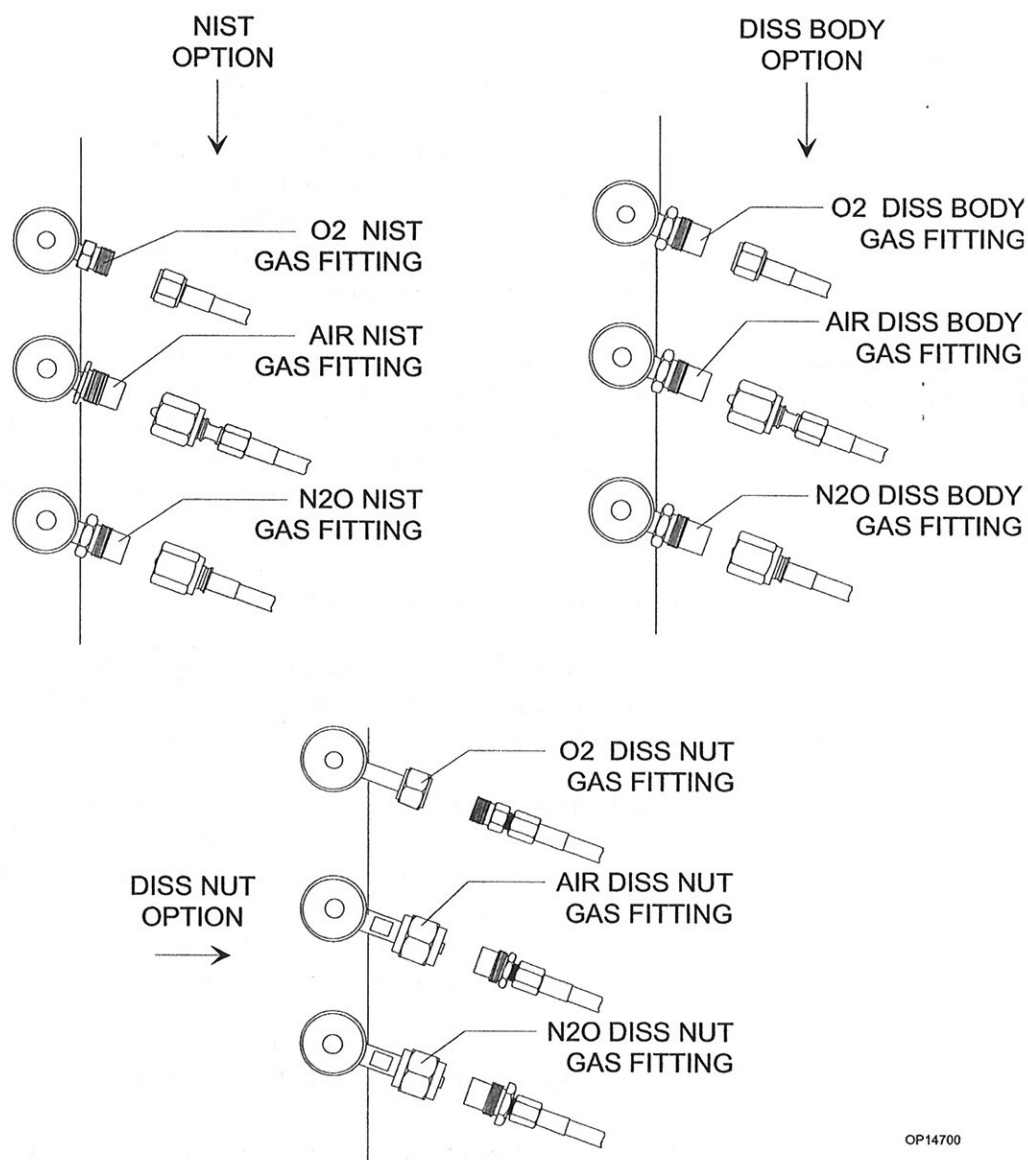
1. Connect the gas fitting on the supply hose to the corresponding gas fitting on the side of the flowmeter housing. Use a wrench to tighten the hex nut.

WARNING: Carefully check hoses each time you connect a machine to a wall or ceiling outlet to ensure that both ends of the hose are indexed for the same gas. Pipeline delivery hoses used between wall outlets and anesthesia machines have caused accidents when an oxygen fitting was placed on one end of the hose and a nitrous oxide fitting on the other end.

2. Connect the other end of the supply hose to the appropriate functioning hospital pipeline supplies.
3. Check the pipeline pressure gauge on the front of the Narkomed 2C for sufficient pipeline pressure (50-55 psi).

Section 5 - Operation

Gas Delivery System



OP14700

Connecting the Gas Cylinders

When attaching a cylinder, make sure that only one washer is installed between the cylinder and the yoke gas inlet. Using multiple washers can compromise the pin-indexed safety system. Be sure to verify the integrity of both index pins when installing a new cylinder.

To connect a gas cylinder to its yoke:

1. Place a new washer on the seat of the yoke gas inlet connection.

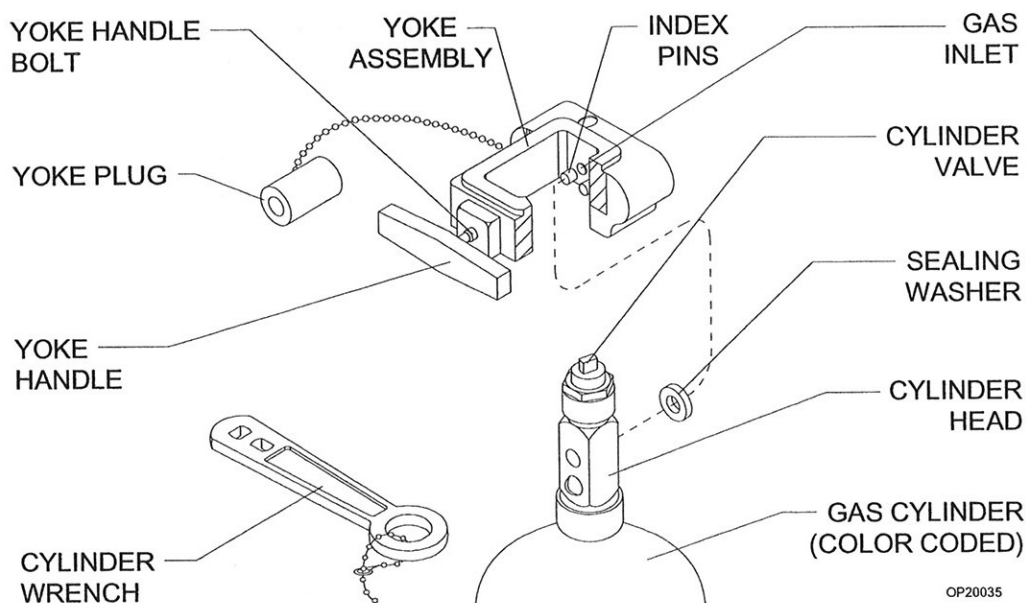
WARNING: Use only one cylinder washer for each yoke. Using more than one washer could cause cylinder gas leakage and compromise the pin-indexing system.

Section 5 - Operation Gas Delivery System

2. Verify that the two index pins below the gas inlet are intact.

WARNING: Check cylinder yokes for the presence of two index pins each time you attach a cylinder to the machine.

3. Insert the head of a gas cylinder with matching gas into the yoke from below, so the gas outlet and indexing holes on the cylinder head face the gas inlet and indexing pins on the yoke assembly.
4. Engage the indexing holes with the index pins. Screw the yoke handle clockwise against the cylinder head, so the point of the yoke handle bolt is aligned with the countersunk recess on the back of the cylinder head.
5. Verify that the sealing washer is in place, that the index pins are engaged, and that the cylinder hangs vertically. Tighten the handle securely.



OP20035

Section 5 - Operation

Gas Delivery System

Connecting the Fresh Gas Hose

To connect the fresh gas hose, pull out the fresh gas locking bar located on the front of the Narkomed 2C to its extended position. Insert the 15 mm male fitting on the fresh gas hose into the 15 mm female terminal. Release the spring-loaded locking bar over the fitting, allowing it to "lock" the fitting into place.

WARNING: Do not pinch or kink the fresh gas hose leading from the fresh gas outlet to the absorber.

Adjusting the Gas Flow

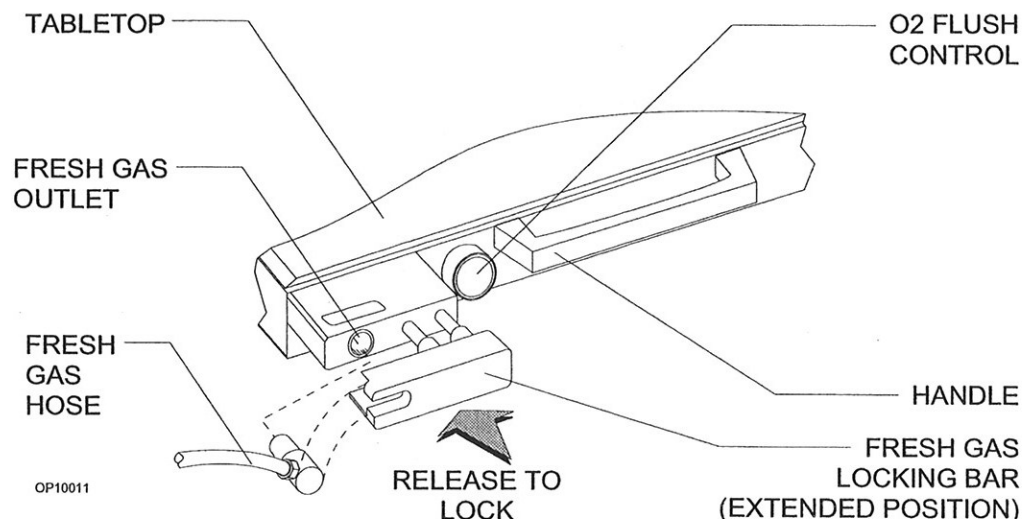
To adjust the gas flow:

1. Turn the flow control knob located below the fine flowmeter tube for the preferred gas. Turning the valve knob counterclockwise increases flow. Turning the knob clockwise decreases flow.
2. While adjusting the flow control knob, observe the flow rate. Flow rate is indicated by the flowmeter scale reading at the center of the float.

CAUTION: The flow of oxygen cannot be completely shut off (see "Minimum Oxygen Flow" in *Section 2 - General Description*). Do not force the oxygen flow control knob past the zero stop to shut off the minimum flow. Forcing the knob can damage the valve seat.

Using the Oxygen Flush

To use the oxygen flush, press the oxygen flush button, located on the front of the machine, for a few seconds. This introduces an unmetered flow of pure oxygen into the breathing circuit at a rate of about 55 l/min.



Overview

The Vapor 19.1 adds an anesthetic gas to the fresh gas stream by producing a precisely metered amount of the vapor of a particular liquid anesthetic. The vaporizer is installed in the fresh gas line upstream of the patient breathing system (semi-closed, semi-open system).

WARNING: The vaporizer must not be connected downstream of the fresh gas outlet of the anesthesia machine.

For low flow (fresh gas flows lower than 250 ml/min) or closed system anesthesia, breathing circuit concentrations may differ considerably from the vaporizer setting. When performing anesthesia with low flow or closed system techniques, it is essential to monitor inspiratory and expiratory anesthesia concentration, oxygen concentration, expiratory volume, and airway pressure in the circuit.

The carrier gases used must be dry and free of oil and dust. The limits for moisture are as follows:

- dew point of oxygen $\leq 5^{\circ}\text{C}$
- dew point of air $\leq 5^{\circ}\text{C}$
- water contents of nitrous oxide $\leq 2\text{ mg/l}$

NOTE: For information on the Tec 6 desflurane vaporizer, refer to its instruction manual.

Filling Systems

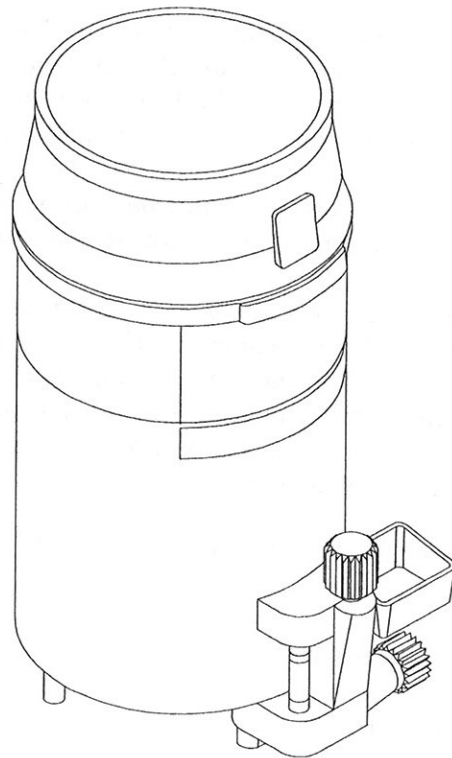
Two filling systems are available for the Vapor 19.1:

- open-funnel system
- key-indexed safety system

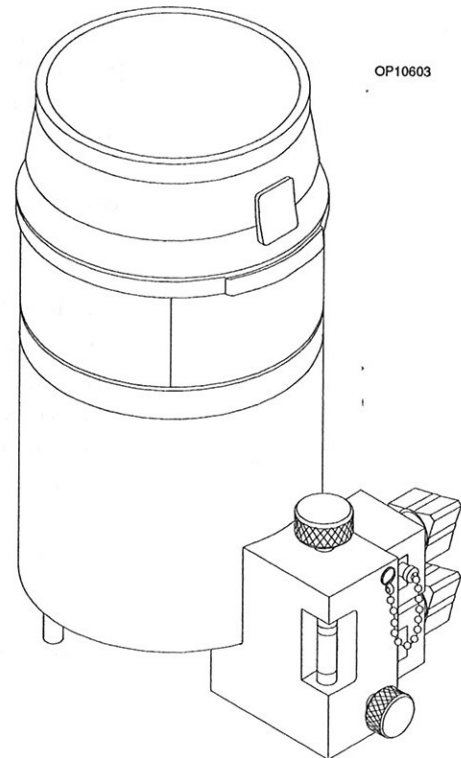
The following figure shows vaporizers with the two different types of available filling systems.

Section 5 - Operation

Vaporizer



OPEN FUNNEL FILLER



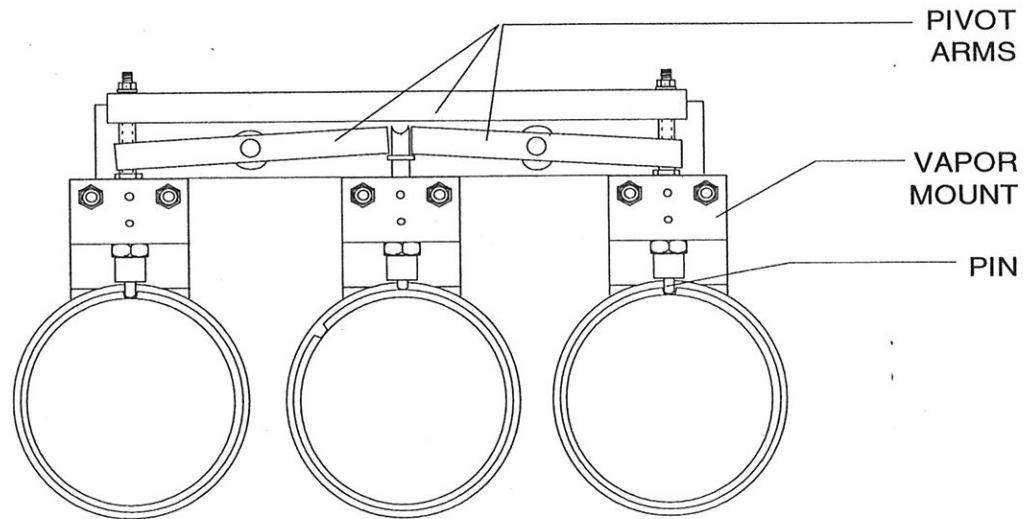
KEY INDEXED
SAFETY SYSTEM

North American Dräger Exclusion System

A cam and lever exclusion (interlock) system incorporated into the vaporizer bank prevents more than one vaporizer from being activated at a time. The exclusion system requires all unused vaporizers to be locked in their zero percent positions.

WARNING: Only one vaporizer can be activated at a time. If the exclusion system permits simultaneous activation of two or more vaporizers and the anesthesia machine is turned on, the Caution message **MULTI VAP SEL** appears on the remote display. Do not use the anesthesia machine under these circumstances. Contact a North American Dräger qualified technical service representative for adjustment.

Section 5 - Operation Vaporizer



Operating the Vaporizers

Before each case, check the following items.

1. Make sure the vaporizer contains a sufficient amount of anesthetic agent as indicated in the sight glass.
2. Make sure the filling and draining valves are closed. For vaporizers with the key-indexed safety system, make sure the sealing plug is properly fitted and locking screw is tight.
3. Make sure the handwheel is set to 0 (zero-point interlock) and that the button is engaged.

NOTE: The Narkomed 2C is configured internally with information about what types of vaporizers are located in the vaporizer positions (left, center, and right). If a vaporizer is installed and the Narkomed's internal configuration is not set, the Advisory message VAP NOT CONFIG appears on the remote display. If this happens, contact a North American Dräger qualified technical service representative to configure the system.

Turning the Vaporizer On

To turn the vaporizer on:

1. Adjust the fresh gas flow.
2. Turn the vaporizer handwheel to the preferred anesthetic concentration. Do not set the handwheel between 0 and 0.2% volume concentration (0.3% volume with Enflurane Vapor). This part of the handwheel actuates the on/off switch and cannot be calibrated.

Section 5 - Operation

Vaporizer

NOTE: After turning on the vaporizer, activate the scavenger system to collect and remove vented gas from the operating room.

Turning the Vaporizer Off

To turn the vaporizer off, turn the vaporizer handwheel to 0 (zero-point interlock) and make sure the button engages. Do not interrupt the fresh gas flow until you have turned off the vaporizer.

NOTE: If you will not be using the vaporizer for a long period of time (longer than one month), or if the vaporizer will be removed from the anesthesia machine, drain the anesthetic agent from the vaporizer.

Filling the Vaporizer

Before filling a vaporizer, identify the filling system on the device as one of the following:

- open-funnel system
- key-indexed safety system

When you have identified the filling system, locate the appropriate procedure and read it entirely before filling the device.

WARNING: Do not inhale anesthetic vapors while filling the vaporizer. Uncontrolled inhalation of anesthetic vapors is injurious to health.

Before filling a vaporizer, note the expiration date of the anesthetic agent. Do not use anesthetics beyond the date of expiration.

CAUTION: Each vaporizer is specifically designed and calibrated for one particular anesthetic agent. Do not fill a vaporizer with any anesthetic other than the particular agent indicated on the vaporizer.

- The Isoflurane vaporizer must be filled with Isoflurane only (trade names: Forane, Forene, Aerrane).
- The Enflurane vaporizer must be filled with Enflurane only (trade names: Ethrane, Alyrane).
- The Halothane vaporizer must be filled with Halothane only (trade name: Fluothane).
- The Desflurane vaporizer must be filled with Desflurane only (trade name: Suprane).
- The Sevoflurane vaporizer must be filled with Sevoflurane only (trade name: Ultane).

Section 5 - Operation Vaporizer

Do not use a vaporizer that has been inadvertently filled with the wrong anesthetic. Drain the vaporizer and return the device to North American Dräger's Technical Service Department.

Filling the Vaporizer During a Case

If you must fill the vaporizer during a case, be extremely careful. While fresh gas is flowing and the vaporizer is turned on, the vaporizing chamber is pressurized. **Do not** open the inlet valve (or the screw of the safety filling device) under these circumstances—liquid anesthetic may gush out. To safely add anesthetic agent while the machine is in use, depressurize the vaporizer by setting the handwheel to 0 (zero-point interlock). Make sure the button engages in the locked position. Allow at least 5 seconds for the vaporizing chamber to depressurize, then use the appropriate procedure to add the anesthetic agent.

WARNING: The vaporizer handwheel must be set to 0 (zero-point interlock) before the vaporizer can be filled.

Filling Vaporizer With Open-Funnel System

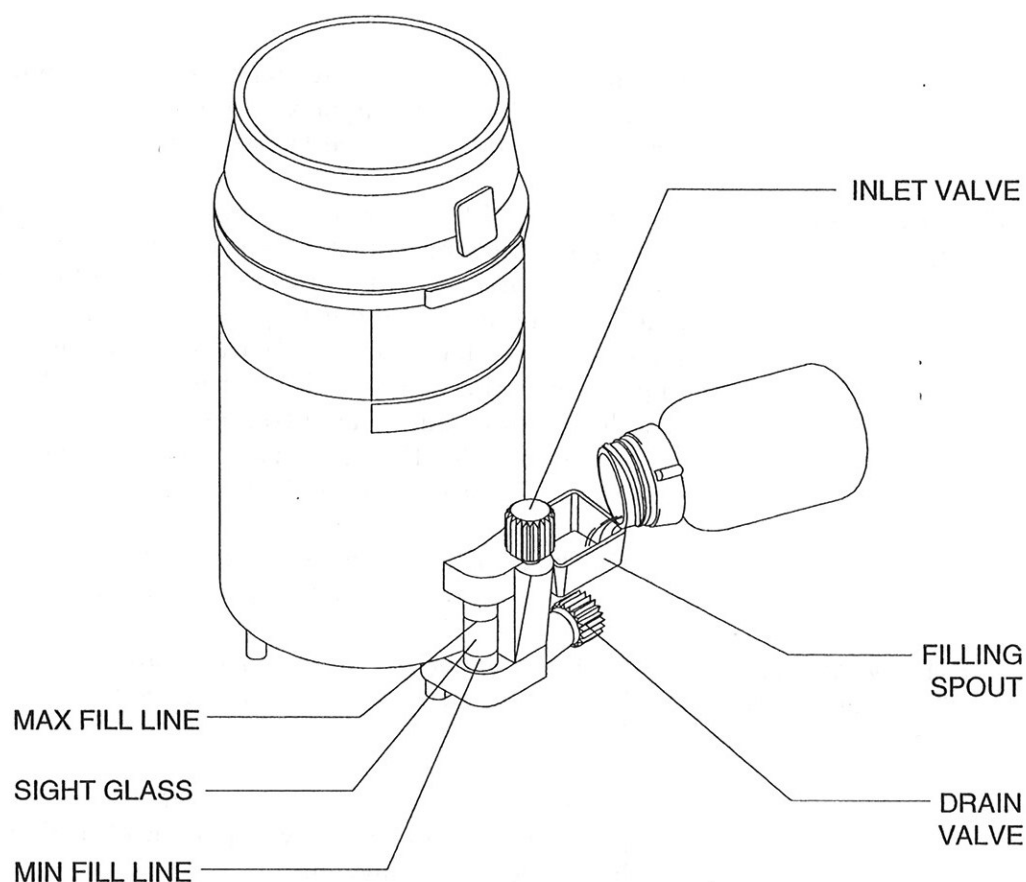
1. With the vaporizer in an upright position, turn the handwheel to 0 (zero-point interlock) and make sure the button engages in the locked position.
2. Make sure the filling spout is clean. To remove dust or other particles, use a clean, dry paper towel. Do not use water or other liquid cleaning solutions.
3. Make sure the drain valve is closed.
4. Open the inlet valve by turning it counterclockwise about three turns.

CAUTION: Be sure to fill the vaporizer in an upright position. Filling the vaporizer in a tilted position can cause overfilling. Overfilling can cause the anesthetic concentration rate to be higher or lower than the handwheel setting.

5. Remove the cap from the anesthetic agent bottle. Check the sealing edge of the bottle for chipping or other damage. **Do not** use if damaged.

Section 5 - Operation

Vaporizer



6. With the vaporizer in an upright position, pour the anesthetic agent into the funnel. As you pour the agent, observe the level through the sight glass. Fill the vaporizer to the MAX mark and close the inlet valve.

NOTE: The capacity of the vaporizer is approximately 140 cm³ with wet wick, and approximately 200 cm³ with dry wick.

7. After filling, check the level at the sight glass. When the vaporizer is in an upright position, the level must not exceed the MAX mark.

If the vaporizer is inadvertently overfilled (MAX mark exceeded), drain the excess anesthetic. For information on draining the vaporizer, refer to "Draining Vaporizer with Open-Funnel Spout" later in this section.

8. Place the cap back on the bottle.

Section 5 - Operation Vaporizer

Filling Vaporizer With Key-Indexed Safety System

The key-indexed safety system uses a matching assembly to prevent inadvertent use of the wrong agent in a Vapor 19.1 device. To fill a vaporizer with key-indexed safety system, you must have the appropriate keyed bottle adapter for the anesthetic agent.

1. With the vaporizer in an upright position, turn the handwheel to 0 (zero-point interlock) and make sure the button engages in the locked position.
2. Remove the cap and seal from the anesthetic agent bottle. Check the sealing edge of the bottle for chipping or other damage. **Do not** use the bottle if it is damaged.
3. Attach the keyed bottle adapter to the keyed collar on the bottle. Screw the parts together tightly to form an airtight seal.
4. Turn the filler port lock screw counterclockwise and remove the filler port plug from the filler port.
5. Insert the keyed adapter into the filler port of the vaporizer so that the two holes in the adapter face the Teflon seal surface of the filler port. Bend the filler tube so that the liquid level in the bottle is below the filler port. Adjust the plastic tubing to avoid kinks.
6. Turn the filler port lock screw clockwise to hold the adapter against the Teflon seal.
7. Open the filler valve by turning the knob counterclockwise two or three turns.

CAUTION: Be sure to fill the vaporizer in an upright position. Filling the vaporizer in a tilted position can cause overfilling. Overfilling can cause the anesthetic concentration rate to be higher or lower than the handwheel setting.

8. Lift the bottle above the filler port level, avoiding kinks in the plastic tube. The liquid should begin flowing within 10 seconds after raising the bottle. If liquid does not begin to flow within 10 seconds, move the bottle below filler port level and raise it above the filler port again. (This allows any air trapped in the tubing to escape.) Repeat as necessary to start the flow.

Section 5 - Operation

Vaporizer

9. Watch the sight glass while the vaporizer is filling, and close the filler valve when the liquid level reaches the lower of the two marks at the upper end of the sight glass. The lower mark is the FULL mark. The upper mark is the OVERFLOW mark.

NOTE: The capacity of the vaporizer is approximately 140 cm³ with wet wick, and approximately 200 cm³ with dry wick.

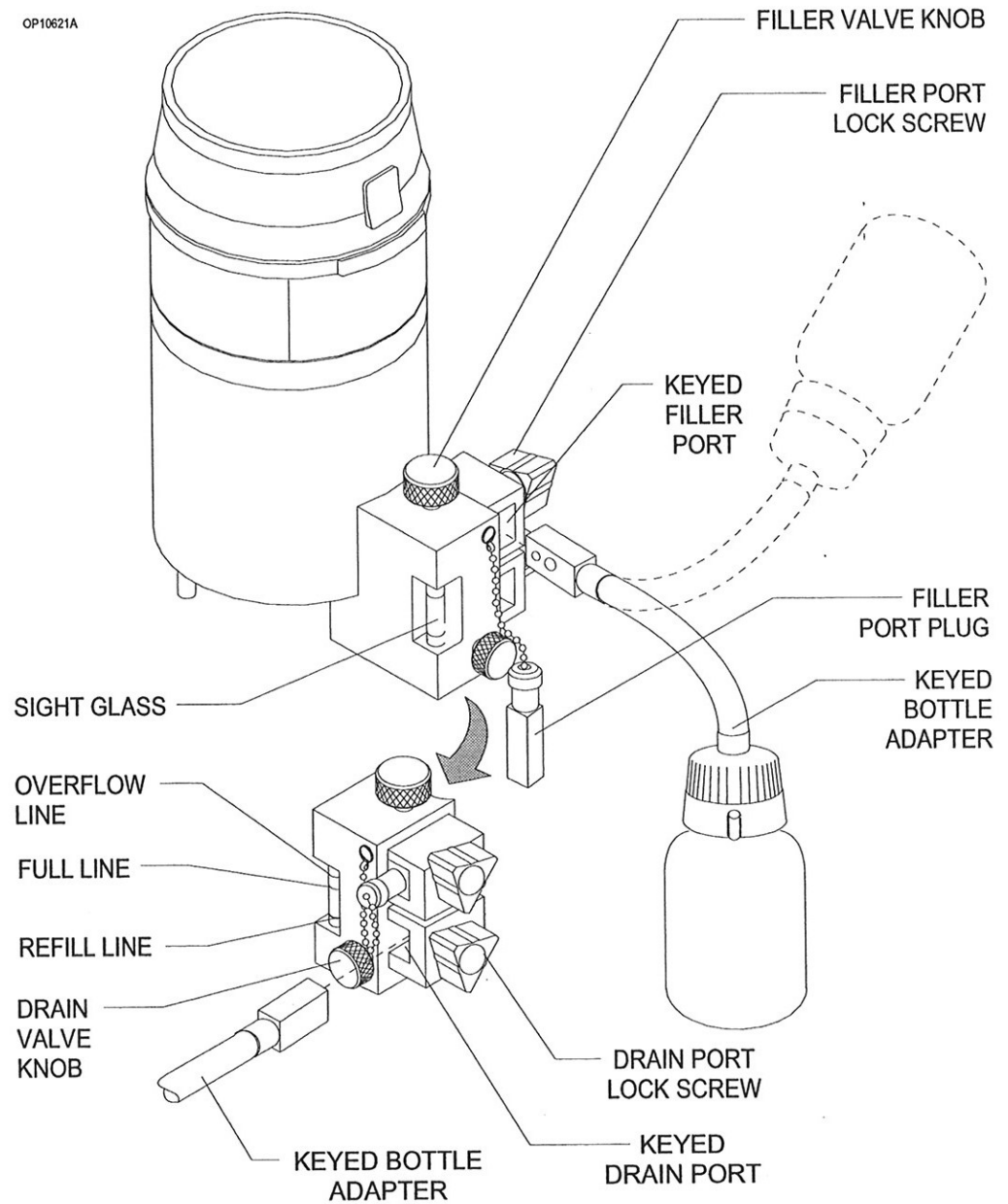
10. Remove the adapter from the filler port.
11. Allow excess liquid to drain from the filler port.
12. Fully insert the filler port plug in the filler port and tighten the plug in place by turning the lock screw clockwise.
13. After filling, check the level at the sight glass. When the vaporizer is in an upright position, the level must not exceed the FULL mark.

If the vaporizer is inadvertently overfilled (FULL mark exceeded), drain the excess anesthetic. For information on draining the vaporizer, refer to "Draining Vaporizer with Key-Indexed Safety System" later in this section.

14. Remove the adapter from the bottle.
15. Place the cap back on the bottle.

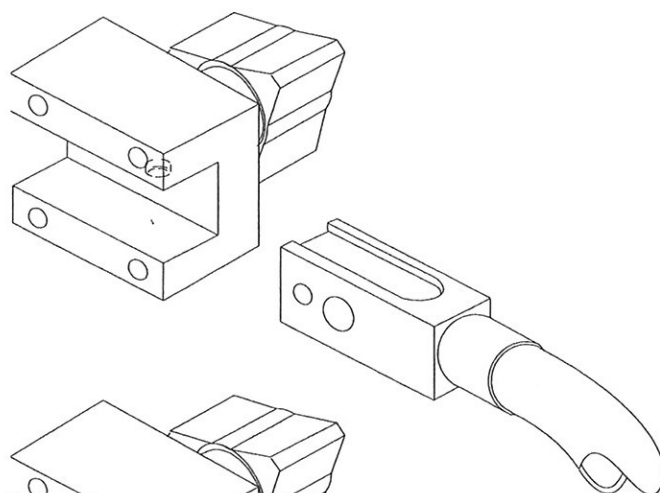
Section 5 - Operation Vaporizer

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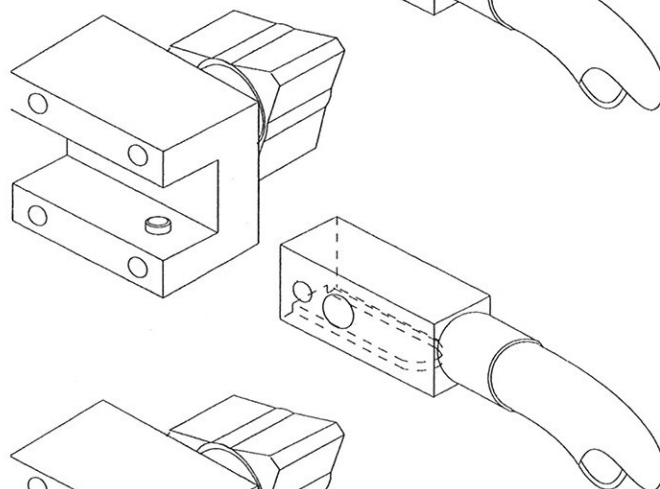


Section 5 - Operation

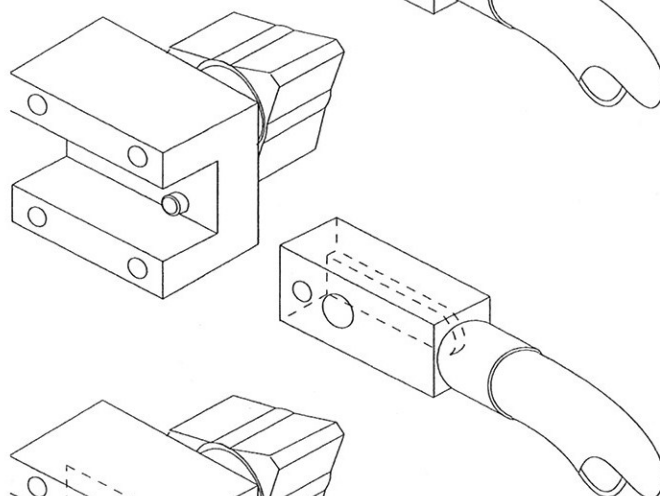
Vaporizer



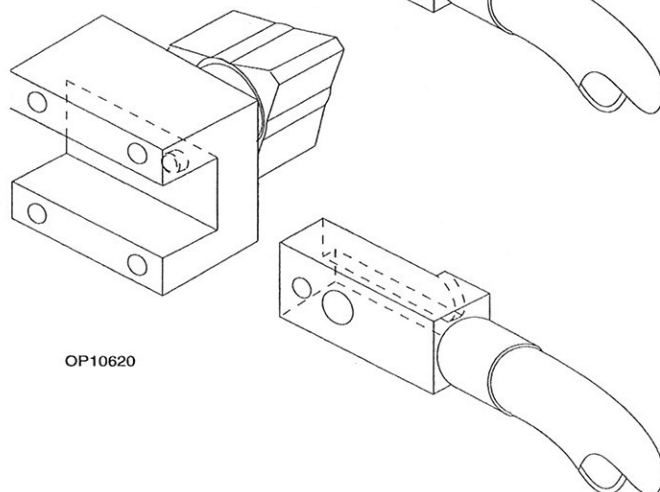
HALOTHANE
(RED)



ENFLURANE
(ORANGE)



ISOFLURANE
(PURPLE)



SEVOFLURANE
(YELLOW)

OP10620

Draining the Vaporizer

Before draining a vaporizer, identify the filling system on the device as one of the following:

- open-funnel system
- key-indexed safety system

When you have identified the filling system, locate the appropriate procedure and read it entirely before draining the device.

WARNING: Do not inhale anesthetic vapors while draining the vaporizer. Uncontrolled inhalation of anesthetic vapors is injurious to health.

Draining Vaporizer With Open-Funnel System

1. With the vaporizer in an upright position, turn the handwheel to 0 (zero-point interlock) and make sure the button engages in the locked position.
2. Place an empty anesthetic-specific bottle under the drain hole of the filling spout. Mark the bottle to indicate that it contains a previously used anesthetic agent.

WARNING: The vaporizer handwheel must be set to 0 (zero-point interlock) before the vaporizer can be drained.

3. Open the drain valve by turning it counterclockwise about three turns. Do not unscrew the valve completely.
4. Close the drain valve.

WARNING: Do not reuse drained agent.

5. Place the cap back on the bottle and dispose of the bottle in accordance with approved hospital procedures.

Section 5 - Operation

Vaporizer

Draining Vaporizer With Key-Indexed Safety System

The key-indexed safety system employs a matching pin-and-socket assembly to prevent inadvertent use of the wrong agent in a Vapor 19.1 device. To drain a vaporizer with key-indexed safety system valves, you must have the appropriate keyed bottle adapter for the anesthetic agent.

1. With the vaporizer in an upright position, turn the handwheel to 0 (zero-point interlock) and make sure the button engages in the locked position.
2. Attach the keyed bottle adapter to the appropriate empty bottle. Tighten to assure airtight seal. Mark the bottle to indicate that it contains a previously used anesthetic.
3. Insert the bottle adapter fitting into the drain port of the vaporizer. The two holes in the adapter fitting must face the Teflon seal surface in the drain port.
4. Turn drain port lock screw clockwise to hold the adapter against the Teflon seal.

WARNING: The vaporizer handwheel must be set to 0 (zero-point interlock) before the vaporizer can be drained.

5. Hold the bottle below drain port level, and avoid kinking the plastic tube. Open the drain valve by rotating the knob counterclockwise. Allow the liquid to drain into the bottle until the vaporizer is empty. The vaporizer is empty when no anesthetic flows from the drain.
6. Close the drain valve and remove the adapter from the drain port.

WARNING: Do not reuse drained agent.

7. Place the cap back on the bottle and dispose of the bottle in accordance with approved hospital procedures.

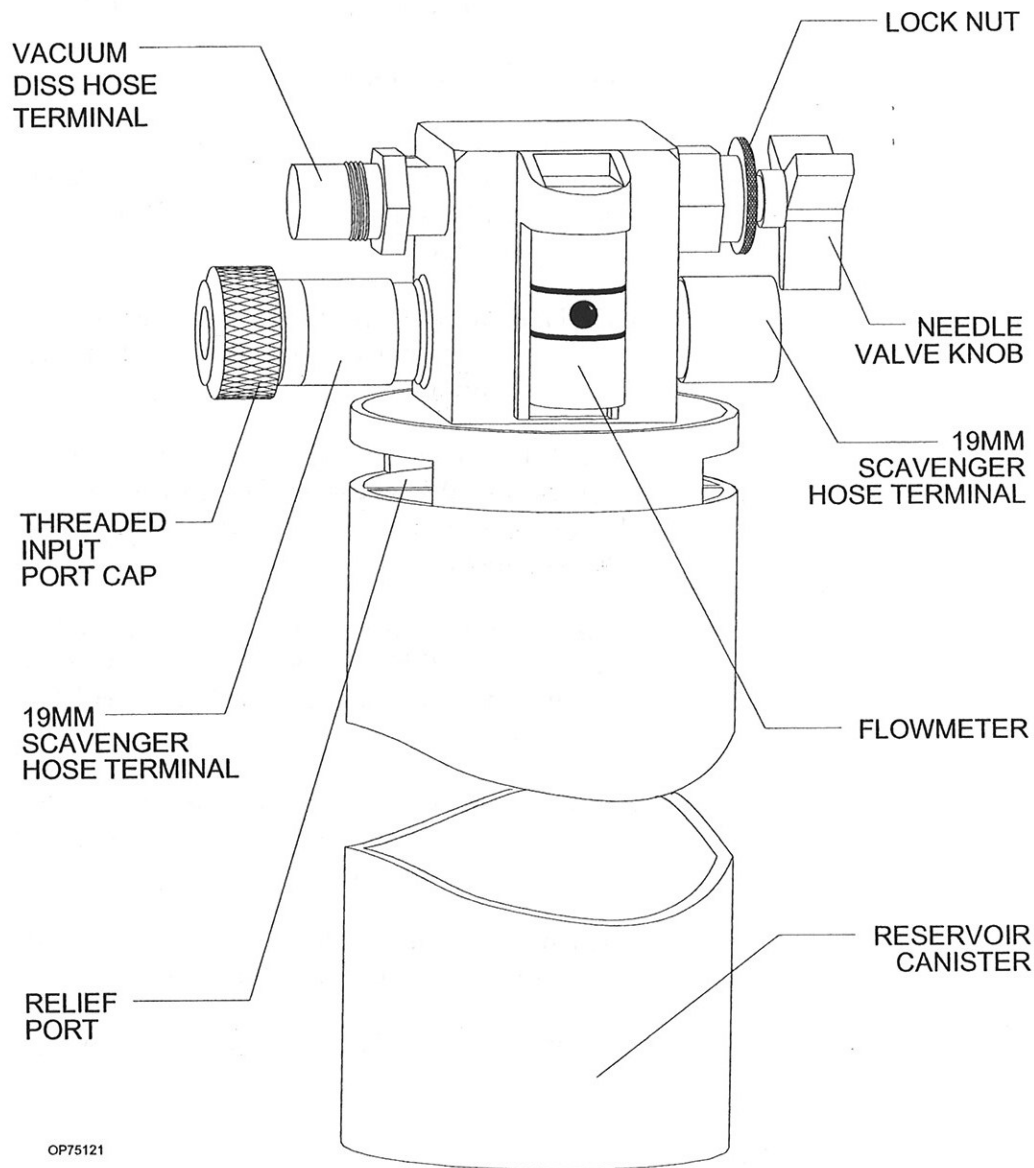
REFER TO SEPARATE MANUAL

REFER TO SEPARATE MANUAL

Section 5 - Operation Open Reservoir Scavenger

Overview

The open reservoir scavenger is intended for use with suction (vacuum) waste gas disposal systems. This scavenging approach applies a continuous suction to transfer waste gas from the scavenger to the disposal system. The open reservoir scavenger is an "open" system, which uses continually open relief ports to provide positive and negative pressure relief.



Section 5 - Operation

Open Reservoir Scavenger

Connecting the Open Reservoir Scavenger System

The open reservoir scavenger system is installed on the Narkomed 2C before shipping. The only thing you need to do before operating the scavenger is to make the hose connections.

CAUTION: Take special care not to accidentally force 19 mm scavenger hoses over 22 mm breathing hose terminals. Carefully follow the hose connection instructions for installing the scavenger and the absorber.

To connect the scavenger hoses:

1. Attach a 19 mm scavenger hose between the 19 mm terminal (marked SCAVENGER HOSE) on the bottom of the absorber pole and the 19 mm terminal (marked SCAVENGER HOSE) on the right side of the scavenger.

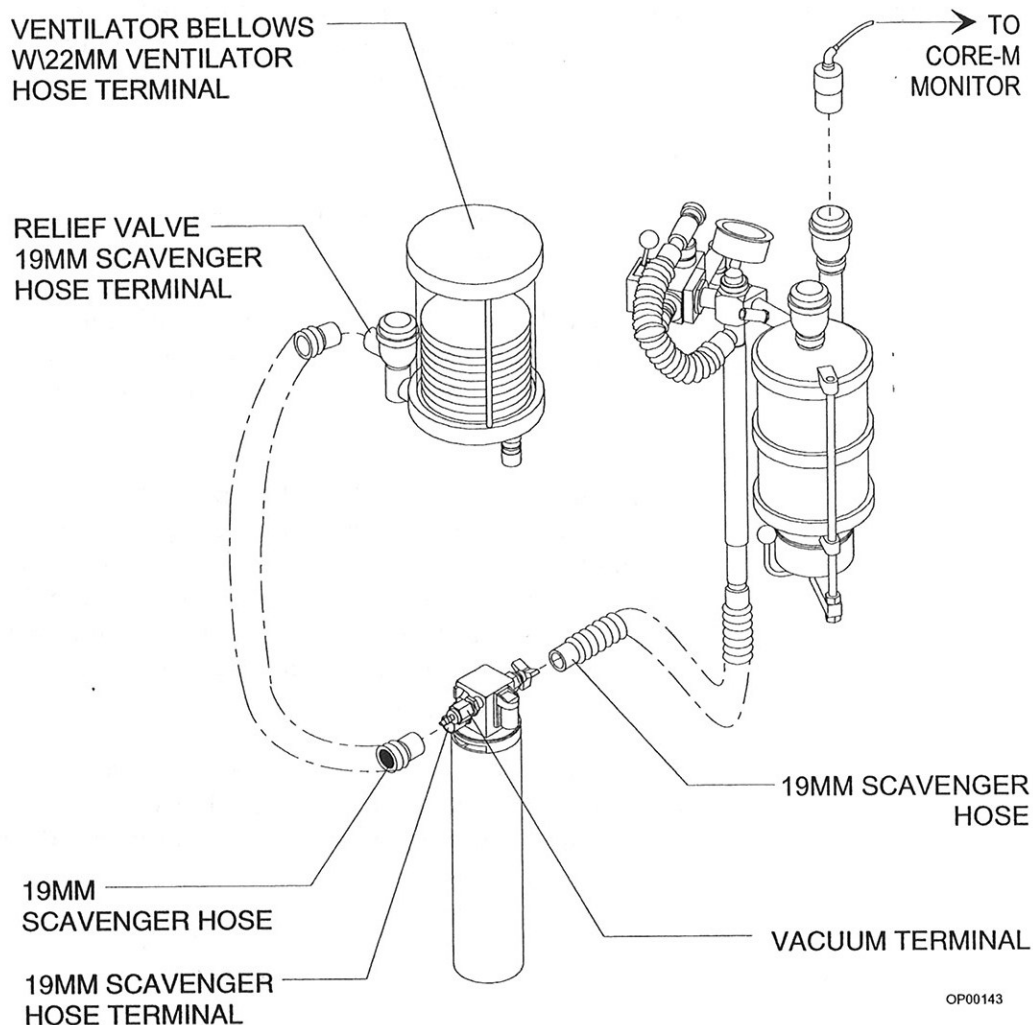
WARNING: Make sure the 19 mm scavenger hoses leading from the absorber are not pinched, kinked, or blocked in any manner.

2. Attach the short 19 mm scavenger hose between the 19 mm terminal (marked SCAVENGER HOSE) on the rear of the APL valve and the 19 mm terminal (marked SCAVENGER HOSE) on the rear of the absorber pole.
3. Attach another 19 mm scavenger hose between the 19 mm terminal (marked SCAVENGER HOSE) on the ventilator relief valve and the 19 mm terminal (marked SCAVENGER HOSE) on the left-hand side of the scavenger.

WARNING: Make sure the 19 mm scavenger hose leading from the ventilator relief valve is not pinched, kinked, or blocked in any manner.

4. Attach a wall suction hose between the wall suction outlet and the suction terminal (DISS or hose barb with adapter) on the scavenger.
5. Verify the proper functioning of the scavenger system.

Section 5 - Operation Open Reservoir Scavenger



Operating the Open Reservoir Scavenger System

Because the open reservoir scavenger's reservoir canister is open to the atmosphere, it does not require spring-loaded relief valves. If the waste gas flow rate from the patient breathing system exceeds the disposal system's suction flow rate, the canister initially accommodates excess waste gas. After excess waste gas fills the canister, waste gas then exits through the relief ports around the top of the canister. Thus, positive pressure does not build up within the patient breathing system.

CAUTION: Waste gas vented from the relief ports may contaminate the operating room. To prevent such contamination, be sure to adjust the needle valve properly.

If the disposal system's flow rate (suction) exceeds the waste gas flow rate from the patient breathing system, the disposal system draws room air through the relief ports. Thus, the disposal system does not apply a negative pressure to the patient breathing system.

Section 5 - Operation

Open Reservoir Scavenger

Adjusting the Needle Valve

You must properly adjust the waste gas flow rate to prevent waste gas contamination of the operating room. The needle valve wing nut regulates the waste gas exhaust flow.

To adjust the needle valve:

1. Attach all appropriate hoses and verify that the waste gas disposal system is active.
2. Turn the needle valve wing nut until the flowmeter indicates a flow halfway between the two white lines etched on the scavenger's flowmeter. This setting corresponds to a suction flow rate of about 25 l/min.

Depending on the fresh gas flow rate, the needle valve setting may have to be increased or decreased to settings either above or below the lines on the flowmeter. If the suction flow rate is set too low, waste gas will exit the canister through the relief ports around the top of the canister and contaminate the operating room. If the suction flow rate is too high, the waste gas disposal system's suction capacity will be needlessly depleted and the system will be noisy.

You may have to readjust the needle valve setting during a case. For example, a shared suction disposal system may provide a varying suction flow rate, depending on the number of users at any given time.

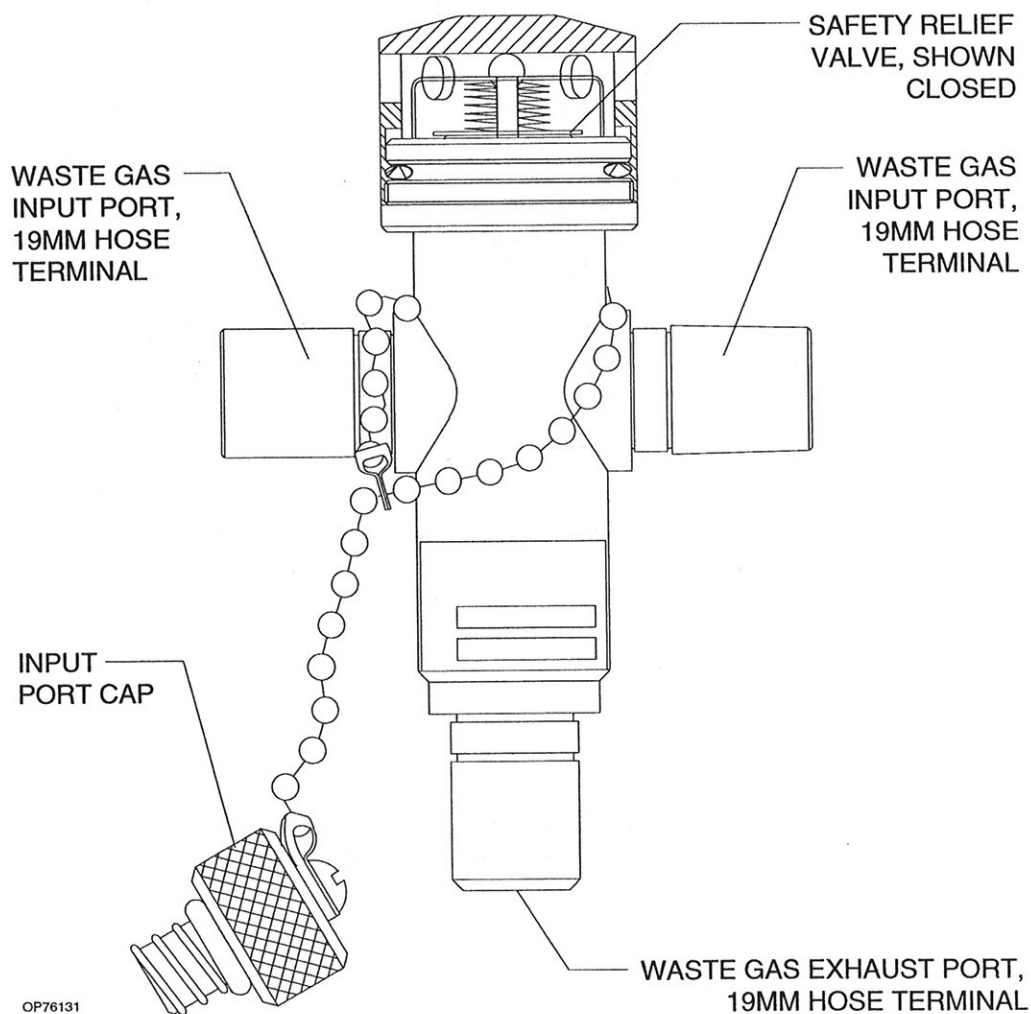
Section 5 - Operation

Scavenger Interface for Passive Systems

Overview

The scavenger interface for passive systems is intended for use with nonrecirculating HVAC systems (also called exhaust systems). This scavenging approach relies on the pressure of the waste gas itself to transfer the gas from the scavenger to the disposal system. The scavenger interface is a "closed" system, which uses spring-loaded valve for positive pressure relief.

WARNING: Do not use this device with a waste gas disposal system capable of applying a negative pressure to the scavenger interface (a suction or vacuum waste gas disposal system).



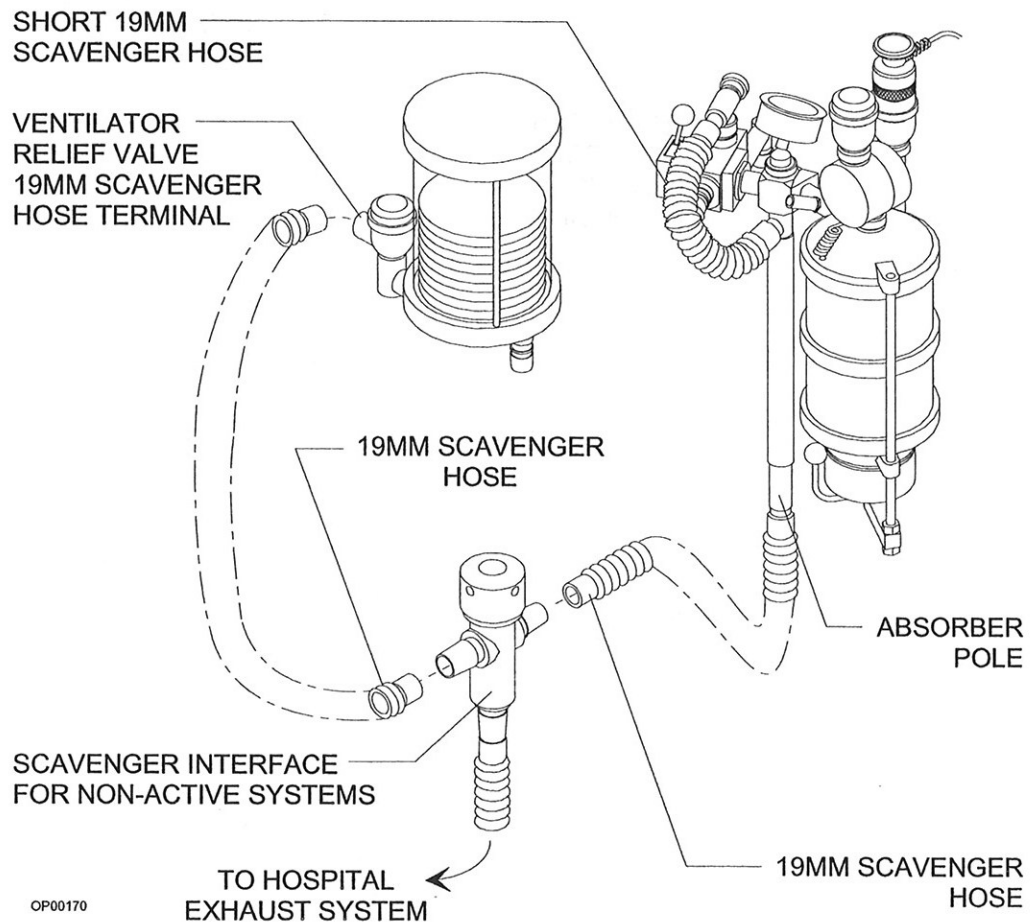
Section 5 - Operation

Scavenger Interface for Passive Systems

Operating the Scavenger Interface for Nonactive Systems

In a typical anesthesia circle system, waste gas exits from the breathing system APL or ventilator relief valves and passes through the scavenger to the exhaust system. If the hospital exhaust system stopped functioning (or if the path between the scavenger and the exhaust system becomes blocked), positive pressure would build up within the scavenging and breathing systems. To prevent such a harmful pressure build-up, the scavenger's positive pressure relief valve is set to open at a pressure of 5 cm H₂O. Waste gas then exits through the holes in the relief valve housing. Therefore, you do not have to adjust this scavenger. You must, however, make sure that hoses are properly connected and that the positive pressure safety relief valve is functioning.

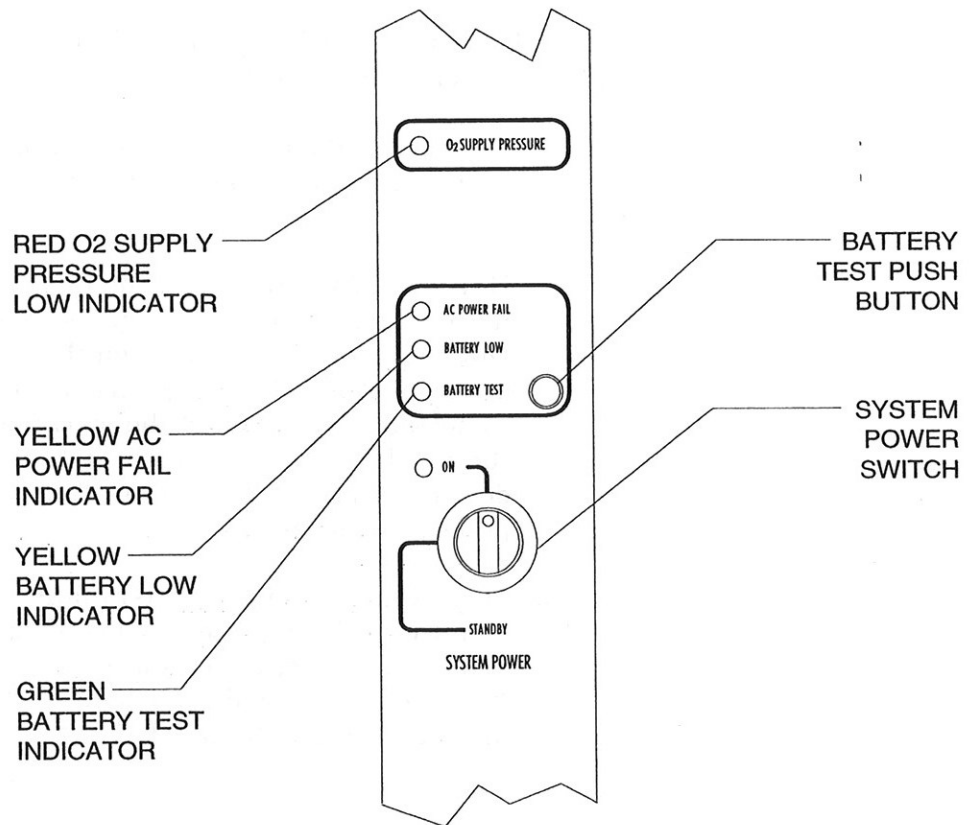
WARNING: The positive pressure relief valve must be inspected and cleaned (if necessary) at six month intervals.



Section 5 - Operation Main Switch Panel

Overview

The main switch panel, located between the ventilator bellows and flowmeter bank, incorporates the SYSTEM POWER switch and indicator lights for low O₂ supply pressure, AC power failure, and battery low alarms. These alarms are annunciated and displayed on the central alarm display.



OP20050

System Power Switch

The SYSTEM POWER switch on the Narkomed 2C has two positions: ON and STANDBY. In the ON position the gas (pneumatic) and electric power circuits are activated and the green LED indicator adjacent to the switch is illuminated. In the STANDBY position the gas supplies, the monitoring system, and all electrical power to the machine except the convenience receptacles and battery charging circuit are deactivated.

NOTE: The battery charging circuit and convenience receptacles are active whenever the power cable is attached to an active wall receptacle, regardless of the switch setting.

Section 5 - Operation

Main Switch Panel

Testing the Battery

The backup battery system shall be tested daily. To test the battery:

1. Turn the SYSTEM POWER switch to ON.
2. Remove the machine's power plug from the electrical outlet, and then press and hold the BATTERY TEST button.
3. If the battery is sufficiently charged, the green BATTERY TEST light illuminates after a short delay.

Usually, a fully charged battery can power the electrical components of the anesthesia machine for at least 30 minutes in the event of a power failure.

NOTE: During an AC power loss, the BATTERY LOW indicator is illuminated when the battery reserve approaches depletion. However, do not rely solely on this indicator for an assessment of battery capacity. If the backup battery becomes completely depleted and the machine does not have AC power, the BATTERY LOW indicator light has no source of power and does not function. Therefore, always remember to perform the preuse battery test.

To prevent premature battery failure, use backup battery power only during interruption of primary AC power. Do not start an anesthetic procedure on the anesthesia machine if the AC POWER FAIL indicator light or the BATTERY LOW indicator light is illuminated.

Overview

The AV2+ anesthesia ventilator is a volume preset, time cycled, pressure limited ventilator with electronic timing, pneumatic circuitry and independent controls for frequency, inspiratory to expiratory (I:E) ratio, inspiratory flow rate, tidal volume, and inspiratory pressure limit.

Pneumatic power (bellows drive gas) to the ventilator is supplied through the hospital pipeline supply or through reserve cylinders on the anesthesia machine. The pressure of the supply gas must be between 40 and 60 psi. The ventilator will not function if this pressure drops below 32 psi. Electrical power is supplied by the Narkomed 2C's AC power source, or, in event of AC power failure, by the backup battery. A fully charged battery can power the ventilator for approximately 30 minutes.

The anesthesia ventilator is designed for use with a North American Dräger absorber system, which incorporates a manual/automatic selector valve. This valve allows you to select either the breathing bag and adjustable pressure limiter (APL) valve for manual ventilation, or the ventilator bellows for automatic ventilation.

During automatic ventilation, the manual/automatic selector valve isolates the absorber's APL valve from the breathing system. To compensate for the continuous introduction of fresh gas into the breathing system, the ventilator incorporates a relief valve mounted behind the bellows chamber.

When the bellows is completely filled, any excess gas in the system is released to the scavenging system through the ventilator relief valve. As in any ascending bellows, the force needed to overcome gravity acting on the bellows causes a positive end-expiratory pressure (PEEP) within the breathing system. For the Narkomed 2C, the PEEP is approximately 2 cmH₂O.

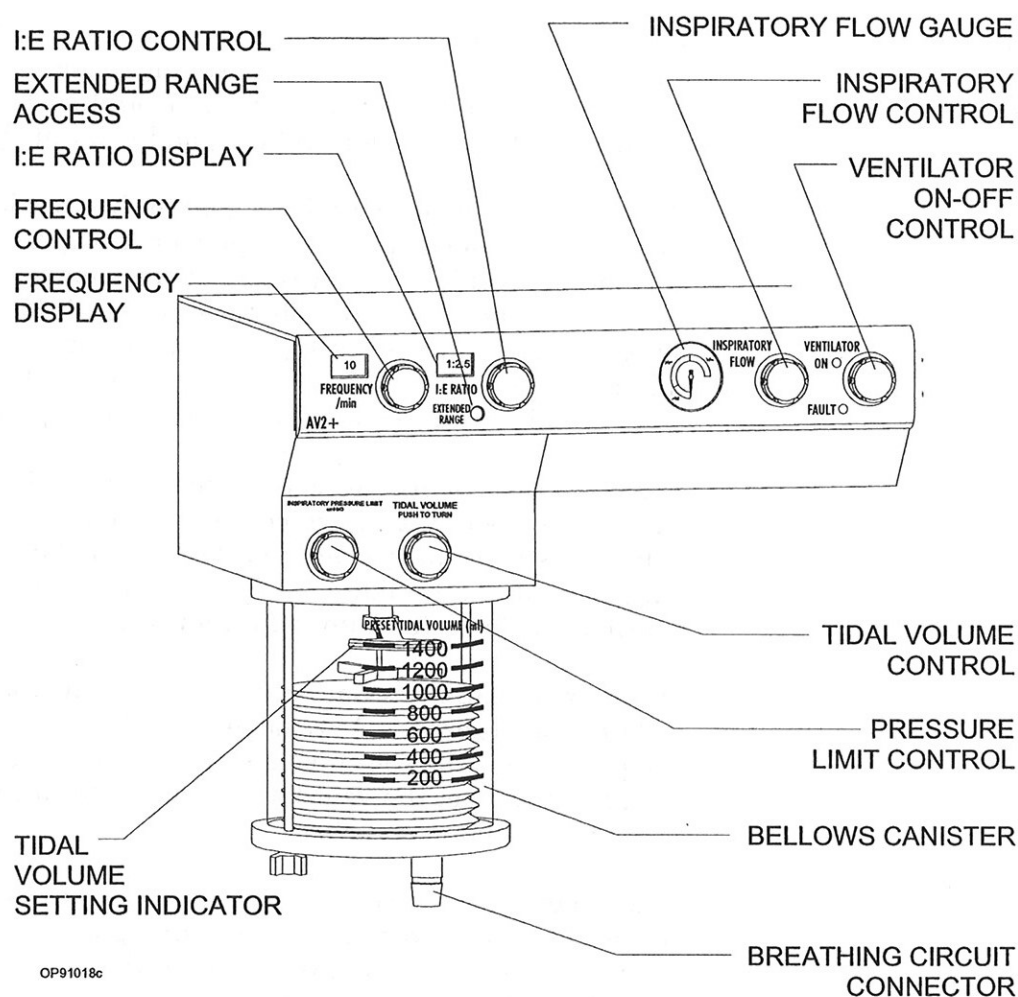
The monitoring system's breathing pressure and expiratory flow waveform displays can be used as an aid in adjusting the ventilator and establishing alarm criteria.

WARNING: Regardless of the indications of any alarm or monitoring device, patient chest movement shall be the primary indication of a securely connected, properly ventilated patient.

A front view of the AV2+ anesthesia ventilator is shown in the following figure.

Section 5 - Operation

AV2+ Anesthesia Ventilator



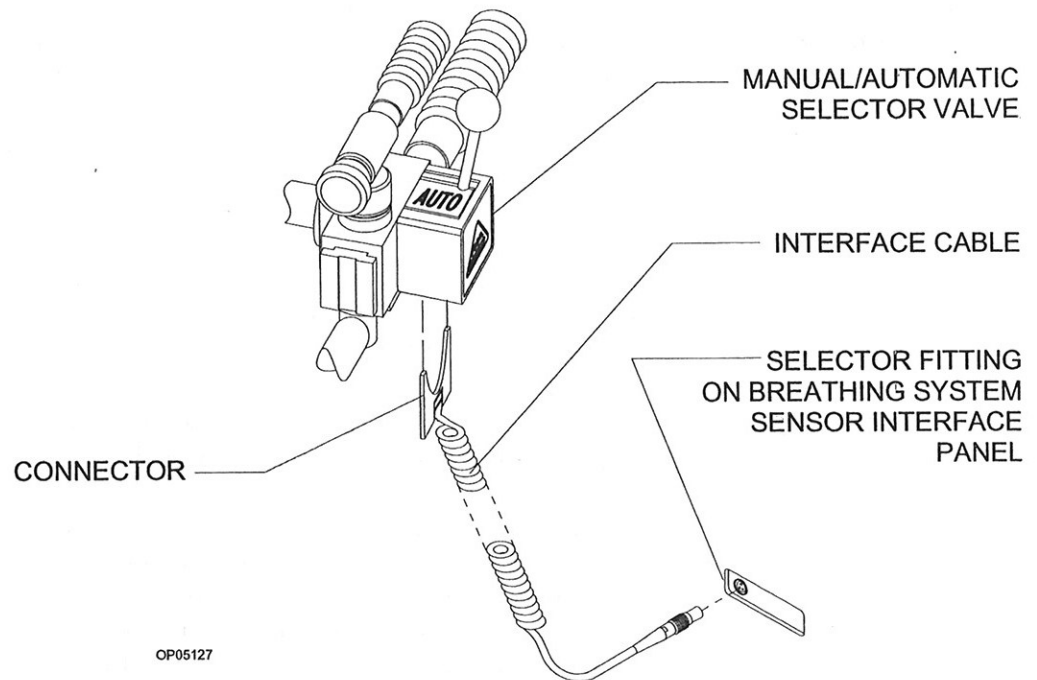
Activating the Ventilator

The ventilator can be activated by using the ventilator on/off control, or, optionally, by using the lever on the manual/automatic selector valve. The anesthesia machine's SYSTEM POWER switch must be set to ON in order for the ventilator to function.

NOTE: The selector valve lever can activate the ventilator only when the interface cable is connected between the manual/automatic selector valve and the SELECTOR fitting on the breathing system sensor interface panel (see the following illustration); when the interface cable is disconnected, the position of the selector lever has no effect on the ventilator.

Section 5 - Operation

AV2+ Anesthesia Ventilator



When the ventilator is activated, both pneumatic and electric power to the ventilator is turned on, and the monitoring system's volume and pressure alarms are automatically enabled. When the ventilator is turned off, the FREQUENCY and I:E RATIO displays remain lighted, but the ventilator will not function.

Using the Ventilator On/Off Control

The ventilator on/off control is a momentary switch that returns to its center position after being turned in either direction.

- To activate the ventilator, turn the switch clockwise; the green ON indicator is then turned on and the switch returns to its center position.

NOTE: The ventilator can only be activated when the manual/automatic selector valve is in the AUTO position (with the interface cable between the selector valve and interface panel connected). If you attempt to activate the ventilator with the selector lever in the BAG position, the yellow FAULT indicator on the ventilator bezel will be turned on, indicating a fault condition.

- To shut down the ventilator, turn the switch counterclockwise; the green ON indicator is then turned off and the switch returns to its center position.

Section 5 - Operation

AV2+ Anesthesia Ventilator

Using the Manual/Automatic Selector Valve Lever

The ventilator can be turned on and off using the selector lever on the manual/automatic selector valve (with the interface cable between the selector valve and interface panel properly connected).

- To activate the ventilator, move the manual/automatic selector valve lever to the AUTO position; the green ON indicator on the ventilator bezel is then turned on.
- To shut down the ventilator, move the manual/automatic selector valve lever to the BAG position; the green ON indicator on the ventilator bezel is then turned off.

Adjusting the Tidal Volume

The tidal volume is adjusted using a self-locking knob, located above the bellows assembly. The control knob positions a stop within the bellows canister which limits the upward travel of the bellows and thus sets the maximum tidal volume of gas delivered to the patient. To adjust the tidal volume, press the self-locking knob so that it can turn, then set the desired tidal volume as shown by the setting indicator on the bellows chamber scale (marked 200–1400 ml). The tidal volume can be adjusted to achieve volumes between 50 and 1500 ml.

Smaller tidal volumes can be adjusted by setting the pointer below the 200 ml marking on the bellows chamber; larger tidal volumes can be selected by setting the pointer above the 1400 ml calibration.

As in any volume-preset anesthesia ventilator, the actual tidal volume delivered to the patient's lungs may differ from the preset volume at the bellows due to the compliance of the breathing system and fresh gas flow. To accurately set the tidal volume, refer to the tidal and minute volume measurements.

The position of the tidal volume indicator can be calibrated for a specific combination of fresh gas flow and equipment compliance by a North American Dräger qualified technical service representative.

Setting the Respiratory Frequency

Use the frequency control knob to set the respiratory frequency from 1 to 99 breaths per minute (BPM) in 1 BPM increments.

Clockwise rotation of the control knob increases the frequency setting, while counterclockwise rotation decreases the frequency setting.

Section 5 - Operation

AV2+ Anesthesia Ventilator

Setting the Inspiratory/ Expiratory (I:E) Phase Time Ratio

Use the I:E ratio control knob to set the inspiratory/expiratory (I:E) phase time ratio. The standard range of ratios is from 1:1 through 1:4.5, adjustable in increments of 0.5.

An extended range of ratios is also available which allows the setting of inverse I:E ratios. The specific extended range settings are: 4:1, 3:1, and 2:1. The extended range settings are accessible by pressing the EXTENDED RANGE switch while rotating the I:E ratio control knob.

Clockwise rotation of the control knob increases the I:E ratio setting, while counterclockwise rotation decreases the I:E ratio setting.

WARNING: The use of inverse I:E ratios will introduce auto-PEEP.

Setting the Inspiratory Flow Rate

Use the inspiratory flow control knob to set the inspiratory flow in the range of 10 l/min to 100 l/min. This setting controls the flow rate of gas into the bellows canister, and thus the flow rate of gas delivered to the patient.

Because of patient circuit variables such as lung compliance, fresh gas flow, airway resistance and equipment compliance, the flow gauge is labeled with nominal zones of LOW, MEDIUM, and HIGH.

You should adjust the flow setting to a point where the ventilator bellows is fully compressed (but not deformed) at the end of the inspiratory phase of the breathing cycle.

You can also use the inspiratory flow control to create an inspiratory plateau at the end of the inspiratory cycle and to affect the potential peak inspiratory pressure within the patient breathing system. Always check the pressure indicated by the breathing system pressure gauge and waveform when adjusting the inspiratory flow control.

Setting the Inspiratory Pressure Limit

The pressure limit control, located above the bellows canister, is used to adjust the pressure limit. Nominal pressure zones are indicated by the label. This control determines the maximum pressure that can be delivered by the ventilator during the inspiratory phase of the respiratory cycle. Because of patient circuit variables, the scale on the label is only a reference; the pressure should be read from the breathing system pressure gauge or the anesthesia machine's pressure monitoring system.

When the pressure limit control is turned fully counterclockwise, the peak inspiratory pressure will be less than or equal to 15 cmH₂O. When the control is turned fully clockwise, the peak inspiratory pressure will be less than or equal to 120 cmH₂O.

Section 5 - Operation

AV2+ Anesthesia Ventilator

Problem Resolution

PROBLEM	POSSIBLE CAUSE	REMEDY
Excessive PEEP	Improperly adjusted ventilator relief valve	Contact NAD qualified technical service representative.
	Insufficient suction scavenger flow setting	Increase suction scavenger flow valve.
	PEEP valve active	Decrease PEEP valve setting.
	Inverse I:E ratios	Reset ratios.
Excessive NEEP	Excessive suction scavenger flow	Reduce suction scavenger flow rate.
Bellows won't reach tidal volume stop setting during expiration	Frequency too high for selected tidal volume	Decrease frequency.
		Increase expiratory phase time.
	Improperly adjusted ventilator relief valve	Contact NAD qualified technical service representative.
	Breathing system leak	Repair leak.
Ventilator won't cycle	Low oxygen supply pressure	Provide sufficient oxygen supply pressure.
Bellows won't compress during inspiration	Absorber manual/automatic selector valve in BAG position	Place selector valve in AUTO position.
	Inspiratory flow control setting on ventilator too low	Increase inspiratory flow control setting.
	Frequency too high	Decrease frequency.

Section 5 - Operation AV2+ Anesthesia Ventilator

PROBLEM	POSSIBLE CAUSE	REMEDY
Moving manual/automatic selector valve lever to AUTO position does not activate ventilator.	SYSTEM POWER switch is in STANDBY position	Turn SYSTEM POWER switch to ON.
	Interface cable is not connected	Connect interface cable.
Ventilator does not operate; yellow FAULT LED on ventilator lights	Selector switch on the absorber is in the BAG position	Turn the selector switch on the absorber to the AUTO position.

Overview

In addition to monitoring clinical parameters, the Narkomed 2C performs diagnostic self-tests every time the machine is turned on. After the initial power-on screen is displayed, use the Screen Selection menu located at the bottom right side of the monitor to display specific screens, including:

- Machine Monitor screen - displays numerical data, trends, and waveforms for oxygen analysis, breathing pressure, and respiratory volume.
- System Monitor screens - display the Datascan (numeric or bar graph) and numerical data and waveforms for selected monitors.
- Set Up screen - includes options to set alarms, initiate calibrations, and set up specific monitoring functions.
- System Configuration screens - a series of screens for customizing operation.
- Data Log screen - displays the numeric Datascan and a tabular listing of previously logged events.
- Data Management screen - displays a menu for selecting various O.R. Data Manager screens (accessible only if the optional O.R. Data Manager is installed).

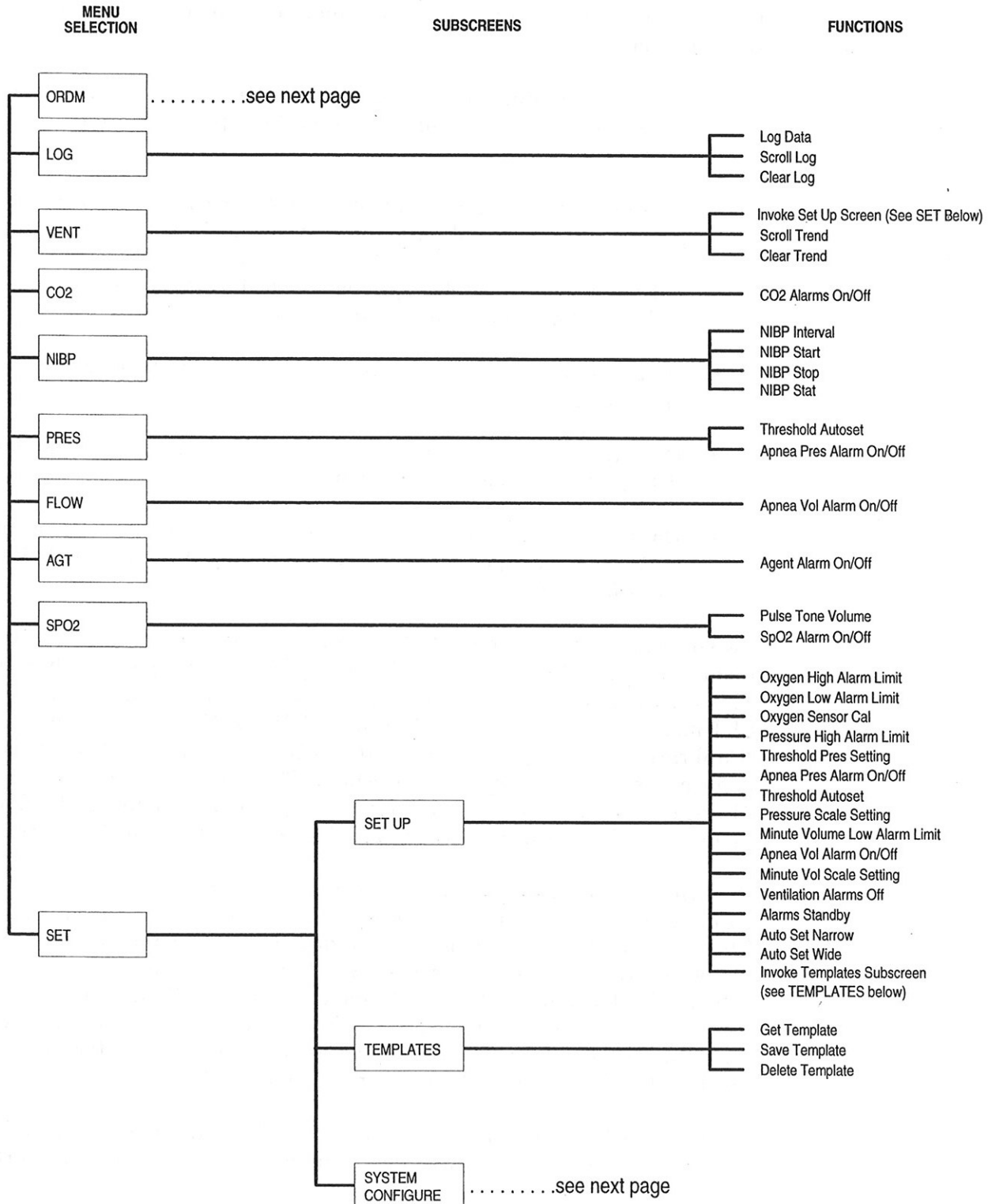
Two options appear to the left of the SET option of the Screen Selection menu—CAL O2 and PTHRESH. The CAL O2 option is for oxygen calibration. This function is the same as the oxygen calibration options offered in the SET menu under SETUP and SYSTEM CONFIGURE described in "Calibrating the Oxygen Sensor" later in this section. The PTHRES option is for auto-setting the pressure threshold. This option is the same as the Threshold Auto-set options available through the PRES and SET/SETUP menus also described in "Setting Auto-Threshold" later in this section.

Real-time ECG waveforms from Marquette and Hewlett-Packard monitors can be viewed on the Narkomed 2C monitor waveform displays. The Narkomed 2C also displays some data from external monitors, including North American Dräger's Vitalert monitors, and Hewlett-Packard, other Marquette monitors, Datex, SpaceLabs, Criticare, Datascope, Siemens, Puritan-Bennett, Colin, Criticon, Nellcor, and Ohmeda monitors. The data recorded by external monitors are displayed in the System Monitor screens and the Data Log screen.

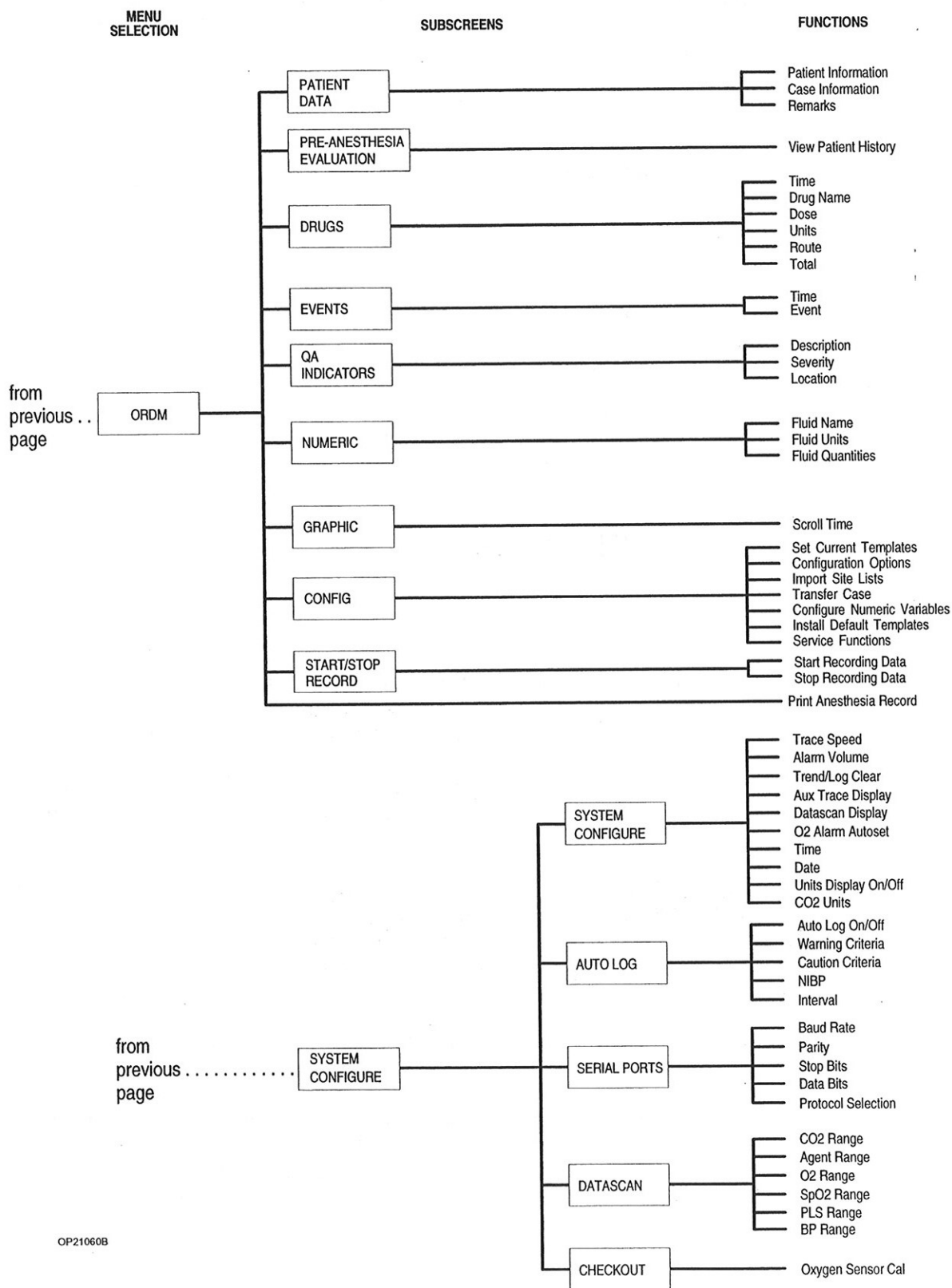
NOTE: All external devices connected to the Narkomed 2C must be turned on for proper operation of the communication interface.

Section 5 - Operation Monitoring System

Narkomed 2C Quick Reference Guide



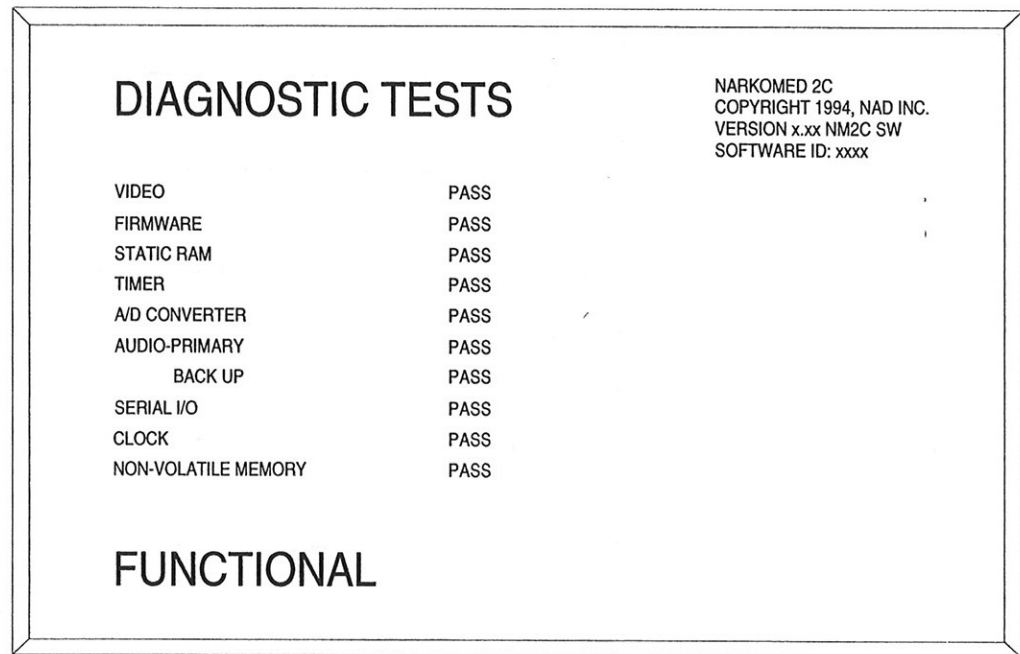
Section 5 - Operation Monitoring System



Section 5 - Operation Monitoring System

Power-On Screen

The Narkomed 2C performs extensive self-tests on the internal hardware when the SYSTEM POWER switch is turned ON. As these diagnostics are performed, each test and its result (PASS or FAIL) appear on the screen.



One of three possible conclusions to the self-tests is posted on the screen:

FUNCTIONAL: Every component of the monitoring system is operational. After a brief delay, the Machine Monitor screen appears. If an external monitor is connected to the Narkomed 2C, the System Monitor screen appears instead.

CONDITIONALLY FUNCTIONAL: A noncritical fault was detected, such as a speaker failure. The Narkomed 2C can be used, but a North American Dräger qualified technical service representative must be notified to correct the problem.

The self-diagnostic report screen remains until the Datagrip trigger is pressed.

NONFUNCTIONAL: A serious fault was detected and operation of the monitors is inhibited. Do not use the machine. Immediately notify a North American Dräger qualified technical service representative to correct the problem.

Section 5 - Operation Monitoring System

Using the Screen Selection Menu

To change any parameters or options for the Narkomed 2C monitoring system, select the appropriate option from the Screen Selection menu. The Screen Selection menu appears in the lower right corner of the Machine Monitor screen, the Data Log screen, and the System Monitor screens. The menu includes these screen options:

- ORDM O.R. Data Manager screen
- LOG Data Log screen
- VENT Machine Monitor screen
- CO2 CO₂ System Monitor screen
- NIBP NIBP System Monitor screen
- PRES Breathing Pressure System Monitor screen
- FLOW Respiratory Volume System Monitor screen
- AGT Agent System Monitor screen
- SPO2 Pulse Oximetry System Monitor screen
- SET Monitor Setup screen

Viewing a Screen

To view a screen:

1. Rotate the thumbwheel to position the cursor on the preferred Screen Selection menu option.
2. After a short pause, the screen appears along with any associated soft keys.

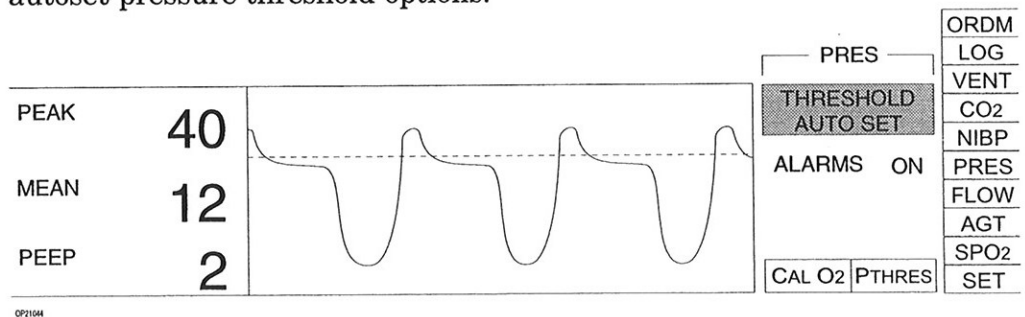
NOTE: The soft keys for CO₂, NIBP, Agent, and SpO₂ monitors appear only when the Narkomed 2C is connected to an external Vitalink monitor that can perform those soft key operations.

Invoking a Screen

To use the soft keys in a particular screen:

1. Rotate the thumbwheel to position the cursor on the preferred option and press the Datagrip trigger.
2. The cursor moves to the first available soft key.

The following illustration shows the breathing pressure monitor with associated soft keys, Screen Selection menu, and oxygen calibration and autoset pressure threshold options.



Section 5 - Operation Monitoring System

To move to another screen:

1. Rotate the thumbwheel to position the cursor on the screen label.
2. Press the Datagrip trigger. This moves the cursor to the Screen Selection menu.

Invoking the Machine Monitor Screen

To invoke the Machine Monitor screen, select VENT from the Screen Selection menu.

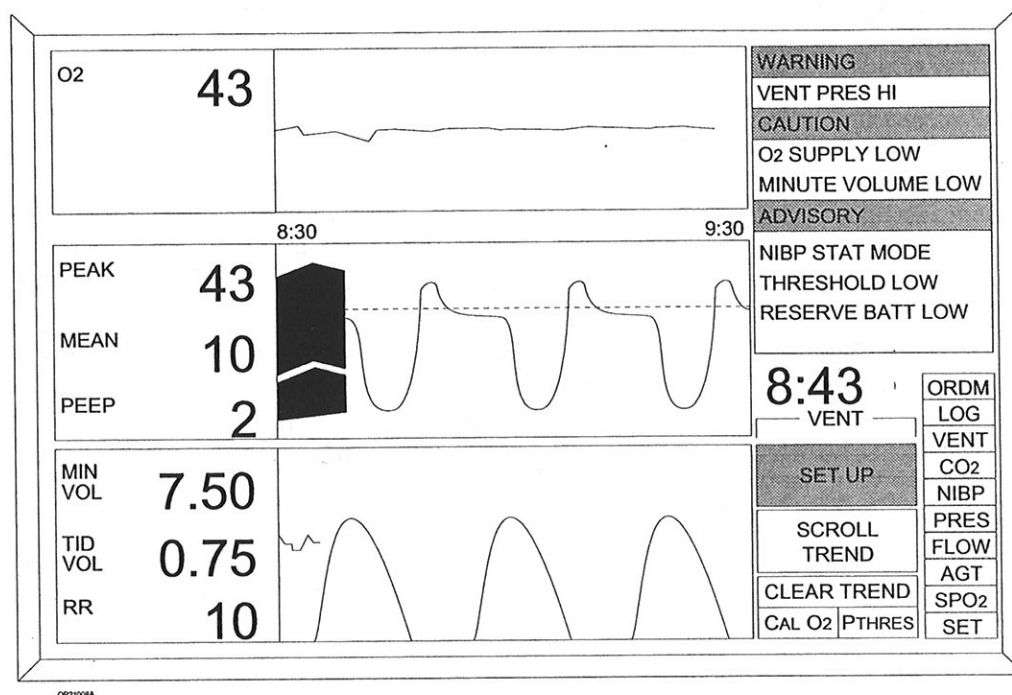
NOTE: If no Vitalink devices are connected to the Narkomed 2C, the Machine Monitor screen is displayed automatically after successful completion of the power-on diagnostics.

The Machine Monitor screen shows numerical measurements, waveforms, and trends for the oxygen monitor, breathing pressure monitor, and the respiratory volume monitor.

The numerical and graphical information for each monitor appears in separate display areas on the screen:

- Central Alarm display is located in the top right corner of the screen.
- Screen Selection menu is located in the bottom right side of the screen.
- Oxygen calibration and pressure threshold autoset options appear to the left of the Screen Selection menu at the bottom of the screen.
- Three Machine Monitor screen soft keys: SET UP, SCROLL TREND, CLEAR TREND also appear to the left of the Screen Selection menu.

Section 5 - Operation Monitoring System



Invoking the
Set Up Screen

To invoke the Set Up screen from the Machine Monitor screen:

1. Position the cursor on the SET UP soft key.
2. Press the Datagrip trigger. The Monitor Set Up screen appears. See "Setting Up the Monitoring System" later in this section for complete instructions for the Set Up screen.

Scrolling the
Trend

Use the SCROLL TREND soft key to scroll through up to eight hours of trended data for the three ventilation monitors. About one hour of trend data is displayed at one time.

1. Position the cursor on the SCROLL TREND soft key.
2. Press the Datagrip trigger.
3. Rotate the thumbwheel down to go back through the trend data or up to move forward. When scrolling back, the amount of waveform data shown in the monitor display area decreases. The amount of trend data proportionally increases until it fills the whole display area. Continue to rotate the thumbwheel to view the trend display further back up to eight hours.
4. Press the Datagrip trigger again to exit the Scroll Trend function.

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Clearing the Trend

To clear all stored trend information:

1. Position the cursor on the CLEAR TREND soft key.
2. Press the Datagrip trigger. CONFIRM? appears with YES and NO selection boxes.
3. Rotate the thumbwheel to select YES to clear the trend and press the Datagrip trigger. Selecting NO maintains the trend information.

Invoking a System Monitor Screen

To invoke a System Monitor screen, move the cursor to the preferred screen (CO₂, NIBP, PRES, FLOW, AGT, or SPO₂) in the Screen Selection menu. When the cursor highlights the option, the System Monitor screens display information available from external monitors.

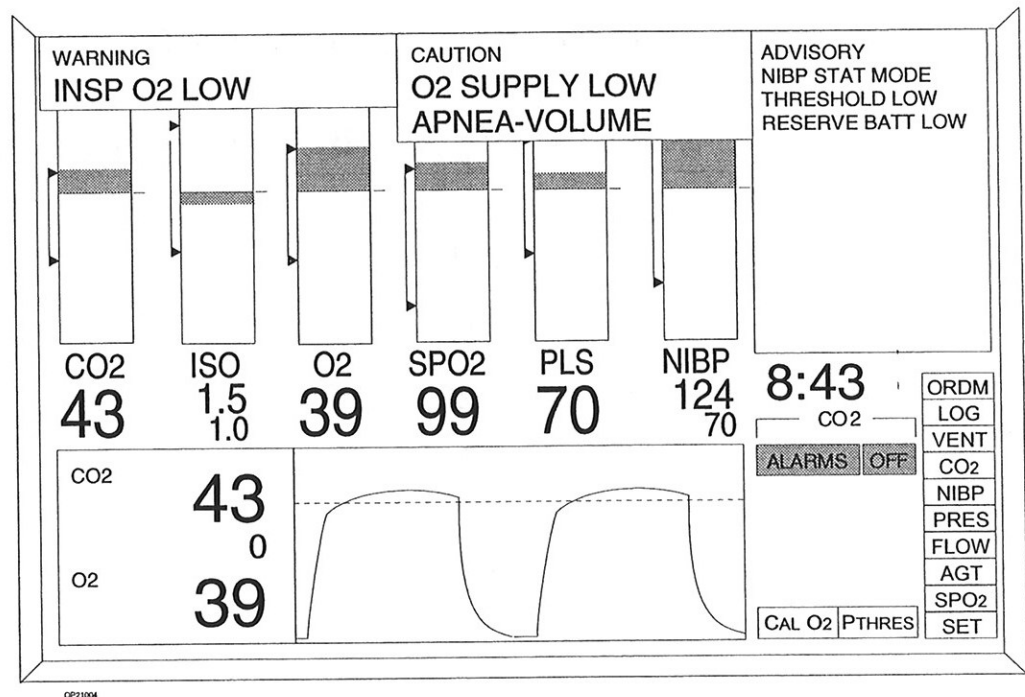
NOTE: If a Vitalink device is connected to the Narkomed 2C, the breathing pressure System Monitor screen is displayed automatically after successful completion of the power-on diagnostics.

The System Monitor screen can have one of two display formats—the numeric Datascan display or the bar graph Datascan display. The Datascan display format is selected in the System Configure screen. (See “Configuring the Monitoring System” later in this section of the manual.)

The System Monitor screen with the bar graph Datascan shows the Datascan and the Advisory window in the top half of the screen. The bottom of the screen shows numerical and graphical information for the selected monitor screen, along with the corresponding soft keys, Screen Selection menu, and oxygen calibration and pressure threshold options. Warning and Caution alarm messages appear in drop-down windows, partially overlaying the Datascan bar graphs.

The following illustration shows the CO₂ System Monitor screen with the bar graph Datascan display.

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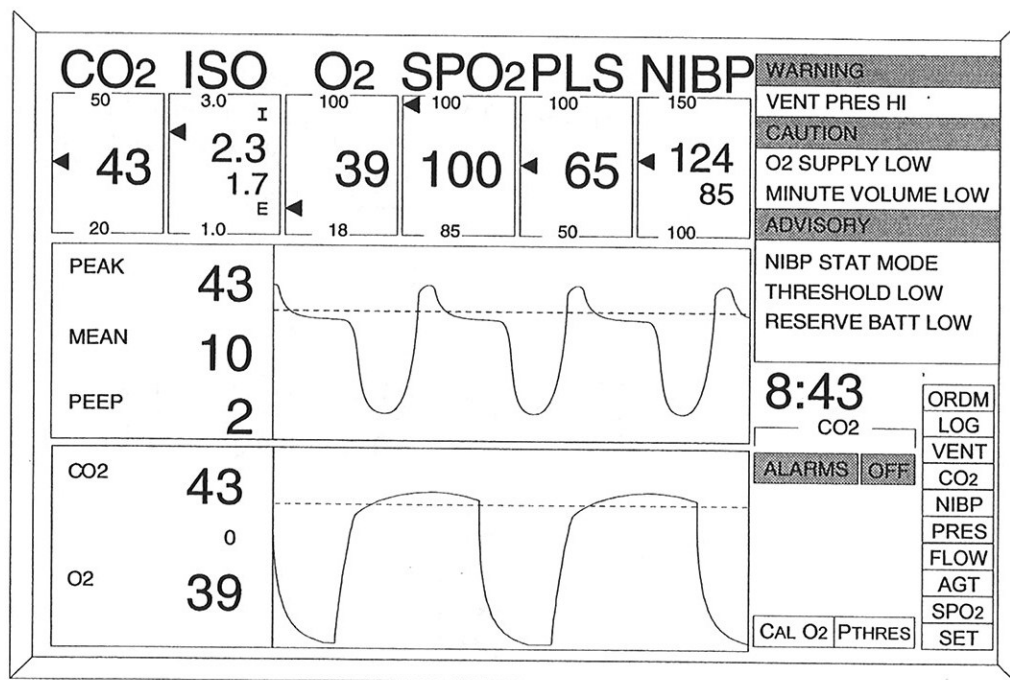
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The numerical Datascan System Monitor screen shows the Datascan and the Central Alarm display at the top of the screen. The numerical and graphical information for the auxiliary monitor trace selected in the System Configure screen appear in middle of the screen. The numerical and graphical information for the monitor selected from the Screen Selection menu appear at the bottom of the screen, along with the corresponding soft keys.

The following illustration shows the CO₂ System Monitor screen with numeric Datascan display and breathing pressure auxiliary monitor trace.

Specific information on each System Monitor screen follows.

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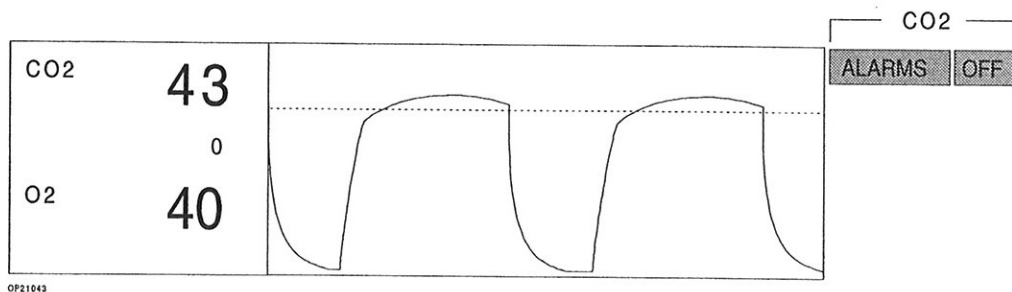


Invoking the CO₂ System Monitor Screen

To invoke the CO₂ System Monitor screen, select CO₂ from the Screen Selection menu. When data is available, numerical and waveform CO₂ data appears at the bottom of the display screen. If the Narkomed 2C is connected to a Vitalert monitor that can accept the associated soft key commands, the ALARMS ON/OFF soft key also appears.

End-tidal CO₂ is displayed in large numbers, with inspiratory CO₂ in small numbers below it. The end-tidal display range is 0–80 mmHg with a resolution of 1 mmHg. For reference, a horizontal dashed line appears on the waveform display at 40 mmHg.

NOTE: The units of measure shown for carbon dioxide are selected in the System Configure screen. For more information, see “Configuring the Monitoring System” later in this section of the manual.



Section 5 - Operation Monitoring System

Setting the CO₂ Alarms On/Off

To set the CO₂ alarms to on or off:

1. Invoke the CO₂ System Monitor screen. The cursor moves to the ALARMS ON/OFF soft key.
2. Press the Datagrip trigger to toggle the alarm setting between ON and OFF until the preferred setting appears.

Invoking the NIBP System Monitor Screen

To invoke the NIBP System Monitor screen, select NIBP from the Screen Selection menu. When data is available, NIBP measurement data appears at the bottom of the screen. If the Narkomed 2C is connected to a Vitalert monitor that accepts the associated soft key commands, the INTERVAL, NIBP START, NIBP STOP, and NIBP STAT soft keys also appear.

The left side of the NIBP display area shows the following information:

- systolic blood pressure in the top position
(display limit: ≤260 mmHg)
- mean blood pressure in middle position
(display limit: ≤260 mmHg)
- diastolic blood pressure in bottom position
(display limit: ≤260 mmHg)

The remainder of the display is a tabular listing of the latest five NIBP measurements, including the times the measurements occurred, the systolic, diastolic, and mean blood pressures, and the pulse.

NIBP mmHg		NIBP			
		TIME	SYS/DIAS	MEAN	PULSE
120		8:30	145/75	95	68
100		8:35	127/70	90	65
		8:40	117/60	90	68
80		8:45	115/60	87	67
		8:50	120/80	100	69

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Setting NIBP Interval

To change the interval between blood pressure measurements:

1. Invoke the NIBP System Monitor screen. The cursor moves to the INTERVAL soft key.
2. Press the Datagrip trigger. The cursor moves to the current setting.

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Monitoring System

3. Rotate the thumbwheel to scroll through the available time intervals (1–30 minutes, in 1-minute increments).
4. Press the Datagrip trigger to set the value. The cursor returns to the INTERVAL soft key.

Invoking NIBP Measurement Mode

The NIBP START, STOP, and STAT soft keys correspond to three modes of NIBP operation—automatic, standby, and stat.

Automatic Mode

To invoke the automatic mode of operation:

1. Invoke the NIBP System Monitor screen.
2. Position the cursor on the NIBP START soft key.
3. Press the Datagrip trigger.
4. A measurement starts and the alarms are enabled. All subsequent measurements occur at the selected interval (see “Setting NIBP Interval” earlier in this section).

The NIBP measurement is displayed for a period equal to the selected interval. For example, for a measurement taken while the interval is set to 5 minutes, if the NIBP STOP soft key is pressed after 2 minutes of operation to place NIBP monitoring in the standby mode, the previous reading remains in the display area for 3 more minutes. After the time interval elapses, the previous reading automatically clears.

Standby Mode

To invoke the standby mode:

1. Invoke the NIBP System Monitor screen.
2. Position the cursor on the NIBP STOP soft key.
3. Press the Datagrip trigger.
4. The cuff immediately deflates, measurements are suspended, and NIBP alarms are disabled.

Stat Mode

Compared to the automatic mode, the sample duration time in the stat mode is slightly reduced, and the time between samples is minimized to approximately 3 seconds. The stat mode automatically stops after 5 minutes. The automatic mode with the previously selected sample interval is resumed.

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To invoke the maximum rate measurement mode:

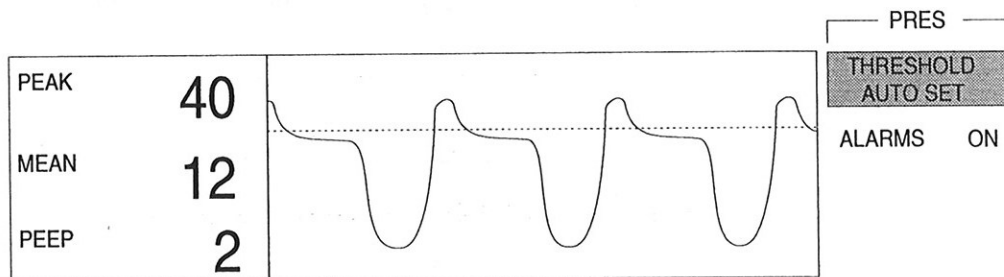
1. Invoke the NIBP System Monitor screen.
2. Position the cursor on the NIBP STAT soft key.
3. Press the Datagrip trigger.

To disable the stat mode, select either the NIBP START soft key or the NIBP STOP soft key.

Invoking the Breathing Pressure System Monitor Screen

To invoke the Breathing Pressure System Monitor screen, select the PRES label from the Screen Selection menu. Numerical and waveform breathing pressure data appear at the bottom of the display screen, along with the THRESHOLD AUTO SET and ALARMS ON/OFF soft keys.

For complete information on breathing pressure monitoring, see the *Operation - Breathing Pressure Monitoring* section of the manual.



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Setting Auto- Threshold

To set the auto-threshold:

1. Invoke the Breathing Pressure System Monitor screen. The cursor moves to the THRESHOLD AUTO SET soft key.
2. Press the Datagrip trigger.
3. The threshold pressure is automatically set to 4 cmH₂O below the current peak pressure measurement (to a maximum of 30 cmH₂O), or 5 cmH₂O, whichever is greater.

NOTE: Pressure threshold can also be autoset by selecting the PTHRES option in the main display. See *Section 5 - Breathing Pressure Monitoring*.

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Setting Apnea
Pressure
Alarm On/Off

To set the apnea pressure alarm to on or off:

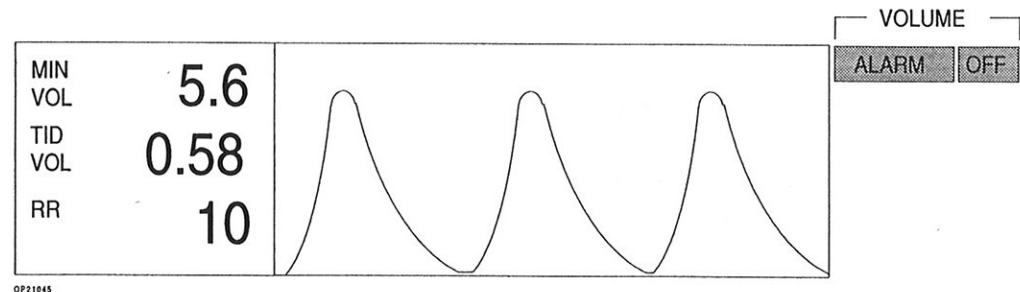
1. Invoke the Breathing Pressure System Monitor screen.
2. Position the cursor on the ALARM ON/OFF soft key.
3. Press the Datagrip trigger to toggle the alarm setting between ON and OFF until the preferred setting appears.

NOTE: If the ventilator is on, this alarm cannot be turned off. If the alarm is in STBY (standby), pressing the Datagrip trigger turns the alarm on.

**Invoking the
Respiratory
Volume System
Monitor Screen**

To invoke the Respiratory Volume System Monitor screen, select the FLOW label from the Screen Selection menu. Numerical and waveform respiratory flow and volume data appear at the bottom of the display screen, along with the ALARM ON/OFF soft key.

For complete information on breathing pressure monitoring, see *Section 5 Operation - Respiratory Volume Monitoring* section of the manual.



Setting Apnea
Volume Alarm
On/Off

To turn the apnea volume alarm on or off:

1. Invoke the Respiratory Volume System Monitor screen. The cursor moves to the ALARM ON/OFF soft key.
2. Press the Datagrip trigger to toggle the alarm setting between ON and OFF until the preferred setting appears.

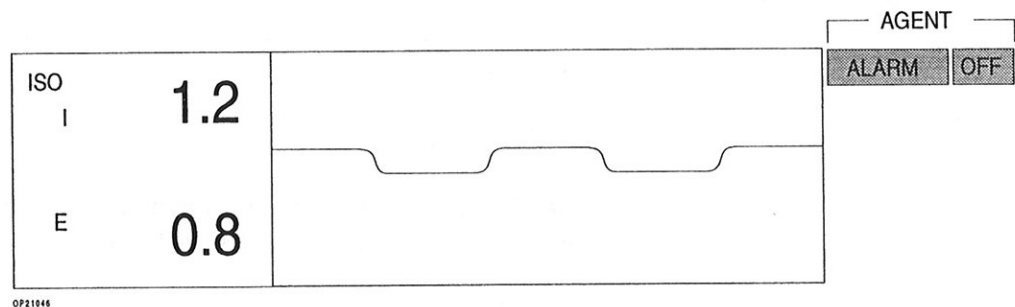
NOTE: If the alarm is in STBY (standby), pressing the Datagrip trigger turns the alarm on.

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Invoking the Agent System Monitor Screen

To invoke the Agent System Monitor screen, select the AGT label from the Screen Selection menu. When data is available, numerical and waveform agent data appears at the bottom of the display screen. If the Narkomed 2C is connected to a Vitalert monitor that can accept the associated soft key commands, the ALARM ON/OFF soft key also appears.

The agent display area shows values for anesthetic concentrations during the inspiratory and expiratory phases. The anesthetic display range is 0-10 (0-24 desflurane) volume % with a resolution of 0.1 volume %.



Setting Agent Alarm On/Off

To turn the agent alarm on or off:

1. Invoke the Agent System Monitor screen. The cursor moves to the ALARM ON/OFF soft key.
2. Press the Datagrip trigger to toggle the alarm setting between ON and OFF until the preferred setting appears.

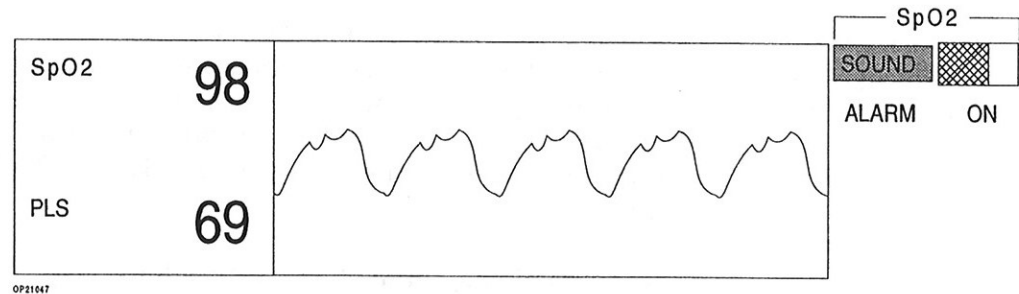
Invoking the Pulse Oximetry System Monitor Screen

To invoke the Pulse Oximetry System Monitor screen, select the SPO2 label from the Screen Selection menu. When data is available, numerical and waveform SpO₂ data appears at the bottom of the display screen. If the Narkomed 2C is connected to a Vitalert monitor that can accept the associated soft key commands, the SOUND and ALARM ON/OFF soft keys also appear.

The SpO₂ display area shows numerical values for oxygen saturation and pulse rate. The display range for SpO₂ is 0-100%, with a resolution of 1%. The display limit for pulse rate is ≤250 beats per minute, with a resolution of 1 beat per minute.

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Adjusting Audio Pulse Tone Volume

To adjust the pulse tone volume:

1. Invoke the SpO₂ System Monitor screen. The cursor moves to the SOUND soft key.
2. Press the Datagrip trigger.
3. Rotate the thumbwheel to increase or decrease the volume. A wider shaded bar indicates increased volume.
4. To save the setting, press the Datagrip trigger.

Setting SpO₂ Low Alarm On/Off

To turn the SpO₂ alarms on or off:

1. Invoke the Pulse Oximetry System Monitor screen. The cursor moves to the SOUND soft key.
2. Position the cursor on the ALARM ON/OFF soft key.
3. Press the Datagrip trigger to toggle the alarm setting between ON and OFF until the preferred setting appears.

Setting Up the Monitoring System

To invoke the Set Up screen:

1. Select the SET label from the Screen Selection menu. Three soft keys appear next to the menu, and the cursor moves to the top key labeled SET UP.

NOTE: If the Machine Monitor screen is selected, the SET UP soft key is always displayed.

2. With the cursor on the SET UP soft key, press the Datagrip trigger. The Set Up screen appears.

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Use the Set Up screen to change alarm and display settings for the three ventilation monitors—oxygen, breathing pressure, and respiratory volume. The Set Up screen displays current numerical data along with a list of alarm limits and other changeable parameters corresponding to each of the ventilation monitors. It is also used to initiate oxygen sensor calibrations.

The menu of specific setup functions appears in the top right side of the screen. A dialog box with instructions on using the thumbwheel and Datagrip trigger appear in the bottom right side of the screen.

NOTE: Any changes made in the Set Up screen take effect immediately—even before exiting from the screen.

NOTE: If the Datagrip trigger is not pressed or the thumbwheel rotated for a period of 60 seconds, the display returns to the previously displayed screen. Any changes made while in the Set Up screen will be saved.

O2	43	OXYGEN HIGH	60	VENTILATION ALARMS OFF ALARMS STANDBY AUTO SET NARROW AUTO SET WIDE TEMPLATES EXIT
		OXYGEN LOW	30	
		OXYGEN SENSOR	CAL	
PEAK	43	PRESSURE HIGH	50	SELECTS FUNCTION ACTIVATES FUNCTION
		THRESHOLD PRES	30	
MEAN	10	APNEA ALARM	OFF	
		AUTO-THRESHOLD	SET	
PEEP	2	PRESSURE SCALE	0-100	
MIN VOL	7.50	MINUTE VOLUME LOW	1.0	
TID VOL	0.75	VOLUME ALARMS	ON	
RR	10	MINUTE VOL SCALE	0-20	

For information on setting individual alarm limits, see the specific monitor operating instructions later in this section.

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Setting Ventilation Alarms Off

To turn off the volume and pressure-apnea alarms:

1. Invoke the Set Up screen.
2. Use the thumbwheel to position the cursor on the VENTILATION ALARMS OFF soft key.
3. Press the Datagrip trigger.
4. The volume and pressure-apnea alarms are turned off.

NOTE: If the ventilator is on, the volume alarms are turned off, but the pressure-apnea alarm remains on.

Setting Alarms Standby

To set the volume alarms and pressure-apnea alarm to Standby:

1. Invoke the Set Up screen.
2. Use the thumbwheel to position the cursor on the ALARMS STANDBY soft key.
3. Press the Datagrip trigger.
4. The volume alarms and pressure-apnea alarms are turned to Standby.

NOTE: The pressure-apnea alarms can be set to standby only if the ventilator is off. When data is detected by the respiratory flow monitor, the volume alarms are turned on. Likewise, when data is detected by the airway pressure monitor, the pressure-apnea alarm is turned on.

Using the Autoset Function

Use the autoset function to automatically set all alarm limits around their current measurements. This function works only if there are measurements available. If there are no current measurements, using the autoset function has no effect.

To set the alarms to the narrow or the wide range:

1. Invoke the Set Up screen.
2. Use the thumbwheel to position the cursor on the preferred soft key (AUTO SET NARROW or AUTO SET WIDE).
3. Press the Datagrip trigger.

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Selecting the “narrow” range sets the alarms to the following values:

Alarm	Value
O ₂	Current Measurement \pm 10%
Pressure High	Current Peak Pressure Measurement + 7 cm H ₂ O
Threshold Press.	Current Peak Pressure Measurement - 2 cm H ₂ O
Minute Volume	Current Measurement - 0.3 liter

Selecting the “wide” range sets the alarms to the following values:

Alarm	Value
O ₂	Current Measurement \pm 20%
Pressure High	Current Peak Pressure Measurement + 15 cm H ₂ O
Threshold Press.	Current Peak Pressure Measurement - 4 cm H ₂ O
Minute Volume	Current Measurement - 0.5 liter

Invoking the Templates Subscreen

To invoke the Templates subscreen:

1. Select SET from the Screen Selection menu. Three soft keys appear next to the menu and the cursor moves to SET UP.
2. Position the cursor on TEMPLATES and press the Datagrip trigger. The Templates subscreen appears.

NOTE: The Templates subscreen can also be invoked by selecting the TEMPLATES soft key from the Set Up Screen menu.

Use the Templates subscreen to choose preconfigured system settings from a list of previously configured templates or to save new settings and delete old ones.

NOTE: All settings must be set before selecting the Templates subscreen. Parameter values cannot be changed while in this screen. For more information on setting parameters, see “Set Up Screen” and “Configuration Screen” in this section.

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The Templates subscreen shows a list of current settings, along with a list of template selections and the dates the templates were saved. The top right of the screen has a menu used to retrieve, save, or delete templates. The bottom right of the screen has a dialog box with instructions on using the Datagrip thumbwheel and trigger.

In addition to the factory defaults, eight templates can be saved. The first template in the selection list is **FACTORY DEFAULTS**, which contains the factory default values and cannot be modified. The second template is **SITE DEFAULTS**, which are initially the same as **FACTORY DEFAULTS**. Values stored in the **SITE DEFAULTS** template are used as the power-on defaults. The site default values can be changed, but the template name (**SITE DEFAULTS**) cannot.

The screenshot displays the Templates subscreen interface. It features a 'SETTINGS' table on the left, a 'SELECTION LIST' on the right, and a vertical menu of control buttons on the far right. A legend at the bottom right explains the controls.

SETTINGS	
O2 HIGH	60
O2 LOW	30
MIN VOL LO	1.0
MIN V SCALE	20
PRES HIGH	50
THRESHOLD	30
PRES SCALE	100
CO2 DEV	± 10
AGT DEV	± 2
O2 DEV	± 10
SPO2 DEV	± 2
PLS DEV	± 20
BP DEV	± 50

SELECTION LIST	
FACTORY DEFAULTS	
SITE DEFAULTS	
PEDIATRIC	4/23/93
DR. JONES	10/26/92
.....
.....
.....
.....
EXIT	

GET TEMPLATE

SAVE TEMPLATE

DELETE TEMPLATE

EXIT

SELECTS FUNCTION

ACTIVATES FUNCTION

Retrieving Templates

To retrieve a list of settings:

1. Invoke the Templates subscreen.
2. Use the thumbwheel to position the cursor on the GET TEMPLATE soft key.
3. Press the Datagrip trigger. A box appears around the first template name (**FACTORY DEFAULTS**).
4. Select a template by rotating the thumbwheel to move the box through the list.


NOTE: Any templates retrieved in the Templates subscreen become effective immediately—even before exiting from the screen.

5. Press the Datagrip trigger to retrieve the settings in the template selected. These become the current machine settings.
6. The cursor moves to the EXIT soft key.

Saving Templates To save a list of settings:

1. Invoke the Templates subscreen from the Set Up screen.
2. Use the thumbwheel to position the cursor on the SAVE TEMPLATE soft key.
3. Press the Datagrip trigger.
4. A box appears around the first template in the selection list (the Site Default template).
5. Rotate the thumbwheel to move the box through the list. Position the box around the preferred template to save the list of parameters. When creating a new template, position the box on a blank line. The current date appears at the right.
6. If the template already has a name, or to change the name of an existing template, skip to step 13.

NOTE: If the template does not have a name, enter a 16-character name. If the name chosen is less than 16 characters, enter blank spaces or type in a single asterisk (*) at the end of the name to clear the remaining characters.

7. Press the Datagrip trigger. A shaded box cursor () appears on the first character for the template name. The first character that appears is the letter A.
8. Scroll through the available characters by rotating the thumbwheel until the preferred character appears at the cursor. Available characters include the alphabet, numbers 0–9, and a blank space.
9. When the preferred character appears at the cursor position, press the Datagrip trigger.

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10. The character is entered and the cursor (█) advances to the next position.
11. The character chosen for the previous position appear in this position, too. This is for selecting repeat characters rapidly—for example, blank spaces at the end of the selection title.
12. After 16 characters are entered, the template name is automatically saved.
13. If the template was previously named (before entering the Default screen), a query appears (CHANGE NAME? with YES and NO selections. Use the thumbwheel to select YES or NO, then push the Datagrip trigger.
 - If YES is selected, change the name as described in steps 8-12.
 - If NO is selected, the new parameter values are saved. The cursor moves to the EXIT soft key.

Deleting Templates

To delete a list of parameters:

1. Invoke the Templates subscreen from the Set Up screen.
2. Use the thumbwheel to position the cursor on the DELETE TEMPLATE soft key.
3. Press the Datagrip trigger. A box appears around the first template in the selection list that can be deleted.
4. Select the template by rotating the thumbwheel to move the box through the list.
5. Press the Datagrip trigger.
6. A query box appears on the screen (ARE YOU SURE?). YES and NO selections also appear.
7. Use the thumbwheel to point to YES or NO, then press the Datagrip trigger.

Exiting the Templates Subscreen

To save changes and exit from the Templates subscreen:

1. Rotate the thumbwheel until the cursor is positioned on the EXIT soft key.
2. Press the Datagrip trigger.

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Exiting the Set Up Screen

To save changes and exit from the Set Up screen:

NOTE: The Set UP screen is exited automatically when exiting out of the Templates subscreen.

1. Rotate the thumbwheel until the cursor is positioned on the EXIT soft key.
2. Press the Datagrip trigger.
3. The screen the where Set Up screen was invoked appears.

Configuring the Monitoring System

These configuration screens are invoked from a Configuration Screen menu:

- System Configure
- Auto Log
- Serial Ports
- Datascan
- Preuse Checkout

To access the configuration screens:

1. Select the SET label from the Screen Selection menu. Three soft keys appear next to the menu. The cursor moves to the top key labeled SET UP.
2. Position the cursor on the SYSTEM CONFIGURE soft key and press the Datagrip trigger. The System Configure screen appears with a Configuration Screen menu in the upper right corner.

To invoke one of the configuration screens:

1. Use the thumbwheel to position the cursor on preferred soft key in the Configuration Screen menu (SYSTEM CONFIGURE, AUTOLOG, SERIAL PORTS, DATASCAN, CHECKOUT).
2. Press the Datagrip trigger. The selected screen appears.

Invoking the System Configure Screen

To invoke the System Configure screen, select the SYSTEM CONFIGURE soft key from the Configuration Screen menu. These system functions are performed from the System Configure screen:

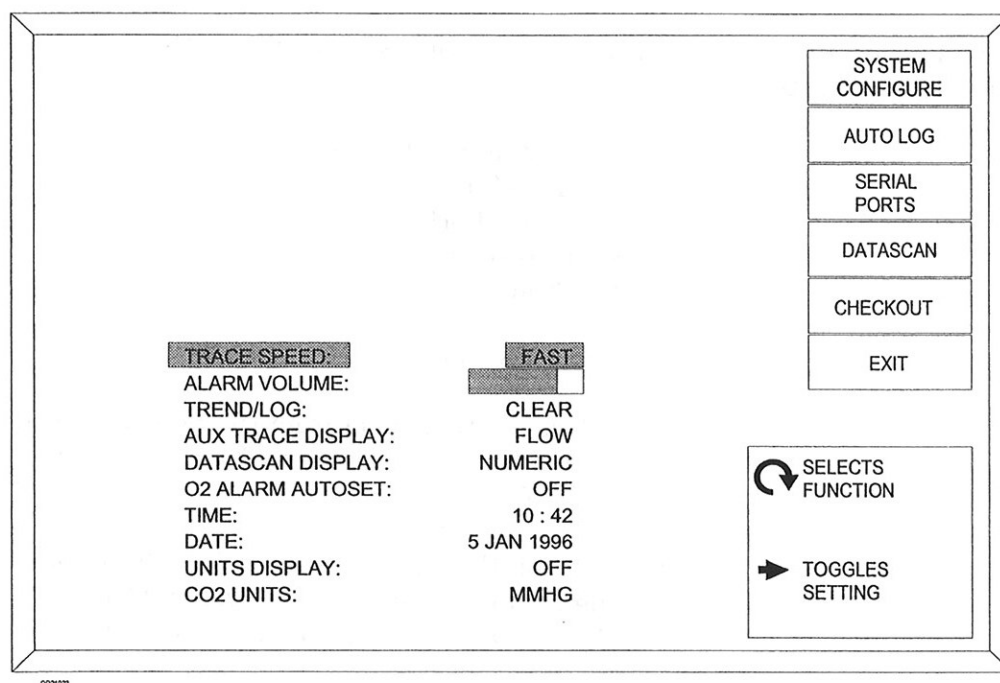
- select trace speed
- set alarm volume
- clear trends and logs
- select auxiliary trace display
- select Datascan display

Section 5 - Operation Monitoring System

- set the O₂ alarm autoset
- set the date and time
- turn the display of units on or off
- set the CO₂ units

Any changed settings are retained if the machine is turned off and will be used when the machine is powered on again.

The screen displays a list of system functions. On the right side of the screen is a menu of configuration screens and a dialog box with instructions on using the Datagrip trigger and thumbwheel.



Setting Trace Speed

To adjust the trace speed:

1. Invoke the System Configure screen.
2. Use the thumbwheel to position the cursor on the TRACE SPEED selection. A shaded cursor appears on the current speed setting.
3. Select the trace sweep speed (SLOW or FAST) by pressing the Datagrip trigger the preferred choice appears. (The Datagrip trigger toggles the trace sweep speed between SLOW and FAST.) The SLOW trace speed displays a complete waveform in about 20 seconds. FAST trace speed displays a complete waveform in about 10 seconds.

Section 5 - Operation Monitoring System

Setting Audio Alarm Volume

To adjust the volume of the audio alarm:

1. Invoke the System Configure screen.
2. Use the thumbwheel to position the cursor on the ALARM VOLUME selection.
3. Press the Datagrip trigger.
4. Rotate the thumbwheel to increase or decrease the volume. A wider shaded bar indicates increased volume. A sample tone also sounds. The factory default is 100% volume.
5. To save the setting, press the Datagrip trigger.

Clearing Trends and Logs

To clear all trends and logs (Data Log and NIBP log):

1. Invoke the System Configure screen.
2. Use the thumbwheel to position the cursor on the TREND/LOG CLEAR selection.
3. Press the Datagrip trigger.
4. YES and NO selections appear to the right of the word CLEAR.
5. Select YES or NO by rotating the thumbwheel, then pressing the Datagrip trigger.
 - To clear all trend and log information, choose YES.
 - To cancel the action, choose NO.

Selecting the Auxiliary Trace Display

To select the auxiliary trace display for viewing in the middle of the System Monitor screens:

1. Invoke the System Configure screen.
2. Use the thumbwheel to position the cursor on the AUX TRACE DISPLAY selection. A box appears around the current trace selection.
3. Press the Datagrip trigger. The cursor moves to the current trace selection.
4. Rotate the thumbwheel to scroll through the available auxiliary trace selections (FLOW, PRES, ECG 1, ECG 2, ECG 3).

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NOTE: ECG 1 must be selected to view Marquette Eagle waveforms.

5. Press the Datagrip trigger to select the trace.

Selecting the Datascan Display

To select the Datascan display:

1. Invoke the System Configure screen.
2. Use the thumbwheel to position the cursor on the DATASCAN DISPLAY selection. A box appears around the current selection.
3. Press the Datagrip trigger. The cursor moves to the current Datascan selection.
4. Rotate the thumbwheel to scroll through the available selections (NUMERIC or BAR GRAPH).
5. Press the Datagrip trigger to select the Datascan.

Setting the O₂ Alarm AutoSet

This setting specifies the deviation value used for resetting oxygen alarm limits around the current oxygen measurement. The alarm limits are reset according to this deviation value when the AUTOSET key on the control key panel is pressed.

The deviation value can be set to WIDE, NARROW, or OFF:

- If the WIDE setting is selected, the alarm limit is reset to the current oxygen measurement $\pm 20\%$ when the AUTOSET key is pressed.
- If the NARROW setting is selected, the alarm limit is reset to the current measurement $\pm 10\%$ when the AUTOSET key is pressed.
- If the OFF setting is selected, oxygen alarm limits are not changed when the AUTOSET key is pressed.

To specify the deviation values used to reset oxygen alarm limits:

1. Invoke the System Configure screen.
2. Use the thumbwheel to position the cursor on O2 ALARM AUTOSET. A box appears around the current setting.
3. Press the Datagrip trigger. The cursor moves to the current setting.
4. Rotate the thumbwheel to scroll through the available settings (WIDE, NARROW, or OFF).

5. Press the Datagrip trigger to set the value.

Setting the Time

To set the clock time:

1. Invoke the System Configure screen.
2. Use the thumbwheel to position the cursor on TIME. A box appears around the current hour setting.
3. Press the Datagrip trigger. The cursor moves to the hour setting.
4. To change the setting, rotate the thumbwheel until the correct hour appears. (The Narkomed 2C uses the 24-hour time format.)
5. Press the Datagrip trigger to save the hour setting. The cursor advances to the current minute setting.
6. To change it, rotate the thumbwheel until the correct minute appears.
7. Press the Datagrip trigger to save the minute setting. The cursor returns to the TIME selection.

Setting the Date

To set the date:

1. Invoke the System Configure screen.
2. Use the thumbwheel to position the cursor on DATE. A box appears around the current day setting.
3. Press the Datagrip trigger. The cursor moves to the day setting.
4. To change it, rotate the thumbwheel until the correct day appears.
5. Press the Datagrip trigger to save the day setting. The cursor advances to the month setting.
6. To change the month setting, rotate the thumbwheel until the correct month appears.
7. Press the Datagrip trigger to save the month setting. The cursor advances to the year setting.
8. To change the year setting, rotate the thumbwheel until the correct year appears.
9. Press the Datagrip trigger to save the year setting. The cursor returns to the DATE selection.

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Monitoring System

Setting Units Display On/Off

To enable/disable the display of units of measure on the monitor display:

1. Invoke the System Configure screen.
2. Use the thumbwheel to position the cursor on UNITS DISPLAY. A shaded cursor appears on the current setting.
3. Press the Datagrip trigger to select the preferred units display mode (ON or OFF) The Datagrip trigger toggles the setting between ON and OFF. The factory default setting is OFF.

Setting CO₂ Units

To set the units to be displayed on the Narkomed 2C for CO₂ data coming from an external CO₂ monitor:

1. Invoke the System Configure screen.
2. Use the thumbwheel to position the cursor on CO2 UNITS. A box appears around the current setting.
3. Press the Datagrip trigger. The cursor moves to the current CO₂ units setting.
4. Rotate the thumbwheel to scroll through the available CO₂ units settings (AUTO, MMHG, %, KPA).
5. Press the Datagrip trigger to select the units.

NOTE: With most external monitors, selecting the AUTO setting in the System Configure screen makes the CO₂ units of measure shown on the Narkomed the same as the units used in the external CO₂ monitor's data log. (For some third-party monitors, these units may differ from the units configured on that monitor's main display.)

However, the Datex AS/3 monitor and the Datascope Point-of-View monitor always transmit CO₂ data in percent, regardless of the units configured on the monitor. To ensure that the preferred CO₂ units of measure are displayed on the Narkomed 2C when receiving data from these monitors, do not use the AUTO setting and select the preferred units in the Narkomed 2C System Configure screen.

NOTE: With some third-party monitors such as the Datascope Point-of-View, the mmHg CO₂ values displayed on the monitor may differ slightly from the mmHg values displayed on the Narkomed 2C due to different ambient pressure values used in calculating the mmHg.

Exiting the System Configure Screen

To save changes and exit from the System Configure screen:

1. Rotate the thumbwheel until the cursor is positioned on the EXIT soft key.
2. Press the Datagrip trigger.
3. The screen where the System Configure screen was invoked appears.

Invoking the Auto Log Screen

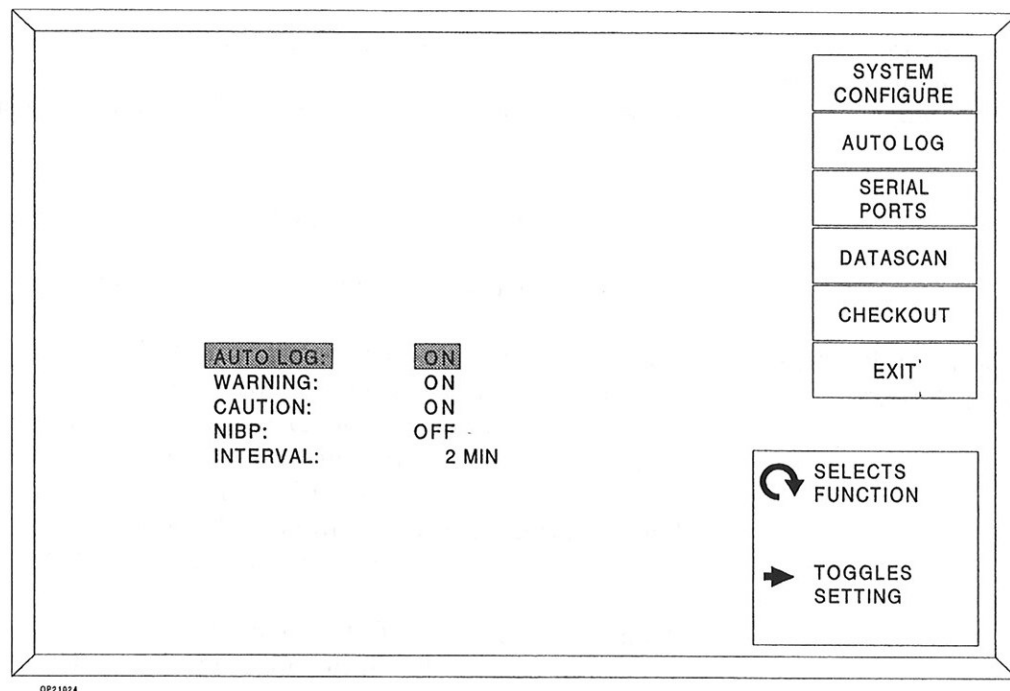
To invoke the Auto Log screen, select the AUTO LOG soft key from the Configuration Screen menu. This screen has an option to turn the Auto Log function on or off and to configure the conditions for logging data. Data can be automatically logged at regular, specified time intervals or with each occurrence of a Warning, Caution, or new NIBP reading. These options can be combined. When Warning or Caution is selected, the alarm text is entered into the log with the numerical data.

To automatically log data, turn the Auto Log function to ON with all the preferred options for data collection. When the Auto Log function is ON, the data log information is saved automatically at the interval selected.

The screen displays a list of auto log selections. On the right side of the screen is a menu of configuration screens and a dialog box with instructions for the Datagrip trigger and thumbwheel. Any changed settings are retained even if the machine is turned off and will be used when the machine is powered on again.

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Monitoring System



Setting Auto Log/ Warning/Caution/ NIBP On/Off

To set the Auto Log, Warning, Caution or NIBP functions to ON or OFF:

1. Invoke the Auto Log screen.
2. Use the thumbwheel to position the cursor on the preferred selection. A shaded cursor appears on the current setting for that selection.
3. Press the Datagrip trigger to select the preferred mode (ON or OFF). The Datagrip trigger toggles the setting between ON and OFF. The factory default setting for all functions is ON. The Auto Log function must be ON for information to be saved automatically according to the options selected.

Setting Interval

To set the time interval:

1. Invoke the Auto Log screen.
2. Use the thumbwheel to position the cursor on the INTERVAL selection. A box appears around the interval time.
3. Press the Datagrip trigger. The cursor moves to the current interval setting.

4. Rotate the thumbwheel to increase or decrease the interval for automatically saving auto log information. The available time intervals are 1, 2, 5, and 10 minutes and OFF. The factory default interval is 5 minutes.
5. To save the value, press the Datagrip trigger. The cursor returns to the INTERVAL selection.

Exiting the Auto Log Screen

To save changes and exit from the Auto Log screen:

1. Rotate the thumbwheel until the cursor is positioned on the EXIT soft key.
2. Press the Datagrip trigger.

Invoking the Serial Ports Screen

To invoke the Serial Ports screen, select the SERIAL PORTS soft key from the Configuration Screen menu. This screen is for setting the parameters for the serial ports.

The screen displays parameters for each port. On the right side of the screen is a menu of configuration screens and a dialog box with instructions for using the Datagrip. Any changed settings are retained even if the machine is turned off. These settings will be used when the machine is powered on again.

NOTE: The thumbwheel moves a box cursor to the preferred setting for a port. The cursor scrolls through the column for Port A first, then the column for Port B.

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Monitoring System

	PORT A	PORT B
BAUD RATE	9600	2400
PARITY	NONE	EVEN
STOP BITS	1	2
DATA BITS	8	7
PROTOCOL	VLNK	VLNK

SYSTEM CONFIGURE
AUTO LOG
SERIAL PORTS
DATASCAN
CHECKOUT
EXIT

SELECTS PARAMETER
TO ADJUST SETTING

Setting the Baud Rate, Parity, Stop Bits, Data Bits, and Protocol for Interfaced Monitors

To set the serial port parameter for a selected port:

1. Invoke the Serial Ports screen.
2. Use the thumbwheel to position the cursor on the preferred selection (BAUD RATE, PARITY, STOP BITS, DATA BITS, or PROTOCOL). A box appears around the current setting.
3. Press the Datagrip trigger. The cursor moves to the current setting.
4. Rotate the thumbwheel to scroll through the available settings for the selection.
5. To save the new setting, press the Datagrip trigger. The cursor returns to the selection.

If a communication error occurs, the Advisory message PORT A ERROR or PORT B ERROR appears on the central alarm display.

NOTE: Data sent to the Narkomed 2C that is outside its display range will not appear on the remote display.

Section 5 - Operation Monitoring System

NOTE: A device and its serial port must have the same configuration. For example, if Port A is configured with a 9600 baud rate, odd parity, 1 stop bit, 8 data bits, and Vitalink, the monitor connected to Port A must be configured the same.

NOTE: If a Vitalert 3000 Series monitor and a third party monitor are connected to the Narkomed 2C, the Vitalert 3000 Series monitor must be connected to Port A.

The factory default settings for serial port parameters are shown in the table below.

Parameter	Default Settings
Baud Rate	9600
Parity	NONE
Stop Bits	1
Data Bits	8
Protocol	VLNK

Section 5 - Operation Monitoring System

The following table shows the suggested settings for devices connected to the Narkomed 2C.

	Baud Rate	Parity	Stop Bits	Data Bits	Protocol
Vitalink and OR/Link Devices	1200, 9600, 19.2K, or 38.4K	ODD, EVEN, or NONE	1 or 2	7 or 8	VLNK or ORLK
Hewlett-Packard MECIF Devices	19.2K or 38.4K	NONE	1	8	MECIF
	NOTE: The remote MECIF device must be set to transmit HIGH BYTE/LOW BYTE.				
	NOTE: Communications must be set to at least 19.2K baud in order for the Narkomed 2C to display ECG waveform information from the MECIF device.				
SpaceLabs DataLogger Devices	9600	NONE	1	8	S LAB
Marquette TramNet Devices	9600	NONE	1	8	MARQ
	NOTE: Marquette devices require a serial interface adapter (connected to the Narkomed 2C port).				
Datex AS/3 Devices	19.2K	EVEN	1	8	DATEX
Datex CARDIOCAP and CAPNOMAC Devices	1200	NONE	1	8	CARD
Criticare Poet IQ Devices	19.2K	NONE	1	8	POET
Criticare 1100 Devices	9600	NONE	1	8	C1100
Datascope Multinex Devices	2400	NONE	1	8	MULTX
Datascope Passport and Point-of-View Devices	9600	NONE	1	8	DIAP

Section 5 - Operation Monitoring System

Siemens SIRECUST Devices	4800	EVEN	1	8	SRCT
Puritan- Bennett Devices	1200	NONE	1	8	PURBN
Colin BP-508 Devices	4800	EVEN	1	7	COLIN
Criticon DINAMAP Devices	600	NONE	1	8	DNMAP
Nellcor N-1000/N-2500 Devices	9600	NONE	1	8	NELL
Ohmeda Rascal Devices	9600	NONE	1	8	RASCL
Ohmeda RGM Devices	9600	NONE	1	8	RGM

Exiting the Serial
Ports Screen

To save changes and exit from the Serial Ports screen:

1. Rotate the thumbwheel until the cursor is positioned on the EXIT soft key.
2. Press the Datagrip trigger.

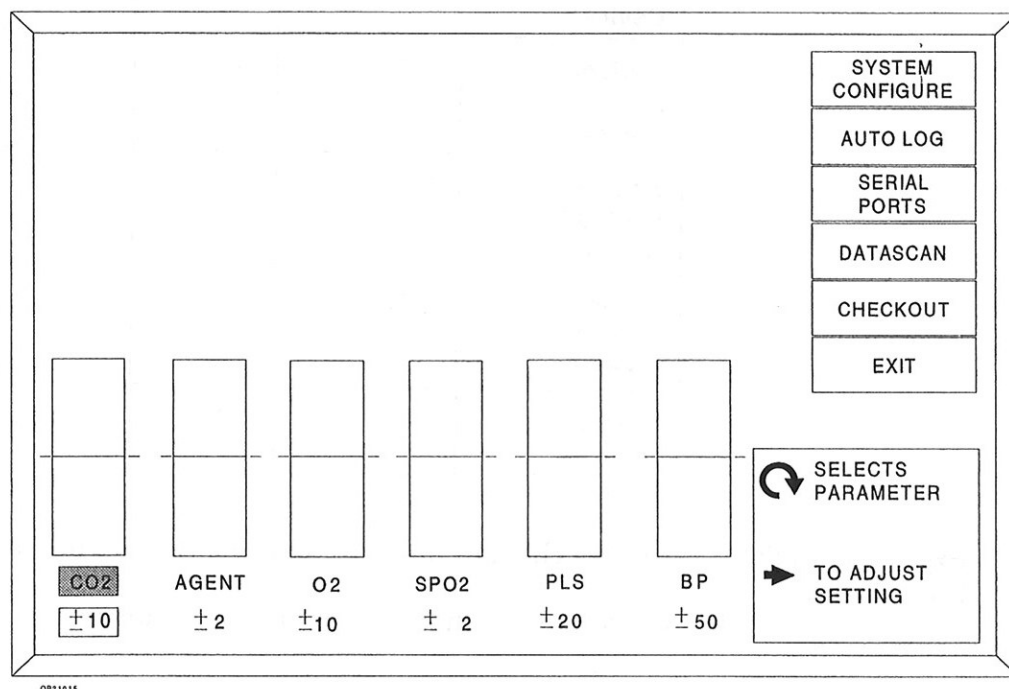
Section 5 - Operation

Monitoring System

Invoking the Datascan Configure Screen

To invoke the Datascan Configure screen, select the DATASCAN soft key from the Configuration Screen menu. This screen has options to change the deviation values for the bar graphs in the Datascan display.

The Datascan Configure screen displays the Datascan bar graphs along with the deviation values for each measurement. On the right side of the screen is a menu of configuration screens and a dialog box with instructions for using the Datagrip trigger and thumbwheel.



Setting CO₂,
Agent, O₂, SpO₂,
Pulse, BP
Deviation

To set the Datascan bar graph deviations:

1. Invoke the Datascan Configure screen.
2. Use the thumbwheel to position the cursor on the preferred selection. A box appears around the current setting.
3. Press the Datagrip trigger. The cursor moves to the current setting.
4. Rotate the thumbwheel to scroll the selection through the available settings. Refer to the following table for available scaling values for each Datascan measurement.

Section 5 - Operation Monitoring System

Measurement	Scaling Values
CO ₂	Current Measurement \pm 5, 10, 15, or 20 mmHg
Agent	Current Measurement \pm 1, 2, 3, or 4 %
O ₂	Current Measurement \pm 10, 20, 30, or 40 %
SpO ₂	Current Measurement \pm 2, 5, 10, or 15 %
Pulse	Current Measurement \pm 10, 20, 50, or 75 BPM
BP	Current Measurement \pm 10, 20, 50, or 75 mmHg

5. When the preferred value appears, press the Datagrip trigger to save the setting.

The factory default settings for the Datascan measurements are shown in the table below.

Measurement	Default Values
CO ₂	Current Measurement \pm 5 mmHg
Agent	Current Measurement \pm 1%
O ₂	Current Measurement \pm 10%
SpO ₂	Current Measurement \pm 2%
Pulse	Current Measurement \pm 10 BPM
BP	Current Measurement \pm 10 mmHg

Exiting the
Datascan
Configure Screen

To save changes and exit from the Datascan Configure screen:

1. Rotate the thumbwheel until the cursor is positioned on the EXIT soft key.
2. Press the Datagrip trigger.

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Invoking the Preuse Checkout Screen

To invoke the Preuse Checkout screen, select the CHECKOUT soft key from the Configuration Screen menu. The Preuse Checkout screens display a list of items to check before each operative procedure with the Narkomed 2C. The screen is also used to initiate oxygen sensor calibrations. For more detailed checkout instructions, see *Section 3 - Daily Checkout*.

Calibrating the Oxygen Sensor

To calibrate the oxygen sensor from the Preuse Checkout screen:

1. Invoke the CHECKOUT configuration screen.
2. With the cursor on the OXYGEN SENSOR selection, press the Datagrip trigger.
3. The prompt CONTINUE? appears with YES and NO selection boxes.
4. Select YES to initiate calibration.

For complete oxygen sensor calibration instructions, see *Section 5 Operation - Oxygen Monitoring*.

PRE-USE CHECKLIST

CONSULT PRE-USE CHECKOUT PROCEDURES IN THE OPERATOR'S MANUAL FOR DETAILED PROCEDURES

- VERIFY CONNECTION OF PROPER PIPELINE SUPPLIED GASES.
- CHECK PIPELINE SUPPLY PRESSURES: 50 - 55 PSI.
- VERIFY CONNECTION OF PROPER CYLINDER SUPPLIED GASES.
- CHECK CYLINDER PRESSURE: O2 - 1900 PSI, N2O - 745 PSI.
- CHECK FOR SUFFICIENT SUPPLY OF LIQUID ANESTHETIC: LEVEL MUST BE BETWEEN MIN AND MAX FULL MARKING.
- VERIFY TIGHTNESS OF VAPORIZER FILLER AND DRAIN VALVES.
- CHECK VAPORIZER EXCLUSION DEVICE.
- VERIFY FUNCTION OF FLOWMETERS: FLOAT MUST MOVE FREELY OVER FULL RANGE.
- CHECK OXYGEN ANALYZER: EXPOSE SENSOR TO AMBIENT AIR.

OXYGEN SENSOR CAL

PAGE 1 OF 3

NEW PAGE

EXIT

NOTE: Oxygen calibration can also be performed by using the CAL O2 option next to the Screen Selection menu or from the SETUP screen. Refer to *Section 5 - Oxygen Monitoring*.

Section 5 - Operation Monitoring System

Paging through the Preuse Checkout Screens

PRE-USE CHECKLIST

CONSULT PRE-USE CHECKOUT PROCEDURES IN THE OPERATOR'S MANUAL FOR DETAILED PROCEDURES

- VERIFY FUNCTION OF ORC:
ORC LIMIT N2O FLOW AT APPROXIMATELY 25% OXYGEN.
- TEST OXYGEN FLUSH: OXYGEN ANALYZER READING SHALL INCREASE.
- VERIFY OXYGEN DELIVERY: OXYGEN ANALYZER SHALL RESPOND TO INCREASE IN OXYGEN FLOW.
- TEST BATTERY POWER: BATTERY TEST INDICATOR SHALL ILLUMINATE GREEN FOR FULLY CHARGED BATTERY.
- CHECK PROPER CONNECTION OF 22 MM BREATHING HOSES.
- CHECK BREATHING PRESSURE PILOT LINE.
- CHECK PROPER CONNECTION OF 19 MM SCAVENGER HOSES.
- CHECK PROPER CONNECTION OF FRESH GAS HOSE.
- CHECK ALL HOSES FOR KINKS.
- CHECK FOR WATER IN HOSES AND ABSORBER DUST CUP.
- CHECK FOR PROPER CAPACITY BREATHING BAG.

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NEW PAGE

EXIT

OP21040

PRE-USE CHECKLIST

CONSULT PRE-USE CHECKOUT PROCEDURES IN THE OPERATOR'S MANUAL FOR DETAILED PROCEDURES

- CHECK STATUS OF ABSORBENT IN THE ABSORBER.
- CHECK FOR FREE GAS PASSAGE IN THE BREATHING SYSTEM.
- CHECK FOR LEAKS IN THE BREATHING SYSTEM.
- TEST PROPER FUNCTION OF APL VALVE: PRESSURE SHALL NOT EXCEED 2 CM H2O AT 8 L/MIN.
- TEST SCAVENGING SYSTEM: WITH Y-PIECE OCCLUDED SUB-ATMOSPHERIC PRESSURE SHALL NOT EXCEED -1 CM H2O.
- TEST VENTILATOR: POSITIVE PRESSURE AT Y-PIECE DURING INSPIRATORY PHASE, FREE GAS PASSAGE DURING EXPIRATORY PHASE.
- TEST PEEP VALVE IF PROVIDED.
- SET ALL ALARM LIMITS TO APPROPRIATE VALUES.
- VERIFY ALARM FUNCTIONS: SIMULATE ALARM CONDITION AND CHECK FOR ALARM ANNUNCIATION.

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NEW PAGE

EXIT

OP21041

To page through the Preuse Checkout screens:

1. In any Preuse Checkout screen, rotate the thumbwheel until the cursor is positioned on the selection labeled NEW PAGE.
2. Press the Datagrip trigger.

Section 5 - Operation Monitoring System

Exiting the Preuse Checkout Screens

To exit from any Preuse Checkout screen:

1. Rotate the thumbwheel until the cursor is positioned on the EXIT soft key.
2. Press the Datagrip trigger.

Invoking the Data Log Screen

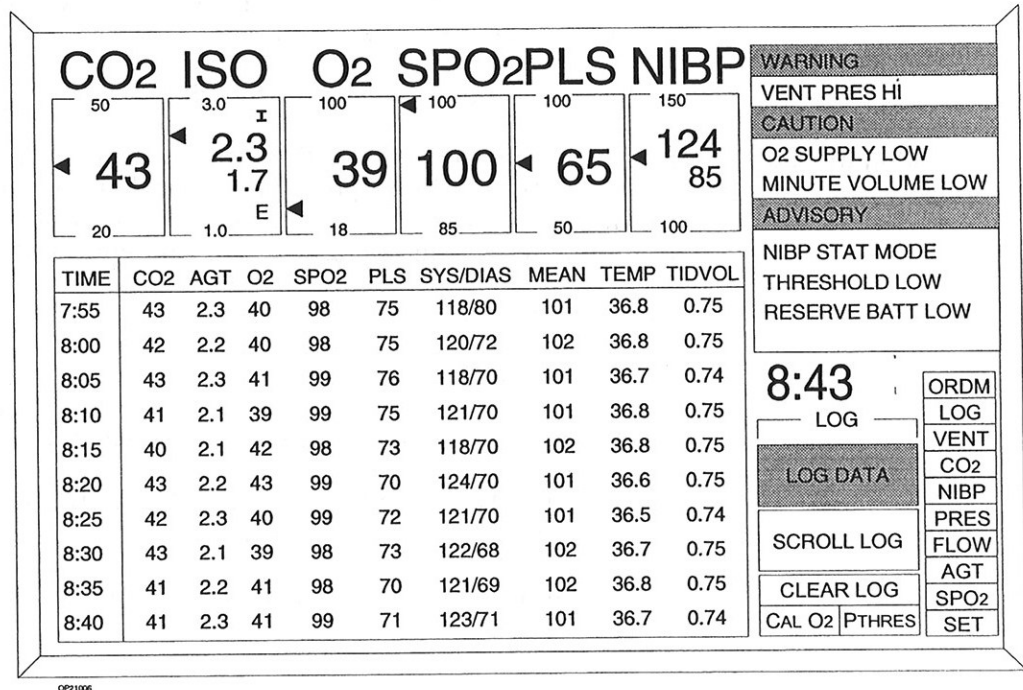
To invoke the Data Log screen, select LOG from the Screen Selection menu. The Data Log is a tabular listing of measurements ("events") saved by the Narkomed 2C for future reference.

The Data Log screen displays up to ten events in tabular, numeric format. The Numeric Datascan and the central alarm display appear at the top of the screen. The Screen Selection menu and the Data Log soft keys, LOG DATA, SCROLL LOG, and CLEAR LOG appear at the bottom right.

Logged events are listed sequentially with their times of occurrence. The most recent data log entry is shown on the bottom line of the table. The following measurements are logged:

- end-tidal carbon dioxide
- inspired agent
- inspired oxygen
- oxygen saturation
- pulse rate
- systolic/diastolic blood pressure
- mean blood pressure
- temperature
- tidal volume

Section 5 - Operation Monitoring System



Events are entered manually or automatically. If events are entered automatically, make sure the preferred options are chosen for automatic entry. These options are:

- during regular timed intervals
- when Warning alarms occur
- when Caution alarms occur
- at each new NIBP reading

For more information on selecting options, see "Invoking the Auto Log Screen" earlier in this section.

Logging Data Manually

To manually enter data into the Data Log for future reference:

1. Invoke the Data Log screen.
2. With the cursor positioned on the LOG DATA soft key, press the Datagrip trigger.
3. The current data is recorded in the Data Log.

Scrolling Through the Data Log

To scroll through the list of events in the Data Log:

1. Invoke the Data Log screen.
2. Position the cursor on the SCROLL LOG soft key.
3. Press the Datagrip trigger.

Section 5 - Operation Monitoring System

4. Rotate the thumbwheel downward to view earlier entries or upward to view the most recent entries.
5. Press the Datagrip trigger to exit the Scroll Log function.

Clearing the Data Logs

The Data Log and the NIBP log can be erased. Typically, logs are cleared at the beginning of a procedure before connecting the patient to the monitoring equipment. This clears the buffer of old data accumulated during machine setup and checkout.

To clear all data log information:

1. Invoke the Data Log screen.
2. Position the cursor on the CLEAR LOG soft key.
3. Press the Datagrip trigger. The prompt CONFIRM? appears with YES and NO selection boxes.
4. Rotate the thumbwheel to select YES or NO and press the Datagrip trigger.

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Invoking the Data Management Screen

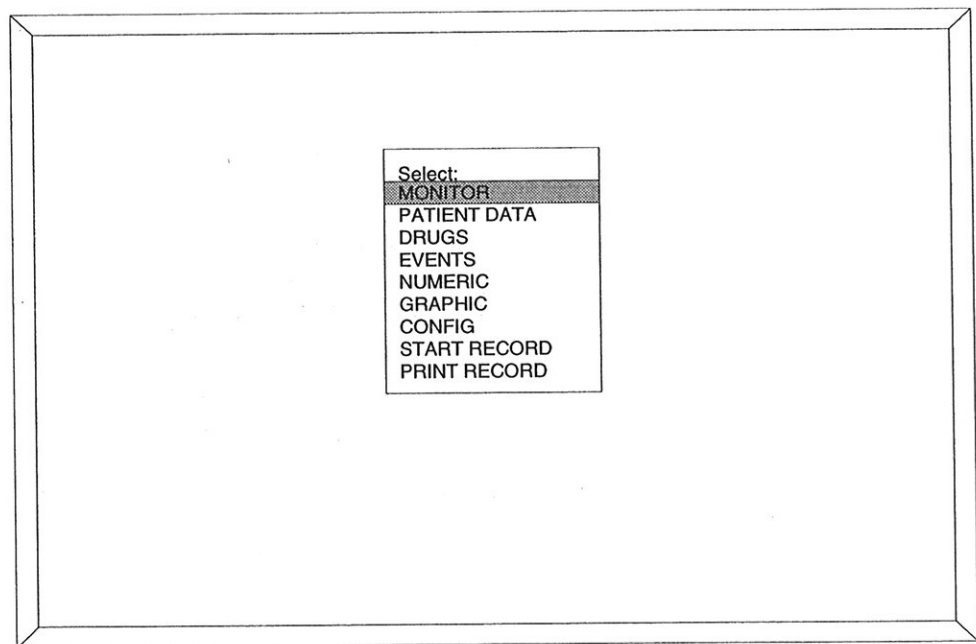
To invoke the Data Management screen, select the ORDM soft key from the Screen Selection menu. A menu is displayed for selecting the various O.R. Data Manager screens. The Data Management screen is available when the optional O.R. Data Manager is installed in the Narkomed 2C.

Selecting an O.R. Data Manager Screen

To select an O.R. Data Manager screen from the Narkomed 2C Data Management screen:

1. Rotate the thumbwheel to move the highlighted cursor to the preferred selection.
2. Press the Datagrip trigger.

For complete information on the O.R. Data Manager screens, see *Operation - O.R. Data Manager*.



Overview

Inspiratory oxygen concentration is measured with a dual galvanic cell sensor attached to the inspiratory valve dome. The sensor works by taking in oxygen, which initiates an electrochemical reaction within the oxygen sensor. The oxygen monitor reads the voltage produced by this reaction and translates it into an oxygen concentration measurement. The sensor incorporates two independent electrochemical cells (or sensor halves), and the oxygen monitor averages the signals produced by the cells.

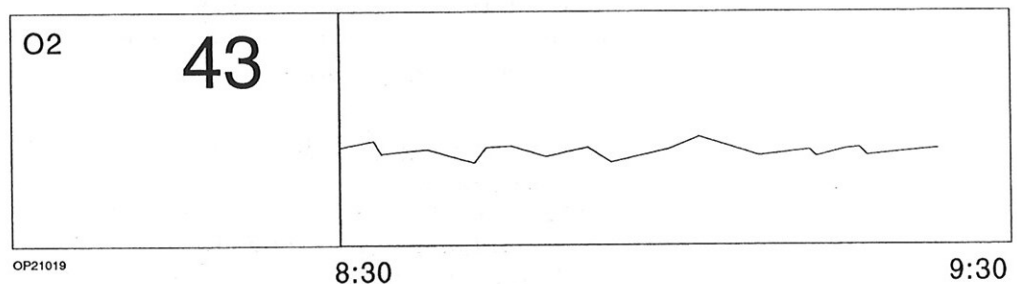
CAUTION: Never remove an oxygen sensor from its housing, except to replace it. If a sensor is removed from its housing, do the following before continuing normal operation:

- Reinstall the sensor in the housing.
- Wait for a period equal to the time that the sensor spent outside the housing.
- Calibrate the sensor.

NOTE: When the machine is not in use, the oxygen sensor assembly should be removed from the inspiratory valve dome, and the inspiratory valve dome should be closed off with the inspiratory valve dome plug.

Monitor Display

The oxygen analysis display area is located at the top of the Machine Monitor screen. It shows the numerical value for inspiratory oxygen as well as an inspiratory oxygen trend. You can scroll the trend display back in time, up to 8 hours, by selecting the SCROLL TREND soft key and then rotating the thumbwheel downward.



Section 5 - Operation

Oxygen Monitoring

Using Set Up Functions

Alarm limit adjustments and oxygen sensor calibrations are done in the Set Up screen. To invoke the Set Up screen:

1. Select the SET label from the screen selection menu. Three soft keys appear next to the selection menu, and the cursor moves to the top key labeled SET UP.

NOTE: If the Machine Monitor screen is selected, the SET UP soft key is always displayed.

2. With the cursor on the SET UP soft key, press the Datagrip trigger. The Set Up screen appears.

NOTE: You can also perform oxygen sensor calibrations from the Preuse Checkout screen or the CAL O2 option available next to the Screen Selection menu.

O2	43	OXYGEN HIGH	60
		OXYGEN LOW	30
		OXYGEN SENSOR	CAL

OP21016

Setting Alarm Limits

To adjust the oxygen high or low alarm limit:

1. Invoke the Set Up screen.
2. Use the thumbwheel to position the cursor on the alarm limit to be changed (OXYGEN HIGH or OXYGEN LOW). A box appears around the current limit setting.
3. Press the Datagrip trigger. The cursor moves to the current setting.
4. Rotate the thumbwheel to scroll the numerical value up or down within its allowable range (19–100% for OXYGEN HIGH, 18–99% for OXYGEN LOW). The factory default values are 100% for the HIGH setting and 30% for the LOW setting.

The OXYGEN HIGH setting cannot be less than or equal to the OXYGEN LOW setting. The OXYGEN LOW setting cannot be greater than or equal to the OXYGEN HIGH setting.

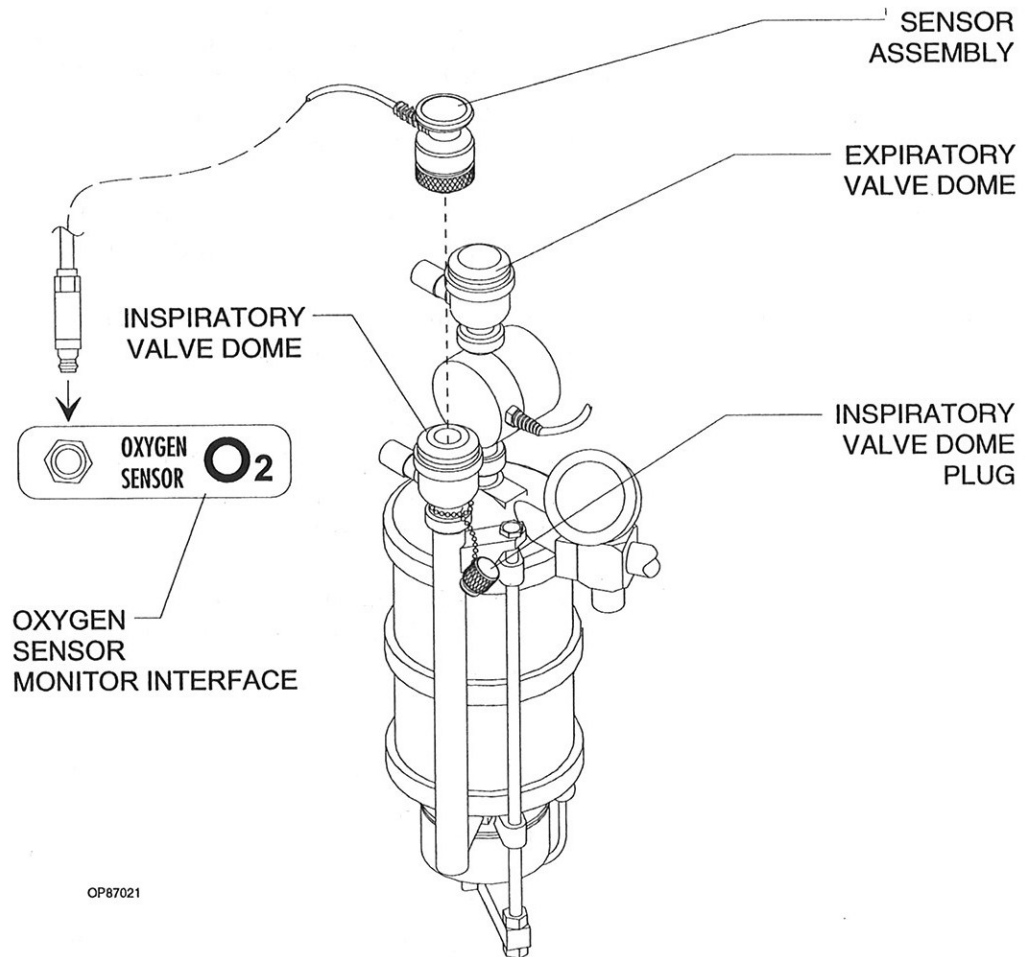
Section 5 - Operation Oxygen Monitoring

Calibrating the Oxygen Sensor

5. To save the new value, press the Datagrip trigger. The cursor returns to the alarm selection.

To be calibrated correctly, the sensor must be exposed to room air. Calibration of the oxygen sensor should be performed as part of the daily preoperative setup of the anesthesia equipment.

1. Remove the sensor assembly from the inspiratory valve dome and close off the dome with the inspiratory valve dome plug. (Do not disassemble the sensor assembly further.)



2. Expose the sensor to ambient air only (away from any open part of the breathing system), and allow it to stabilize for several minutes. The sensor should only be exposed to the 21% oxygen concentration normally found in ambient air.
3. Invoke the Set Up screen by selecting the SET label from the Screen Selection menu, and then selecting the SET UP soft key.

Section 5 - Operation

Oxygen Monitoring

NOTE: The CAL O2 option on the main display also calibrates the oxygen sensor.

4. Use the thumbwheel to position the cursor on OXYGEN SENSOR. A box appears around the word CAL.
5. Press the Datagrip trigger to initiate the oxygen sensor calibration. You will be prompted to verify that the sensor is exposed to ambient air (21% O₂). Follow the instructions that appear on the display.

The length of time that the sensor takes to calibrate depends on the gas mixture which the sensor was exposed to before calibration. If the sensor is exposed to 21% oxygen, calibration can take as little as 10 seconds. If the sensor is exposed to higher concentrations of oxygen, calibration may last up to 50 seconds. Typically, calibration lasts less than 30 seconds.

6. When the Narkomed 2C has completed calibration, pull the inspiratory valve dome plug and reinsert the sensor assembly.

Calibration Using the CAL O2 Option

1. Use the thumbwheel to scroll through the Selection Menu past SET and PTHRES to the CAL O2 option.
2. Press the Datagrip trigger to initiate calibration. A confirmation message is displayed. No calibration instructions are provided.
3. Select YES to continue.

Causes of Unsuccessful Calibration

If, at the end of the calibration period, the oxygen display area remains blank, the calibration was not successful. (This condition is also indicated by Advisory messages.) An unsuccessful calibration can be caused by several conditions:

- *Sensor was exposed to an excessively lean or excessively rich oxygen calibration mixture.* Make sure that the sensor is exposed to room air only for the entire calibration period.
- *Sensor was exposed to a constantly changing calibration mixture.* As stated above, make sure that the sensor is exposed only to room air for the entire calibration period.
- *Sensor has not received the proper waiting period.* If the sensor capsule has been removed from the sensor assembly, a waiting period equal to the time that the capsule spent outside the sensor assembly (up to one week) is necessary. New sensors require a 15 minute waiting period.

Section 5 - Operation Oxygen Monitoring

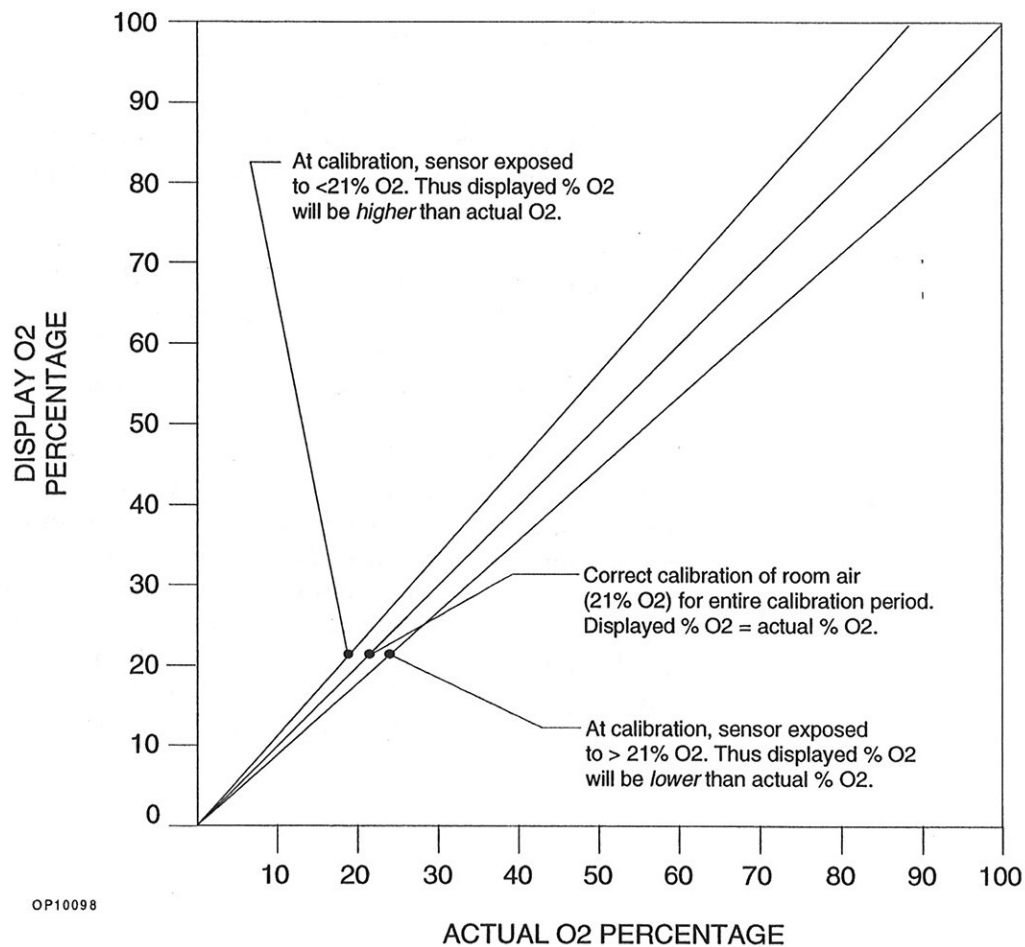
- *Sensor is exhausted.* If the oxygen sensor has decayed beyond its useful service life (see *Section 7 - Specifications* section of the manual), replace the decayed sensor with a new sensor and allow the proper waiting period.
- *Sensor is defective.* If there is too great a difference between the outputs of the two sensor halves, replace the defective sensor with a new sensor and allow the proper waiting period.
- *Sensor is disconnected.* When the sensor is disconnected, the display area is blank, and the message O2 SENSOR DISC appears on the central alarm display. If this happens, reconnect the sensor cord to the interface panel on the Narkomed 2C and select the OXYGEN SENSOR selection on the Set Up screen again.

Results of Unsuccessful Calibration

If the oxygen sensor is improperly calibrated, it can cause inaccurate measurements. When a calibration gas mixture is excessively rich or lean in oxygen, the Narkomed 2C will not complete an attempted calibration; however, if the calibration gas is rich or lean but is within certain limits, the Narkomed 2C will complete the calibration. As a result, when displaying sensor measurements, the Narkomed 2C displays an oxygen percentage either greater or less than the actual oxygen percentage. Therefore, make sure that the sensor is exposed only to room air during the entire calibration period.

Section 5 - Operation Oxygen Monitoring

The following figure illustrates the relationship between the calibration mixture and the accuracy of oxygen measurement.



Section 5 - Operation Oxygen Monitoring

Oxygen Alarm Messages

The following list contains all warning, caution and advisory alarms associated with oxygen monitoring.

INSP O2 LOW (Warning)

The Narkomed 2C continuously compares the current inspiratory oxygen percentage with the preset low oxygen alarm limit. If the measured oxygen concentration falls below the low alarm limit, the Warning message INSP O2 LOW appears on the central alarm display and a continuous audible alarm sounds.

INSP O2 HIGH (Advisory)

If the measured inspiratory oxygen concentration exceeds the preset high alarm limit, the Advisory message INSP O2 HIGH appears on the central alarm display and a single-tone audible alarm sounds.

O2 SENSOR DISC (Advisory)

If the oxygen sensor cord becomes disconnected (or is damaged enough to cause an open circuit), the Advisory message O2 SENSOR DISC appears on the central alarm display and a single-tone audible alarm sounds.

REPLACE O2 CELL (Advisory)

During oxygen sensor calibration and monitoring, the Narkomed 2C checks for a difference between the outputs of the two sensor channels. If the difference exceeds a predetermined percentage, the Advisory message REPLACE O2 CELL appears on the central alarm display.

During oxygen sensor calibration, the Narkomed 2C also checks the sensor's output against a range of acceptable output voltages. There are three possible causes for deviation from within this range.

- *Exhausted sensor.* If the sensor's capacity is exhausted, its output voltage will not meet the required minimum.
- *Incorrect calibration environment.* If the sensor is exposed to an excessive oxygen during calibration, the sensor's output will be above or below the acceptable output range.
- *Improper waiting.* If the proper waiting period is not allowed for a new sensor or for a sensor removed from the sensor housing, the sensor's output may be above or below the acceptable output range.

If a sensor error condition is detected during monitoring, the Advisory message REPLACE O2 CELL appears on the central alarm display and operation continues. Try to recalibrate the sensor; if the message remains, replace the sensor cell.

Section 5 - Operation

Oxygen Monitoring

CAL O2 SENSOR (Advisory)

The Advisory message CAL O2 SENSOR appears on the central alarm display in the following instances:

- the oxygen sensor enters a uncalibrated state
- the Narkomed 2C is unable to calibrate the oxygen sensor
- more than 18 hours have elapsed since the last calibration

SERVICE O2 MON (Advisory)

If the Narkomed 2C detects an internal electronic failure that would prevent proper operation, the Advisory message SERVICE O2 MON appears on the central alarm display. If this happens, contact a North American Dräger qualified technical service representative.

Low Oxygen Supply Whistle

If the Narkomed 2C is configured to do so, it sounds a 7-second whistle when the oxygen supply drops too low to properly pressurize the fresh gas circuit (below about 37 psi). If this alarm sounds, it cannot be silenced.

Section 5 - Operation Oxygen Monitoring

Problem Resolution

PROBLEM	POSSIBLE CAUSE	REMEDY
Display area remains blank when a reading is expected. CAL O2 SENSOR message on central alarm display.	Needs calibration	Perform proper calibration. Remove sensor assembly from breathing circuit. Make sure sensor is exposed to room air only. Press the Datagrip trigger to invoke the menu. Use the selection wheel to select OXYGEN SENSOR CAL, then press the Datagrip trigger and follow the on-screen instructions.
O ₂ analyzer fails to retain calibration. Alarm message CAL O2 SENSOR appears on central alarm.	Backup memory power not available	Check battery circuit breaker. Allow backup battery to recharge, and recalibrate the analyzer.
	Hardware malfunction	Contact NAD qualified technical service representative.
Pressing OXYGEN SENSOR CAL does not initiate calibration.	Sensor is disconnected	Reconnect sensor cord to input receptacle on anesthesia machine.
	Sensor cord is damaged	Replace housing/cord assembly.

Section 5 - Operation

Oxygen Monitoring

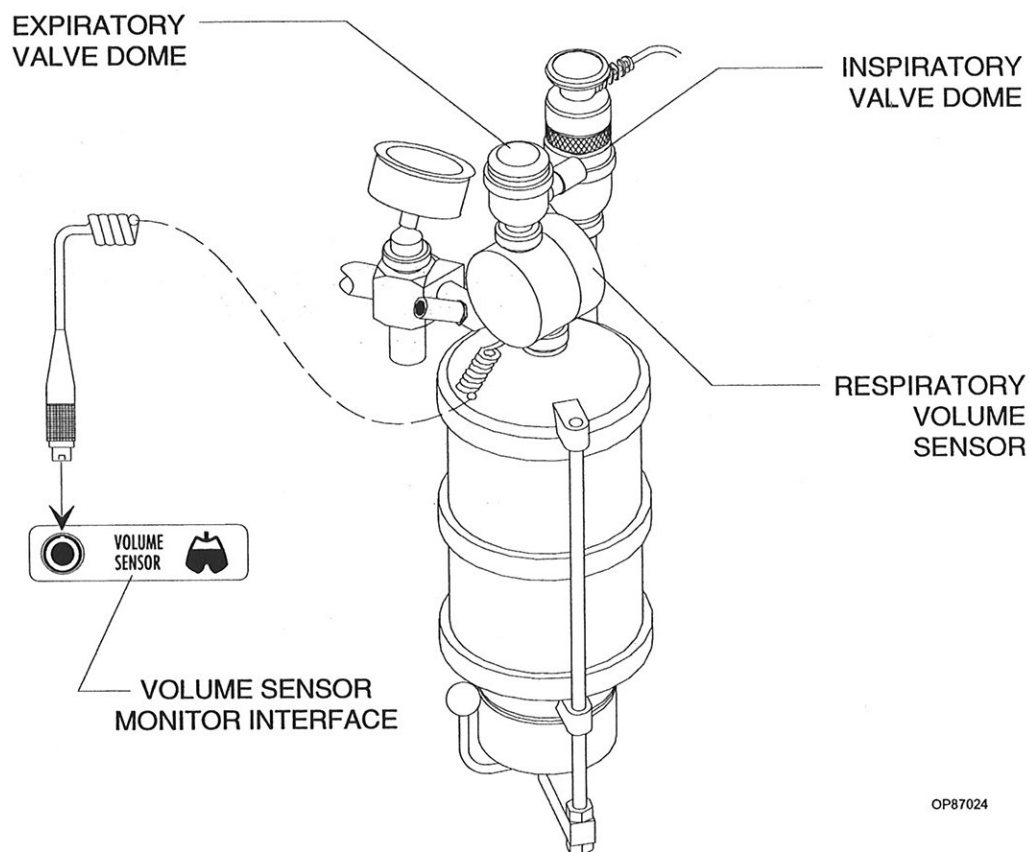
PROBLEM	POSSIBLE CAUSE	REMEDY
Pressing OXYGEN SENSOR CAL initiates calibration, but display window remains blank at end of calibration period	Sensor is exposed to incorrect oxygen concentration	Expose sensor to room air for 21% calibration.
	Sensor exposed to constantly changing calibration mixture	
	Sensor capsule was removed from housing for a prolonged period	Allow a waiting period equal to duration of capsule removal.
	New capsule not given proper waiting period	Allow a 15 minute waiting period.
	Exhausted or defective sensor capsule	Replace sensor capsule. Allow a 15 minute waiting period.
O2 SENSOR DISC message appears on central alarm display during monitoring	Defective sensor housing and cable	Replace housing/cable assembly.
	Sensor cord is disconnected	Reconnect sensor cord to input receptacle on anesthesia machine.

Section 5 - Operation

Respiratory Volume Monitoring

Overview

Respiratory volume is measured by a respiratory sensor which is attached to the expiratory valve and is mounted to the top of the absorber assembly. The sensor uses a positive displacement rotating-lobe impeller that generates electronic pulses in response to the patient's expiratory flow. These pulse patterns are converted into meaningful readings for minute volume, tidal volume, and respiratory rate displays.



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Section 5 - Operation

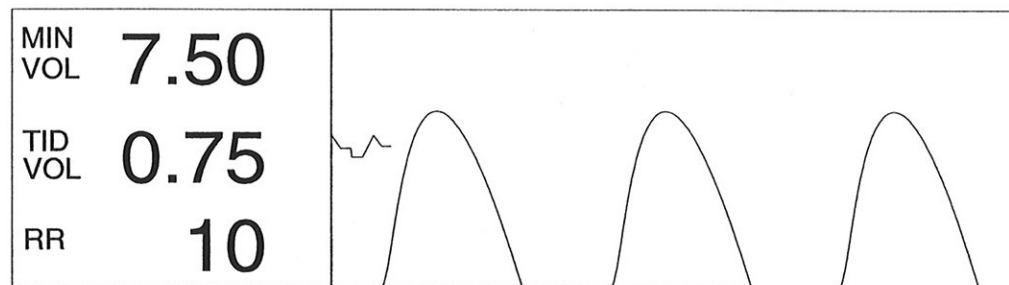
Respiratory Volume Monitoring

CAUTION: Although the Narkomed 2C is designed to minimize the effects of ambient radio-frequency interference, the functioning of the respiratory volume monitor may be adversely affected by the operation of electrosurgical equipment or short wave or microwave diathermy equipment in the vicinity.

NOTE: Sudden, irregular expiratory flow may cause erratic tidal volume and respiratory rate displays. To avoid such erroneous measurements, defer reading the display until a full minute has elapsed after the irregular flow has stopped.

Monitor Display

The respiratory volume display is located at the bottom of the Machine Monitor screen. It shows numerical values for minute volume, tidal volume and breaths per minute. It also shows the expiratory flow waveform and up to one hour of minute volume trend data. You can scroll the trend display back in time, up to 8 hours, by selecting the SCROLL TREND soft key and then rotating the thumbwheel downward. In the System Configure screen, you can choose a fast or a slow speed for waveform display.



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The minute volume display continuously shows the volume of exhaled gas accumulated during the previous minute of respiration. If a full one-minute history of exhaled volume is not available, the MIN VOL display area is blank. You can adjust the low alarm limit for minute volume.

The tidal volume display shows the volume for each breath. If at any time the monitor does not detect a valid breath within a 30-second period, the TID VOL and MIN VOL display areas go blank.

Fixed alarms are provided for low tidal volume, low minute volume, and reverse flow through the sensor. While the ventilator is on, apnea volume alarms are generated at 15 seconds (Caution) and 30 seconds (Warning) if the respiratory volume monitor does not sense a valid breath. While the ventilator is off, these alarms are generated at 30 seconds (Caution) and 60 seconds (Warning).

Section 5 - Operation

Respiratory Volume Monitoring

The respiratory rate shows the number of breaths per minute.

The Narkomed 2C's volume alarms are automatically enabled when the ventilator power switch is turned to the ON position. A disconnected or damaged sensor causes a sensor failure alarm.

Using Set Up Functions

Alarm limits and the minute volume trend scale are configured in the Set Up screen. To invoke the Set Up screen:

1. Select the SET label from the screen selection menu. Three soft keys appear next to the selection menu, and the cursor moves to the top key labeled SET UP.

NOTE: If the Machine Monitor screen is selected, the SET UP soft key is always displayed.

2. With the cursor on the SET UP soft key, press the Datagrip trigger. The Set Up screen appears.

MIN VOL	7.50	MINUTE VOLUME LOW VOLUME ALARMS	1.0 ON
TID VOL	0.75		
RR	10	MIN VOL SCALE	0-20

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Setting Minute Volume Low Limit

To set the minute volume low limit:

1. Invoke the Set Up screen.
2. Use the thumbwheel to position the cursor on the MINUTE VOLUME LOW selection. A box appears around the current alarm limit setting.
3. Press the Datagrip trigger. The cursor moves to the current setting.
4. Rotate the thumbwheel to scroll the numerical value up or down within its allowable range (0.2–10 liters). The factory default setting is 1.0 liters.
5. To save the new setting, press the Datagrip trigger. The cursor returns to the MINUTE VOLUME LOW selection.

Section 5 - Operation

Respiratory Volume Monitoring

Setting Volume Alarms On/Off

To turn the volume alarms on or off:

1. Invoke the Set Up screen.
2. Use the thumbwheel to position the cursor on the VOLUME ALARMS selection.
3. A second shaded cursor appears on the current setting.
4. Press the Datagrip trigger to toggle the alarm setting between ON and OFF. The factory default setting is OFF.

NOTE: If the alarms are in STBY (standby), pressing the Datagrip trigger will turn the alarms on.

Setting Minute Volume Trend Scale

To set the minute volume trend scale:

1. Invoke the Set Up screen.
2. Use the thumbwheel to position the cursor on the MIN VOL SCALE selection. A box appears around the current scale setting.
3. Press the Datagrip trigger. The cursor moves to the current setting.
4. Rotate the thumbwheel up or down to scroll through the available minute volume trend scales: 0-5, 0-10 or 0-20.
5. To save the new setting, press the Datagrip trigger. The cursor returns to the MIN VOL SCALE selection.

Section 5 - Operation

Respiratory Volume Monitoring

Respiratory Volume Alarm Messages

The following list contains all warning, caution and advisory alarms associated with respiratory volume monitoring.

APNEA-VOLUME (Warning/ Caution)

The Narkomed 2C continuously monitors the expiratory flow in the patient breathing system. By processing the expiratory flow pattern, the monitor can determine if a "valid" breath has occurred. A "valid" breath has a tidal volume of 50 ml or greater.

When the ventilator is on:

If a valid breath is not detected for an interval of 15 seconds, the Caution message APNEA-VOLUME appears on the central alarm display and an intermittent audible alarm sounds.

If a valid breath is not detected for an additional 15 seconds (30 seconds total), the Caution message APNEA-VOLUME is upgraded to a Warning on the central alarm display and a continuously repeating audible alarm sounds.

When the ventilator is off:

The Caution condition does not occur until 30 seconds have elapsed; the Warning condition does not occur until 60 seconds have elapsed.

During apneic conditions, the respiratory volume measurements disappear after 30 seconds. When a valid breath is detected, alarm annunciation ceases and a tidal volume measurement appears in the display window. However, a full minute of respiratory activity must be registered before the minute volume and respiratory rate appear.

NOTE: Volume-related alarms can be disabled with the Volume Alarms selection in the Set Up screen.

MINUTE VOLUME LOW (Caution)

Whenever the Narkomed 2C measures a minute volume less than the low minute volume alarm limit, the Caution message MINUTE VOLUME LOW appears on the central alarm display and an intermittent audible alarm sounds.

Section 5 - Operation

Respiratory Volume Monitoring

REVERSE FLOW (Advisory)	<p>If a reverse flow in excess of 20 ml is detected, the Advisory message REVERSE FLOW appears on the central alarm display and a single-tone audible alarm sounds.</p> <p>A forward flow greater than 20 ml clears the alarm condition. The REVERSE FLOW alarm message remains on the screen for 5 seconds after the resumption of forward flow to allow the recognition of an intermittent reverse flow condition.</p>
VOL SENSOR DISC (Advisory)	<p>If the respiratory volume sensor cord is not properly connected to its input receptacle on the anesthesia machine (or if the cord is damaged enough to cause an open circuit), the Advisory messages VOL SENSOR DISC and VOL ALARMS OFF appear on the central alarm display.</p>
VOL ALARMS OFF (Advisory)	<p>When the volume alarms have been disabled, the Advisory message VOL ALARMS OFF appears on the central alarm display.</p> <p>This alarm condition is also generated by a disconnect of the sensor cord.</p>
VOL ALARMS STBY (Advisory)	<p>When the volume alarms have been set to Standby, the Advisory message VOL ALARMS STBY appears on the central alarm display.</p>
SERVICE VOL MON (Advisory)	<p>If the Narkomed 2C detects an internal electronic failure that would prevent proper operation, the Advisory message SERVICE VOL MON appears on the central alarm display. If this happens, contact a North American Dräger qualified technical service representative.</p>

Section 5 - Operation Respiratory Volume Monitoring

Problem Resolution

PROBLEM	POSSIBLE CAUSE	REMEDY
Blank display area	One full minute has not elapsed (for Minute Volume and Respiratory Rate) since respiration began	Wait one minute to read display.
	Apnea condition	Correct apnea condition.
Blank display area, VOL SENSOR DISC and VOL ALARMS OFF alarm messages on central alarm display	Sensor cord disconnected	Reconnect sensor cord plug to interface panel on anesthesia machine.
	Sensor cord damaged	Repair sensor cord.
REVERSE FLOW alarm message on central alarm display	Leak between sensor and expiratory valve	Check gasket; make sure it is in good condition and is seated properly.
	Expiratory valve not closing completely during inspiration	Check expiratory valve disc and pins. Clean, repair, or replace expiratory valve.
	Defective sensor	Repair or replace sensor.
Tidal volume readings obtained are consistently low and sensor is noisy during operation	Excessive friction in sensor	Lubricate, repair, or replace sensor.

Section 5 - Operation Breathing Pressure Monitoring

Overview

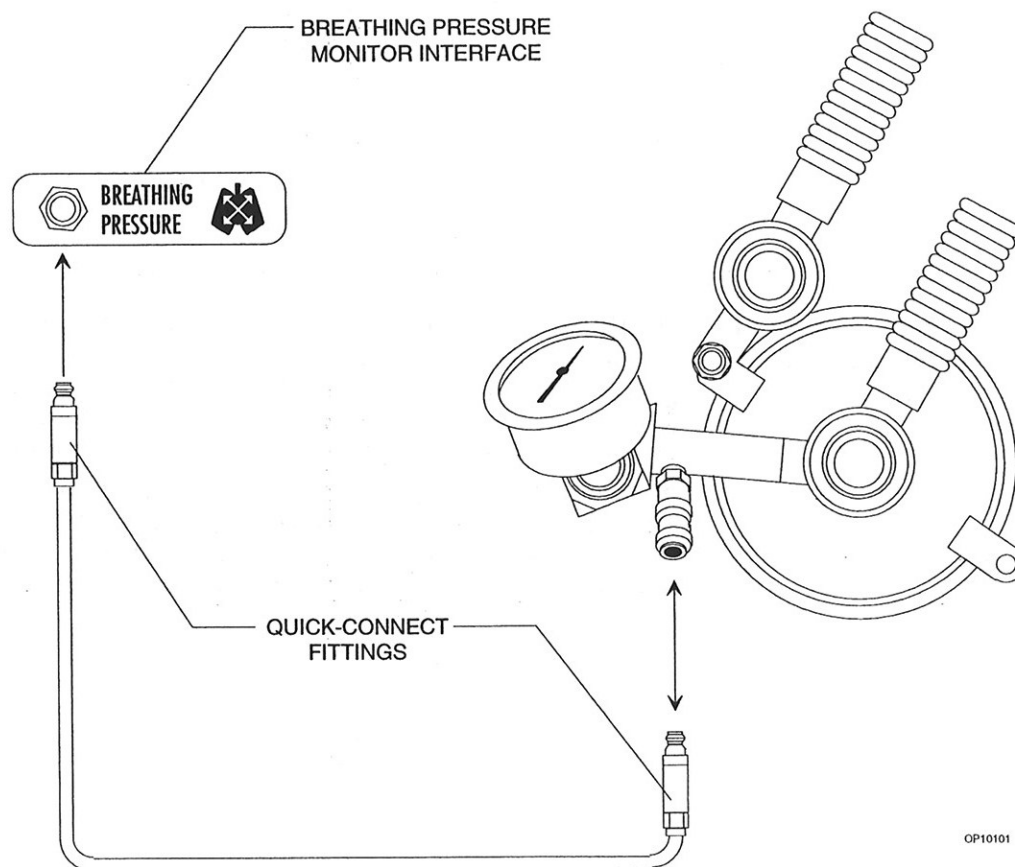
Breathing pressure is measured with a solid-state pressure transducer that can sense pressure at either the absorber or patient Y-piece, depending on which pilot line is used.

Installing the Breathing Pressure Pilot Line

North American Dräger anesthesia systems are supplied with two breathing pressure pilot lines: a shorter one for breathing pressure monitoring at the absorber, and a longer line for breathing pressure monitoring at the Y-piece. For either type of pilot line, check the line for obstructions and moisture accumulation before and during use.

For breathing pressure monitoring at the absorber, install the shorter pilot line (which has a quick-connect fittings on both ends) as follows:

1. Insert one quick-connect fitting on the pilot line into the quick-connect fitting mounted on the rear of the gas pipe that extends from the absorber top assembly. (The absorber quick-connect fitting has a self-closing construction, and can be left unused when employing the longer pilot line.)
2. Insert the other quick-connect fitting into the quick-connect fitting on the breathing pressure monitor interface panel.



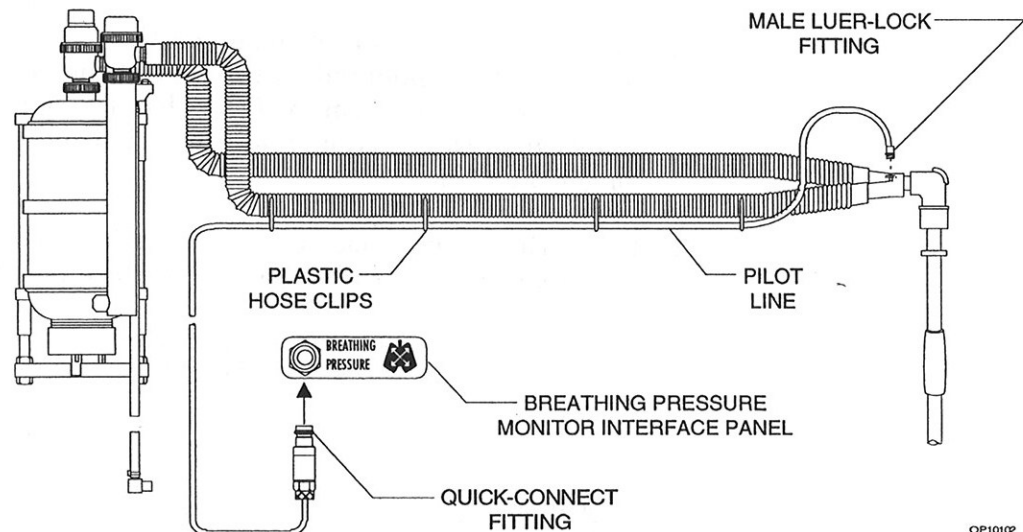
OP10101

Section 5 - Operation

Breathing Pressure Monitoring

For breathing pressure monitoring at the patient Y-piece, install the longer pilot line (which has a quick-connect fitting on one end and a Luer type fitting on the other end) as follows:

1. Insert the quick-connect fitting on the pilot line into the quick-connect fitting on the breathing pressure monitor interface panel.
2. Insert the Luer fitting on the pilot line with a Luer fitting on either the patient Y-piece or a 15 mm adapter on the patient side of the Y-piece. Use the four plastic hose clips attached to the pilot line to mount it on either of the breathing hoses leading to the Y-piece.



Choice of Breathing Pressure Monitoring Location

North American Dräger has no control over the type of breathing hoses and Y-pieces that are ultimately used with NAD absorber systems and pressure monitors—specifically, whether such user-supplied components include a terminal for pressure monitoring at or near the Y-piece. In order to ensure that some form of pressure monitoring is always used, provisions have been made for pressure monitoring at the absorber (the quick-connect fitting on the absorber gas pipe). However, do not construe this provision for monitoring at the absorber as a recommendation from North American Dräger for this pressure monitoring location.

Section 5 - Operation Breathing Pressure Monitoring

In fact, arguments can be made for pressure monitoring at either the Y-piece or at the absorber. Advocates of Y-piece pressure monitoring first claim that it more accurately reflects the pressure developed in the patient's lungs. They also claim that a blocked breathing system can be more easily detected with this method when compared with pressure monitoring at the absorber.

For example, if the inspiratory breathing hose became kinked or blocked during automatic ventilation, the ventilator bellows would continue to cycle against the blocked hose. A pressure monitor connected at the Y-piece (downstream of the occlusion) could sense either an absence of pressure fluctuation and alarm, or could sense a reduced pressure fluctuation (below the threshold pressure alarm limit) and alarm. In contrast, a pressure monitor connected at the absorber (upstream of the occlusion) could sense a pressure fluctuation above the threshold pressure alarm limit, and thus would not alarm. (Both of these scenarios assume that the occlusion does not cause a peak pressure high enough to activate the peak pressure alarm, which is meant to detect pressures likely to cause barotrauma.)

However, North American Dräger disagrees with the idea of relying on pressure monitoring to detect a blocked breathing circuit. Carbon dioxide monitoring and respiratory flow monitoring provide superior detection of blocked breathing paths when compared to pressure monitoring, which detects such conditions only in some instances. North American Dräger pressure monitors are therefore not promoted for detection of blocked breathing paths.

Further, Y-piece pressure monitoring has several disadvantages that could collectively cause the operator to neglect connecting the pressure monitoring pilot line. Examples include increased contamination of the pilot line due to its proximity to secretions, buildup of condensation within the pilot line, and the introduction of additional disconnection points (if the pilot line connects to a 15 mm adapter).

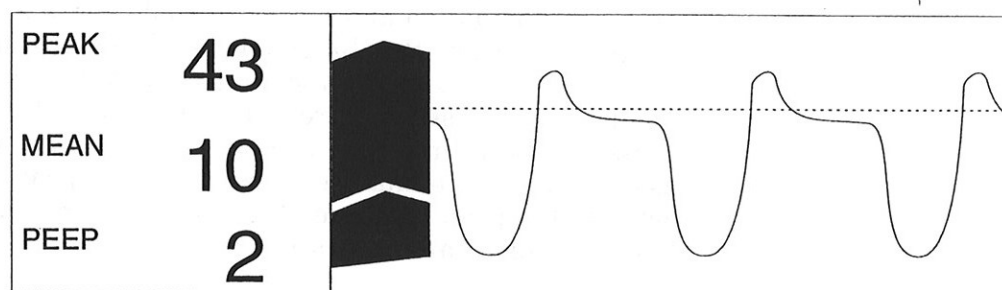
In conclusion, the responsibility for the selection of pressure monitoring at either the absorber or the Y-piece rests with you, the operator. Your clinical considerations, over which North American Dräger has no control, must be included in this decision. North American Dräger is available to discuss with you in detail the positive and negative aspects of each pressure monitoring approach.

Section 5 - Operation

Breathing Pressure Monitoring

Monitor Display

The breathing pressure monitoring display is located in the middle of the Machine Monitor screen. It shows numerical values for peak, mean, and positive end-expiratory pressure (PEEP) airway pressures. The minimum numeric display range is -10 to 125 cmH₂O with 1 cmH₂O resolution. The display also shows a pressure waveform and up to one hour of combined trend of the three airway pressure measurements. You can scroll the trend display back in time, up to 8 hours, by selecting the SCROLL TREND soft key and then rotating the thumbwheel downward. In the System Configure screen, you can choose a fast or a slow speed for waveform display.



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The peak pressure is the highest instantaneous pressure value for each breath. The mean pressure represents the average of all of the instantaneous pressure values recorded during each breath. The PEEP pressure is the pressure after exhalation.

During apneic conditions, the pressure monitor displays numeric information as long as it detects a peak pressure at least 10 cmH₂O greater than PEEP pressure. When this pressure difference drops below 10 cmH₂O, the numeric information remains 60 seconds longer and then disappears.

The breathing pressure waveform provides a visual assessment of lung mechanics and ventilation. The horizontal dotted line on the waveform represents the threshold pressure (apnea) alarm limit, which is useful when adjusting the limit. (For more information, see "Setting Pressure High and Threshold Pressure Limits" later in this section.)

Using Set Up Functions

Alarm adjustments and the setting of the breathing pressure trend scale are done in the Set Up screen. To invoke the Set Up screen:

1. Select the SET label from the screen selection menu. Three soft keys appear next to the selection menu, and the cursor moves to the top key labeled SET UP.

Section 5 - Operation

Breathing Pressure Monitoring

NOTE: If the Machine Monitor screen is selected, the SET UP soft key is always displayed.

2. With the cursor on the SET UP soft key, press the Datagrip trigger. The Set Up screen appears.

PEAK	43	PRESSURE HIGH	50
		THRESHOLD PRES	30
MEAN	10	APNEA ALARM	OFF
		AUTO-THRESHOLD	SET
PEEP	2	PRESSURE SCALE	0-100

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Setting Pressure High and Threshold Pressure Alarm Limits

To set the pressure high limit and the threshold pressure alarm limit:

1. Invoke the Set Up screen.
2. Use the thumbwheel to position the cursor on the desired selection (PRESSURE HIGH or THRESHOLD PRES). A box appears around the current limit setting.
3. Press the Datagrip trigger. The cursor moves to the current setting.
4. Rotate the thumbwheel to scroll the numerical value up or down within its allowable range (30–120 cmH₂O for PRESSURE HIGH, 5–30 cmH₂O for THRESHOLD PRES.) The factory default values are 50 cmH₂O for the HIGH setting and 12 cmH₂O for the THRESHOLD setting.
5. To save the new value, press the Datagrip trigger. The cursor returns to the alarm selection.

WARNING: The threshold pressure alarm limit should be set as close as possible to the sensed peak pressure without exceeding it.

If a breathing system leak or partial disconnection occurs when the threshold pressure alarm limit is set significantly lower than the peak pressure, continued positive pressure ventilation can produce a pressure fluctuation great enough to exceed the threshold (and thereby satisfy the alarm), yet not great enough to provide adequate ventilation.

To address the problem, the Advisory message THRESHOLD LOW appears on the central alarm display under the following conditions:

Section 5 - Operation

Breathing Pressure Monitoring

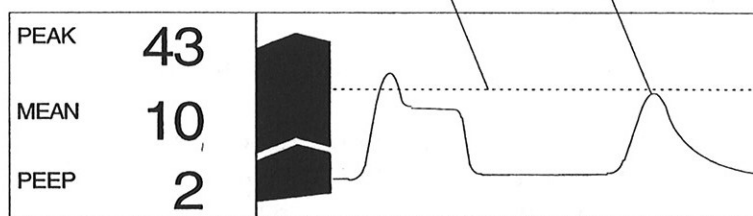
- If the sensed peak pressure exceeds the set threshold by more than 6 cmH₂O at threshold pressure alarm limit settings of 5–20 cmH₂O.
- If the sensed peak pressure exceeds the set threshold by more than 8 cmH₂O at threshold pressure alarm limit settings of 21–29 cmH₂O.

NOTE: The threshold setting may be affected when the ventilator is turned on or off. If you turn the ventilator off while the threshold is set to a value greater than 15 cmH₂O, the setting is changed to 15 cmH₂O. (If the threshold is set lower than 15 cmH₂O when the ventilator is turned off, the threshold retains its setting.) When the ventilator is turned back on, the threshold is restored to its previous set value.

The figure below illustrates the effects of correct and incorrect settings of the threshold pressure alarm limit.

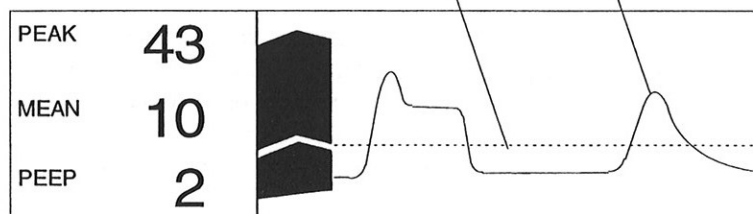
1. Threshold pressure alarm limit correctly set to within 6 cm H₂O of peak pressure (for alarm limit settings of 5 through 20 cm H₂O).

2. Thus, after partial breathing system disconnection or leak, small pressure fluctuation does not cross threshold pressure alarm limit. Operator is warned of apnea condition.



1. Threshold pressure alarm limit incorrectly set > 6 cm H₂O below peak pressure.

2. Thus, after partial breathing system disconnection or leak, small pressure fluctuation in system satisfies incorrectly set threshold pressure alarm limit. Operator is not alerted of apnea condition.



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Section 5 - Operation

Breathing Pressure Monitoring

Setting Apnea Alarm On/Off

To set the apnea alarm:

1. Invoke the Set Up screen.
2. Use the thumbwheel to position the cursor on the APNEA ALARM selection.
3. A second shaded cursor appears on the current setting.
4. Press the Datagrip trigger to toggle the alarm setting between ON and OFF until the desired setting appears. The factory default setting is STBY.

NOTE: If the ventilator is on, this alarm cannot be turned off. If the alarm is in STBY (standby), pressing the Datagrip trigger will turn the alarm on.

Setting Auto-Threshold

To set the auto-threshold:

1. Invoke the Set Up screen.

NOTE: Auto-threshold is also set by selecting PTHRES in the main display.

2. Use the thumbwheel to position the cursor on the AUTO-THRESHOLD selection. A box appears around the SET setting.
3. Press the Datagrip trigger.
4. The threshold pressure limit is automatically set to 4 cmH₂O below the current peak pressure measurement (to a maximum of 30 cmH₂O), or 5 cmH₂O, whichever is greater.

Setting Pressure Trend Scale

To set the pressure trend scale:

1. Invoke the Set Up screen.
2. Use the thumbwheel to position the cursor on the PRESSURE SCALE selection. A box appears around the current scale setting.
3. Press the Datagrip trigger. The cursor moves to the current setting.
4. Rotate the thumbwheel up or down to scroll through the available pressure trend scales: 0–20, 0–50 or 0–100 cmH₂O.
5. To save the new setting, press the Datagrip trigger. The cursor returns to the PRESSURE SCALE selection.

Section 5 - Operation

Breathing Pressure Monitoring

Breathing Pressure Alarm Messages

The following list contains all warning, caution and advisory alarms associated with breathing pressure monitoring.

APNEA-PRESSURE (Warning/Caution)

When the ventilator is on:

If the measured breathing pressure remains below the threshold pressure alarm limit for more than 15 seconds, the Caution message APNEA-PRESSURE appears on the central alarm display and an intermittent audible alarm sounds.

If the breathing pressure remains below the threshold pressure for an additional 15 seconds (30 seconds total), the Caution message APNEA-PRESSURE is upgraded to a Warning on the central alarm display, and a continuously repeating audible alarm sounds. During the Warning condition, numeric data remains on the display as long as the monitor detects a peak pressure at least 10 cmH₂O greater than PEEP pressure. When this pressure difference drops and remains below 10 cmH₂O for more than 60 seconds, the numeric data is cleared.

When the ventilator is off:

The Caution condition does not occur until 30 seconds have elapsed; the Warning condition does not occur until 60 seconds have elapsed.

VENT PRESSURE HI (Warning)

If the measured breathing pressure exceeds the high pressure limit, the Warning message VENT PRESSURE HI appears on the central alarm display and a continuously repeating audible alarm sounds.

This alarm condition is cleared when the measured breathing pressure drops below the high pressure alarm limit. However, the alarm message is extended for 5 seconds to allow for a momentary high pressure condition.

SUB ATM PRESSURE (Warning)

If the measured breathing pressure falls below -10 cmH₂O, the Warning message SUB ATM PRESSURE appears on the central alarm display and a continuously repeating audible alarm sounds.

This alarm condition is cleared when the sensed pressure rises above -10 cmH₂O. However, the alarm message is extended for 5 seconds to allow the recognition of a momentary subatmospheric pressure condition.

CONTINUOUS PRES (Warning)

If the measured breathing pressure remains above the threshold pressure alarm limit for more than 15 seconds, the breathing pressure display area is cleared, the Warning message CONTINUOUS PRES appears on the central alarm display, and an intermittent audible alarm sounds.

When the measured breathing pressure drops below the threshold pressure alarm limit, alarm annunciation ceases.

Section 5 - Operation

Breathing Pressure Monitoring

PEEP > 25
(Caution)

Any time that the monitor measures a PEEP of 26 cmH₂O or greater, the Caution message PEEP > 25 appears on the central alarm display and an intermittent audible alarm sounds.

Alarm annunciation ceases when the measured PEEP drops below 26 cmH₂O. Also, an APNEA or CONTINUING PRESSURE alarm condition will clear this alarm condition.

THRESHOLD
LOW
(Advisory)

The Advisory message THRESHOLD LOW appears on the central alarm display any time the sensed peak pressure exceeds the threshold pressure alarm limit by more than 6 cmH₂O at threshold pressure alarm limit settings of 5–20 cmH₂O, or by more than 8 cmH₂O at threshold pressure alarm limit settings of 21–29 cmH₂O. Setting the threshold pressure alarm limit at 30 cmH₂O disables the THRESHOLD LOW advisory.

PEEP > 4
(Advisory)

Any time the monitor measures a PEEP of 5 cmH₂O or greater, the Advisory message PEEP > 4 appears on the central alarm display.

When the measured PEEP drops below 5 cmH₂O, the Advisory message is cleared from the display.

APNEA-P
ALRM OFF
(Advisory)

Any time that the apnea pressure alarm (threshold pressure alarm limit) has been disabled, the Advisory message APNEA-P ALRM OFF appears on the central alarm display.

APNEA-P
ALM STBY
(Advisory)

Any time that the apnea pressure alarm (threshold pressure alarm limit) has been set to Standby, the Advisory message APNEA-P ALM STBY appears on the central alarm display.

SERVICE
PRES MON
(Advisory)

If the Narkomed 2C detects an internal electronic failure that would prevent proper operation, the Advisory message SERVICE PRES MON appears on the central alarm display. If this happens, contact a North American Dräger qualified technical service representative.

Section 5 - Operation

Breathing Pressure Monitoring

Problem Resolution

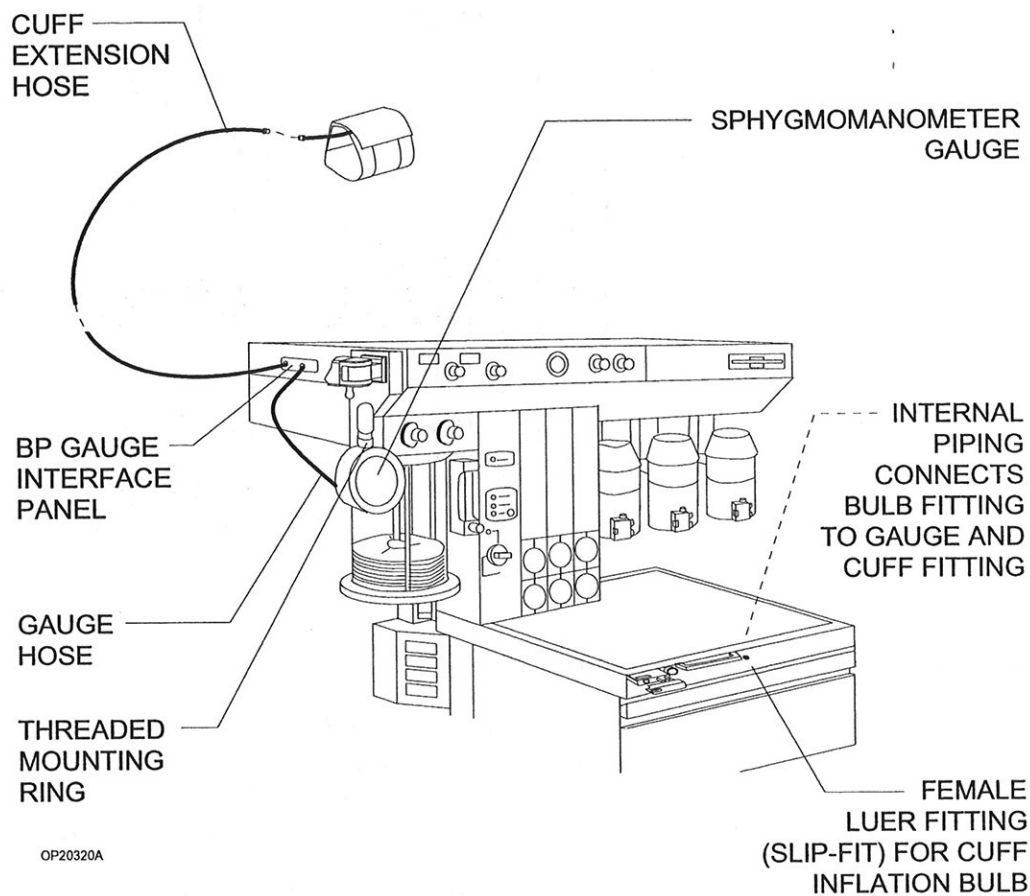
PROBLEM	POSSIBLE CAUSE	REMEDY
No pressure readout in display area during ventilation	Pilot line not connected	Make sure pilot line is properly connected.
	Pilot line blocked or kinked	Make sure that lumen of pilot line is free of obstructions.
Erratic readings	Condensation accumulation in pilot line	Drain and reconnect pilot line.

Section 5 - Operation

Manual Sphygmomanometer

Overview

An aneroid manual sphygmomanometer can be mounted on the Narkomed 2C. The sphygmomanometer gauge is positioned on the left side of the anesthesia machine, next to the ventilator bellows. The cuff inflation bulb is located to the right of the oxygen flush button on the front of the machine.



Section 5 - Operation

Manual Sphygmomanometer

Selecting a Blood Pressure Cuff

When preparing for a case that includes noninvasive blood pressure monitoring, be sure to choose the correct cuff size and to place the cuff correctly. Use the following table to select the appropriate cuff size. If you don't have a tape measure, use the INDEX and RANGE lines marked on the cuff as described in *Placing the Cuff*, below.

Cir. (cm)		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	25	30	35	40	45	50	55	60	65	70	
Disposable Cuff	Neonatal#10 3-6cm																													
	Neonatal#11 6-9.5cm																													
	Neonatal#12 8-12cm																													
	Neonatal#13 9-14cm																													
Nondisposable Cuff	Newborn 6-11cm																													
	Infant 10-19cm																													
	Pediatric 18-26cm																													
	Adult 25-35cm																													
	Large Adult 33-47cm																													
	Thigh 46-66cm																													

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Connecting the Cuff

To connect the cuff:

1. Connect the cuff hose (attached to the cuff) to the extension hose (with a threaded fitting on one end and a Luer lock fitting on the other end). Insert the Luer lock fitting on the cuff hose into the Luer lock fitting on the extension hose, and twist until they lock together.
2. Attach the other end of the extension hose to the fitting on the patient interface panel labeled BP CUFF. Hand-tighten the threaded hose fitting onto the threaded fitting of the interface panel.
3. Make sure that none of the hoses are pinched or kinked.

After connecting the manual sphygmomanometer, check the gauge's pressure indication. With zero pressure applied to the gauge and cuff, the gauge pointer should remain within the band marked on the face plate.

Section 5 - Operation

Manual Sphygmomanometer

Placing the Cuff

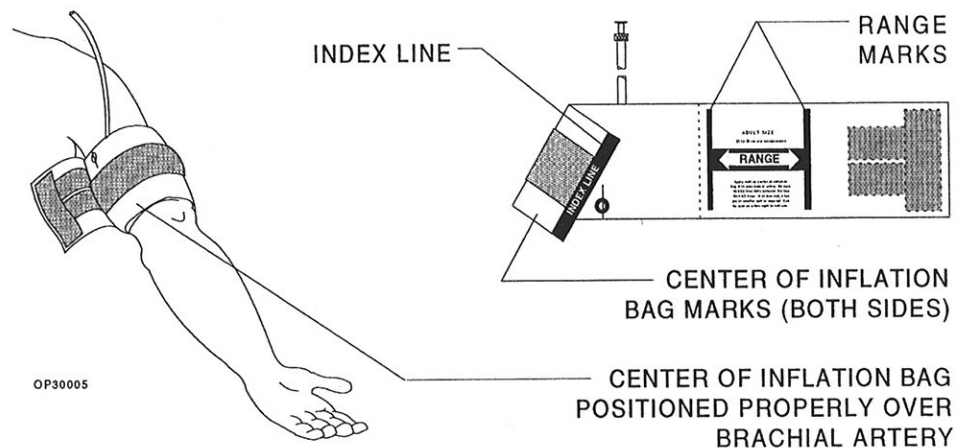
When fitting the cuff, place the center of the cuff inflation bag over the artery (for the brachial artery, place over the inside of the arm above the elbow). Make sure that the cuff fits securely on the limb and that the INDEX line falls between the two RANGE lines. If the INDEX line does not fall between the RANGE lines, select a smaller or larger cuff.

The cuff can be used on either the right or left extremity, but the left is usually preferred.

NOTE: Do not place the cuff on a limb being used for infusion.

For accurate blood pressure measurements, position the cuff at the same level as the patient's heart. Placing the cuff above the heart causes the reading to be falsely low; placing the cuff below the heart causes the reading to be falsely high. In instances where you cannot place the cuff at the same level as the heart, use the following general rule.

- For every inch of elevation above the heart, add 1.8 mmHg to the reading.
- For every inch of elevation below the heart, subtract 1.8 mmHg from the reading.



Cleaning and Sterilization

Follow these guidelines to clean and sterilize the Narkomed 2C and its parts. Follow your institution's policies regarding specific methods and agents for cleaning and sterilization. Determination of the need and frequency of sterilization of any particular component is the responsibility of the user institution. Sterilization procedures should be performed according to procedures established by the user institution, following the specific instructions provided by the manufacturer of the sterilizing equipment or agent to be used. Such policies, procedures, and instructions should ultimately be consistent with established principles of clinical microbiology and infection control.

Surfaces

Clean painted, plated, and plastic surfaces of the Narkomed 2C with a soft cloth moistened with an aqueous germicidal cleaner. Mix the germicidal cleanser in accordance with instructions provided by the manufacturer. Do not use solvent cleaners or abrasive cleaning agents on any surfaces of the Narkomed 2C.

Do not use anesthetic agents for cleaning purposes.

CAUTION: Do not allow liquid to enter the interior of the Narkomed 2C. Take extra precaution around the O.R. Data Manager disk drive opening.

Rubber Goods

Before disinfecting or sterilizing reusable rubber goods, thoroughly clean them with soap and water and thoroughly rinse them with water to remove all soap. To prevent water spots, use distilled or demineralized water. Avoid using hard-bristle brushes, which can damage the rubber goods.

Manufacturers of rubber goods have typically recommended that reusable rubber goods be soaked in a liquid disinfection agent. Always follow the agent manufacturer's instructions for use. After disinfection, thoroughly dry rubber goods before returning them to service.

CAUTION: Disinfectants containing phenol or phenyl compounds destroy rubber goods. Latex and rubber goods treated with disinfectants having a quaternary ammonium base will be damaged if subsequently autoclaved.

Reusable rubber goods may be autoclaved at 121°C. However, such temperatures accelerate the natural aging of rubber goods. Autoclaved rubber goods may also harden over time as a result of the loss of softeners. Exposure to ozone or ultraviolet light also accelerates the natural aging of rubber goods. Reusable rubber goods may also be gas sterilized with ethylene oxide. After EtO sterilization, properly aerate rubber goods before returning them to service.

Section 6

Cleaning and Routine Maintenance

NOTE: Do not autoclave face masks. Autoclaving causes rapid deterioration of face mask cushions.

Ventilator Bellows Assembly

The bellows assembly and the ventilator relief valve are the only ventilator components that come in contact with the patient's breath. To clean and sterilize the ventilator bellows assembly:

1. Remove the ventilator bellows assembly from the machine by loosening the two wing nuts below the bellows canister.
2. Unscrew the knurled ring nut around the ventilator relief valve and pull the relief valve dome and pilot line away from the relief valve body.
3. Remove the ventilator bellows from the assembly by unscrewing it in a counterclockwise direction.
4. Clean the bellows assembly and all its parts with a mild detergent solution, followed by a distilled water rinse.

NOTE: Take special care not to change the position of the adjustment lock ring on the ventilator relief valve dome. Do not attempt to loosen the knurled relief valve ring nut by twisting the pilot line hose barb.

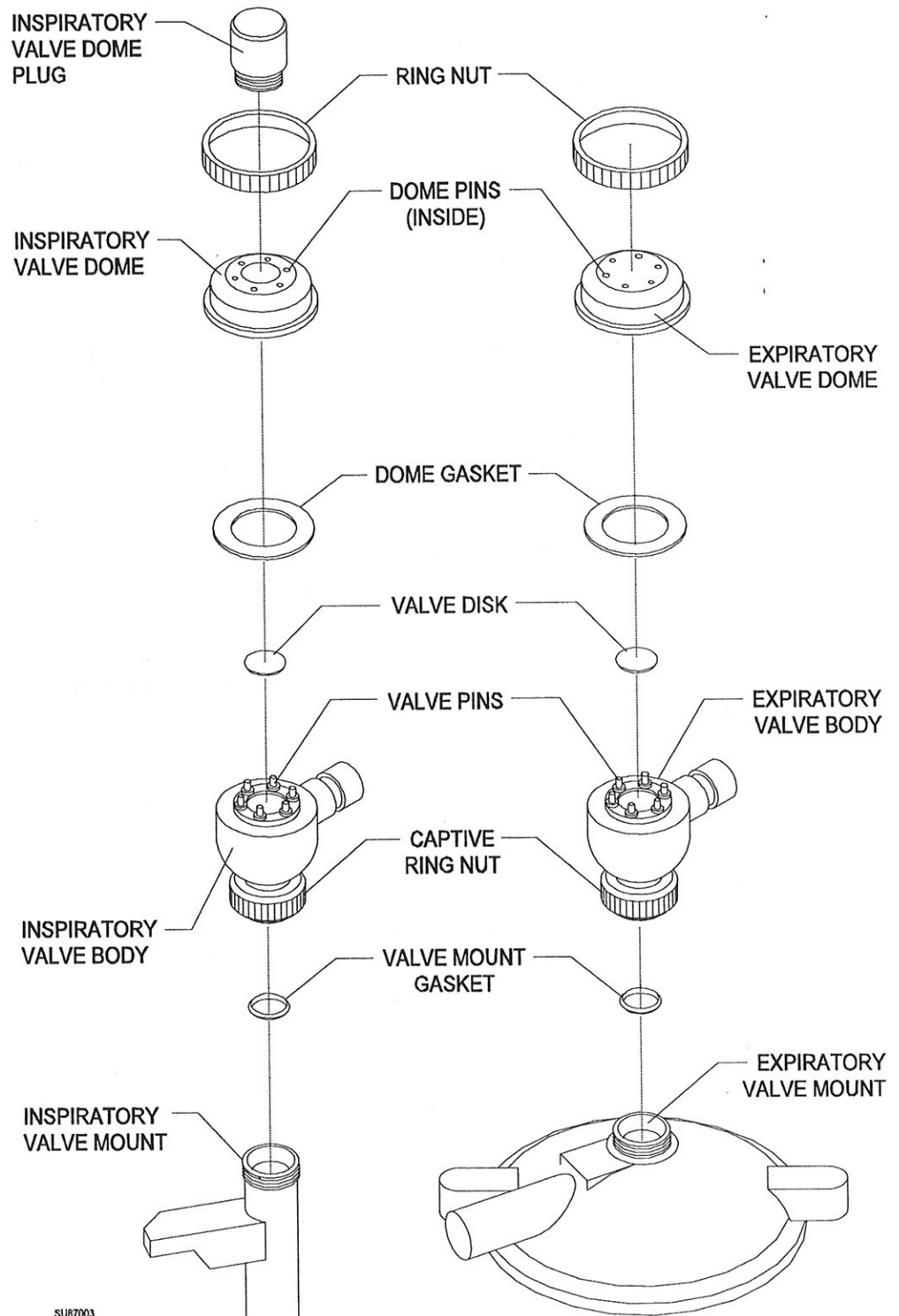
5. Drip dry the assembly and all parts. If necessary, sterilize them in ethylene oxide gas (cold cycle), followed by shelf aeration for 24 hours or 8 hours aeration in an appropriate aeration cabinet.
6. After aeration, fit the relief valve dome onto the relief valve body, and tighten the knurled ring nut. Replace the ventilator bellows followed by the entire bellows assembly into the bellows canister. Verify that the ventilator relief valve pilot line is completely dry. If necessary, dry the line with compressed air or oxygen.
7. Perform the Daily Checkout procedure provided in the *Section 3 - Daily Checkout* to verify proper reassembly.

Inspiratory and Expiratory Valves

Clean the inspiratory and expiratory valves frequently. Remove the valves by unscrewing the ring nut at the base of the valve. Before cleaning the valves, you may want to disassemble them. To disassemble the valves, unscrew and remove the ring nut around the plastic valve dome; then remove the dome, gasket, and valve disk.

Section 6

Cleaning and Routine Maintenance



Section 6

Cleaning and Routine Maintenance

The valve assemblies can be gas sterilized, immersed in a liquid disinfection agent, or autoclaved at a temperature not exceeding 121°C. The valve disks should be cleaned with a liquid disinfection agent. They may also be autoclaved in certain instances, but should not be autoclaved routinely.

Be careful with the valve disks; improper handling can damage them. After cleaning or sterilizing an inspiratory or expiratory valve assembly, verify that the valve disk and all internal pins are undamaged and that the valve disks are correctly reinstalled.

Absorber System

It is necessary to remove certain components of the absorber system prior to cleaning and/or sterilization. However, the only items that should ever be removed from the absorber assembly are hoses, breathing bag, sensors, canisters, gaskets, dust cup, inspiratory and expiratory valve assemblies, and breathing system pressure gauge.

Once the specified components have been removed from the absorber system, the rest of the system can be removed from the absorber pole and cleaned and sterilized as a unit.

NOTE: Before cleaning or sterilization procedures, turn the APL valve control knob fully counterclockwise.

Absorber Canisters and Gaskets

Clean the canisters frequently. Remove used absorbent and clean absorbent residues from canister and gasket surfaces. Use only cleaning agents compatible with plastic. Because absorbent is caustic, avoid contact with absorbent and residues.

The canisters and gaskets can be autoclaved. If the canisters are sterilized with ethylene oxide, properly aerate treated parts before returning them to service.

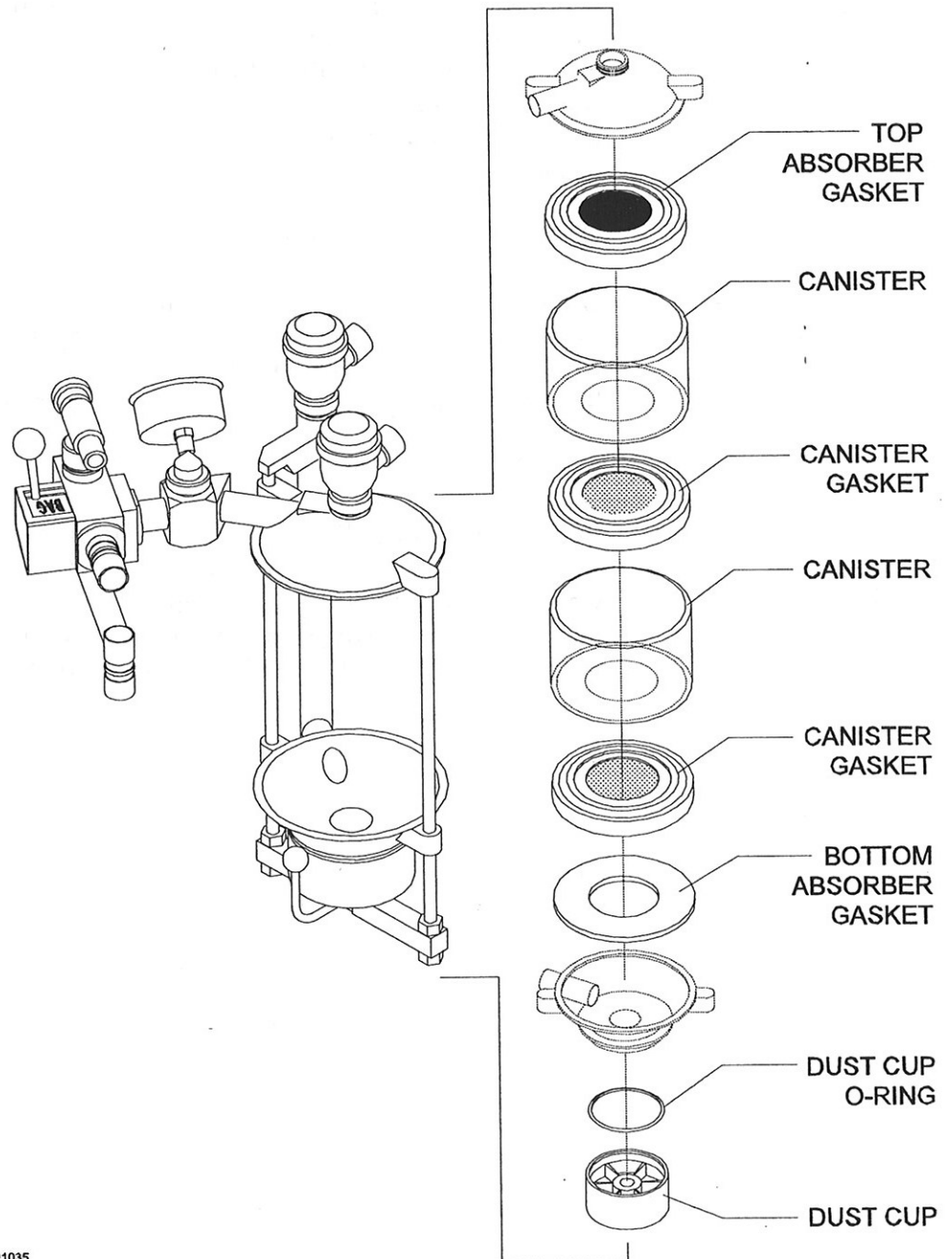
Absorber Dust Cup

Check the dust cup periodically and empty it when necessary. Use only cleaning agents compatible with plastic. When emptying the absorber dust cup, be careful not to spill the contents, which can be a caustic mixture.

The dust cup can be autoclaved. If the dust cup is sterilized with ethylene oxide, properly aerate it before returning it to service.

Section 6

Cleaning and Routine Maintenance



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Section 6

Cleaning and Routine Maintenance

PEEP Valve

The PEEP valve must never be disassembled or autoclaved. Prior to cleaning the PEEP valve, place the PEEP bypass in the PEEP OFF position (down). The PEEP valve interior will tolerate a mild detergent solution followed by a distilled water rinse. An Absorber system with a PEEP valve may be gas sterilized with ethylene oxide, followed by proper aeration.

CAUTION: Do not autoclave the PEEP valve.

Oxygen Sensor Capsule and Sensor Housing

Do not autoclave the sensor assembly. Sterilize the sensor housing and capsule with ethylene oxide gas at a temperature not exceeding 50° C. After sterilization with ethylene oxide, aerate the sensor assembly for at least three hours at a temperature not exceeding 45° C.

CAUTION: Do not autoclave the sensor assembly.

Breathing Pressure Pilot Line

Both types of pilot lines can be sterilized with ethylene oxide. First, clean the pilot line with a mild detergent solution and rinse it with water. Dry the pilot line thoroughly (for example, with a tube drying device). Then, sterilize the pilot line with a cold cycle and allow it to properly aerate (at least 8 hours in an appropriate aeration cabinet).

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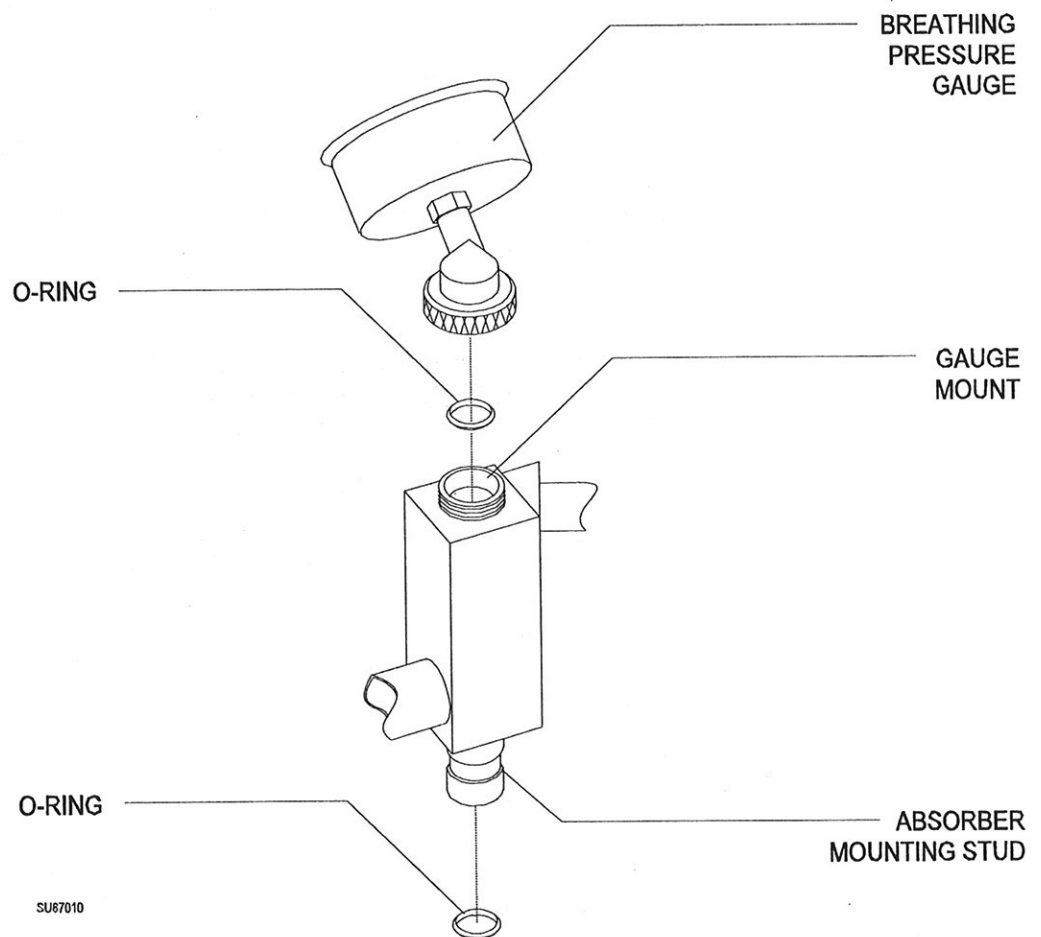
Cleaning and Routine Maintenance

Breathing System Pressure Gauge

The breathing system pressure gauge cannot withstand immersion or the heat and pressure of autoclaving. Therefore, it must be removed from the Absorber system prior to such a procedure. The gauge may be sterilized with ethylene oxide gas, followed by appropriate aeration.

After cleaning, check the gauge needle's zero position and adjust it if necessary.

CAUTION: Do not autoclave the breathing system pressure gauge.



Section 6

Cleaning and Routine Maintenance

Vaporizers

Disinfect external surfaces of the vaporizer by wiping with a damp cloth moistened with a liquid disinfectant, making sure that none of the disinfectant enters the filling funnel. Do not sterilize the vaporizer.

Do not immerse the vaporizer in water or other liquids, and do not allow water or any other liquid to enter the fill or drain ports or fresh gas inlet or outlet ports. Any vaporizer suspected of contamination with water or any other liquid must be returned to North American Dräger's Technical Service department for a complete overhaul.

WARNING: Water and other liquids (with the exception of the appropriate anesthetic) that enter the vaporizer chamber may cause injury to the patient or may form corrosive products that affect the function of the vaporizer.

Additional care must be taken with halothane vaporizers. Halothane contains a stabilization additive called thymol, which evaporates more slowly than halothane, and collects in the vaporizer. Over time, thymol may decompose into compounds that affect the wick material and turn the halothane yellow.

If you see particles in the sight glass of a halothane vaporizer, or if the halothane turns yellow, rinse the vaporizer chamber with fresh halothane as follows:

1. Drain the discolored halothane from the vaporizer.
2. Fill the vaporizer with fresh halothane up to the maximum level, then drain completely.
3. Dispose of the drained halothane in accordance with standard practices at your facility.

For information about filling and draining the vaporizer, see *Section 5 Operation - Vaporizer*.

Noninvasive Blood Pressure Cuff

Before cleaning or sterilizing the NIBP cuff, detach it from the extension hose by twisting the Luer-lock fitting at the juncture of the cuff hose and measurement hose. Clean the cuff with a liquid disinfection agent or mild detergent solution.

Do not autoclave the cuff. It can be sterilized with ethylene oxide gas, followed by at least 2 hours aeration in an appropriate aeration cabinet.

Do not autoclave the extension hose. It can be sterilized with ethylene oxide gas (cold cycle), followed by at least 8 hours aeration in an appropriate aeration cabinet.

Section 6

Cleaning and Routine Maintenance

Manual Sphygmomanometer

Under typical conditions, the only cleaning the manual sphygmomanometer requires is a wiping down with a liquid disinfection agent. However, if further disinfection is required, remove the sphygmomanometer gauge assembly, hoses, and blood pressure cuff from the anesthesia machine and sterilize them with ethylene oxide gas (cold cycle), followed by appropriate aeration according to the sterilizer manufacturer's instructions.

NOTE: Do not autoclave the gauge assembly; it cannot withstand the heat of autoclaving.

Open Reservoir Scavenger

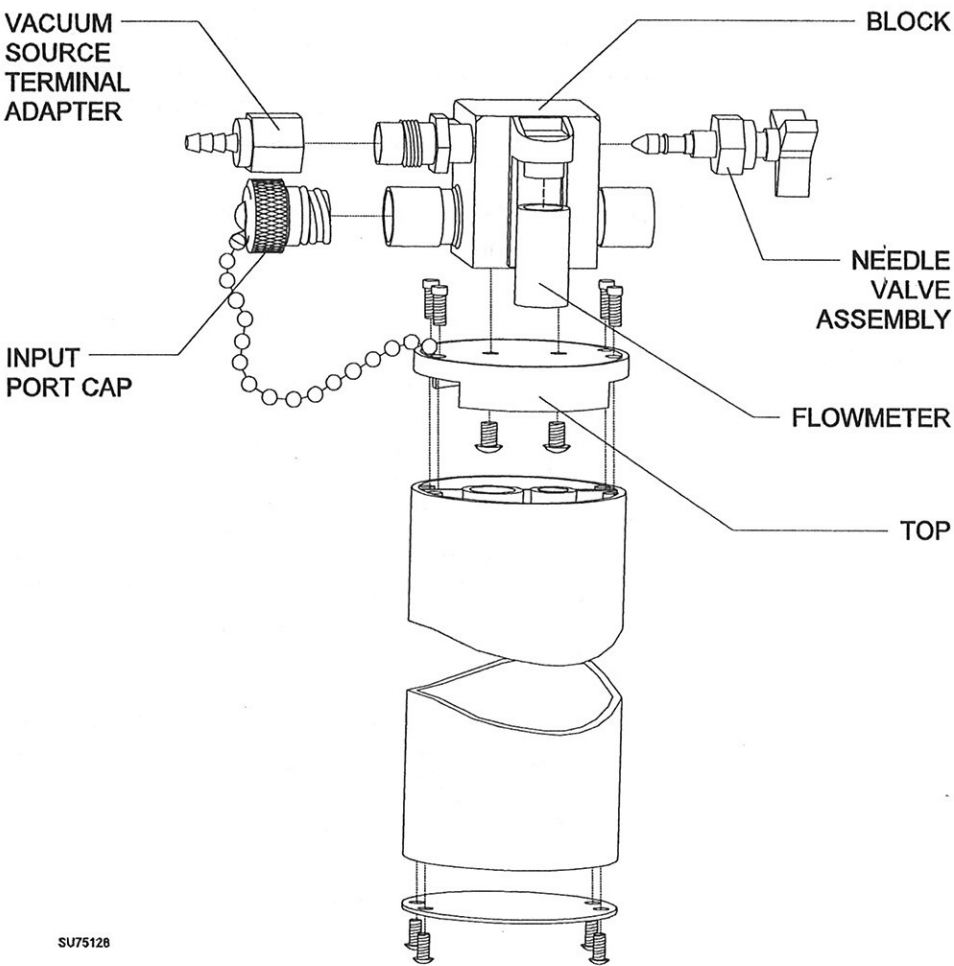
Clean the scavenger every 6 months with the following procedure.

1. Clean the outer surface of the scavenger with a moist cloth.
2. Inspect all scavenger hoses for deterioration. Replace any worn hoses.
3. Unscrew the wing nut until the needle valve assembly can be removed from its seat. Remove the nut and disassemble the valve. Inspect the needle valve and seat for lint or dust accumulation. Clean with compressed air, if necessary.
4. The flowmeter has a small port, located on its underside, that is open to the atmosphere. For the flowmeter to work properly, this port must remain open. Remove the flowmeter from the block and inspect this port. If it is blocked, clean it with compressed air.
5. Remove the reservoir canister from the scavenger body by unscrewing the four socket head cap screws located at the top of the canister.
6. Replace the cleaned needle valve assembly and reservoir canister; verify that all parts are completely dry before reassembly.
7. Perform the open reservoir scavenger portion of the Daily Checkout procedure provided in Section 3.

The Open Reservoir Scavenger does not typically require sterilization. However, if it must be sterilized, use ethylene oxide gas followed by appropriate aeration.

CAUTION: Do not autoclave the Open Reservoir Scavenger. The scavenger's flowmeter cannot withstand the heat of autoclaving.

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Scavenger Interface for Passive Systems

Clean the scavenger every 6 months with the following procedure.

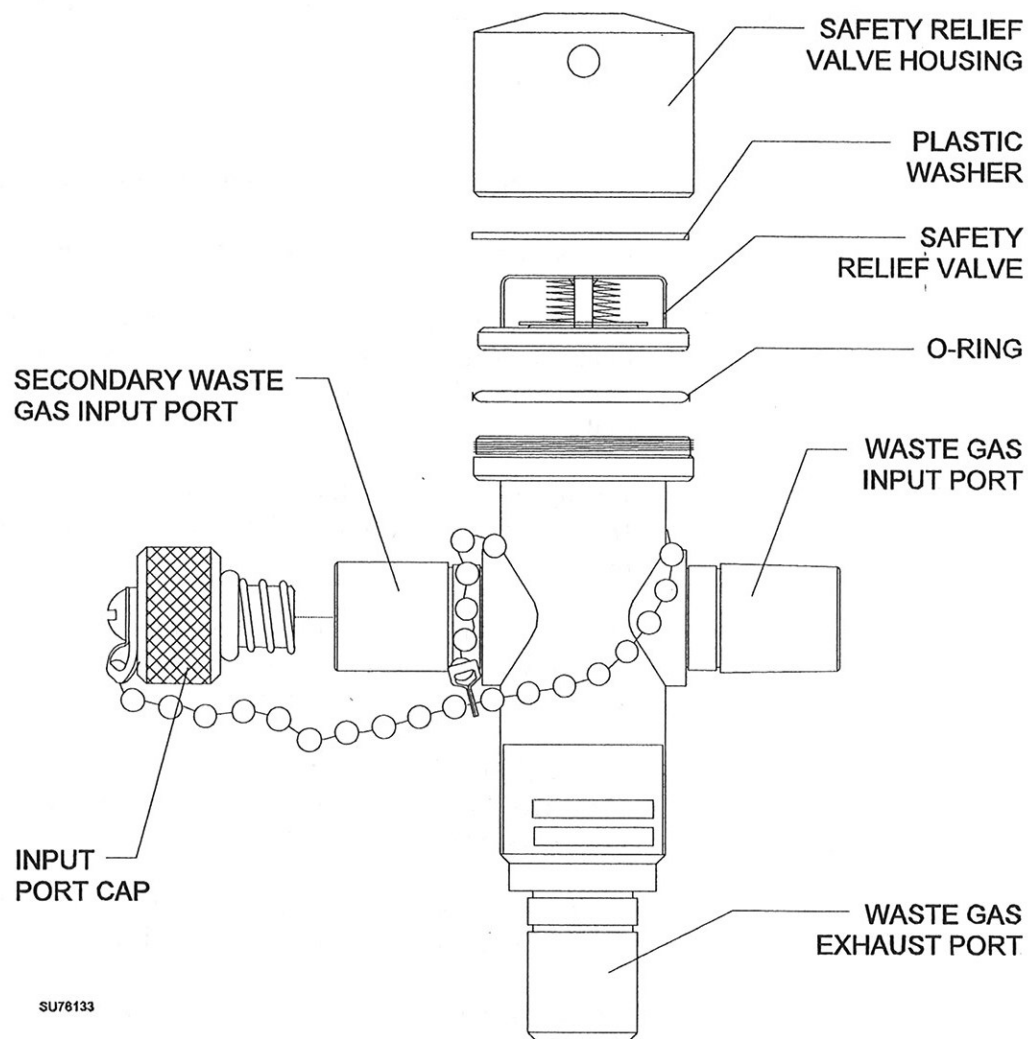
1. Clean the scavenger body with a moist cloth.
2. Inspect all scavenger hoses for deterioration. Replace any worn hoses.
3. Remove the relief valve housing by unscrewing it counterclockwise.
4. Inspect the rubber O-ring. If it is worn, replace it.
5. Remove the relief valve by twisting it counterclockwise out of the housing. You can use the tips of a needle-nose pliers to turn the valve, but take care not to damage the relief valve's fragile valve disk.
6. Brush any accumulated lint or dust off the valve with a soft brush. the valve can be further cleaned with a low flow of clean air or oxygen.
7. 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.
8. Verify 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.
9. Perform the scavenger interface for passive systems portion of the Daily Checkout procedure provided in Section 3.

The scavenger interface for passive systems does not typically require sterilization. However, if it must be sterilized, use ethylene oxide gas followed by appropriate aeration.

CAUTION: Do not autoclave the scavenger interface for passive systems. The scavenger's relief valves cannot withstand the heat of autoclaving.

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Cleaning and Routine Maintenance



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Cleaning and Routine Maintenance

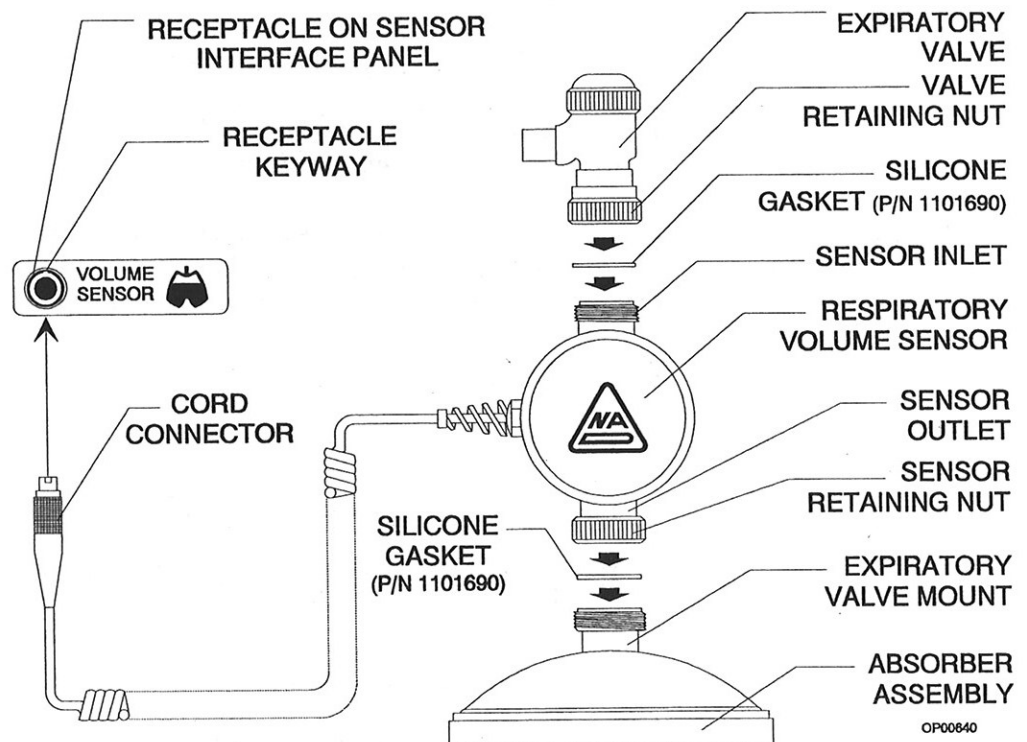
Respiratory Volume Sensor

Clean the sensor after each working day by running distilled water through the housing. (Do not immerse the sensor in water.) After cleaning, dry the sensor with a hose-drying unit or allow it to dry overnight.

CAUTION: Do not autoclave the sensor as its internal parts will not withstand the heat of autoclaving.

Sterilize the sensor with ethylene oxide gas at a temperature not exceeding 50°C. After sterilizing, aerate the sensor for at least three hours in an appropriate aeration cabinet.

Lubricate the sensor bearings after two months of use or after 30 ethylene oxide sterilizations (whichever comes first). Follow the instructions in the supplied Sensor Lubrication Kit (P/N 2218180). Do not use any lubricant other than the one provided in the Sensor Lubrication Kit.



Section 6

Cleaning and Routine Maintenance

Replacing the Oxygen Sensor

When the electrolyte in the oxygen sensor is depleted, the sensor cannot correctly analyze oxygen concentrations, and the sensor capsule must be replaced with a new one. New sensors require a 15-minute waiting period (with the sensor correctly installed in its housing) to allow the sensor's electrochemical reaction to reach a state of equilibrium. During this waiting period, the oxygen sensor cannot be calibrated.

To replace the oxygen sensor capsule:

1. Turn the SYSTEM POWER switch to STANDBY.
2. Remove the oxygen sensor housing from the inspiratory valve dome. (It is a press fit.)
3. Unscrew the cover from the sensor housing and remove the sensor capsule.
4. Install the replacement sensor capsule in the housing. Verify that the copper rings on the capsule mate with the electrical contacts in the sensor housing.
5. Wait 15 minutes to allow the sensor capsule to stabilize.
6. Perform an oxygen sensor calibration as described in *Section 5 Operation - Oxygen Monitoring*.

Replacing the Absorber System Absorbent

The carbon dioxide absorbent in the absorber system must be replaced when it is exhausted. Consult the absorber manufacturer's literature for specific recommendations on when to change the absorbent.

To replace the absorbent:

1. Pull the canister release lever down.
2. Remove the canisters from the absorber system.
3. Empty the contents of the canisters into an appropriate refuse container.
4. Check the canisters to make sure they are not chipped or cracked.
5. Taking care not to chip or crack the canisters, add new absorbent to each one.
 - When using absorbent prepacks, remove all packaging materials (some have clear plastic wrappers) and place a prepack into each canister.

Section 6

Cleaning and Routine Maintenance

- When using loose absorbent, fill the canister to the fill line. Do not overfill.

WARNING: Absorbent is caustic and is a strong irritant to the eyes, skin, and respiratory tract. When replacing the absorbent, take care not to spill its caustic contents.

6. Stack one canister on top of the other, and center the stack on the gasket of the bottom dome.
7. Raise the bottom dome, remove and empty the dust cup if loose absorbent is present, and replace the dust cup.
8. Pull the canister release lever up to close the absorber system.
9. Perform the absorber portion of the Daily Checkout procedure provided in Section 3 to verify proper reassembly.

Replacing the Keyboard Cover

If the O.R. Data Manager keyboard cover becomes contaminated or damaged, it should be replaced.

To replace the keyboard cover:

1. Pull the keyboard tray out to its fully extended position.
2. Remove the contaminated or damaged keyboard cover from the keyboard faceplate by loosening the edges and pulling it away from the keyboard.
3. Clean any adhesive residue from the keyboard faceplate.
4. Remove the protective tape backing from the new shield to expose the adhesive surface.
5. Fit the new cover over the keys and press its adhesive perimeter firmly onto the keyboard faceplate. Verify that there are no gaps between the cover and the faceplate.

Section 7 Specifications

General	Dimensions (approximate) (W x H x D) 40 x 56 1/4 x 27 inches Weight (approximate) 425 lbs Equipment class IEC 601 Class 1, Type B
Environmental	
Storage	Temperature -10–60° C Humidity 10–90% relative humidity (noncondensing)
Operating	Temperature 15–40° C Humidity 30–75% relative humidity (noncondensing)
Electrical	Leakage current ≤ 100 microamps Ground impedance ≤ 0.1 ohm (60 Hz source) Dielectric withstand ≥ 1500 VAC (per UL 544) Chassis resistance (between any metallic point and ground pin on power cord) ≤ 0.1 ohm
117 Volt Power Supply	Primary input voltage (acceptable range) 100–120 VAC @ 50/60 Hz Primary input current ≤ 10 amps (RMS total) ≤ 3 amps (machine) ≤ 7 amps (receptacles)
220/240 Volt Power Supply	Primary input voltage (acceptable range) 200–240 VAC @ 50/60 Hz Primary input current ≤ 1.5 amp (RMS total)
Backup Battery	Charging time ≤ 12 hours Reserve power time (from full charge) ≥ 30 min
Gas Delivery System	Pipeline inlet connections DISS/male (ANSI B57.1-1977) Nut with nipple (Canada) Pipeline inlet pressure 50–55 psi (345–380 kPa) (O ₂ , N ₂ O, Air) Pipeline gauge accuracy ±3 psi (0–25 psi) ±2 psi (25–75 psi) ±3 psi (75–100 psi) Cylinder connections Pin-indexed hanger yokes (ANSI/CGA V-1-1987) Over pressure relief valve 95 psi (655 kPa) Over pressure relief valve (Canada) 75 psi (520 kPa) (CSA Standard Z168.3-M84)

Section 7 Specifications

	Fresh gas common outlet	15 mm female (Canada: 15 mm female, 22 mm male)
	Fresh gas oxygen concentration (ORC)	25 ±4%
	Oxygen flush flow rate	55 (±10) l/min
	Minimum oxygen flow (at 50 psi pipeline pressure)	150 ±50 ml/min
	Low oxygen supply pressure alarm	34–40 psi
	Cylinder gauge accuracy	±90 psi (0–750 psi) ±60 psi (750–2250 psi) ±90 psi (2250–3000 psi)
Cylinder Gas Pressures (at 70°F, 21°C)	Oxygen, Air	1900 psi (13100 kPa)
	Nitrous oxide	745 psi (5130 kPa)
	Carbon dioxide	838 psi (5770 kPa)
	Oxygen-Helium	1900 psi (13100 kPa)
Flowmeter Accuracy (at 20° C and 760 mmHg)	Oxygen, Nitrous Oxide, Air (Fine)	100–1000 ml/min ±2.5% FS
	Oxygen, Nitrous Oxide, Air (Coarse)	1–10 l/min ±2.5% FS
	Air (Dual Tapered)	0.2–1 l/min ± 50 ml of reading 2–10 l/min ±5% FS
	Carbon Dioxide	0.05–1.0 l/min ±5% FS
	Oxygen-Helium	2–10 l/min ±5% FS
	Oxygen, Nitrous Oxide (Fine) (Optional, Low-Flow)	20–500 ml/min ±2.5% FS
	Oxygen, Nitrous Oxide (Coarse) (Optional, Low-Flow)	0.6-10 l/min ±2.5% FS @ >1 l/min ± 15% of reading @ <1 l/min
	Oxygen (Auxiliary Oxygen)	0–10 l/min ±5% FS
Vaporizers (Vapor 19.1)	Temperature Range	+15–35° C (at normal atmospheric pressure of 760 mmHg)
	Flow Range	0.25-15 l/min
	Maximum Pressure Load	150 mmHg (above atmospheric)
	Maximum Angle of Inclination	45°
	Weight	Approximately 7.5 kg
The following values refer to individual concentration settings when operated with a continuous flow of air in the range 0.25–15 l/min, temperature at 22° C, and normal atmospheric pressure (760 mmHg).		
Halothane	Adjustment range	0.2–5 vol%
	Accuracy	± 0.15% concentration (volume) or ± 15% (whichever is higher)

Section 7 Specifications

Enflurane	Adjustment range	0.3–7 vol%
	Accuracy	± 0.2% concentration (volume) or ± 20% (whichever is higher) or + 20%/- 30% with flow settings 6.0–15 l/min and handwheel settings higher than 5.0% volume concentration
Isoflurane	Adjustment range	0.2–5 vol%
	Accuracy	± 0.15% concentration (volume) or ± 15% (whichever is higher)
Sevoflurane	Adjustment range	0.2–5 vol%
	Accuracy	± 0.2% concentration (volume) or ± 10% (whichever is higher)
Ventilator AV2+	Frequency	1–99, ±1 BPM (in 1 BPM increments)
	I:E ratio	<i>Standard range:</i> 1:1–1:4.5, ±0.1 (in increments of 0.5); <i>Extended range:</i> 4:1, 3:1, 2:1
	Inspiratory flow	10–100 l/min (uncalibrated)
	Tidal volume	50–1500 ml, ±100 ml
	Pressure limit control adjustment range	15–120 cmH ₂ O
Absorber System		
Inspiratory Valve	Mounting ring nut size	M35 x 1
	Hose terminal	22 mm male
Expiratory Valve	Mounting ring nut size	M33 x 1
	Hose terminal	22 mm male
PEEP Valve (optional)	Range	approx. 2–15 cmH ₂ O (continuously adjustable)
Breathing System Pressure Gauge	Range	-20 to +80 cmH ₂ O
	Smallest scale division	2 cmH ₂ O
	Nominal accuracy	-20 to +5 cmH ₂ O: 3% FS +5 to +55 cmH ₂ O: 2% FS +55 to +80 cmH ₂ O: 3% FS
	Mounting ring nut size	1 1/8 x 18
APL Valve	Nominal low flow resistance	2 cmH ₂ O at 8 l/min
	Hose terminal	19 mm male
Breathing Bag Terminal	Bag terminal	22 mm male

Section 7 Specifications

Oxygen Monitoring	Range	10–100 vol% O ₂	
	Resolution	1 vol% O ₂	
	Accuracy	±3 vol% O ₂ (When calibrated within 18 hours, and constant temperature and pressure)	
	Response time	≤ 25 sec (T90)	
	Zero drift	≤ 0.1 vol % O ₂ /month	
	Span drift	≤ 1 vol % O ₂ /8 hours	
	Temperature error	≤ ± 3% of reading (15° to 40° C)	
	Sensor service life	≥8 months at 25° C, 50% relative humidity, 50% O ₂ gas mixture (or ≥5000% hour CO ₂)	
	Breathing Pressure Monitoring	Numeric display range	-10–125 cmH ₂ O
Resolution		1 cmH ₂ O	
Accuracy		±3 cmH ₂ O or ±10% of reading, whichever is greater	
Waveform display range - full		0–100 cmH ₂ O	
Waveform resolution		1 cmH ₂ O	
Waveform accuracy		±3 cmH ₂ O or ±10% of reading, whichever is greater	
Waveform display scales		0–20, 0–50, 0–100 cmH ₂ O	
Respiratory Volume Monitoring	Minute Volume	Display Range	0.1–99.9 l
		Resolution	0.1 l
		Accuracy	≤ +10% or 0.1 l, whichever is greater
	Tidal Volume	Display Range	0.05–9.99 l (Note: the standard bellows will deliver up to 1.5 l)
		Resolution	0.01 l
		Accuracy	≤ ±10% or 0.01 l, whichever is greater
		Volume Apnea Threshold	0.05 l
		Respiratory Rate	Numeric display range
	Resolution		1 BPM
	Accuracy		≤ ±10% or ±1 BPM, whichever is greater
	Expiratory Flow	Waveform display range - full	0–100 l/minute
		Waveform resolution	1 l/minute
		Waveform display scales	0–20, 0–50, 0–100 l/minute (corresponds to minute volume settings of 5, 10, and 20 liters)

Serial Interface

Serial Ports	Type	RS-232C (ports A and B) (port C reserved for external printer, Hewlett-Packard PCL4)
	Baud Rate	300, 600, 1200, 2400 4800, 9600, 19.2K, 38.4K
	Parity	Odd, Even, None
	Data Bits	7 or 8
	Stop Bits	1 or 2
	Protocols	Vitalink, OR/Link
	(optional protocols:	Hewlett-Packard MECIF Marquette TramNet SpaceLabs DataLogger Datex AS/3, CARDIOCAP, and CAPNOMAC Criticare Poet IQ and 1100 Datascope Multinex, Passport, and Point-of-View Siemens SIRECUST Puritan-Bennett Colin BP-508 Criticon DINAMAP Nellcor N-1000 and N-2500 Ohmeda Rascal and RGM)

Appendix Spare and Replacement Parts

	Description	Part Number
Manuals	Narkomed 2C Operator's Instruction Manual	4112260-001
	Narkomed 2C Technical Service Manual	4112817-003
Absorber System	Gasket - Canister Top	4105848
	Gasket - Canister Bottom	4105849
	Gasket - Absorber Bottom	1101001
	Screen - Canister	1100022
	Canister	4105852
	Breathing Pressure Gauge Assembly	4105853
	PEEP Bypass	4110300
	Dome - Inspiratory/Expiratory Valve (without port)	2109230
	Dome - Inspiratory Valve (with sensor port)	4108329
	Plug Assembly - (for inspiratory valve dome with sensor port)	4106837
	Valve Assembly - Inspiratory (with ported dome assembly and plug assembly)	4107649
	Valve Assembly - Expiratory	4107650
	Ring Nut (inspiratory or expiratory valve upper ring nut)	2109228
	Gasket (flat washer, inspiratory or expiratory valve mount)	1101690
	Dust Cup	4106874
	Spring Clip (absorber rod)	1100097
	Hose Assembly (patient pressure/Luer)	4108528
	O-ring #020, Silicone (absorber mount)	4105868
	O-ring #237, Silicone (dust cup fitting)	4102940
Breathing System Accessories	Breathing Hose, 22 mm x 23" long	9995123
	Breathing Hose, 22 mm x 32" long	9995132
	Breathing Hose, 22 mm x 40" long	9995140
	Rubber Good Set (includes Y-Piece, Mask Elbow, 2 Liter Breathing Bag, and 2 each 32" Breathing Hoses)	1101071
Gas Evacuation Accessories	Hose, 19 mm x 10" long	9995210
	Hose, 19 mm x 20" long	9995220
	Hose, 19 mm x 30" long	9995230
	Hose, 19 mm x 48" long	9995248
Breathing Bags	2.0 liter	9995320
	5.0 liter	9995350
Vaporizers 19.1	Mounting screws (4 x 30 metric)	HW01072
	O-rings	2121929
	Cover assembly vapor block (short circuit block)	4104530

Appendix

Spare and Replacement Parts

	Description	Part Number
Bellows	Adult Latex-Free Bellows (replacement bellows)	4106930-001
	Pediatric Bellows	4109700
Oxygen Monitoring Accessories	Oxygen Sensor Capsule	6803290
	Sensor Housing & Cable Assembly	4106363
	Inspiratory Valve Dome	4108329
	Inspiratory Valve Dome Plug	4106387
Breathing Pressure Monitoring Accessories	Breathing Pressure Pilot Line (to absorber)	4109368
	Breathing Pressure Pilot Line (with Luer to Y-piece)	4108528
Respiratory Volume Monitoring Accessories	Volume Monitor Sensor Assembly	4106362
	Volume Sensor Lubrication Kit (supplied with Sensor Assembly)	2218180
	Gasket (expiratory valve mount and sensor inlet)	1101690
Communication Cables	DB9/DB9/2.5 ft for use with Vitalink	4110328
	DB9/DB25/8 ft for use with Hewlett-Packard MECIF	4112318
	DB9/DB25/8 ft for use with SpaceLabs DataLogger	4112349
	DB9/DB25/8 ft for use with Marquette TramNet	4112442
	DB9/DB9/8 ft for use with Marquette Tramscope	4113117
	DB9/DB9/8 ft for use with Datex AS/3	4112477
	DB9/DB25/8 ft for use with Datex CARDIOCAP and CAPNOMAC	4113314
	DB9/DB25/8 ft for use with Criticare Poet IQ	4112318-002
	DB9/DB9/8 ft for use with Criticare 1100	4110328-003
	DB9/DB25/8 ft for use with Datascope Multinex	4113142
	DB9/SDL/8 ft for use with Datascope Passport and Point-of-View	4113242-002
	DB9/SDL/8 ft for use with Siemens SIRECUST	4113242-001
	DB9/DB25/8 ft for use with Puritan-Bennett	4113142-001
	DB9/DIN/8 ft for use with Colin BP-508	4113241
	DB9/DB25/8 ft for use with Criticon Dinamap	4113142-002
	DB9/DB9/8 ft for use with Nellcor N-1000 and N-2500	4113503
	DB9/DB9/8 ft for use with Ohmeda RGM	4113566
	DB9/DB25/8 ft for use with Ohmeda Rascal	4112318-003
O.R. Data Manager	Laser Printer	4111380
	Printer Cable (8 feet)	4110568
	Printer Cable (50 feet)	4111626
	Floppy Disk (3.5"/pkg of 10)	4111462

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