NORTH
AMERICAN
DRÄGER

Technical Service Manual

North American Dräger
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NARKOMED 2B

SECTION 7

April 1988

A fluid or gas is flowing through a long, large bore tube with a constriction (B) in the center. The constriction is smooth, so the flow remains laminar. While the flow rate in the larger part of the tube (A) and (C) is th same, the flow rate in the smaller part of the tube (B) is increased. The pressure in part (A) is converted into speed in constriction (B). Therefore, the pressure in constriction (B) is decreased and will even drop below atmospheric pressure. Then the pressure is measured at points D, E and F, the pressure will be positive (above atmosphere) at points D and F and negative (below atmosphere) at point E. This phenomenon is called Venturi Effect.

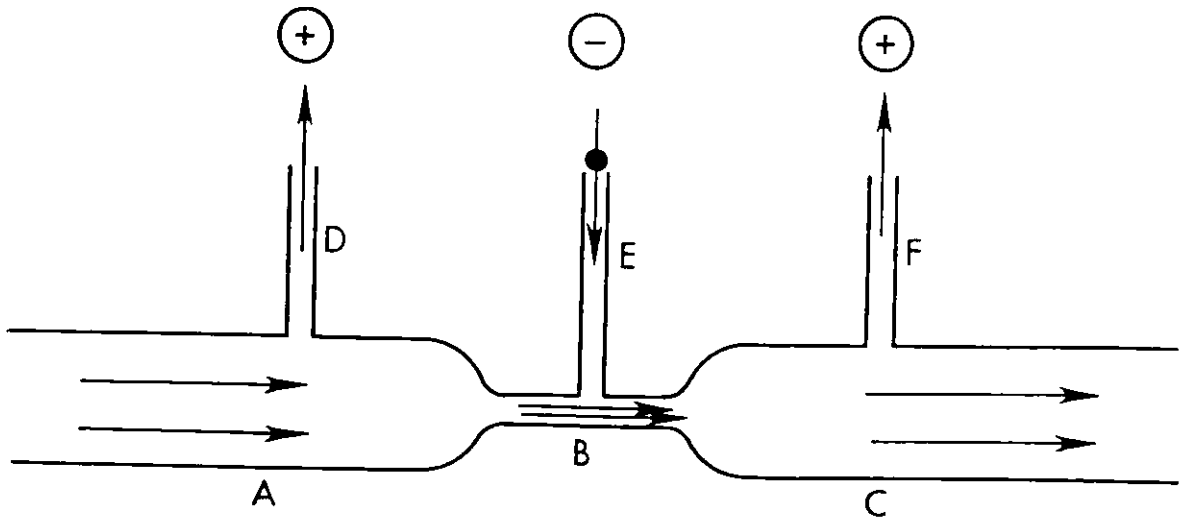
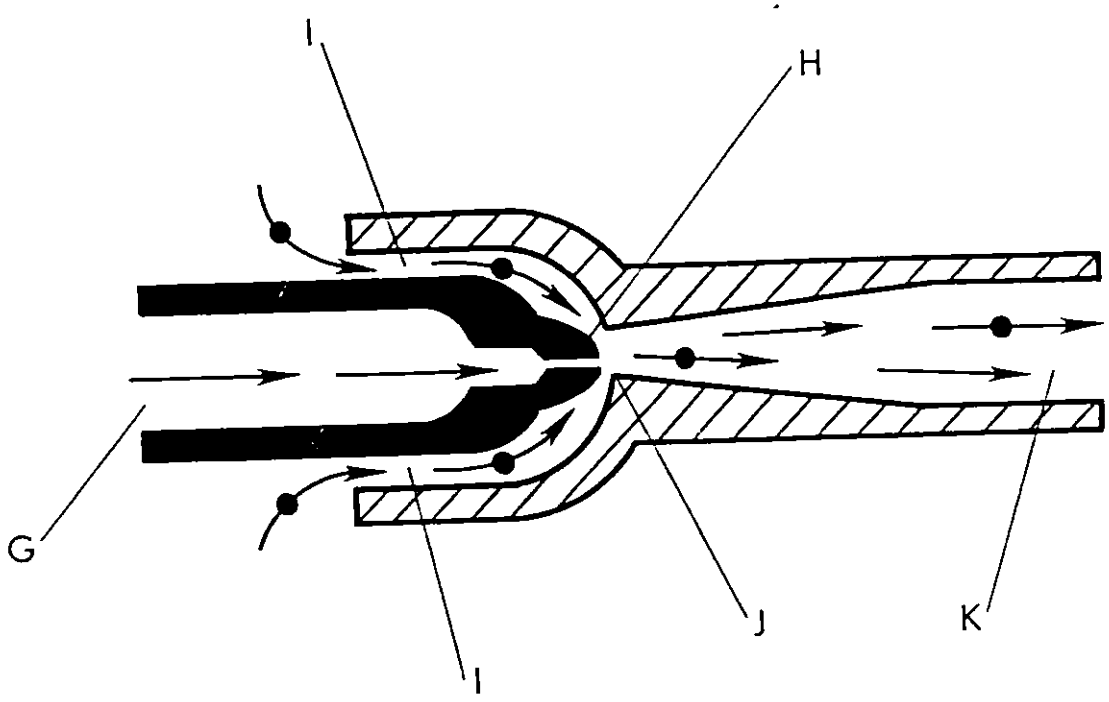


FIGURE 7-1: VENTURI EFFECT

There are many applications for the venturi effect. The NAD anesthesia ventilator uses the venturi effect to increase the gas flow, respectively gas volume into the bellows canister. Although commonly called venturi, the device is actually an injector.

The injector (venturi) consists of the compressed gas tube (G), a jet (H), entrainment port (I), throat (J) and diffuser (K).

As the compressed gas is forced at high speed through the jet and throat, which resembles the constriction, a sub-atmospheric pressure is created in the entrainment port. This results in ambient air being added to the compressed gas source which consequently are combined in the diffuser. The result is the availability of a considerably larger gas volume than the original compressed gas source could have supplied.



Injector

compressed gas (oxygen)
ambient gas (air)

FIGURE 7-2: INJECTOR

NAD ANESTHESIA VENTILATOR AV-E LEGEND

1. Electric power supply (117VAC)
2. Gas supply-Oxygen (50 psi)
3. Ventilator ON/OFF switch
4. Electrical supply ON/OFF switch (1 psi pressure switch)
5. AV-E P.C. Board
6. I:E ratio control
7. Frequency control
8. Solenoid pilot pressure line
9. Solenoid valve
10. Control valve
11. Flow regulator
12. Flow indicator gauge
13. Venturi
14. Venturi entrainment port
15. Pilot actuator
16. Bellows chamber
17. Bellows
18. Tidal Volume adjustment plate
19. Tidal Volume control
20. Relief valve pilot line
21. Ventilator relief valve
22. Patient breathing system connector
23. Waste gas scavenging system connector

NOTE: Oxygen supply pressure and electric power must be supplied to operate the AV-E

NOTE: This is a general description of all North American Dräger electronic ventilators.

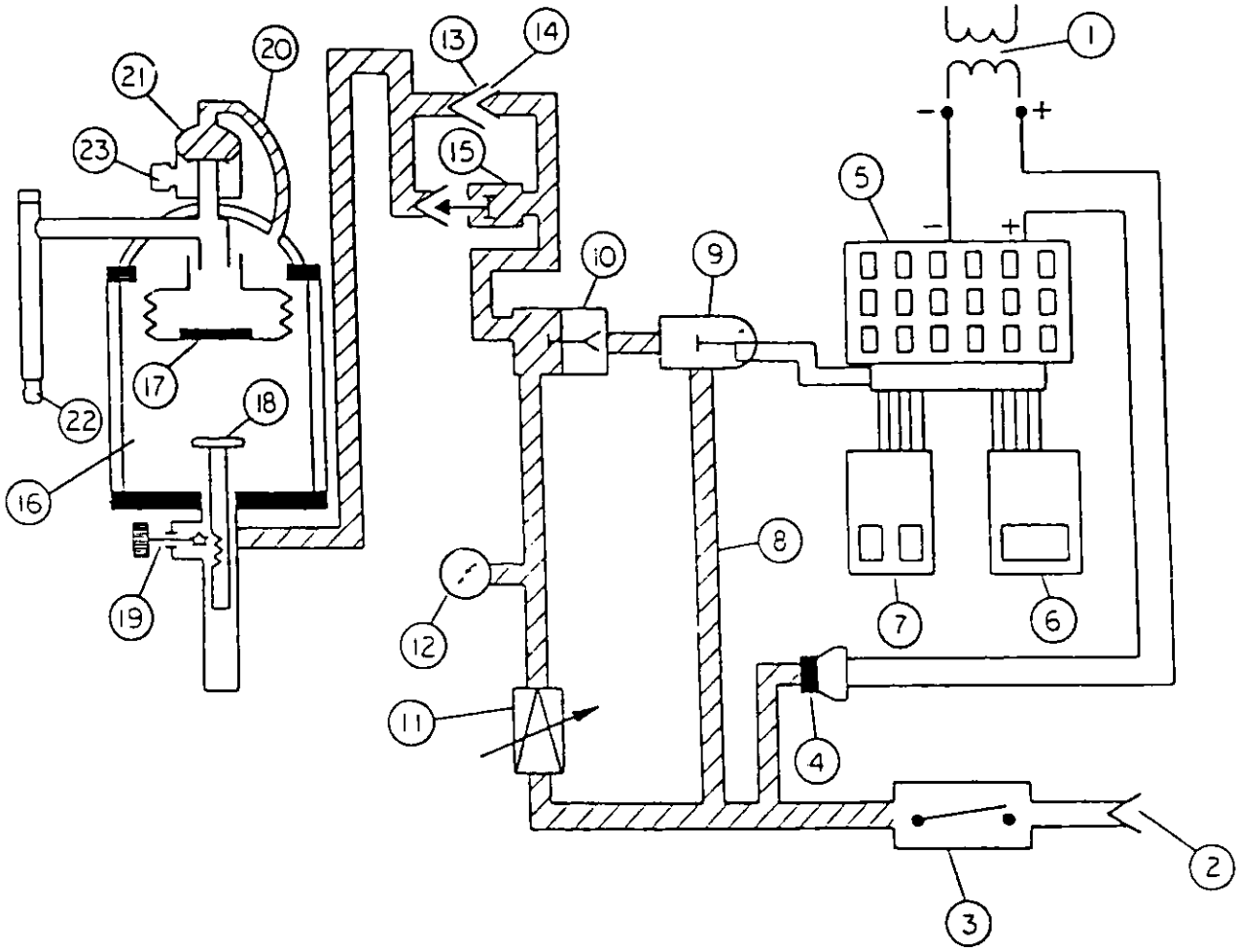


FIGURE 7-3: NAD ANESTHESIA VENTILATOR AV-E LEGEND

After ventilator ON/OFF switch (3) is turned ON, gas pressure is supplied to 1 psi switch (4), which is activated and supplies the electronic circuit with electric power. Flow regulator (11) car, now be adjusted to the desired inspiratory flow rate. Frequency (7) and I:E ratio (6) controls must be adjusted as desired. Solenoid valve (9) receive an electric signal from AV-E P.C. board (5). This electric signal will remain during the entire inspiration and activates the solenoid valve (9). Gas at 50 psi pressure can now pass through solenoid valve (9) and activate control valve (10). This allows the preset gas flow from flow regulator (11) to pass through the control valve (10) to venturi (13). The preset inspiratory flow rate can be monitored on flow indicator gauge (12). Back pressure from venturi (13) is directed to pilot actuator (15) which is closed. Ambient gas is entrained by venturi (13) through entrainment port (14). The combined gas is forced into bellows chamber (16). As pressure develops in bellows chamber (16) the bellows (17) rise and force air into the patient's lungs through patient breathing connector (22). Gas pressure is also supplied via the pilot line (20) from bellows chamber (16) to ventilator relief valve (21). This valve, which replaces the APL valve of the manual breathing circuit remains closed as long as bellows chamber (16) contains pressure.

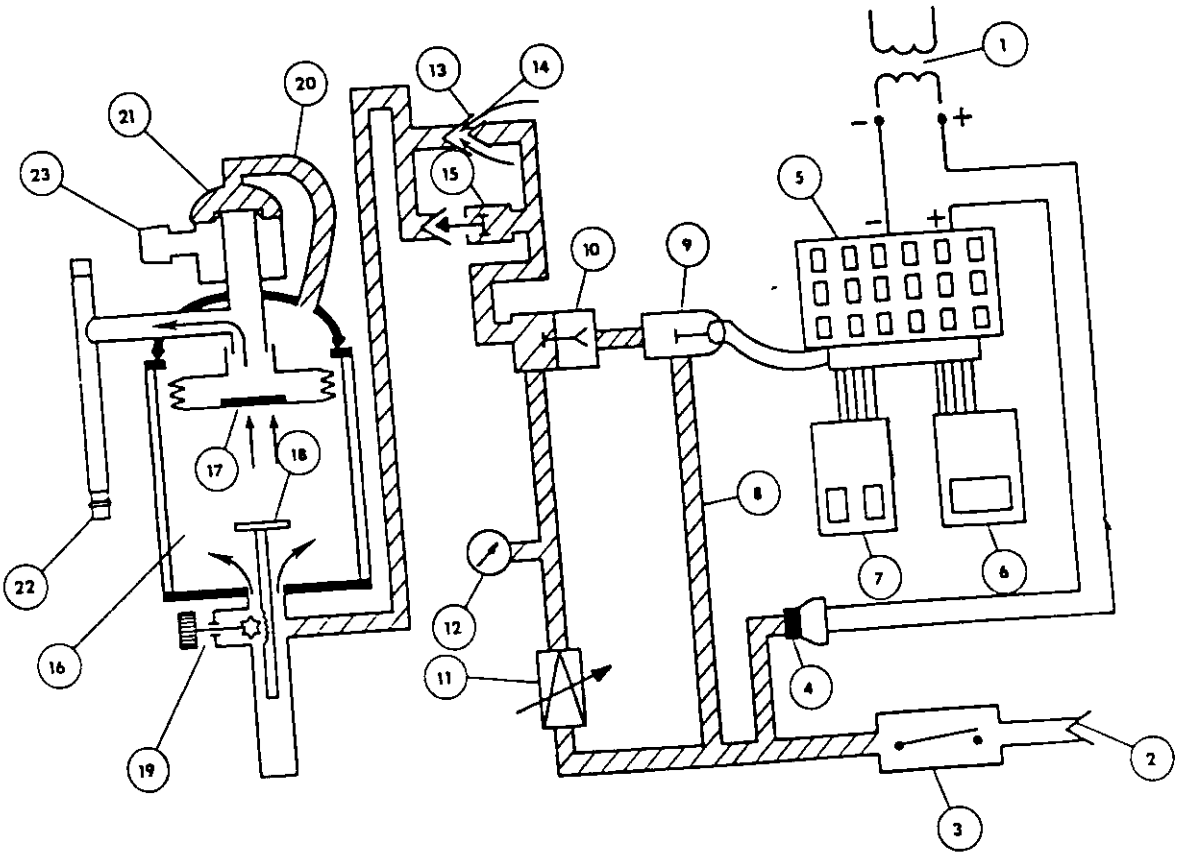


FIGURE 7-4: INSPIRATORY FLOW TIME

The inspiratory pause time (inspiratory pause) starts at the time when the bellows stop the upward movement and lasts until the downward movement of the bellows begins.

All pneumatic and electronic functions remain in the same as during the inspiratory flow time. The pressure in the bellows chamber (16), as preset with the flow regulator (11) cannot increase further. Therefore, all excess pressure is released through the entrainment port (14). Venturi (13) does not entrain air into the system at this point.

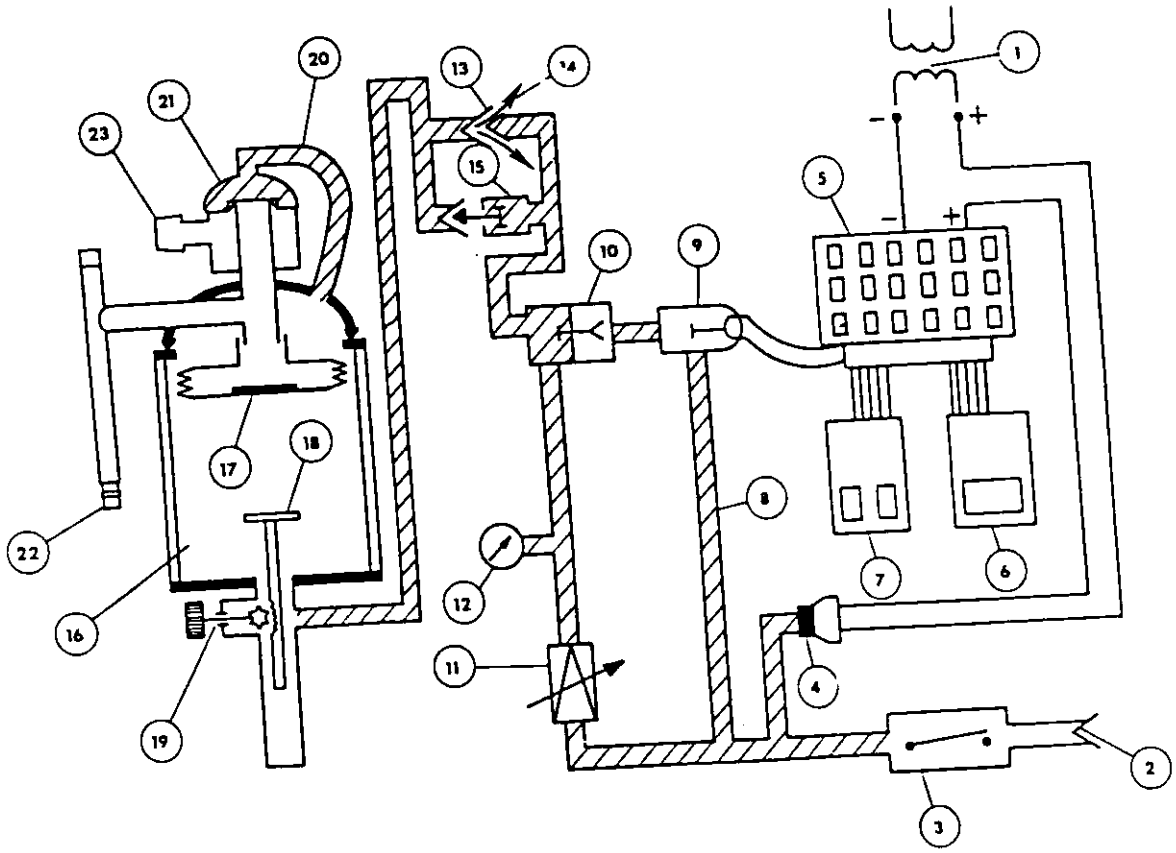


FIGURE 7-5: INSPIRATORY PAUSE TIME

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Based on frequency and I:E ratio setting on frequency control (7) and I:E ratio control (6), the expiratory flow time begins when the electric signal from the AV-E P.C. Board (5) is no longer supplied to solenoid valve (9). As soon as the electric signal stops, solenoid valve (9) is deactivated and closes. This stops the gas supply of 50 psi pressure to control valve (10), which becomes also deactivated and closes. The preset gas flow regulator (11) is interrupted by control valve (10). This causes an immediate pressure drop at venturi (13) and no back pressure is supplied to pilot actuator (15). This valve opens and allows gas from bellows chamber (16) to discharge through pilot actuator (15), but also through the entrainment port (14) of venturi (13). As the pressure drops in bellows chamber (16), the bellows (17) begin to move downward. As long as any pressure still remains in bellows chamber (16), ventilator relief valve (21) is also pressurized and remains closed.

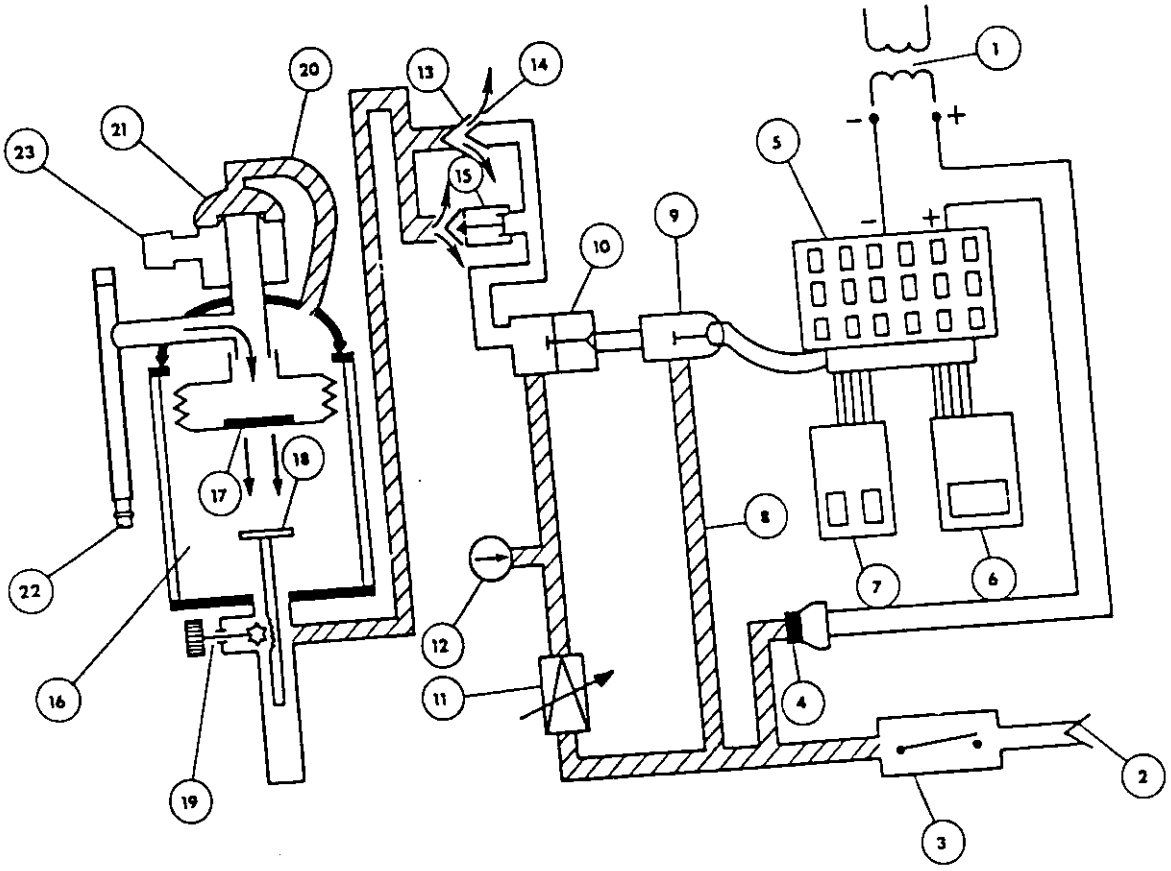

FIGURE 7-6: EXPIRATORY FLOW TIME

The expiratory pause time (expiratory pause or resting period) starts at the time when the bellows stop the downward movement (bellows resting on tidal volume adjustment plate 18) and lasts until the upward movement of the bellows begins.

All pneumatic and electronic functions remain the same as during the expiratory flow time with the exception of ventilator relief valve (21). Since no pressure remains in the bellows chamber (16), no pressure is transmitted via pilot line (20) to ventilator relief valve (21). Therefore, this valve is open and residual exhaled gases as well as excess fresh gas flow are discharged through the waste gas scavenging system connector (23) into the scavenger interface.

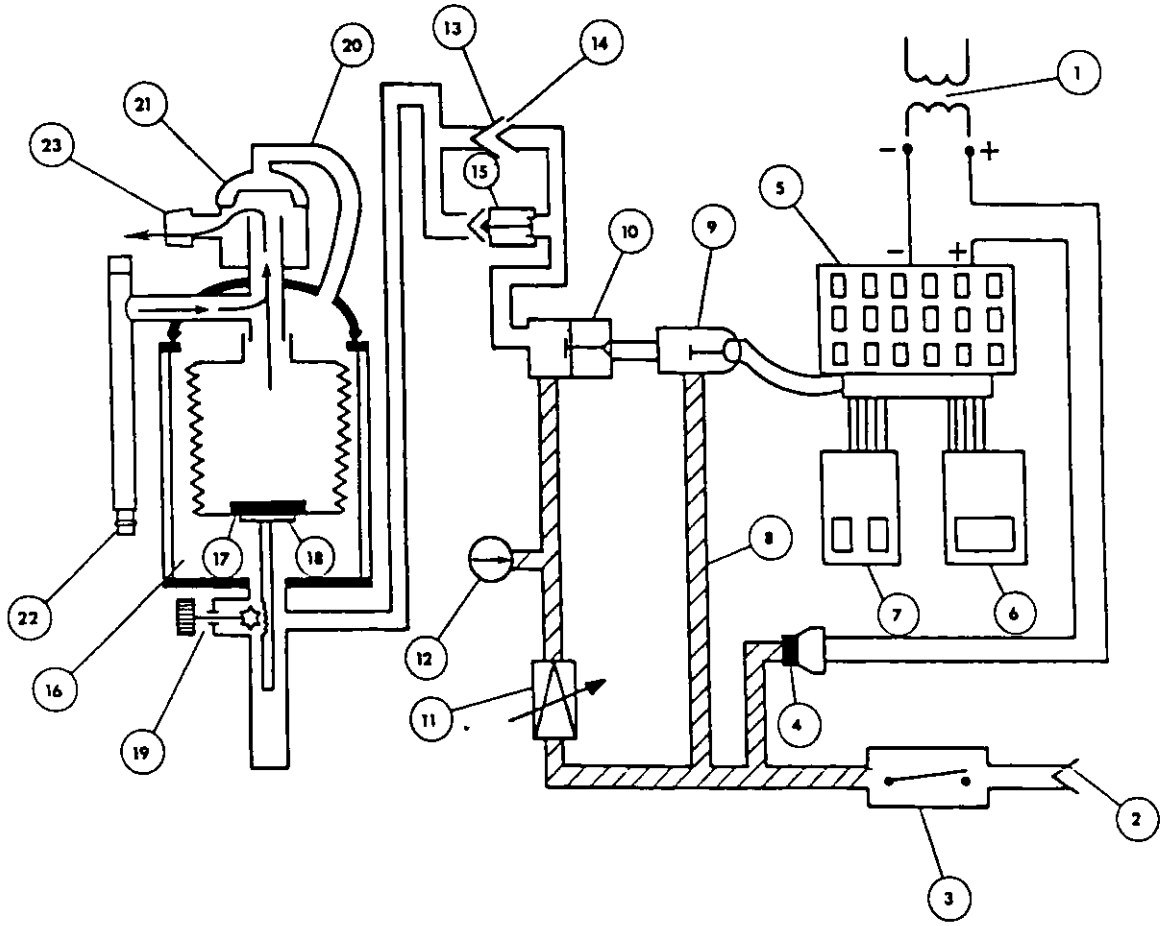

FIGURE 7-7: EXPIRATORY PAUSE TIME

AV-E ANESTHESIA VENTILATOR

The Dräger AV-E Anesthesia Ventilator (Figure 7-8) is a volume pre-set, time-cycled ventilator that features solid state timing, pneumatic circuitry, and independent controls.

The pneumatic power to drive the ventilator may be supplied through the pipeline supply or, if the pipeline supply fails or is disconnected, through reserve cylinders. The pressure of the driving gas must be between 40 and 60 PSI. The ventilator will cease to function if this pressure drops below 28 PSI.

The monitoring system's breathing pressure and expiratory flow waveform displays can be used as an aid in adjusting the AV-E ventilator.

NOTE: The AV-E Anesthesia ventilator is designed for use with NAD absorber systems, which incorporate a manual/automatic selector valve. This valve allows the operator to bring either the breathing bag and pop-off valve, for manual ventilation, or the ventilator bellows, for automatic ventilation, into the breathing system. Breathing system hose connections to this valve are described in the SETUP & INSTALLATION section of this manual.

VENTILATOR POWER SWITCH

The ventilator power switch controls both pneumatic and electrical power for the AV-E ventilator. In the "OFF" (i.e., 9 o'clock) position the ventilator is not operable and the Advisory message "VENT OFF" appears on the anesthesia machine's central alarm display. In the "ON" (i.e., 12 o'clock) position the ventilator is activated and cycles according to the settings of the other controls.

The ventilator power switch also automatically enables the volume monitor's volume-related alarms and the breathing pressure monitor's apnea pressure alarm.

For further details, see the MONITORING SYSTEM section of this manual.

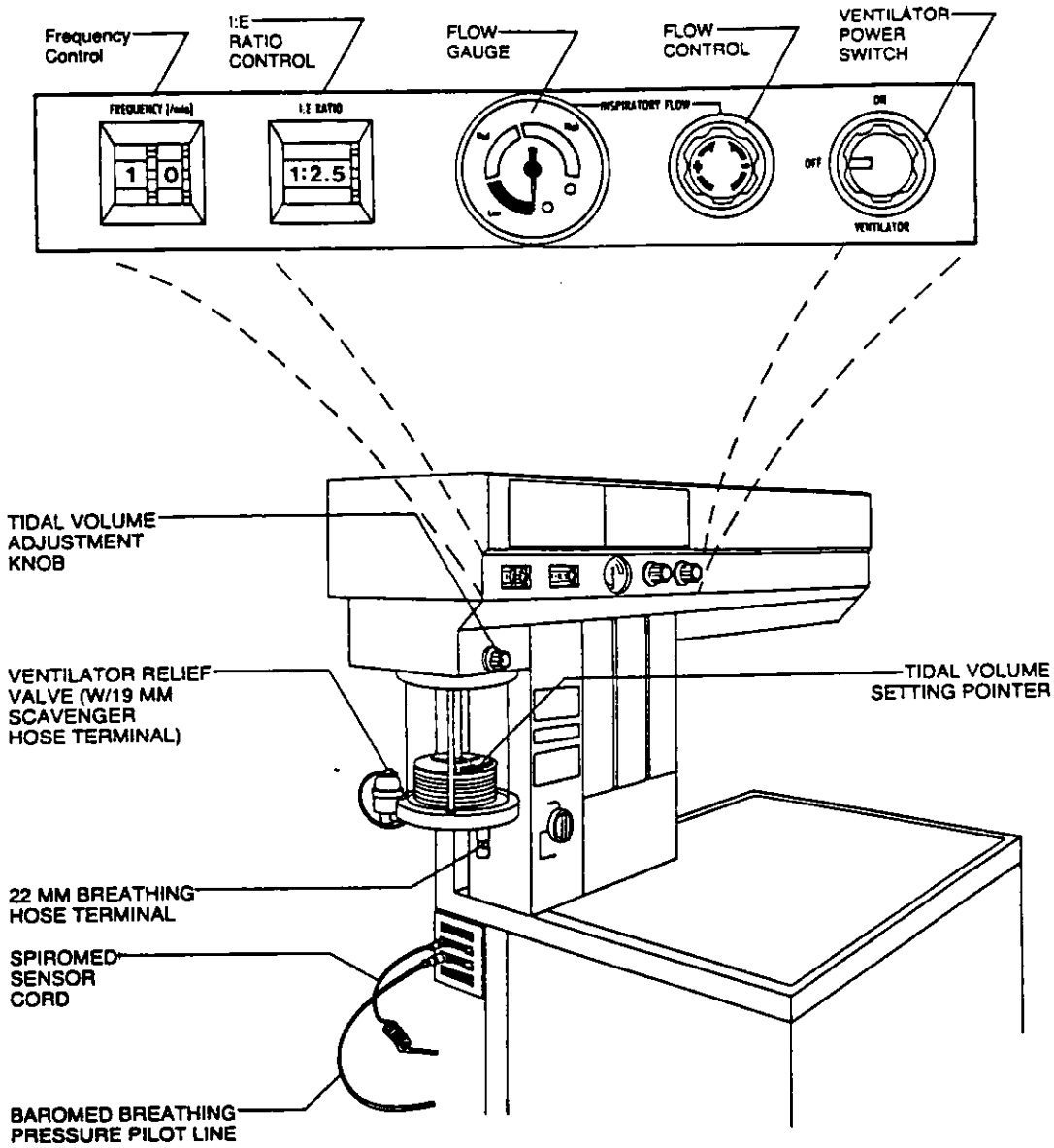

FIGURE 7-8: AV-E VENTILATOR

TIDAL VOLUME ADJUSTMENT

The tidal volume may be adjusted between 50 and 1500 ml. A self-locking knob, located above the bellows assembly, adjusts a bellows stop within the bellows canister. To adjust the tidal volume, first depress the self-locking knob to allow rotation. Then set the desired tidal volume, as indicated by the bellows stop pointer on the scale (marked 200 to 1400 ml) on the bellows chamber.

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 choosing settings 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. The compliance of the breathing system and freshgas flow are two possible causes for a difference between the preset and actual tidal volume. To accurately set the tidal volume, the operator should refer to the tidal volume and minute volume readings supplied by the integral volume monitor. The position of the tidal volume indicator can be adjusted by an NAD authorized service representative to give correct indications for a specific combination of freshgas flow and equipment compliance.

FREQUENCY CONTROL

The respiratory frequency can be preset between 1 and 99 BPM, in 1 BPM increments, with a two-digit thumb-wheel switch labeled "FREQUENCY."

INSPIRATORY/EXPIRATORY PHASE TIME RATIO CONTROL

The operator can vary the inspiratory/expiratory phase time ratio in calibrated steps from 1:1 through 1:4.5. Calibrations at each 0.5 increment are marked on the I:E controller-indicator thumbwheel. The thumbwheel is located to the right of the frequency thumbwheel and is labeled "I:E RATIO."

INSPIRATORY FLOW CONTROL

The rotary knob marked "INSPIRATORY FLOW" controls the flow rate of gas into the bellows chamber, and thus the inspiratory flow rate of gas into the patient's lungs. However, due to such variables as total lung compliance, equipment compliance, and airway resistance, the inspiratory flow control cannot be calibrated with numerical values. Instead, the gauge to the left of the control knob is labeled with three zones, "LOW," "MEDIUM," and "HIGH."

The flow setting should be adjusted so that the bellows is fully compressed at the end of the inspiratory phase. However, too high a flow setting will collapse the already compressed bellows at the end of the inspiratory phase. Such bellows deformation can increase the delivered tidal volume by as much as 100 ml. In order to deliver the desired, preset tidal volume, adjust the inspiratory flow control so that the bellows corrugations make contact with each other and do not deform at the end of the inspiratory phase.

The "INSPIRATORY FLOW" control setting also affects the peak inspiratory pressure that can be developed within the patient breathing system. **Always** check the pressure indicated by the breathing system pressure gauge when adjusting the inspiratory flow control.

PERFORMANCE

The DRÄGER AV-E Anesthesia Ventilator performs as a time-cycled ventilator for the change from inspiratory to expiratory phase as well as for the change from expiratory to inspiratory phase. The independent controls of frequency, I:E Ratio, generated flow, and tidal volume facilitates the performance of an inspiratory pause time when desired. Inspiratory pause time, by definition, is a period of no flow at the end of the inspiratory phase which supports distribution of gas between anesthesia breathing system and within the lungs themselves.

The pressure time DIAGRAM I shows a typical performance of the Dräger AV-E. The solid pressure line in the diagram demonstrates the pointer movement of the system pressure gauge as a function of time. The dotted line demonstrates the imagined mean pressure within the alveoli. The volume preset in the bellows is delivered when $P_I max$ is reached. During the final period of T_{IF} an equalization of pressure between the system and alveoli takes place resulting in a decrease of system pressure and an increase of alveolar pressure are equal during the inspiratory pause time T_{IP} facilitating the possibility to determine alveolar pressure with the system pressure gauge.

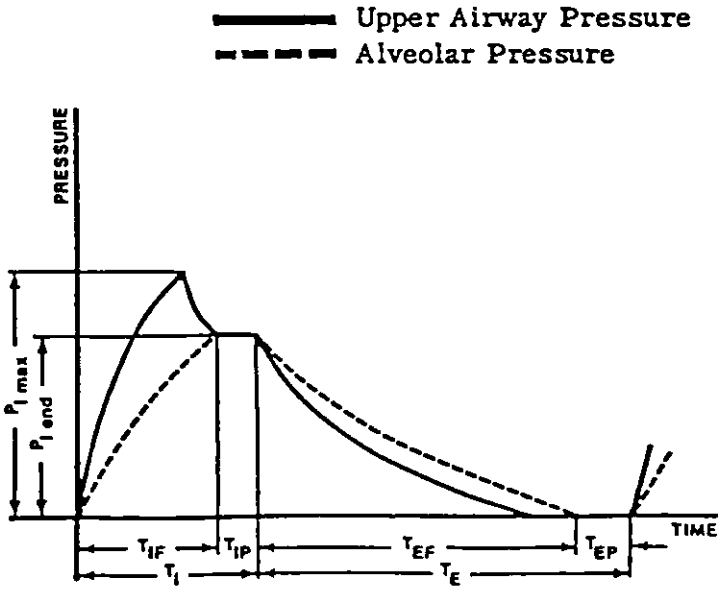

DIAGRAM I

The system pressure gauge and the "TRACE" breathing pressure waveform become important instruments when used in combination with a ventilator like the DRÄGER AV-E. The peak pressure in the system may be affected by generated flow, airway resistance, compliance and preset tidal volume. The end inspiratory pressure, when an inspiratory pause is performed, will be affected by preset tidal volume and compliance.

The influencing parameters listed above can be separated into two different groups: parameters which are changed as a result of a re-adjustment of the ventilator and parameters which are changed as a result of a change in the patient's condition.

Diagrams II and III demonstrate changes in the reading of the system pressure gauge as a result of changes in the condition of the patient or changes within the anesthesia breathing system (II A-B) and changes resulting from alteration of the ventilator controls (III A-E). The left side diagram in each case demonstrates the same original condition, while the right side diagram indicates the effect on the pressure time pattern as a result of changes in resistance or compliance (II) or ventilator adjustment (III). It is assumed that the working pressure setting permits the bellows to properly collapse with all examples.

DIAGRAM I illustrates, in detail, the features of DIAGRAMS II-A through II-E.
DIAGRAM I shows a typical performance of the DRÄGER AV-E.

DIAGRAMS II-A and II-B show the effect of changes in the patient's condition or patient system.

DIAGRAMS III-A through III-E show the effect of variation of the controls of the DRÄGER AV-E.

II CHANGES IN PATIENT'S CONDITION OR PATIENT SYSTEM

II-A

Assuming that the left side of the Diagram 11-A represents an original pressure pattern of ventilation, the right side indicates an increase of resistance which may be either an increase of airway resistance or a mechanical occlusion of any other gas passage. It should be noted that increase of peak pressure as a result of increase of resistance may be accompanied by no or little change of pressure during the inspiratory pause.

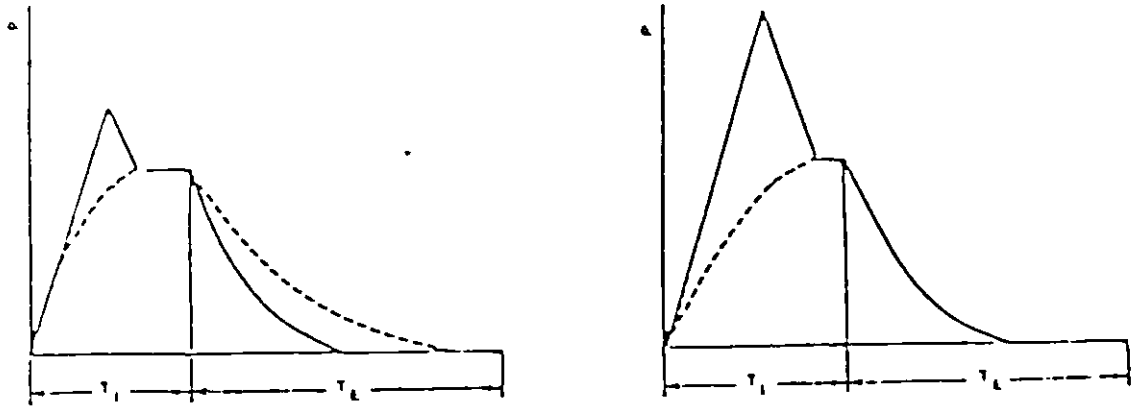

DIAGRAM II-A

II CHANGES IN PATIENT'S CONDITION OR PATIENT SYSTEM

II-B

Diagram II-B demonstrates the effect of compliance change on the reading of the system pressure gauge; such a compliance change may be the result of a change in lung compliance. It should be noted that the increase of pressure during the inspiratory pause is accompanied by a slight increase of peak pressure only.

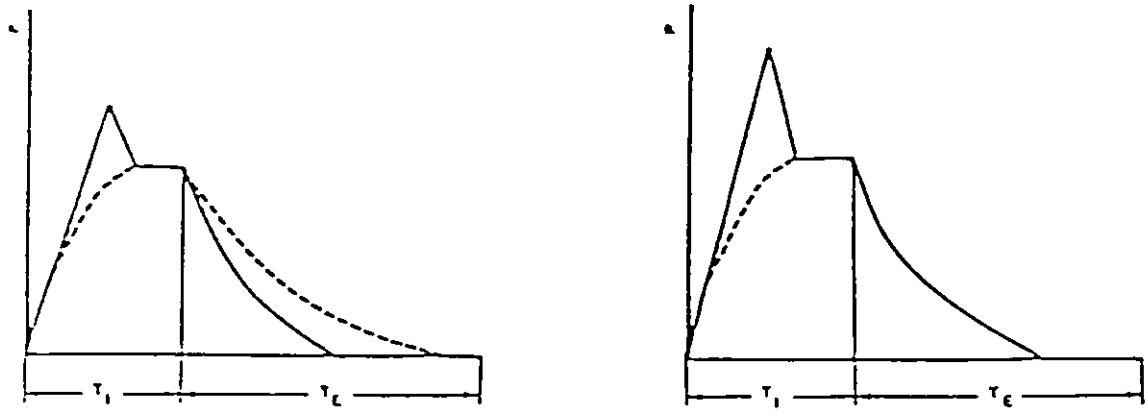

DIAGRAM II-B

III - CHANGES IN VENTILATOR CONTROLS

III-A

Diagrams III-A does indicate an increase of generated flow, that means: increasing the setting of flow control knob. It should be noted that the increase of flow increases the peak pressure during the flow period but does not affect the pressure during the inspiratory pause. A similar effect may be noticed when increasing the maximum pressure setting.

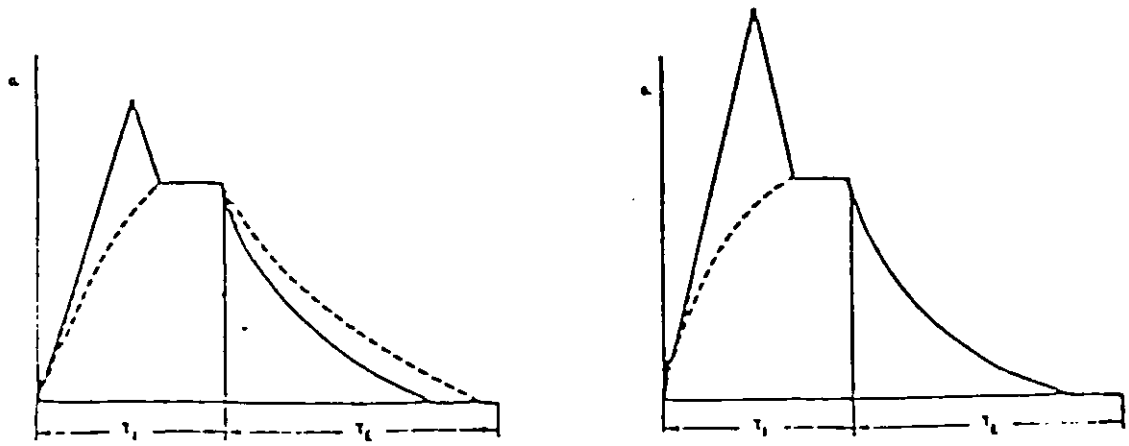

DIAGRAM III-A

III - CHANGES IN VENTILATOR CONTROLS

III-B

To reduce peak pressure during inspiration to a minimum, the inspiratory flow can be reduced until the difference between the peak pressure and the inspiratory pause pressure indicated at the system pressure gauge becomes a minimum (III-B). With such a performance, the inspiratory pause time becomes also a minimum and an unexpected increase in the airway resistance of the patient or other increase of resistance may result in a decrease of lung ventilation. A similar effect may be noticed when increasing the maximum pressure setting.

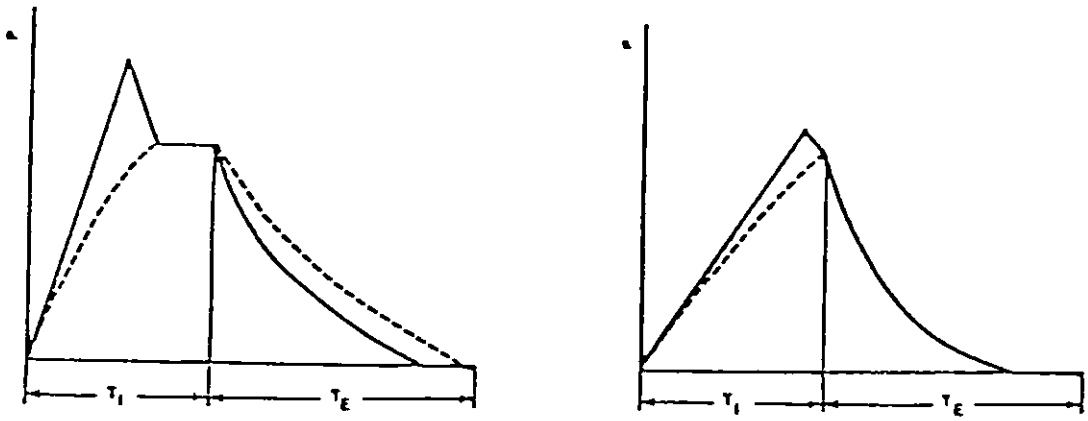

DIAGRAM III-B

III - CHANGES IN VENTILATOR CONTROLS

III-C

Diagram III-C indicates an increase in frequency. It should be noted that due to independent controls of frequency, flow and tidal volume, the pressure readings during the flow portion of the inspiratory cycle are not effected by a change in the increase of frequency, however, the period of inspiratory pause is shortened in relationship to the increase of frequency. The inspiratory pause may be eliminated completely in the event of a significant increase in frequency which would require an increase of flow in order to re-establish the inspiratory pause. It should also be noted that the respiratory minute volume is increased in exact proportion to the increase of frequency when the tidal volume is kept constant.

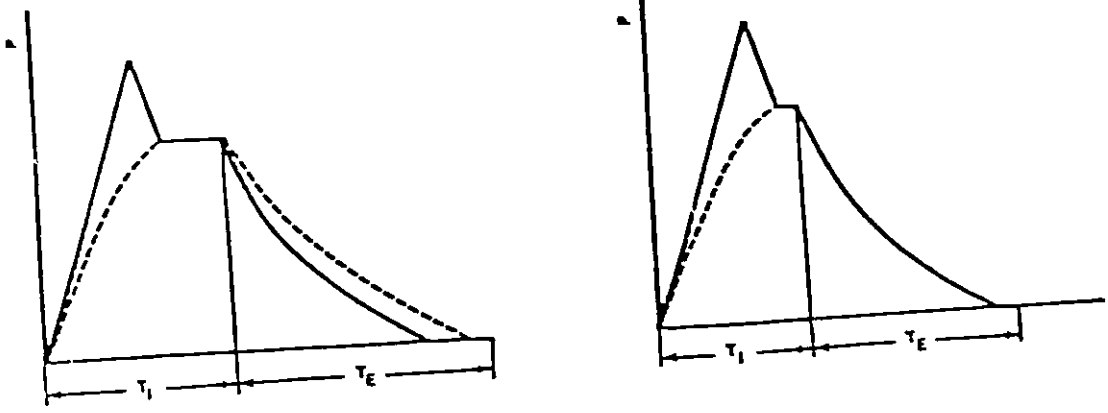

DIAGRAM III-C

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III - CHANGES IN VENTILATOR CONTROLS

III-E

Diagram III-E shows the effect of changing the I:E phase time ratio while maintaining the same frequency. This procedure shortens the inspiratory pause time but prolongs the expiratory pause time by an equal period.

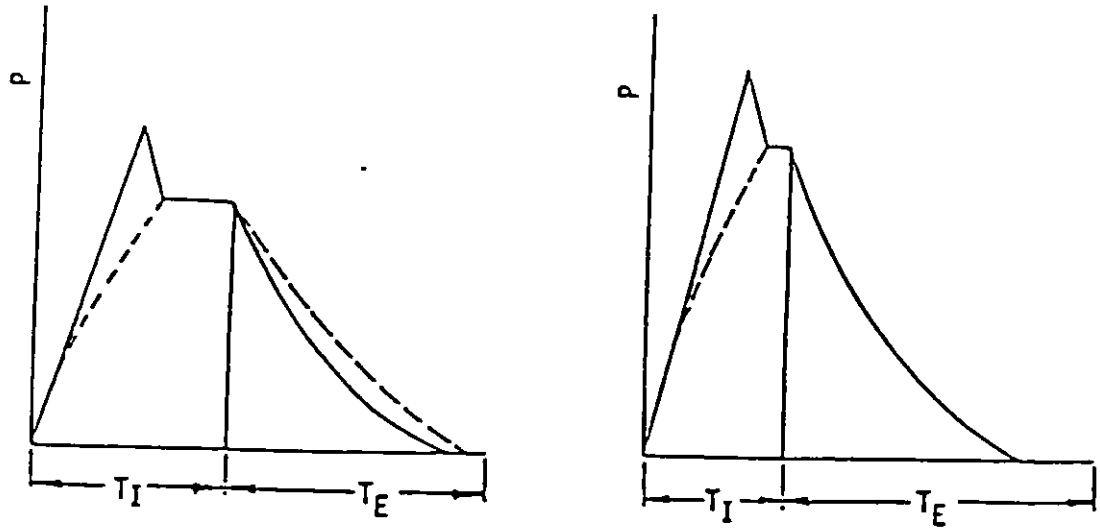

DIAGRAM III-E

VENTILATOR RELIEF VALVE

During automatic ventilation, the manual/automatic selector valve isolates the absorber system's APL (automatic pressure limiting) valve from the breathing system. Thus, to compensate for the continuous introduction of freshgas into the breathing system, the ventilator incorporates a relief valve mounted behind the bellows chamber.

The ventilator relief valve remains closed until the very end of expiration so that the ascending bellows can expand upwards and refill. As in any ascending bellows, the force needed to overcome gravity acting on the bellows causes a PEEP within the breathing system, in this case approximately 2 cm H2O. This valve causes a PEEP of approximately 2 cm H2O.

BELLOWS PEEP VALVE (OPTIONAL)

An optional ventilator PEEP valve mounts beneath the bellows. (An optional absorber-mounted PEEP valve is also available.) The operator can set a PEEP of approximately 2 to 18 cm H2O with the PEEP valve control knob. Clockwise rotation of the knob increases PEEP and counterclockwise rotation decreases PEEP. The breathing system pressure gauge and the BAROMED breathing pressure monitor indicate the amount of PEEP at the end of exhalation. For further details, see the Bellows PEEP Valve Instruction Manual.

Before use, perform Step 29-B of this manuals Pre-Use Checkout Procedure.

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18. Secure 4109649A PANEL ASM-AVE FRONT-NM2B with six (6) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO.

19. Test the ventilator as per the PMS procedure.

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NARKOMED 2B

SECTION 8

April 1988

ALARM PANEL

The alarm panel is located between the ventilator bellows and flowmeter bank and incorporates alarms pertaining to the status of the system as a whole. These alarms are annunciated and simultaneously displayed by the central alarm display (see the MONITORING SYSTEM section of this manual).

Figure 8-1 illustrates the indicators and controls on the alarm panel.

O2/N2O FLOW RATIO (ORMC)

The oxygen flow ratio alarm indicator (marked "O2/N2O FLOW RATIO") activates whenever the ORMC limits the nitrous oxide flow in order to maintain a fresh-gas oxygen concentration of at least 25±3% of the combined oxygen and nitrous oxide flow. Therefore, this alarm means that the oxygen and/or nitrous flow control valves have been incorrectly set and the ORMC has responded by limiting nitrous oxide flow. This alarm does not mean that the freshgas mixture itself has become hypoxic.

Whenever the ORMC is actively limiting the nitrous oxide flow to prevent a hypoxic freshgas mixture, an "O2/N2O LOW" alarm message appears on the central alarm display, the "O2/N2O FLOW RATIO" LED indicator on the alarm panel lights continuously yellow, and a single tone audible alarm sounds.

Due to rebreathing of previously exhaled gas in a circle system, lower freshgas flows require a correspondingly higher oxygen concentration to maintain a sufficient inspiratory oxygen concentration. To address this problem, the ORMC has been designed to maintain higher levels of oxygen in the freshgas at lower flow rates. Thus, especially at low freshgas flow rates, the ORMC alarm may activate at freshgas oxygen concentrations well above 25% of the combined oxygen and nitrous oxide flow.

It should be noted that the ORMC interlocks only the flows of oxygen and nitrous oxide. Hypoxic freshgas concentrations are possible if an additional gas other than air is used.

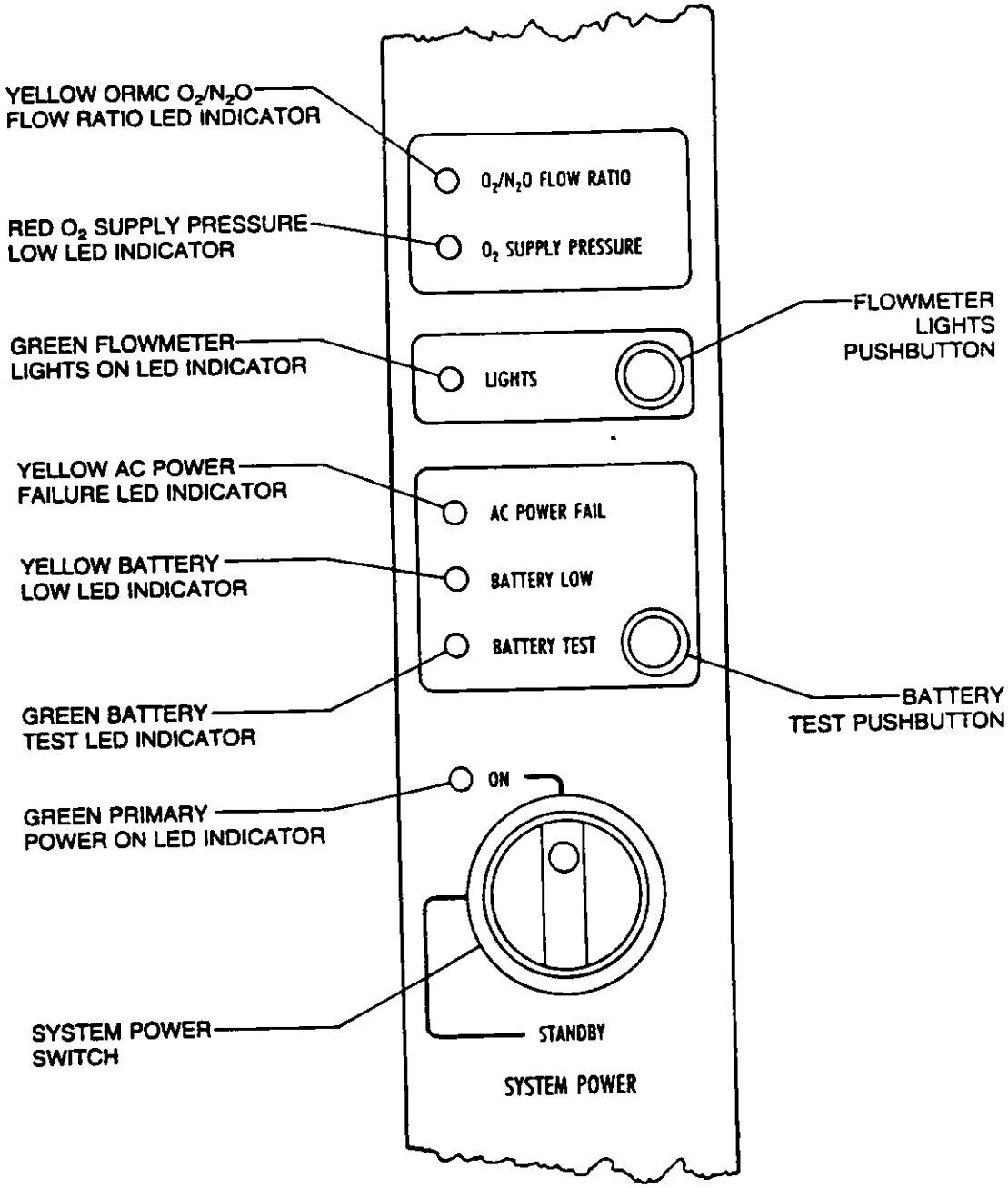

FIGURE 8-1: ALARM PANEL

In the following instances, ORMC audible and visual alarms are automatically disabled (as indicated by the Advisory message "ORM ALRM OFF" on the central alarm display):

- If the NARKOMED 2B is equipped with an addition-all gas circuit controlled by the additional gas selector switch (i.e., all additional gas options except carbon dioxide as a third gas) and the selector switch is placed in the "ALL GASES" position, the ORMC audible and visual alarms are automatically disabled.

-The ORMC audible and visual alarms are automatically disabled at nitrous oxide flows below 150±50 ml/min.

Although ORMC audible and visual alarms are automatically disabled in the above two instances, the ORMC continues to control the ratio of oxygen to nitrous oxide flow regardless of the alarm status.

NOTE: If the anesthesia machine has been optionally configured to eliminate the minimum oxygen flow feature, ORMC audible and visual alarms are automatically disabled at nitrous oxide flows below 750±75 ml/min instead of the 150±50 ml/min limit used for standard machines.

OXYGEN SUPPLY PRESSURE ALARM

The oxygen supply pressure alarm activates if the oxygen supply pressure (from either the pipeline supply or reserve cylinders) in the system decreases below 30 ±3 psi. The LED indicator marked "O2 SUPPLY PRESSURE" lights continuously red, the alarm message "LO O2 SUPPLY" appears on the central alarm display, and an intermittent audible alarm sounds.

NOTE: If only one of the sources of oxygen supply pressure (either reserve cylinders or pipeline) fails while the other maintains proper supply pressure within the machine's oxygen supply lines, the oxygen supply pressure alarm will not activate.

BATTERY TEST AND INDICATORS

The operator must test the back-up battery system daily by pressing the green "BATTERY TEST" pushbutton. Before pressing the pushbutton, make sure that the "System Power" switch is in the on position. The green indicator lights when the pushbutton to the right is pressed if the battery has been charged to normal operating potential. Any time that the battery potential drops below the normal operating threshold, the yellow "BATTERY LOW" LED lights, whether the "BATTERY TEST" button has been pressed or not.

NOTE: Do not rely only on the "BATTERY LOW" indicator for an assessment of battery capacity. If the backup battery became completely depleted and the machine did not have AC power, the "BATTERY LOW" indicator would have no source of power. Therefore, always remember to perform the daily battery test.

AC POWER FAILURE INDICATOR

The yellow "AC POWER FAIL" LED signals AC power disruption. This LED illuminates whenever the battery is supplying power to the monitoring system and the electronic ventilator. When AC power is first disrupted, a single-tone audible alarm sounds. However, if the anesthesia machine's backup battery is completely discharged, the AC power failure indicator will not be supplied with the power.

SYSTEM POWER SWITCH

The System Power switch of the NARKOMED 2B has two functional positions: "STANDBY" (9 o'clock position) and "ON" (12 o'clock position). Set to the "ON" position, the System Power switch actuates all gas and electric power.

To prevent inadvertent disengagement of the switch, it must be depressed when turning it to a new position. A green LED indicator adjacent to the switch remains lit any time that the switch is "ON" and supplying power to the machine. A single, brief tone sounds when the switch is turned to the "ON" position.

Set in the "STANDBY" position, the System Power switch shuts down the alarm system and the gas supplies. The battery charging circuit and convenience receptacles are powered whenever the power cord is attached to an active wall receptacle, regardless of the setting of the switch. To prevent drainage of the backup battery and waste or depletion of the oxygen supply through the minimum oxygen flow, the System Power switch shall be turned to the "STANDBY" position whenever the machine is not in use.

FLOWMETER LIGHTS

A pushbutton on the alarm panel controls lights for the flowmeter panel.

PART NUMBER: 4108592A **PROCEDURE: REPLACEMENT**
DESCRIPTION: ALARM CHANNEL ASM

APPLICABLE TO: 4109436A NARKOMED 2B
PART(S) REQUIRED: 4108592A ALARM CHANNEL ASM
SPECIAL TOOL(S) : ESD CONTROL EQUIPMENT

1. Disconnect the pipeline supply pressure for all gases.

2. Turn off all cylinders.

3. Turn the SYSTEM POWER switch to ON.

4. Bleed the pressure from all gas circuits.

5. Turn the SYSTEM POWER switch to STAND BY.

6. Unplug the NARKOMED 2B.

7. Disable the DC BATTERY CB1 circuit breaker.

8. Remove the seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO securing 4109666A SHELF ASM-CRT BOX-NM2B.

9. Lift the rear of 4109666A SHELF ASM-CRT BOX-NM2B and disconnect 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.

10. Remove 4109666A SHELF-ASM CRT BOX-NM2B.

11. Use ESD precautionary procedures.

12. Disconnect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B.

13. Disconnect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B

14. Remove the six (6) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO securing 4109676S COVER-FLOWMETER REAR-NM2B.

15. Remove 4109676S COVER-FLOWMETER REAR NM2B.

16. Disconnect the two (2) copper tubes connected to the SYSTEM POWER SWITCH clippard valve.

17. Disconnect 4109139A CABLE ASM-RIBBON 14CONDX13 from J4 ON 4108592A ALARM CHANNEL ASM.

18. Disconnect 4109236A WIRE HARNESS from J3 on 4108592A ALARM CHANNEL ASM.

19. Disconnect 4108594A WIRE HARNESS-FLOWMETER LIGHTS from J2 on 4108592A ALARM CHANNEL ASM.

20. Disconnect 4109072A WIRE HARNESS-ALM CHAN/VENT NM3 from J1 ON 4108592A ALARM CHANNEL ASM.

21. Remove the two (2) 7701025P SCR-CAP SKT HD 10-32X1/2L SS and 7766003P WASHER-FLAT #10 SS THK .049 SECURING 4103357A COVER ASM-FRONT.

22. Remove 4103357A COVER ASM-FRONT.

23. Remove the five (5) 7701012P SCR-CAP SKT HD 8-32X3/8L SS securing 4103367A TABLE TOP ASM.

24. Remove 4103367A TABLE TOP ASM.

25. Remove one (1) 7701025P SCR-CAP SKT HD 10-32X1/2L SS, 7765003P WASHER-LOCK SPLIT #10 SS, and 7766003P WASHER-FLAT #10 SS THK .049 securing 4108592A ALARM CHANNEL ASM, USING A 5/32 ALLEN WRENCH.

26. Remove 4108592A ALARM CHANNEL ASM.

27. Place 4108592A ALARM CHANNEL into the flowmeter head.

28. Start the two (2) COPPER TUBES onto the system POWER SWITCH clippard valve.

29. Secure 4108592A ALARM CHANNEL ASM to the flowmeter head with one (1) 7701025P SCR-CAP SKT HD 10-32X1/2L SS, 7765003P WASHER-LOCK SPLIT #10 SS, and 7766003P WASHER-FLAT #10 SS THK .049.

30. Install 4103357A COVER ASM-FRONT.

31. Secure 4103357A COVER ASM-FRONT with two (2) 7701025P SCR-CAP SKT HD 10-32X1/2L SS and 7766003P WASHER-FLAT #10 SS THK .049.

32. Tighten the two (2) copper tubes on the SYSTEM POWER SWITCH clippard valve.

33. Open one cylinder of oxygen.

34. Let the oxygen pressure stabilize.

35. Close the oxygen cylinder.

36. The pressure should not drop more than 50 psi in the following two (2) minutes.

37. Connect 4109139A CABLE ASM-RIBBON 14CONDX13 to J4 on 4108592A ALARM CHANNEL ASM.

38. Connect 4109236A WIRE HARNESS to J3 on 4108592A

ALARM CHANNEL ASM.

39. Connect 4108594A WIRE HARNESS-FLOWMETER LIGHTS to J2 ON 4108592A ALARM CHANNEL ASM.

40. Connect 4109072A WIRE HARNESS-ALM CHAN/VENT NM3 to J1 on 4108592A ALARM CHANNEL ASM.

41. Install 4103367A TABLE TOP ASM.

42. Secure the 4103367A TABLE TOP ASM with five (5) 7701012P SCR-CAP SKT HD 8-32X3/8L SS.

43. Install 4109676S COVER-FLOWMETER REAR-NM2B.

44. Secure 41089676 COVER-FLOWMETER REAR-NM2B with six (6) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO.

45. Connect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B.

46. Connect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B

47. Remove the ESD control equipment.

48. Position 4109666A SHELF ASM-CRT BOX-NM2B on top of the NARKOMED 2B.

49. Attach 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4109666A SHELF ASM-CRT BOX-NM2B to 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.

50. Install 4109666A SHELF ASM-CRT BOX-NM2B.

51. Secure 4109666A SHELF ASM-CRT BOX-NM2B with seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO.

52. Enable DC BATTERY CB1 circuit breaker.

53. Plug the NARKOMED 2B into a live receptacle.

54. Perform a complete Periodic Manufacture Service on the NARKOMED 2B.

PART NUMBER: 4108592A **PROCEDURE: REPLACEMENT**

DESCRIPTION: ALARM CHANNEL ASM

APPLICABLE TO: 4109436A NARKOMED 2B
WITH 4109310A FLOWMETER ASM-AUXILIARY-02

PART(S) REQUIRED: 4108592A ALARM CHANNEL ASM
4106068P TIE STRAP -.09W X 4-1/8L BLACK
4106366P FTG-TEE-FOR 1/16ID HOSEX1/8MPT

SPECIAL TOOL(S) : ESD CONTROL EQUIPMENT

1. Disconnect the pipeline supply pressure for all gases.
2. Turn off all cylinders.
3. Turn the SYSTEM POWER switch to ON.
4. Bleed the pressure from all gas circuits.
5. Turn the SYSTEM POWER switch to STAND BY.
6. Unplug the NARKOMED 2B.
7. Disable the DC BATTERY CB1 circuit breaker.
8. Remove the seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO securing 4109666A SHELF ASM-CRT BOX-NM2B.
9. Lift the rear of 4109666A SHELF ASM-CRT BOX-NM2B and disconnect 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.
10. Remove 4109666A SHELF-ASM CRT BOX-NM2B.
11. Use ESD precautionary procedures.
12. Disconnect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B.
13. Disconnect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B
14. Remove the six (6) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO securing 4109676S COVER-FLOWMETER REAR-NM2B.
15. Remove 4109676S COVER-FLOWMETER REAR NM2B.
16. Disconnect the two (2) copper tubes connected to the SYSTEM POWER SWITCH clippard valve.
17. Disconnect 4109139A CABLE ASM-RIBBON 14CONDX13 from J4 ON 4108592A ALARM CHANNEL ASM.

18. Disconnect 4109236A WIRE HARNESS from J3 on 4108592A ALARM CHANNEL ASM.

19. Disconnect 4108594A WIRE HARNESS-FLOWMETER LIGHTS from J2 on 4108592A ALARM CHANNEL ASM.

20. Disconnect 4109072A WIRE HARNESS-ALM CHAN/VENT NM3 from J1 ON 4108592A ALARM CHANNEL ASM.

21. Remove the two (2) 7701025P SCR-CAP SKT HD 10-32X1/2L SS and 7766003P WASHER-FLAT #10 SS THK .049 SECURING 4103357A COVER ASM-FRONT.

22. Remove 4103357A COVER ASM-FRONT.

23. Remove the five (5) 7701012P SCR-CAP SKT HD 8-32X3/8L SS securing 4103367A TABLE TOP ASM.

24. Remove 4103367A TABLE TOP ASM.

25. Remove one (1) 7701025P SCR-CAP SKT HD 10-32X1/2L SS, 7765003P WASHER-LOCK SPLIT #10 SS, and 7766003P WASHER-FLAT #10 SS THK .049 securing 4108592A ALARM CHANNEL ASM.

26. Remove 4108592A ALARM CHANNEL ASM.

27. Cut 4106068P TIE STRAP-.09W X 4-1/8L BLACK securing 8808003P HOSE-CLEAR .075 X .135OD to 4106366P FTG-TEE-FOR 1/16ID HOSEX1/8MPT on 4108592A ALARM CHANNEL ASM.

28. Disconnect 8808003P HOSE-CLEAR .075 X .135OD from 4106366P FTG-TEE-FOR 1/16ID HOSEX1/8MPT on 4108592A ALARM CHANNEL ASM.

29. Connect 8808003P HOSE-CLEAR .075 X .135OD to 4106366P FTG-TEE-FOR 1/16ID HOSEX1/8MPT on the 4108592A ALARM CHANNEL ASM.

30. Secure 8808003P HOSE-CLEAR .075 X .135OD to 4106366P FTG-TEE-FOR 1/16ID HOSEX1/8MPT using one (1) 4106068P TIE STRAP-.09W X 4-1/8L BLACK.

31. Cut off the extra 4106068P TIE STRAP-.09W X 4-1/8L BLACK.

32. Place 4108592A ALARM CHANNEL into the flowmeter head.

33. Start the two (2) COPPER TUBES onto the system POWER SWITCH clippard valve.

34. Secure 4108592A ALARM CHANNEL ASM to the flowmeter

head with one (1) 7701025P SCR-CAP SKT HD 10-32X1/2L SS, 7765003P WASHER-LOCK SPLIT #10 SS, and 7766003P WASHER-FLAT #10 SS THK .049.

35. Install 4103357A COVER ASM-FRONT.

36. Secure 4103357A COVER ASM-FRONT with two (2) 7701025P SCR-CAP SKT HD 10-32X1/2L SS and 7766003P WASHER-FLAT #10 SS THK .049.

37. Tighten the two (2) copper tubes on the SYSTEM POWER SWITCH clippard valve.

38. Open one cylinder of oxygen.

39. Let the oxygen pressure stabilize.

40. Close the oxygen cylinder.

41. The pressure should not drop more than 50 psi in the following two (2) minutes.

42. Connect 4109139A CABLE ASM-RIBBON 14CONDX13 to J4 on 4108592A ALARM CHANNEL ASM.

43. Connect 4109236A WIRE HARNESS to J3 on 4108592A ALARM CHANNEL ASM.

44. Connect 4108594A WIRE HARNESS-FLOWMETER LIGHTS to J2 ON 4108592A ALARM CHANNEL ASM.

45. Connect 4109072A WIRE HARNESS-ALM CHAN/VENT NM3 to J1 on 4108592A ALARM CHANNEL ASM.

46. Install 4103367A TABLE TOP ASM.

47. Secure the 4103367A TABLE TOP ASM with five (5) 7701012P SCR-CAP SKT HD 8-32X3/8L SS.

48. Install 4109676S COVER-FLOWMETER REAR-NM2B.

49. Secure 41089676 COVER-FLOWMETER REAR-NM2B with six (6) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO.

50. Connect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B.

51. Connect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B

52. Remove the ESD control equipment.

53. Position 4109666A SHELF ASM-CRT BOX-NM2B on top of the NARKOMED 2B.

54. Attach 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4109666A SHELF ASM-CRT BOX-NM2B to 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.

55. Install 4109666A SHELF ASM-CRT BOX-NM2B.

56. Secure 4109666A SHELF ASM-CRT BOX-NM2B with seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO.

57. Enable DC BATTERY CB1 circuit breaker.

58. Plug the NARKOMED 2B into a live receptacle.

59. Perform a complete Periodic Manufacture Service on the NARKOMED 2B.

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Technical Service Manual

North American Dräger
DrägerService
24 Commerce Drive
Telford, PA 18969
(215) 723-9824

NARKOMED 2B

SECTION 9

April 1988

POWER SUPPLY

The NARKOMED 2B is equipped with a central power supply for the ventilator, alarm system, and integrated monitors. The NARKOMED 2B shall always be plugged into an active AC outlet when in use.

LINE CORD

A fifteen foot cable with a standard 3-prong hospital-grade plug supplies the AC power required by the NARKOMED 2B. The allowable input voltage range is from 90 to 130 VAC at 50-60 Hz. Excess cable length may be stored on the cord wrap on the rear of the NARKOMED 2B. When unplugging the line cord, pull the plug, never the cord.

HOSPITAL GRADE RECEPTACLES

The NARKOMED 2B includes four convenience receptacles supplied with unswitched power. These hospital grade receptacles are mounted on the underside of the rear of the monitor bank assembly. The total current draw for devices plugged into the receptacles shall not exceed 5 amps. A 5-amp circuit breaker protects the convenience receptacle circuit. This circuit also incorporates an EMI filter, which minimizes interference with the anesthesia machine from devices plugged into the convenience receptacles.

NOTE: Devices plugged into the convenience receptacles contribute to the anesthesia system's total leakage current. This total leakage current shall not exceed 100 microamps.

BATTERY BACKUP SYSTEM

The backup battery system consists of a rechargeable 12 volt battery (6.5 amp-hour, sealed lead-acid) and a built-in battery charging system. The battery and charging system are not user-serviceable and are mounted within the monitoring bank.

Although most hospitals have emergency generators to

provide AC power when line power fails, delays are frequently encountered before generator power comes on line. The battery back-up system automatically provides power during the interim between line power failure and the activation of the hospital's emergency generator. The backup battery also performs the important function of powering the machine whenever the anesthesia machine's line cord is accidentally unplugged during a case.

When the hospital's emergency generator comes on line (or when a disconnected line cord is reconnected), the NARKOMED 2B automatically switches back to AC power and recharges its battery. The battery charging system will charge the battery any time that the line cord is connected to an active AC power source. The charger will take approximately 16 hours to recharge a fully discharged battery.

To prevent premature battery failure, backup battery power shall be used only during interruption of primary electric service. No anesthetic procedure shall be started using a NARKOMED 2B anesthesia machine if the yellow "AC POWER FAIL" indicator or the yellow "BATTERY LOW" indicator is illuminated.

Sufficient back-up battery power shall be tested daily by pressing the "BATTERY TEST" button on the alarm panel (Figure 14). A green light indicates that power to operate the electrical components of the anesthesia machine is available but does not indicate the period of time for which this power will be provided. This depends on the duration of previous battery use and recharging.

MACHINE FUNCTIONS WHILE ON BACKUP BATTERY POWER

If the hospital's primary AC power fails, the backup battery system works in two stages:

1. The backup battery will power all machine functions except the AC convenience receptacles for a minimum period of **30 minutes**. As an indication of AC power disruption, the yellow "AC POWER FAIL" indicator on the alarm panel illuminates, the alarm message "AC PWR FAIL" appears on the central alarm display, and a single-tone audible alarm sounds.

   As use of the backup battery proceeds, the battery capacity will gradually decline. When the battery voltage drops below the normal operating threshold, the yellow "BATTERY LOW" indicator on the alarm

panel illuminates, and the alarm message "BATTERY LOW" appears on the central alarm display. This message indicates that the backup battery is nearing its automatic cutoff point as described below.

2. In the second stage (when the battery voltage drops to 10 volts), all electrical power to the anesthesia machine is automatically cut off to prevent deep discharge of the battery. (Deep discharge damages lead-acid batteries.) At this point, all gas supply systems remain operative. However, since the AV-E ventilator is inoperative when battery power has been cut off, manual ventilation by bag squeezing must be performed. In this final stage, the anesthesia machine can not provide monitoring or alarm functions until it is reconnected to an active AC power source.

CIRCUIT BREAKERS

The NARKOMED 2B electrical system includes three magnetic circuit breakers to protect the various machine functions (primary AC power input, convenience receptacles, reserve battery power).

The circuit breakers are located on the rear of the monitoring bank. When the white plunger of a circuit breaker is flush with the surface of its black base, the circuit breaker is in its normal, closed position. A circuit breaker is open (tripped) when its white plunger extends beyond its black base. The cause of an open breaker must be investigated. Equipment that has caused the breaker to open shall be repaired or replaced before the anesthesia system is returned to service.

EMI FILTERING

All power for the NARKOMED 2B is filtered for conducted electro-magnetic interference by a low pass filter in the primary AC line. This filter also prevents noise generated within the NARKOMED 2B from leaving the device through the AC line.

PART NUMBER: 4109634A **PROCEDURE: REPLACEMENT**
DESCRIPTION: POWER SUPPLY ASM-NM2B

APPLICABLE TO: 4109436A NARKOMED 2B
PART(S) REQUIRED: 4109634A POWER SUPPLY ASM-NM2B
SPECIAL TOOL(S) : ESD CONTROL EQUIPMENT

1. Turn the SYSTEM POWER switch to STAND BY.

2. Unplug the NARKOMED 2B.

3. Disable the DC BATTERY CB1 circuit breaker.

4. Remove the seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO securing 4109666A SHELF ASM-CRT BOX-NM2B.

5. Lift the rear of 4109666A SHELF ASM-CRT BOX-NM2B and disconnect 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.

6. Remove 4109666A SHELF-ASM CRT BOX-NM2B.

7. Use ESD precautionary procedures.

8. Disconnect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B.

9. Disconnect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B.

10. Disconnect 4109583A CABLE ASM-AC FILTER/CB from the AC RECEPTACLE circuit breaker CB3.

11. Disconnect 4109550A CABLE ASM-RIBBON 14CONDX3.5 from J9 on 4109634A POWER SUPPLY ASM-NM2B.

12. Disconnect 4109570A WIRE HARNESS-POWER-NM2B from J10 on 4109634A POWER SUPPLY ASM-NM2B.

13. Loosen the four (4) captive screws securing 4109634A POWER SUPPLY ASM-NM2B to 4109647A CRT BOX ASM-NM2B.

14. Record the serial number of 4109634A POWER SUPPLY ASM-NM2B being removed.

15. Remove 4109634A POWER SUPPLY ASM-NM2B from 4109647A CRT BOX ASM-NM2B.

16. Disconnect J7 BATTERY on the new 4109634A POWER SUPPLY ASM-NM2B.

17. Position the new 4109634A POWER SUPPLY ASM-NM2B into 4109647A CRT BOX ASM-NM2B.

18. Record the serial number of 4109634A POWER SUPPLY

ASM-NM2B.

19. Secure 4109634A POWER SUPPLY ASM-NM2B to 4109647A CRT BOX ASM-NM2B with the four (4) captive screws.

20. Connect 4109570A WIRE HARNESS-POWER-NM2B to J10 on 4109634A POWER SUPPLY ASM-NM2B.

21. Connect 4109550A CABLE ASM-RIBBON 14CONDX3.5 to J9 on 4109634A POWER SUPPLY ASM-NM2B.

22. Connect 4109583A CABLE ASM-AC FILTER/CB to the AC RECEPTACLE circuit breaker CB3.

23. Connect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B.

24. Connect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B

25. Remove the ESD control equipment.

26. Position 4109666A SHELF ASM-CRT BOX-NM2B on top of the NARKOMED 2B.

27. Attach 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4109666A SHELF ASM-CRT BOX-NM2B to 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.

28. Install 4109666A SHELF ASM-CRT BOX-NM2B.

29. Secure 4109666A SHELF ASM-CRT BOX-NM2B with seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO.

30. Plug the NARKOMED 2B into a live receptacle.

31. Perform a complete Periodic Manufacture Service on the NARKOMED 2B.

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NARKOMED 2B

SECTION 10

April 1988

GENERAL DESCRIPTION

The NARKOMED 2B incorporates three standard, integral monitors: an oxygen analyzer, a breathing pressure monitor, and a respiratory volume monitor.

These monitors present all of their information on a CRT display (see Figure 10-1). All visual alarm signals (alphanumeric alarm messages) are centralized on the CRT display and organized into a three-tiered alarm structure. A central audio annunciator produces all audible alarms, using three different sound patterns to indicate three different levels of alarm urgency.

The monitoring system also "interlocks" the audible alarms so that only the highest priority, currently active alarm signal is annunicated while others are supressed. This design eliminates the confusion caused by multiple, simultaneous alarm sounds.

The oxygen analyzer and respiratory volume monitor require sensors to be mounted within the patient breathing system. The breathing pressure monitor requires a pressure sensing pilot line. Figure 15 schematically illustrates these sensor connections.

For details on external interfaced monitors, refer to the operator's manual supplied with the device. Interfacing instructions can be found in the SETUP & INSTALLATION section of this manual.

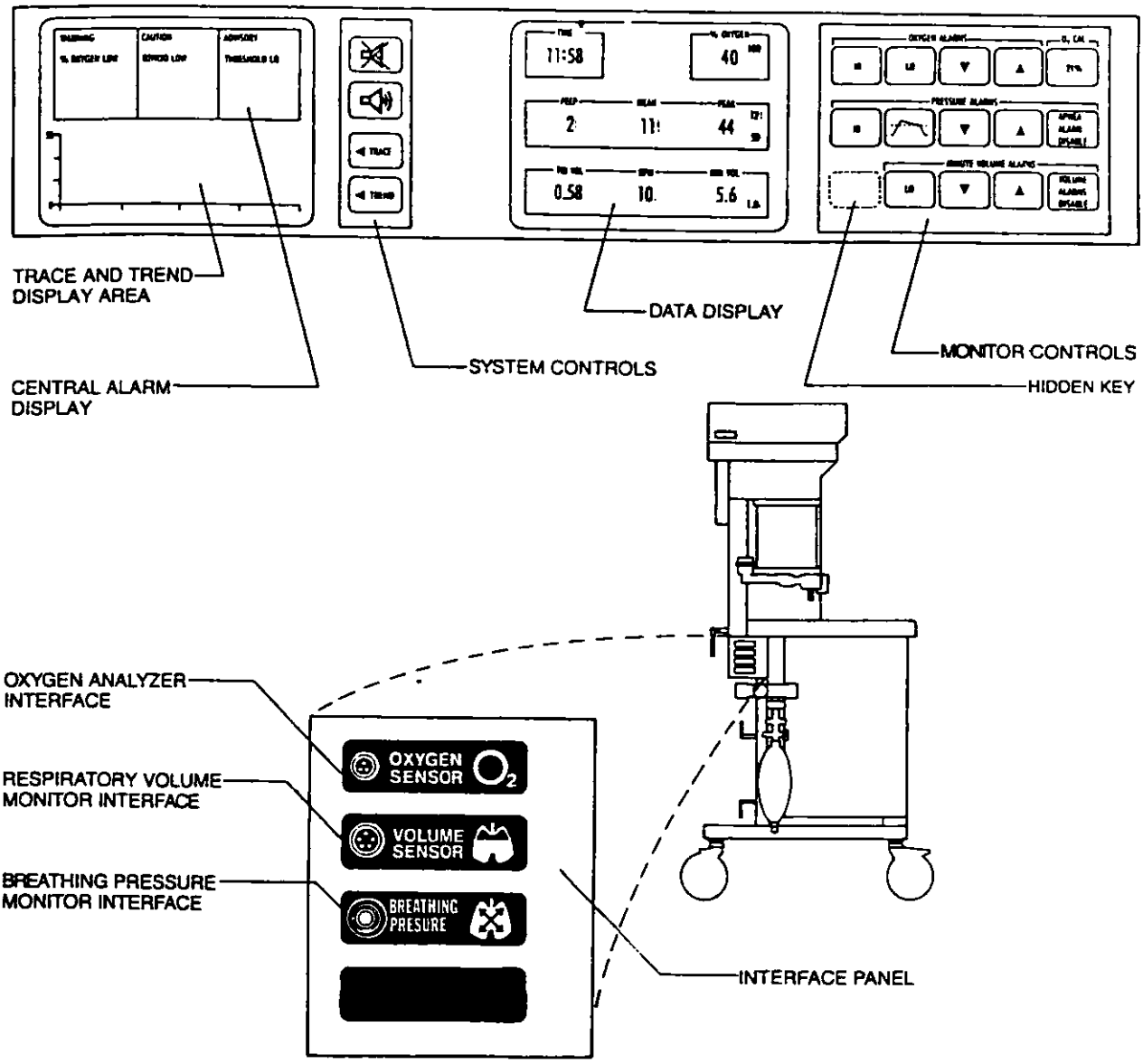


FIGURE 10-1: NARKOMED 2B MONITORING SYSTEM

NARKOMED 2B SELF-DIAGNOSTICS

When the "SYSTEM POWER" switch is turned to the "ON" position, the NARKOMED 2B performs extensive self-tests on its internal hardware. As these tests are performed, messages appear on the CRT's, indicating the status of various components of the NARKOMED 2B monitoring system.

VIDEO TEST	PASS	**NARKOMED 2B**
FIRMWARE TEST	PASS	VERSION 1.XX - DIAGNOSTICS
MEMORY TEST	PASS	COPYRIGHT, NAD Inc. 1987
TIMERS TEST	PASS	
ANALOG TEST	PASS	
AUDIO TEST - PRIMARY	PASS	
- BACK UP	PASS	
SERIAL I/O TEST	PASS	
CLOCK TEST	PASS	
BACKUP MEMORY TEST	PASS	
AC POWER TEST	PASS	
RESERVE POWER TEST	PASS	

FUNCTIONAL

There are three possible conclusions to the self-tests:

1.) Functional--All tests pass

2.) Conditionally Functional--Minor failure

3.) Non-Functional--Major failure

The conclusion to the self-test is posted on the left display after completion of the self test.

In the first case (Functional), normal operation of the machine continues. In the second case (Conditionally Functional), a keystroke is required to continue operation, but it should be noted that some of the non-critical functions of the machine (such as the two serial port interfaces) may be non-functional. A North American Drager service representative should be notified. In the third instance (Non-Functional), operation of the machine is halted, and the monitoring package will not operate under this condition. The NARKOMED 2B should not be used, and a North American Drager service representative should be notified immediately.

After successful completion of NARKOMED 2B Self-Diagnostics, the following occurs:

* The left-hand screen shows the central alarm display and the breathing pressure waveform.

* The right-hand screen shows a digital data display.

* All continuous audible alarms are silenced for a period of 120 seconds to allow machine setup without nuisance alarms. During this period, any occurrence of a new alarm will produce a non-repeating tone pattern appropriate for its priority.

* The breathing pressure apnea alarm is automatically disabled on power-up to avoid a spurious alarm with a spontaneously breathing patient. The breathing pressure apnea alarm will remain disabled until it is manually enabled with the "APNEA ALARM DISABLE" key, or automatically enabled when the ventilator is turned on or a pressure greater than the threshold limit is detected by the breathing pressure monitor.

* The respiratory volume monitor's low minute volume and apnea volume alarms are automatically disabled on power-up until a valid breath is detected.

CENTRAL ALARM DISPLAY

The central alarm display occupies the upper half of the left-hand display screen (see Figure 10-2). As alarm conditions occur, alarm messages (such as "% OXYGEN LO") are indicated on the central alarm display and organized into one of three areas. The three areas are labeled Warning, Caution, and Advisory.

Each type of alarm message produces a different sound pattern during an alarm condition:

Warnings: produce two short high pitch tones followed quickly by one short lower pitch tone in a pattern that repeats with a gradually shortened time interval until it levels off, annunciating every 3 seconds.

Cautions: produce two short low pitch tones followed quickly by one short higher pitch tone in a pattern repeating every 30 seconds.

Advisories: produce one brief, non-repeating low pitch tone. (Some Advisories may not call for an audible alarm.

Alarm messages are listed in the order of the time of occurrence, with the most recent alarm messages appearing at the bottom of the list. To alert the operator of the time at which a Warning or Caution occurred, an arrow appears to the left of the last alarm message that has appeared on the screen (Figure 16). If the alarm condition creating this message is then resolved, the arrow disappears and does not reappear until the occurrence of a new alarm condition.

NOTE: If the number of alarm messages in any of the three categories exceeds the space provided on the display screen for that category, the most recent alarm messages will be held in the machine's memory until space is available for them (i.e., through the resolution of some of the existing alarm conditions).

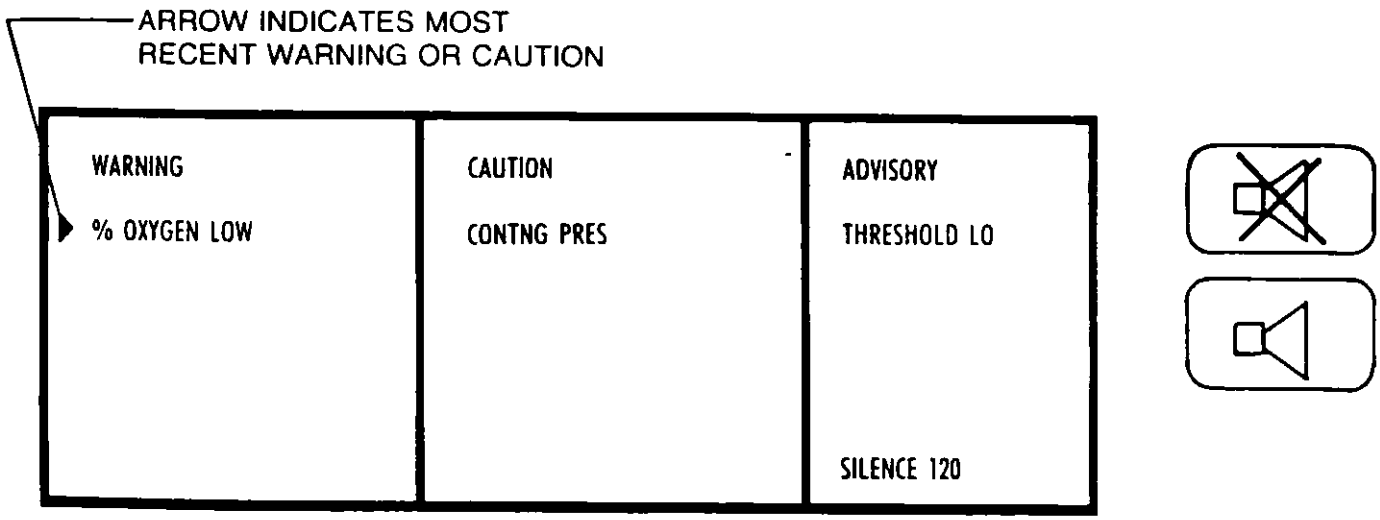


FIGURE 10-2: CENTRAL ALARM DISPLAY
AND AUDIO SILENCE KEYS

NM2B ALARM MESSAGES

CLASS	ALARM MESSAGE	ALARM CONDITION	AUDIBLE ALARM
WARNING	% OXYGEN LOW	% O2 < low limit setting	CONTINUOUS
WARNING	APNEA - PRES	Apnea for 30 seconds	CONTINUOUS
WARNING	APNEA - VOL	Apnea for 30 seconds	CONTINUOUS
WARNING	VENT PRES HI	Pressure > high limit	CONTINUOUS
WARNING	SUB ATM PRES	Pressure < -10 cm H2O	CONTINUOUS
CAUTION	LO O2 SUPPLY	O2 supply pressure < 30 psi	INTERMITTENT
CAUTION	APNEA - PRES	Apnea for 15 seconds	INTERMITTENT
CAUTION	APNEA - VOL	Apnea for 15 seconds	INTERMITTENT
CAUTION	CONTNG PRES	Pressure > t'hold for 15 seconds	INTERMITTENT
CAUTION	PEEP > 25	Peep $\geq$ 26 cm H2O	INTERMITTENT
CAUTION	MIN VOL LOW	< low limit	INTERMITTENT
ADVISORY	O2 SENS DISC	Sensor cord disconnected	SINGLE TONE
ADVISORY	O2/N2O LOW	ORMC Limiting N2O	SINGLE TONE
ADVISORY	% OXYGEN HI	> high limit	SINGLE TONE
ADVISORY	AC PWR FAIL	NM2B not receiving line power	SINGLE TONE
ADVISORY	VOL SEN DISC	Sensor cord disconnected	NONE
ADVISORY	REVERSE FLOW	> 20 ml	NONE
ADVISORY	O2 CAL DUE	> 18 hours since last O2 analyzer calibration	NONE
ADVISORY	O2 NOT CAL	O2 analyzer	NONE
ADVISORY	O2 SENS ERR	O2 analyzer sensor error	NONE
ADVISORY	O2 CAL ERR	Bad calibration data	NONE

CLASS	ALARM MESSAGE	ALARM CONDITION	AUDIBLE ALARM
ADVISORY	THRESHOLD LO	Threshold pressure alarm limit set > 5 cm H2O from peak	NONE
ADVISORY	PEEP > 4	PEEP ≥ 5 cm H2O	NONE
ADVISORY	BATTERY LOW	NM2B battery < 11 VDC	NONE
ADVISORY	SPEAKER FAIL	NM2B primary speaker failure	NONE
ADVISORY	SILENCE XXX	Temporary alarm silence in effect	NONE
ADVISORY	VENT OFF	AV-E ventilator power switch in off position	NONE
ADVISORY	ORM ALRM OFF	ORMC alarm disabled	NONE
ADVISORY	APNEA-P OFF	Apnea pressure (threshold) alarm disabled	NONE
ADVISORY	O2 ALRM OFF	O2 analyzer patient alarms disabled	NONE
ADVISORY	VOL ALRM OFF	Volume alarms disabled	NONE

TIMED AUDIO SILENCE

Two keys to the right of the central alarm display (Figure 10-2) can be used to temporarily silence and enable continuous audible alarms. Pressing the silence key (labeled with a speaker with an X through it) once will begin a 60 second period in which any occurrence of a new alarm will produce a non-repeating tone pattern appropriate for its priority.

Pressing the silence key twice will start a 120 second silence period. The audio silence condition and the silent time remaining are displayed at the bottom of the ADVISORY section of the central alarm display. Audible alarms can be immediately enabled at any time by pressing the enable key (labeled with a speaker producing sound) located beneath the silence key.

TRACE DISPLAY

The lower half of the central alarm display can display the breathing pressure waveform.

Pressing the "TRACE" key selects the breathing pressure waveform (see Figure 10-3).

The breathing pressure waveform provides the operator with a means for a visual assessment of lung mechanics and ventilation. The patient's positive end expiratory pressure (PEEP) corresponds to the amount of pressure that the baseline is raised from zero. The peak pressure corresponds to the peak of the waveform. The inspiratory flow rate can be correlated with the slope of the trace as it rises toward the peak pressure; the steeper the slope, the higher the flow rate. The length of the inspiratory pause (if present) can be visually determined by noting the length of the plateau that extends from the peak pressure to the decrease in pressure that corresponds to expiration.

The horizontal dotted line on the waveform represents the threshold pressure (apnea) alarm limit. See the BREATHING PRESSURE MONITOR section below for more details.

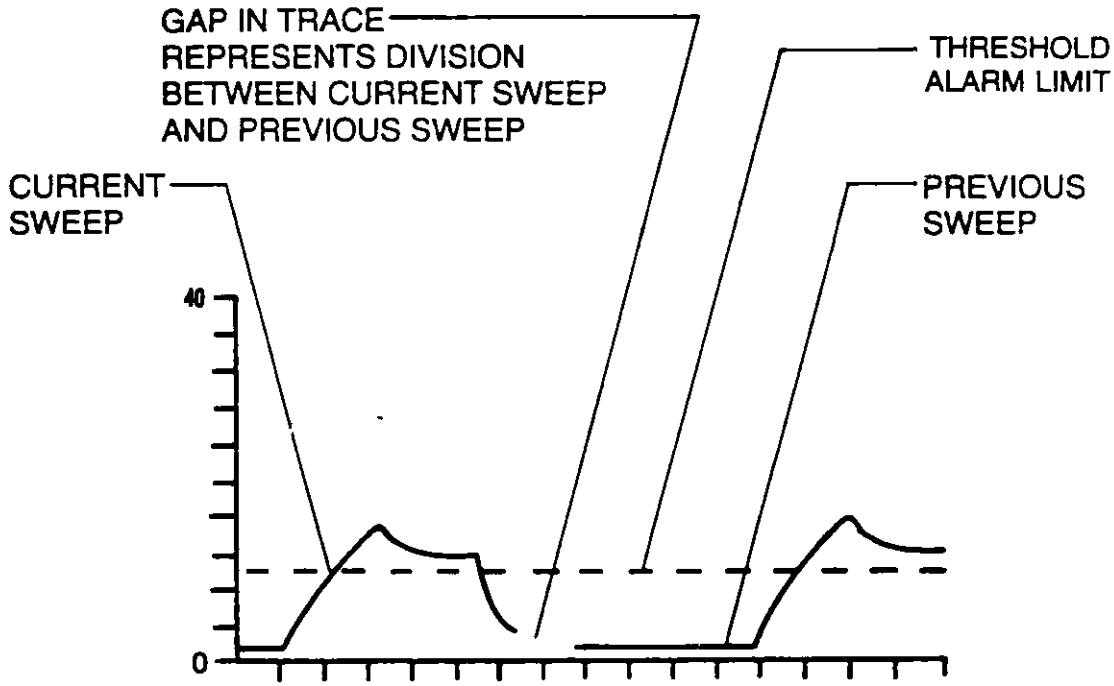


FIGURE 10-3: TRACE DISPLAY (BREATHING PRESSURE SHOWN)

TREND DISPLAY

The lower half of the central alarm display can also diplay trends.

Pressing the "TREND" key steps the trend display area through a series of trend displays for percent oxygen, breathing rate, and minute volume. If compatible external monitors (pulse oximeter, NIBP, or CO2) have been interfaced with the system, trend displays for oxygen saturation, pulse, temperature, blood pressure, and CO2 parameters can also appear.

The variable selected for trending is displayed above the trend graph's vertical axis and the horizontal axis is calibrated in time (see Figure 10-4). A line graph, representing the historical variations of the trended measurement, travels from left to right across the graph as new trend data accumulates.

Each trend display has a fixed vertical axis scale. The horizontal axis is calibrated in military time for a time period of one hour. Since the trend display can be selected at any time, the trend display rounds out the time scale labeling to the previous ten minute time increment for ease of reading.

For example, if the operator selects the trend display at 12:23 and begins monitoring at that point, a trend graph will appear with the left-most time mark representing the time 12:20. The operator should note that if the trend display did not receive data between 12:20 and 12:23, for example, there will be a gap on the left hand portion of the trend graph display. This gap does not represent a loss of data but rather shows that data for that gap has not been trended.

As trending proceeds past one hour, the trend display adjusts the time scale as follows: When the graph fills up with trend data, the trend display creates a new time scale that carries over only the most recent 50 minutes of data from the previous graph. The other 10 minutes of trend data is erased from memory.

NOTE: The Blood Pressure trend appears as a shaded area on the screen showing the blood pressure envelope, with the top of of the area representing peak systolic blood pressure, the bottom representing PEEP diastolic, and the unshaded gap in the area representing the mean blood pressure.

The CO2 trend appears as a shaded area on the screen showing the CO2 envelope, with the top of the area representing end-tidal CO2 and the bottom representing inspiratory CO2.

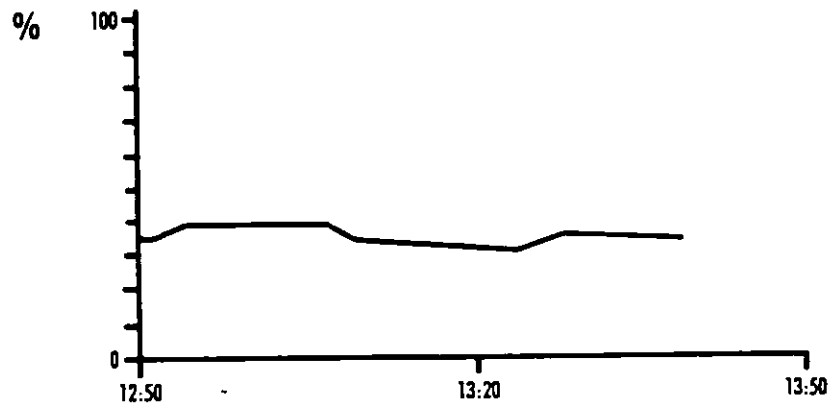


FIGURE 10-4: TREND DISPLAY (% O2 SHOWN)

CONFIGURATION

Certain aspects of the NARKOMED 2B can be configured by the user. This is done by invoking the Configure screen (Figure 10-5) using the hidden key at the bottom left of the monitor control key panel (see Figure 10-1).

Using the "SELECT" key, the operator can choose to alter the audio volume of the alarms annunciator, the current date, the current time, or the serial Port A configuration.* A box is drawn around the variable which has been selected for adjustment.

Once the desired variable has been selected for adjustment, the "INC" and "DEC" keys can be used to increase or decrease the value of the selected variable.

Pressing the "EXIT" key will terminate configuration and return the screen to the central alarm display. Configuration is automatically terminated after one minute with no keystroke.

* Only Port A can be configured by the user. Port B is permanently configured for use with the Co-Writer anesthesia recorder. Port A is designed to communicate using the Vitalink 1.00 Communications Protocol. Refer to the Vitalink (version 1.00) Technical Reference Manual for Vitalink programming details.

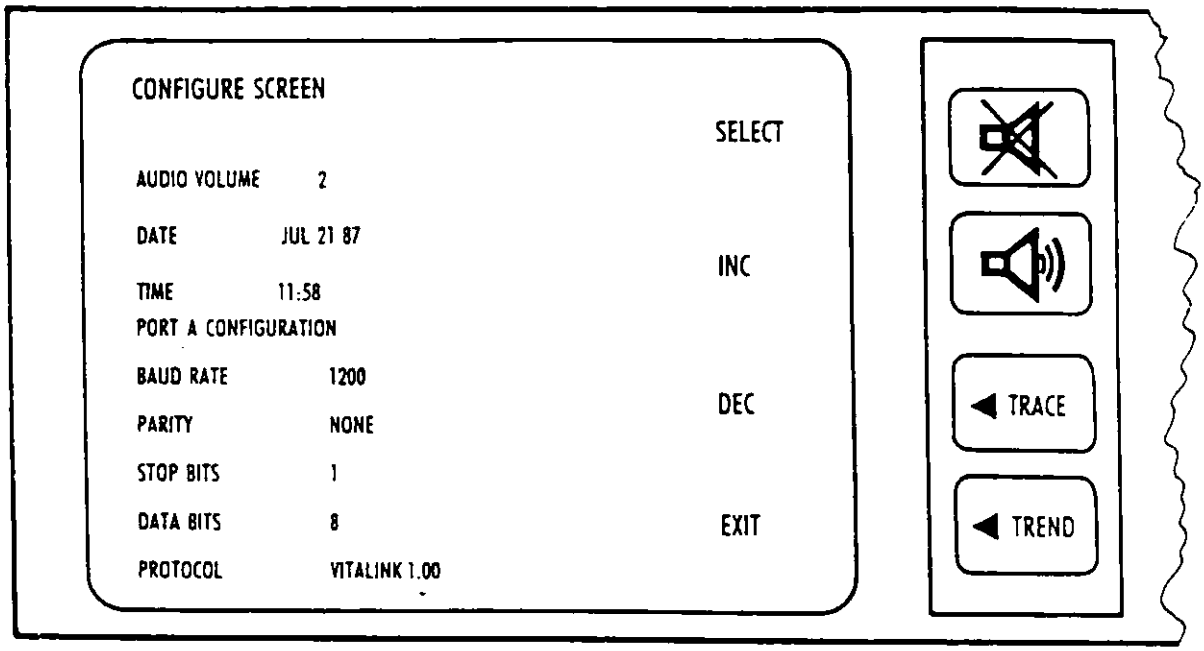


FIGURE 10-5: CONFIGURE SCREEN

OXYGEN ANALYZER-GENERAL DESCRIPTION

The oxygen analyzer uses a dual redundant galvanic cell sensor to monitor and digitally display the oxygen concentration in the patient breathing system. The operator can set low and high oxygen concentration alarm limits. The monitor can be calibrated to 21% oxygen with a single keystroke. The oxygen concentration data also appears on a trend graph display.

OXYGEN ANALYZER SENSOR INSTALLATION

1. Remove the new sensor capsule from its sealed package and discard the circular piece of foam packing and the circular piece of aluminum foil. Unscrew the sensor housing cover from the sensor housing. Insert the sensor capsule into the sensor housing, making sure electrical contacts in the sensor housing mate with the copper rings on the sensor capsule.

2. Screw the sensor housing cover back into place on the sensor housing.

3. Pull the inspiratory valve dome plug from the inspiratory valve dome and remove the sensor cap from the sensor housing cover.

4. Check the inspiratory valve dome and valve disc for cracks. If any cracks are present, replace the cracked valve dome or valve disc.

5. Insert the sensor assembly into the inspiratory valve dome by pressing it into place.

6. Insert the sensor cord connector into the "OXYGEN SENSOR" input receptacle on the left of the oxygen analyzer sensor interface.

7. Check for leaks from the oxygen analyzer sensor assembly by performing a breathing and freshgas delivery system test as described in the PRE-USE CHECKOUT PROCEDURE of this manual.

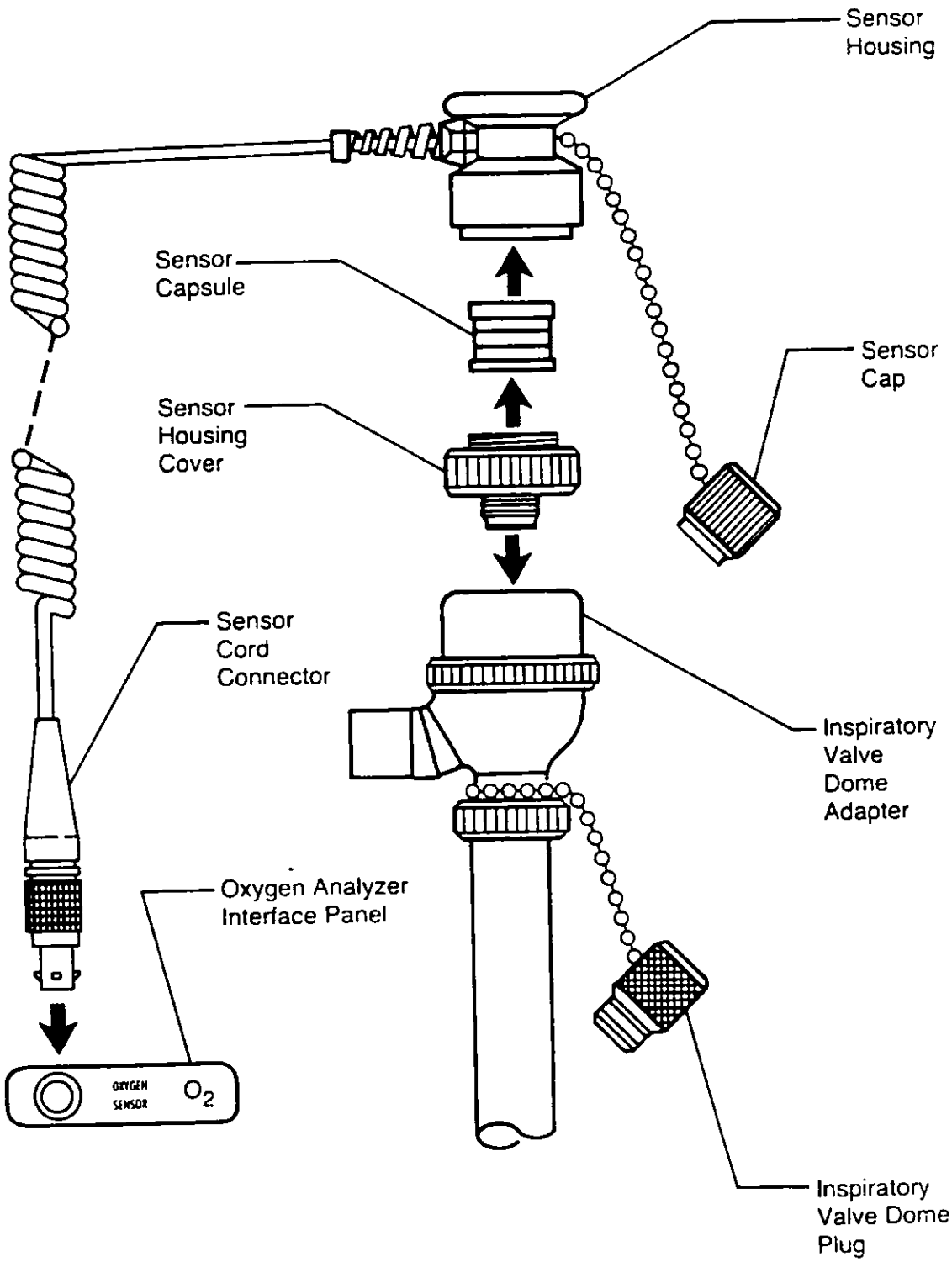


FIGURE 10-6: OXYGEN ANALYZER SENSOR INSTALLATION

CARE OF SENSOR ASSEMBLY

The sensor capsule works by taking in oxygen, which then initiates an electrochemical reaction within the capsule. The oxygen analyzer reads the voltage produced by this reaction and translates it into an oxygen concentration measurement. The sensor capsule incorporates two independent electrochemical cells (or sensor halves); the oxygen analyzer averages the signals produced by the cells.

When removing a new sensor capsule from its sealed package and installing it into the sensor assembly, the operator must wait 15 minutes (with the sensor capsule correctly installed into the sensor housing) before calibration. This waiting period allows the capsule's electrochemical reaction to achieve a state of equilibrium acceptable for monitoring. During this waiting period, the monitor may not accept a calibration.

Conversely, if a sensor capsule is removed from the sensor assembly for a prolonged period of time, it can absorb too much oxygen. In this instance, the capsule needs a waiting period equal to the time spent outside the sensor assembly before normal operation can resume. Therefore, the sensor capsule should not be removed from its housing except for replacement when it is exhausted or defective.

NOTE: During the waiting period, the sensor capsule must be correctly installed into the sensor housing, but the oxygen analyzer does not have to be powered up.

Exposure to oxygen (even the 21% oxygen concentration of room air) causes the sensor capsule to very gradually decay. Thus, to prolong capsule life, the sensor assembly should be removed from the patient breathing circuit (the O2MED should indicate 21% oxygen) and capped when not in use.

AFTER POWER-UP

When the anesthesia machine's System Power switch is turned to the on position, and following the self diagnostics, the digital O2 display area should immediately show the currently sensed oxygen concentration. The digital display area shows the high and low alarm limits as smaller numbers to the right of the oxygen concentration measurement.

If the oxygen analyzer does not have a calibration value in its memory, the digital display areas will remain blank, and the Advisory messages "O2 NOT CAL" and "O2 ALRM OFF" will appear on the central alarm display. In this instance, a calibration procedure as described below must be performed.

If the oxygen analyzer has not been calibrated in the last 18 hours but the monitor does have a calibration value in its memory, the display area will show an oxygen concentration and the Advisory message "O2 CAL DUE" will appear on the central alarm display. In this instance, the monitor can be used but the calibration procedure below should be performed as soon as possible.

OXYGEN ANALYZER CALIBRATION PROCEDURE

Calibration should be performed as part of the daily, pre-operative setup of the anesthesia equipment. Follow these step-by-step instructions:

Step 1: Prior to calibration, remove the sensor assembly from the inspiratory valve dome. (Do not disassemble the sensor assembly further.)

Step 2: With the sensor cap off the sensor assembly, hold the sensor assembly away from any open part of the patient breathing system and away from any gas fittings. This step ensures that the sensor will be exposed to the 21% oxygen concentration normally found in ambient air, without the influence of breathing system gases.

Step 3: Then, when you are sure that the sensor is exposed only to room air, press the "O2 CAL" key. The display area will show the message "CALIBRATING" during calibration and the Advisory messages "O2 NOT CAL" and "O2 ALRM OFF" will appear on the central alarm display.

The length of time that the monitor takes to calibrate depends on the gas mixture to which the sensor had been exposed prior to calibration. If the sensor had been exposed to 21% O2 for greater than one minute, calibration can take as little as 10 seconds. If the sensor had been exposed to higher concentrations of oxygen, calibration may last up to 50 seconds. Typically, calibration will last less than 30 seconds.

Step 4: When the monitor has completed calibration, the Advisory messages "O2 NOT CAL" and "O2 ALRM OFF" are removed from the central alarm display and the currently sensed oxygen concentration appears in the display area.

If, at the end of the calibration period, the display area remains blank, the calibration attempt has not succeeded. (This condition is also indicated by the Advisory messages "O2 SENS ERR", "O2 NOT CAL", and "O2 ALRM OFF".)

Causes for an unsuccessful calibration follow:

Exposing the sensor to an excessively lean or excessively rich oxygen calibration mixture will invalidate the calibration. In this instance, make sure that the sensor is exposed only to room air for the entire calibration period.

Exposing the sensor to a constantly changing calibration mixture will invalidate the calibration. As above, make sure that the sensor is exposed only to room air for the entire calibration period. NOTE: In this instance, the "O2 SENS ERR" message is replaced by "O2 CAL ERR".

If calibration is attempted with a sensor that has not received the proper waiting period, the calibration will be invalidated. In this instance, first make sure that the sensor capsule has not been recently removed and then reinstalled into the sensor assembly. If it 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.

If calibration is attempted with an exhausted sensor, the calibration will be invalidated. If the sensor capsule has decayed beyond its useful service life, replace the decayed sensor with a new sensor and allow for the proper waiting period.

If calibration is attempted with a defective sensor (i.e., a sensor with too great a difference between the outputs of the two sensor halves), the calibration will be invalidated. Replace a defective sensor with a new sensor and allow for the proper waiting period.

If calibration is attempted while the sensor is disconnected, the calibration will be inhibited. With the sensor disconnected, the display area will be blank, and the messages "O2 SENS DISC", "O2 NOT CAL", and "O2 ALRM OFF" will appear on the central alarm display. In this instance, reconnect the sensor cord to the interface panel on the anesthesia machine and press the "O2 CAL" key again.

During operation, the oxygen analyzer may also determine if a calibration procedure is required and alert the operator to press the "O2 CAL" key. See "Improper Calibration Advisory" below for details.

NOTE: A Correct Calibration is Important

The oxygen analyzer can be improperly calibrated in a manner that can result in an inaccurate measurement. If the calibration gas mixture is excessively rich or lean in oxygen, the monitor will not complete an attempted calibration. However, if the calibration gas is too rich or lean yet still within certain limits, the monitor will complete the calibration. As a result, the oxygen monitor will display 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.

The figure below describes the relationship between the calibration mixture and the accuracy of the O2 measurement.

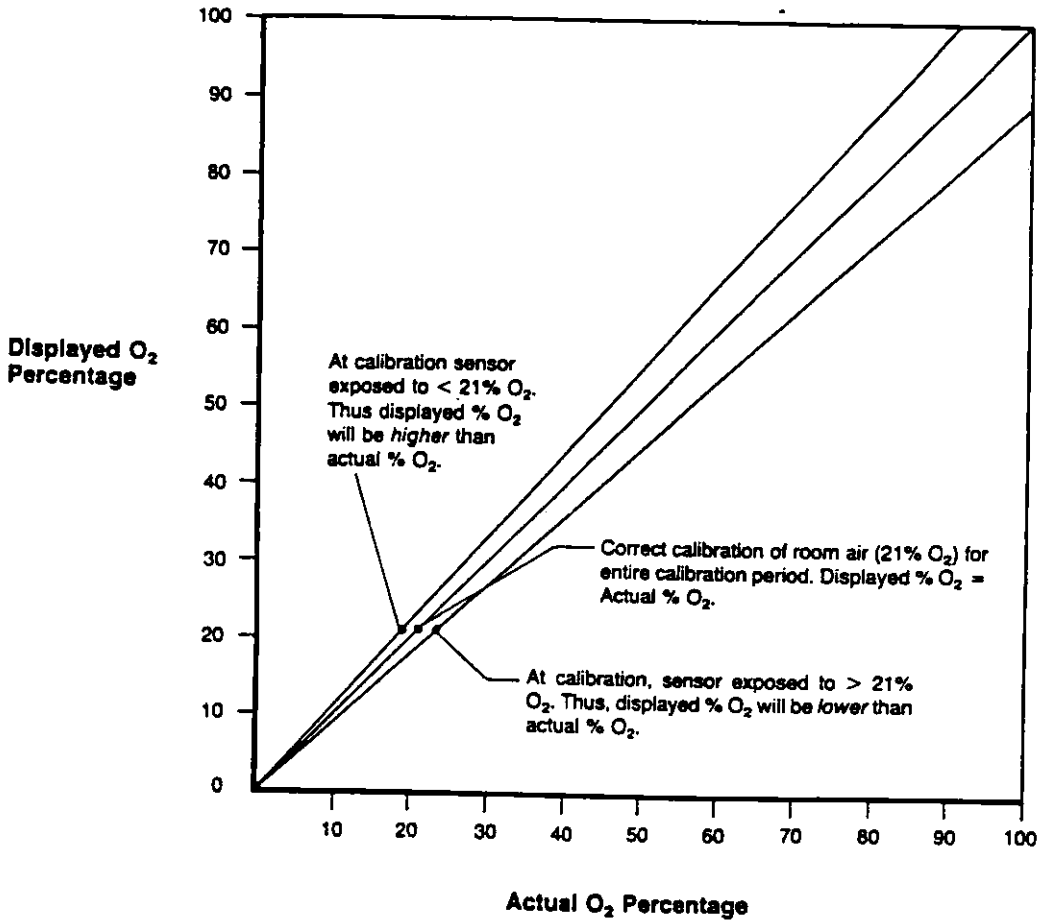


FIGURE 10-7: MEASUREMENT ERROR DUE TO INCORRECT CALIBRATION

ADJUSTING ALARM LIMITS

The "HI" and "LO" keys can be used to adjust alarm limits. Pressing either the "HI" or "LO" key places a box around the appropriate alarm limit on the data display. While the alarm limit remains highlighted, the increment and decrement keys (marked with arrows) can be used to adjust the alarm limit. The box disappears after five seconds if these keys are not pressed.

The high limit can be adjusted within a range of 22 to 100% and the low alarm limit can be adjusted from 21 to 99%.

The oxygen analyzer does not allow the high and low alarm limit settings to overlap. The highest low limit setting is equal to the high limit setting minus 1 volume %. The lowest high limit setting is equal to the low limit setting plus 1 volume %. For example, a low limit setting of 30% provides a high limit adjustment range of 31%-100% and a high limit setting of 40% provides a low limit adjustment range of 21%-39%.

Holding either the increment or decrement key in a depressed position will increase the the alarm limit's rate of change. For fine adjustment, the increment or decrement key can be intermittently pressed.

POWER-ON DEFAULT ALARM LIMITS

Oxygen analyzer factory-set default alarm limits are 30% for the low alarm limit setting and 100% for the high alarm limit setting. The monitor automatically sets these limits on power-up.

LOW OXYGEN WARNING

The oxygen analyzer continuously compares the current oxygen percentage with the preset low oxygen alarm limit. If the measured oxygen concentration falls below the low alarm limit, the Warning message "% OXYGEN LOW" appears on the central alarm display, and a continuous audible alarm sounds.

As soon as the measured oxygen concentration exceeds

the low oxygen alarm limit, alarm annunciation ceases.

HIGH OXYGEN ADVISORY

If the measured oxygen concentration exceeds the preset high alarm limit, the Advisory message "% OXYGEN HI" appears on the central alarm display, and a single-tone audible alarm sounds.

As soon as the measured oxygen concentration falls below the high oxygen alarm limit, alarm annunciation ceases.

MONITOR NOT CALIBRATED ADVISORY

If at any time the oxygen analyzer enters an uncalibrated state, the Advisory messages "O2 NOT CAL" and "O2 ALRM OFF" appear on the central alarm display, and the display area is blanked.

CALIBRATION REQUIRED ADVISORY

Any time that the monitor has a valid calibration value in the battery backed-up memory but it has been greater than 18 hours since the last valid calibration, the Advisory message "O2 CAL DUE" appears on the central alarm display. In this instance, the monitor can be used, but a calibration should be performed as soon as possible.

SENSOR DISCONNECT ADVISORY

If the sensor cord becomes disconnected (or is damaged enough to cause an open circuit) the alarm messages "O2 SENS DISC", "O2 NOT CAL", and "O2 ALARM OFF" appear on the central alarm display, and a single-tone audible alarm sounds. Also, since cord disconnection invalidates the calibration, the oxygen concentration display areas are blanked.

If the operator then plugs the sensor cord back into the interface panel, the "O2 SENS DISC" Advisory message is removed from the central alarm display, and

the display area remains blank until a new calibration is performed.

SENSOR ERROR ADVISORY

During calibration and monitoring, the oxygen analyzer checks for a difference between the outputs of the two sensor halves. If the difference exceeds a predetermined percentage, the Advisory message "O2 SENS ERR" appears on the central alarm display.

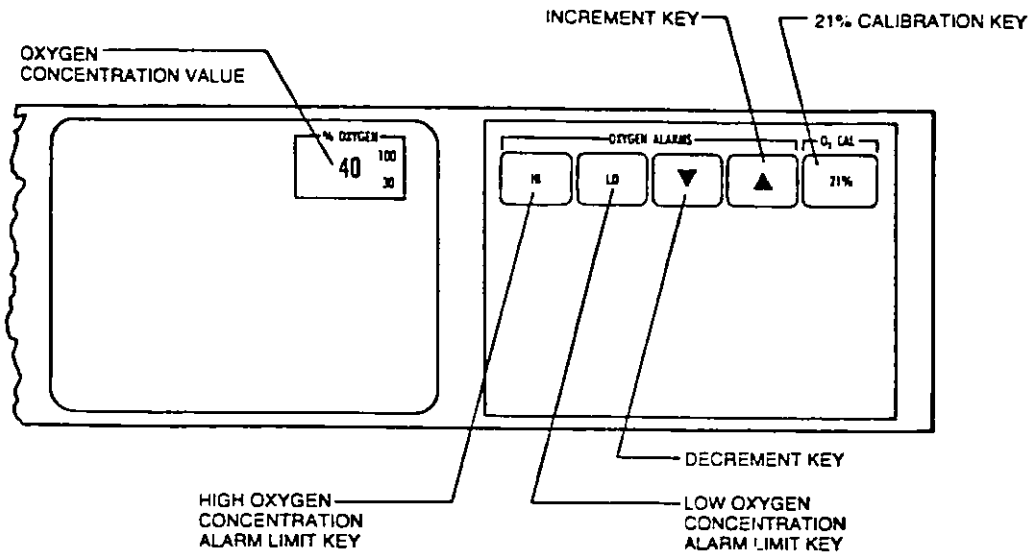
During calibration, the oxygen analyzer also checks the sensor's output against a range of acceptable output voltages. There are three possible causes for deviation from within this range:

Exhausted Sensor: If the sensor's capacity is exhausted, its output voltage will not meet the minimum required.

Incorrect Calibration Environment: If the operator exposes the sensor to an excessively rich or lean oxygen mixture during calibration, the sensor's output will either exceed or fall below the acceptable output range.

Improper Waiting Period: If the operator doesn't allow for a proper waiting period for a new sensor or for a sensor removed from the sensor housing, the sensor's output can either exceed or fall below the acceptable output range.

If a sensor error condition is detected during monitoring, an "O2 SENS ERR" Advisory message appears on the central alarm display screen, but operation can continue. If the monitor detects this condition during calibration, the calibration will be invalidated, as shown by a blank display area at the end of calibration period, and the Advisory messages "O2 NOT CAL", "O2 ALRM OFF", and "O2 SENS ERR".



CENTRAL ALARM DISPLAY

WARNING	CAUTION	ADVISORY
% OXYGEN LOW		O2 SENS DISC % OXYGEN HI O2 NOT CAL O2 CAL DUE O2 SENS ERR O2 CAL ERR O2 ALRM OFF

FIGURE 10-8: OXYGEN ANALYZER CONTROLS AND DISPLAYS/ CENTRAL ALARM DISPLAY WITH ALL POSSIBLE OXYGEN ANALYZER ALARM MESSAGES

IMPROPER CALIBRATING ADVISORY

During monitoring, if the calculated oxygen concentration exceeds 103%, the Advisory message "O2 CAL ERR" appears on the central alarm display, and remains on the display until a new calibration is performed. (Even though the calculated oxygen concentration can exceed 100%, 100% is displayed for all calculated oxygen concentration values $\geq$100%.)

During monitoring, if the calculated oxygen percentage exceeds 105%, the oxygen analyzer invalidates the present calibration. The display area is blanked, and the Advisory messages "O2 CAL ERR", "O2 NOT CAL", and "O2 ALRM OFF" appear on the central alarm display. The display area remains blank until a new calibration is performed.

During calibration, if the sensor is exposed to a constantly changing gas mixture, the calibration will be invalidated and the "O2 CAL ERR" Advisory message replaces the "O2 SENS ERR" message normally used for an invalidated calibration.

BREATHING PRESSURE MONITOR-GENERAL DESCRIPTION

The breathing pressure monitor uses a solid-state pressure transducer to measure and digitally display mean, peak, and positive end expiratory pressure (PEEP) in cm H2O. The display range is from -10 to 70 cm H2O, with a 1 cm H2O resolution. The monitor can sense pressure at either the absorber or patient Y-piece, depending on which supplied pilot line is used.

The operator can set a threshold pressure (apnea) alarm limit and a high pressure alarm limit. Alarms are provided for high pressure, pressure below the threshold for 15 and 30 seconds, subatmospheric pressure, and continuing pressure above the set threshold for 15 seconds. The unit can also alert the operator of an improperly set threshold pressure.

The apnea alarm (threshold pressure) is automatically enabled when either:

- the main power switch of the ventilator is in the "ON" position.
- the breathing pressure monitor detects a pressure that exceeds the threshold pressure setting. (Older firmware)

At regular intervals, the breathing pressure monitor automatically exposes the pressure transducer to ambient pressure to determine the monitor's zero point. This procedure lasts less than one second and does not affect monitoring.

PILOT LINE INSTALLATION

North American Dräger anesthesia machines are supplied with two different breathing pressure pilot lines.

Install the shorter pilot line (approx. 38", with quick-connect fittings on either end) as follows (refer to Figure 10-9):

Insert one of the male quick-connect fittings on the pilot line into the female quick-connect fitting mounted on the rear of the gas pipe that extends from the absorber top assembly. Insert the other male quick-connect fitting into the female quick-connect fitting on the breathing pressure monitor interface panel.

Install the longer pilot line (approx. 67", with a quick-connect fitting on one end and a Luer type fitting on the other end) as follows (Refer to Figure 10-10):

The absorber gas pipe female quick-connect fitting is of a self-closing construction and may be left unused when using the longer pilot line. Insert the male quick-connect fitting on the pilot line into the female quick-connect fitting on the breathing pressure monitor interface panel. Mate the male Luer fitting on the pilot line with an appropriate female Luer fitting on either the patient Y-piece or a 15 mm adapter on the patient side of the Y-piece. Four plastic hose clips attached to the pilot line can be used to mount the line on either of the breathing hoses leading to the Y-piece.

For either type of pilot line, check the line for obstructions and moisture accumulation before and during use.

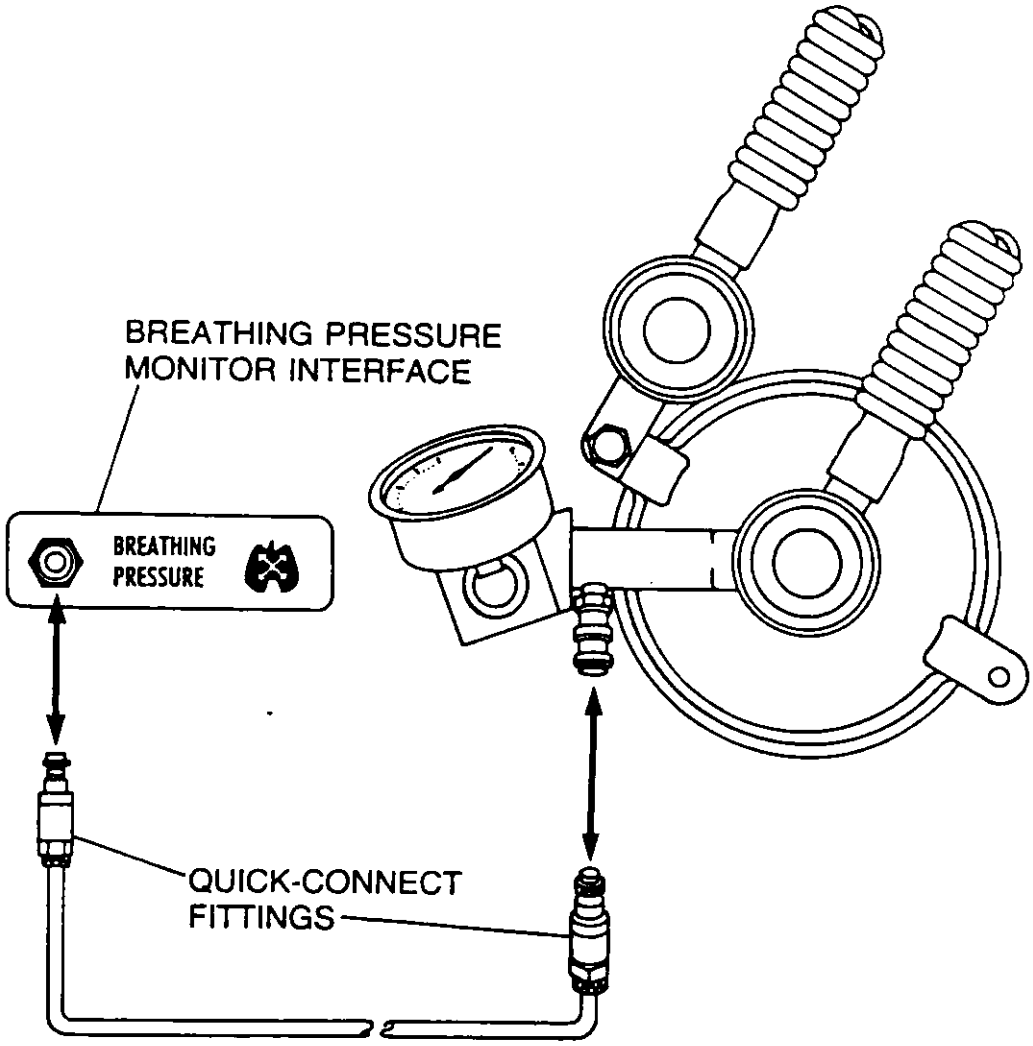


FIGURE 10-9: INSTALLATION OF BREATHING PRESSURE PILOT LINE AT ABSORBER

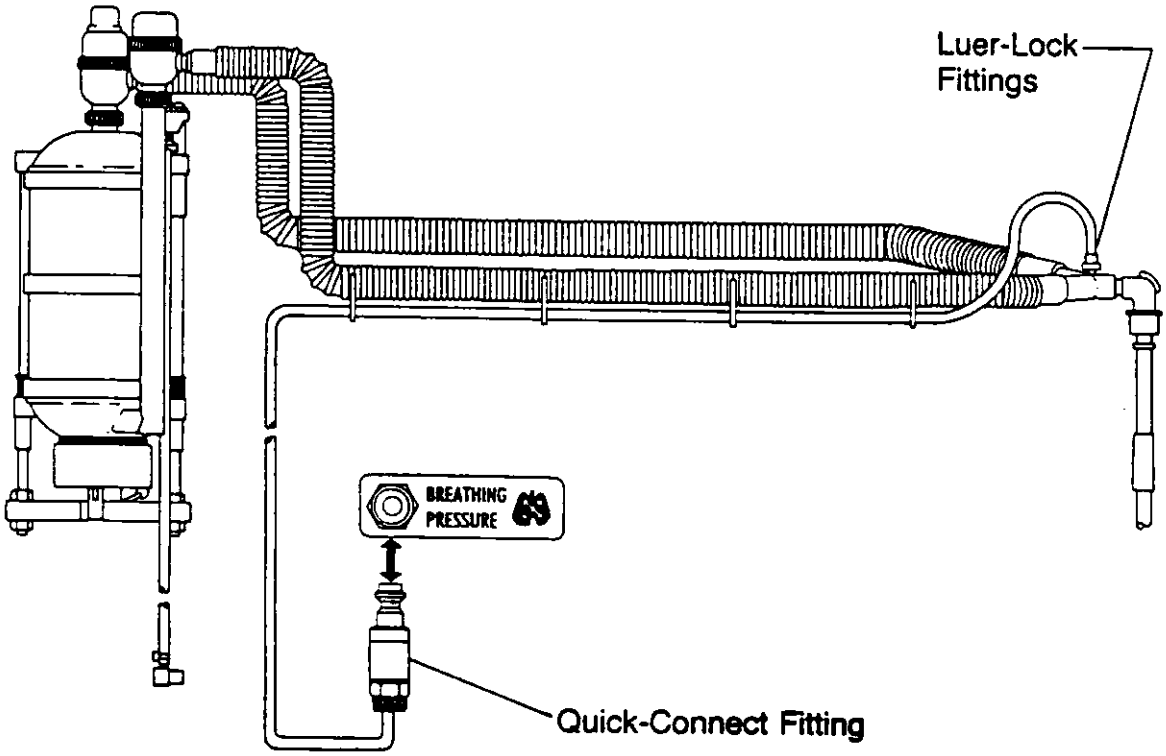


FIGURE 10-10: INSTALLATION OF BREATHING PRESSURE PILOT LINE AT PATIENT Y-PIECE

CHOICE OF MONITORING LOCATION

North American Dräger has no control over the type of breathing hoses and Y-piece that will ultimately be 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. Thus, in order to ensure that some form of pressure monitoring is always used, we have made provisions for pressure monitoring at the absorber (the quick-connect fitting on the absorber gas pipe). However, this provision for pressure monitoring at the absorber shall not be construed as a recommendation from North American Dräger for this monitoring location.

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 an occluded 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 occluded 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 an occluded/blocked breathing circuit. CO2 and respiratory flow monitoring provide superior detection of occluded/blocked breathing paths when compared to pressure monitoring, which will detect such conditions only in some instances. North American Dräger pressure monitors are therefore not promoted for the detection of occluded/blocked breathing paths.

Further, Y-piece pressure monitoring has several disadvantages that could collectively cause the operator to neglect to connect 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 the operator. The operator's clinical considerations, over which North American Dräger has no control, must be considered to make this decision. North American Dräger is available to discuss in detail the positive and negative aspects of each pressure monitoring approach.

AFTER POWER UP

When the anesthesia machine's system power switch is turned to the "ON" position, the breathing pressure monitor is ready to display data. The threshold pressure (apnea) alarm is automatically disabled after power up (see below for details).

AUTOMATIC APNEA ALARM DISABLE

On power-up, the breathing pressure monitor automatically disables the apnea pressure alarm, as indicated by the Advisory message "APNEA-P OFF" on the central alarm display. This automatic disable period allows patient set-up without nuisance alarms and is in effect only when the ventilator power switch is in the "OFF" position and pressure of the patient breathing system does not exceed the threshold pressure setting. The operator can cancel the automatic disable period by pressing the "APNEA ALARM DISABLE" key, or by turning the ventilator power switch to the "ON" position. The breathing pressure monitor automatically enables the apnea pressure alarm when it detects a pressure greater than the threshold pressure setting.

APNEA ALARM DISABLE KEY & VENTILATOR INTERFACE

During spontaneous ventilation, the patient's expiration produces a pressure fluctuation of only a few cm H2O, as opposed to the larger pressure

fluctuation seen during positive pressure ventilation. Thus, to prevent the generation of spurious apnea alarms, the breathing pressure monitor's threshold pressure (apnea) alarm can be disabled with the "APNEA ALARM DISABLE" key.

This key can be used to disable and enable the audible and visual alarm signals for the threshold pressure alarm. During the disabled period, the alarm message "APNEA-P OFF" appears on the central alarm display. Pressing the key again enables the audible and visual alarm signals for the threshold pressure alarm, indicated by the removal of the "APNEA-P OFF" message from the central alarm display. Successive keystrokes will toggle the apnea alarm on and off.

To ensure that apnea pressure monitoring is used during automatic ventilation, the apnea disable key is tied into the ventilator power switch. If the operator turns the ventilator power switch to the "ON" position, the apnea alarm is automatically enabled, even if the apnea alarm had been disabled with the "APNEA ALARM DISABLE" key. If the operator turns the ventilator power switch to the "OFF" position, the apnea alarm remains enabled and must be disabled manually, if desired, by pressing the "APNEA ALARM DISABLE" key.

NOTES: The threshold pressure delay period of 15 and 30 seconds begins from the time that the apnea alarm is re-enabled, with either the "APNEA ALARM DISABLE" key, ventilator power switch, or a pressure reading on the monitor that exceeds the threshold setting.

The apnea pressure alarm cannot be disabled while the ventilator power switch is in the "ON" position.

DISPLAYS

The breathing pressure monitor provides three simultaneous displays (see Figure 10-11). In the digital display area, the right most is the peak pressure, the middle is the mean pressure, and the left most number is the PEEP.

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

exhalation. The possible display range for all three display modes is -10 to at least 70 cm H20. The threshold pressure and high pressure alarm limits appear on the data display as numbers to the right of the "PEAK PRES" variable. The high pressure alarm limit corresponds to the upper number and the threshold pressure alarm limit corresponds to the lower number.

ADJUSTING ALARM LIMITS

The high pressure alarm limit key (labeled "HI") and the threshold alarm limit key (labeled with a drawing of a pressure waveform) can be used to adjust alarm limits.

Pressing either the "HI" or threshold key places a box around the appropriate alarm limit. While the alarm limit remains highlighted, the increment and decrement keys (labeled with arrows) can be used to adjust the alarm limit. The box disappears in five seconds if these keys are not pressed.

The threshold pressure alarm limit can be adjusted within a range of 5 to 30 cm H20 and the high pressure alarm limit can be adjusted from 30 to 70 cm H20.

Holding either the increment or decrement key in a depressed position will increase the alarm limit's rate of change. For fine adjustment, the increment or decrement key can be intermittently pressed.

POWER ON DEFAULT ALARM LIMITS

The breathing pressure monitor's factory-set default alarm limits are 50 cm H20 for the high pressure alarm limit and 12 cm H20 for the threshold pressure alarm limit. The monitor automatically sets these limits on power-up.

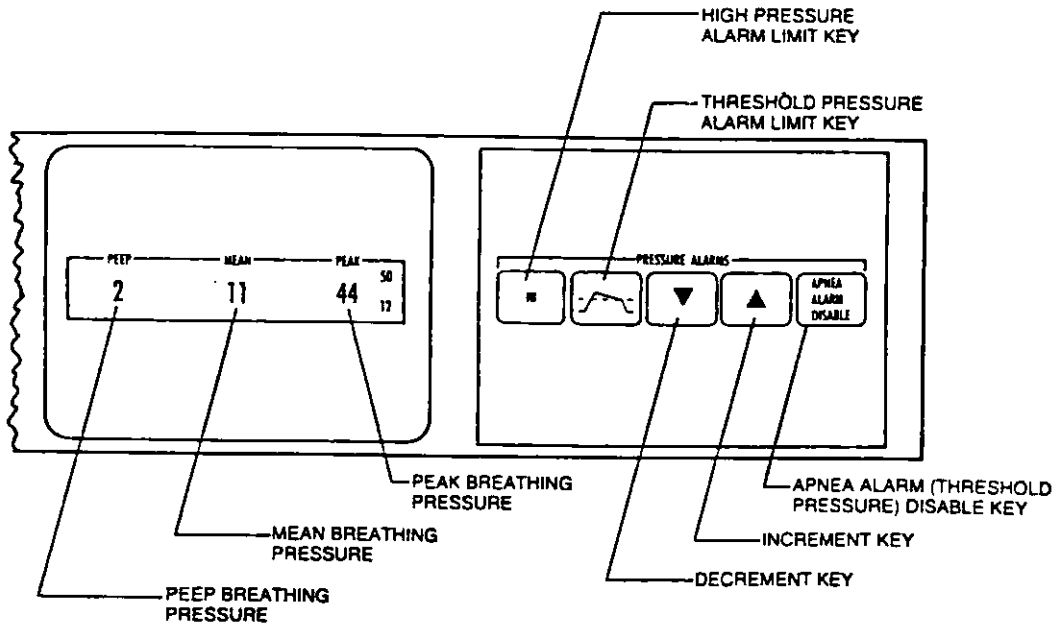


FIGURE 10-11: BREATHING PRESSURE MONITOR CONTROLS AND DISPLAY

NOTE: The Threshold Pressure Alarm Limit Must Be Set Properly (Refer to Figure 10-12)

If a breathing system leak or partial disconnection occurs while the threshold pressure alarm limit is set significantly lower than the peak pressure, continued positive pressure ventilation can produce a pressure fluctuation large enough to exceed the threshold (and thus satisfy the monitor's alarm) yet too small to provide adequate ventilation.

To address this problem, the breathing pressure monitor displays a "THRESHOLD LO" Advisory on the central alarm display if the sensed peak pressure exceeds the set threshold by more than 6 cm H2O at threshold pressure alarm limit settings of 5 through 20 cm H2O, and by more than 8 cm H2O at threshold pressure alarm limit settings of 21 through 29 cm H2O. Since the maximum threshold pressure alarm limit setting is 30 cm H2O, setting the threshold pressure alarm limit at 30 cm H2O disables the "THRESHOLD LO" Advisory.

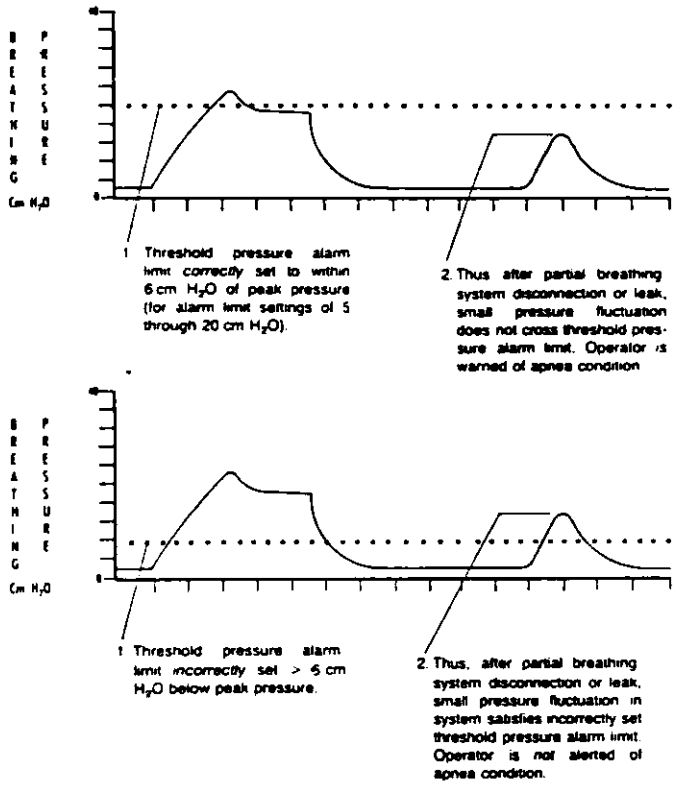


FIGURE 10-12: THRESHOLD PRESSURE ALARM LIMIT

* APNEA PRESSURE (THRESHOLD PRESSURE LIMITO) |||||

If the measured breathing pressure remains below the threshold pressure alarm limit for more than 15 seconds, the Caution message "APNEA PRES" appears on the central alarm display, and an intermittent audible alarm sounds. If the measured breathing pressure continues to remain below the threshold pressure alarm limit for an additional 15 seconds (30 seconds total), the breathing pressure display area is blanked , and a continuously repeating audible alarm sounds, and the Caution message "APNEA - PRES" is upgraded to a Warning on the central alarm display.

As soon as the measured breathing pressure exceeds the threshold pressure alarm limit, alarm annunciation ceases.

Since the threshold pressure alarm limit should be adjusted as close as possible to the patient's peak inspiratory pressure without exceeding it, the breathing pressure monitor advises the operator of an improperly set threshold pressure alarm limit. A "THRESHOLD LO" Advisory message appears on the central alarm display if the sensed peak pressure exceeds the threshold pressure alarm limit by more than 6 cm H2O at threshold pressure alarm limit settings of 5 through 20 cm H2O, and by more than 8 cm H2O at threshold pressure alarm limit settings of 21 through 29 cm H2O. Since the maximum threshold pressure alarm limit setting is 30 cm H2O, setting the threshold pressure alarm limit at 30 cm H2O disables the "THRESHOLD LO" Advisory.

CONTINUNING PRESSURE (THRESHOLD PRESSURE LIMIT) ||

If the measured breathing pressure remains above the threshold pressure alarm limit for more than 15 seconds, the breathing pressure display area is blanked, the Caution message "CONTNG PRES" appears on the central alarm display, and an intermittent audible alarm sounds. As soon as the measured breathing pressure drops below the threshold pressure alarm limit, alarm annunciation ceases.

* Apnea pressure alarm signals can be disabled with the "APNEA ALARM DISABLE" key when the ventilator power switch is in the "OFF" position and the monitor does not detect a pressure exceeding the threshold setting.

CENTRAL ALARM DISPLAY

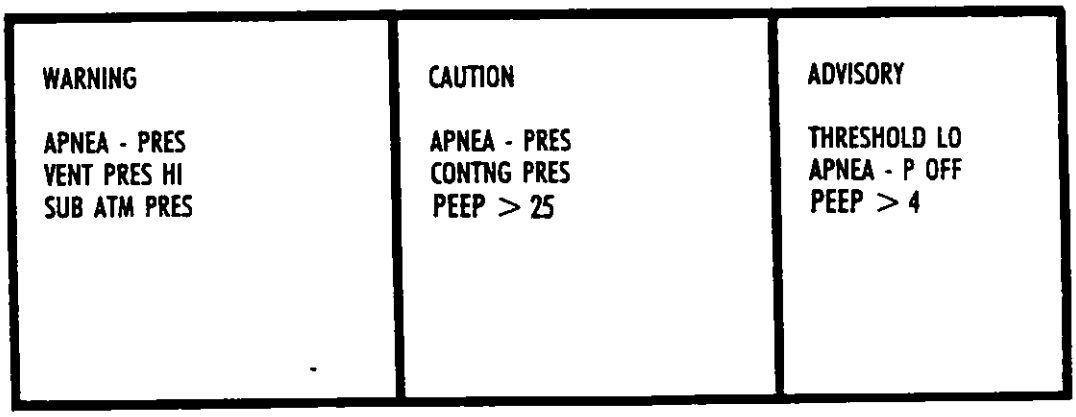


FIGURE 10-13: CENTRAL ALARM DISPLAY WITH ALL POSSIBLE BREATHING PRESSURE MONITOR ALARM MESSAGES

HIGH PRESSURE

If the measured breathing pressure exceeds the high pressure limit, the Warning message "VENT PRES HI" appears on the central alarm display, and a continuously repeating audible alarm sounds. This alarm condition is cleared as soon as the measured breathing pressure drops below the high pressure alarm limit. However, the alarm signal is extended for 5 seconds to allow the operator to note a high pressure condition that comes and goes rapidly.

SUB-ATMOSPHERIC PRESSURE

If the measured breathing pressure falls below -10 cm H2O, the Warning message "SUB ATM PRES" 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 cm H2O. However, the alarm signal is extended for 5 seconds to allow the operator to note a sub-atmospheric pressure condition that comes and goes rapidly.

EXCESSIVE PEEP CAUTION

Any time that the monitor measures a PEEP of 26 cm H2O or greater, the Caution message "PEEP > 25" appears on the central alarm display and an intermittent audible alarm sounds. Alarm annunciation ceases as soon as the measured PEEP drops below 26 cm H2O. Also, an Apnea or Continuing Pressure alarm condition will clear this alarm condition.

PEEP ACTIVE ADVISORY

Any time that the monitor measures a PEEP of 5 cm H2O or greater, the Advisory message "PEEP > 4" appears on the central alarm display. As soon as the measured PEEP drops below 5 cm H2O, the Advisory message disappears from the central alarm display.

APNEA ALARM OFF

Any time that the apnea pressure alarm (threshold pressure alarm limit) has been disabled with the "APNEA ALARM DISABLE" key, the Advisory message "APNEA-P OFF" appears on the central alarm display. This Advisory is also generated automatically after power-up if the ventilator power switch is in the OFF position.

RESPIRATORY VOLUME MONITOR-GENERAL DESCRIPTION

The respiratory volume monitor employs a positive displacement rotating-lobe impeller that generates electronic pulses in response to the patient's expiratory flow. The monitor converts these pulse patterns into meaningful readings for Tidal Volume, Minute Volume, and Respiratory Rate displays.

The operator can set a low alarm limit for minute volume. Fixed alarms are provided for low tidal volume, high respiratory rate, and reverse flow through the sensor. An apnea alarm is generated if the monitor does not sense a valid breath for 15 and 30 seconds. A sensor failure alarm warns of a disconnected or damaged sensor.

The monitor's volume alarms are automatically enabled when either:

- the ventilator power switch is turned to the "ON" position.
- the monitor detects a "valid" breath, defined as having a tidal volume greater than 80 ml. (Older firmware)

The respiratory volume monitor's readings can appear on the data and trend displays.

SENSOR INSTALLATION

1. Remove the expiratory valve from the NAD absorber assembly by unscrewing the valve retaining nut.

2. Make sure that the gasket above the threads of the absorber expiratory valve mount is properly seated and in good condition.

3. Attach the respiratory volume monitor sensor to the NAD absorber assembly by positioning the sensor at the location previously occupied by the expiratory valve, and then by hand tightening the sensor retaining nut. The sensor retaining nut is specific to the expiratory valve mount and will not fit the inspiratory valve mount.

4. Verify that a red silicone gasket in good condition is properly seated above the threads of the respiratory volume monitor sensor inlet.

5. Attach the expiratory valve to the top of the sensor inlet by threading the valve retaining nut onto the sensor inlet. Hand tighten the valve retaining nut.

6. With the sensor and expiratory valve securely in place, align the sensor plug key axially with the sensor receptacle keyway on the anesthesia machine. Push the sensor plug into place, taking care not to twist the plug to avoid damage to the connecting pins. An audible click indicates complete contact engagement and latching.

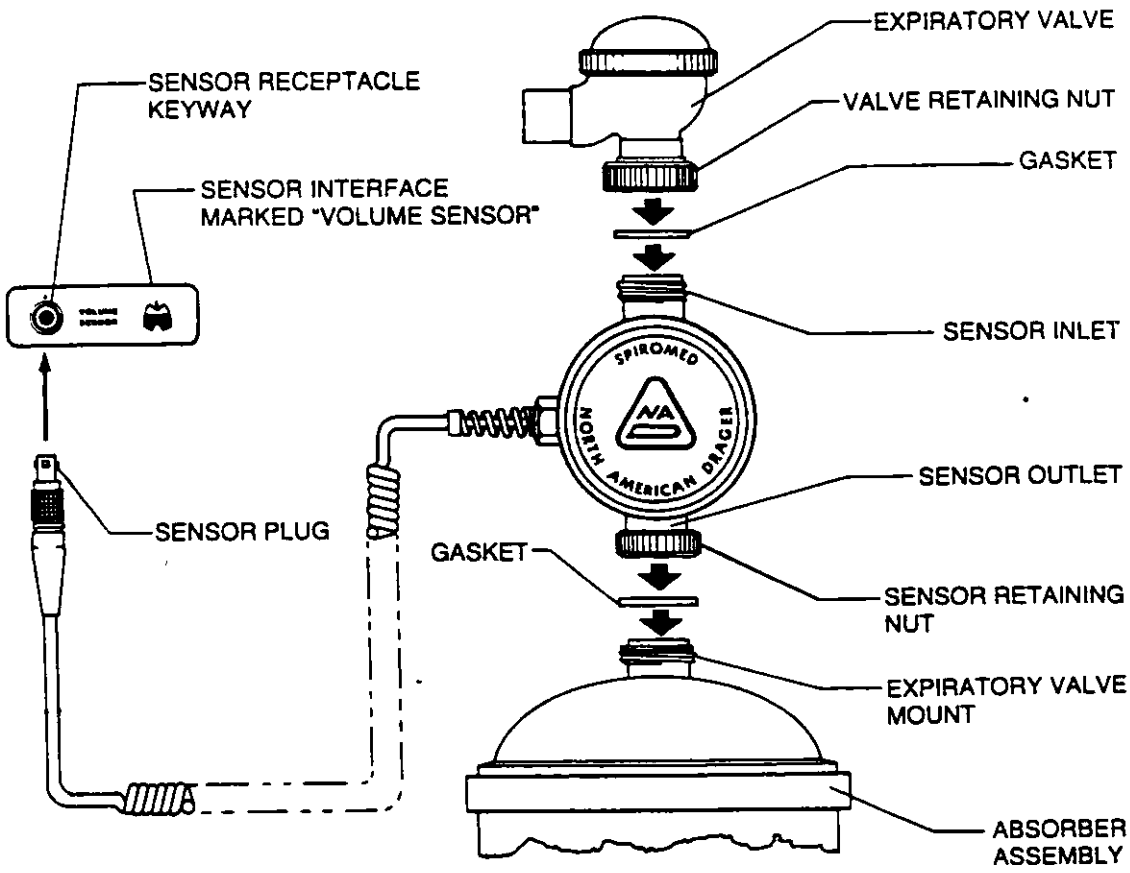


FIGURE 10-14: RESPIRATORY VOLUME MONITOR SENSOR INSTALLATION

AFTER POWER UP

When the anesthesia machine's System Power switch is turned to the "ON" position, the monitor is ready to display tidal volume. However, a full minute of respiration must be registered before Minute Volume and Breathing Rate readings can appear in the display area.

Following power-up, all volume alarms are disabled, if the ventilator is turned off, to allow patient setup without nuisance alarms. The volume alarms are automatically enabled when the monitor detects a valid breath or when the ventilator is turned on.

VOLUME ALARMS DISABLE KEY & VENTILATOR INTERFACE

The "VOLUME ALARMS DISABLE" key can be used to disable and enable audible and visual alarm signals for the Tidal Volume, Minute Volume, and Apnea-Volume alarms. During the disabled period, the Advisory message "VOL ALRM OFF" appears on the central alarm display. Pressing the key again enables the audible and visual volume alarms, as indicated by the removal of the "VOL ALRM OFF" message from the central alarm display. Successive keystrokes will toggle the alarms on and off.

To ensure that the volume alarms are used during automatic ventilation, the "VOLUME ALARMS DISABLE" key is tied into the ventilator power switch. If the operator turns the ventilator power switch to the "ON" position, the volume alarms are automatically enabled, even if they had been disabled with the "VOLUME ALARMS DISABLE" key. However, since some users may want to use automatic ventilation with a non-rebreathing circuit (in which the respiratory volume monitor cannot be used), the volume alarms can be manually disabled while the ventilator power switch is in the "ON" position.

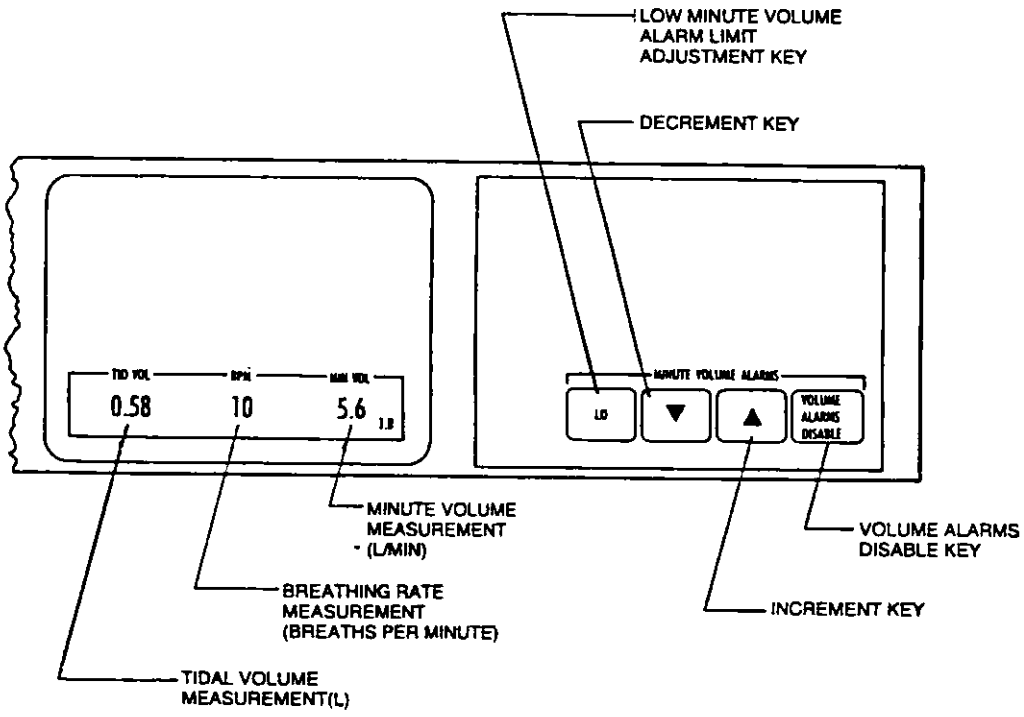


FIGURE 10-15: RESPIRATORY VOLUME MONITOR CONTROLS AND DISPLAY

DISPLAYS

The respiratory volume monitor displays three measurements: minute volume, tidal volume, and respiratory rate (See Fig. 10-15).

MINUTE VOLUME DISPLAY

The minute volume display continuously indicates the total volume of exhaled gas accumulated during the previous minute of respiration. It therefore represents a true measurement of the minute volume and not the result of a calculation. If a full one-minute history of exhaled volume is not available, the "MIN VOL" display area will remain blank. The minute volume display also shows the low minute volume alarm limit to the right of the minute volume reading.

TIDAL VOLUME DISPLAY

The tidal volume display indicates the tidal volume for each breath. If a breath has not been registered for 30 seconds, the "TID VOL" display area will remain blank.

RESPIRATORY RATE DISPLAY

The respiratory rate ("BPM") display indicates the total number of breaths (exhalation cycles) registered by the monitor during the previous minute of respiratory activity. As with the minute volume display, if a full minute of respiration has not occurred, the "BPM" display area will remain blank.

ADJUSTING THE LOW MINUTE VOLUME ALARM LIMIT

The "LO" key can be used to adjust the low minute volume alarm limit. Pressing the "LO" key places a box around the low minute volume alarm limit (to the right of the "MIN VOL" reading). While the low minute volume alarm limit remains highlighted, it can be adjusted with the the increment and decrement keys

(labeled with arrows). Holding either the increment or decrement key in a depressed position will increase the alarm limit's rate of change. For fine adjustment, the increment or decrement key can be pressed intermittently. The box disappears in five seconds if the keys are not pressed.

The low minute volume alarm limit can be adjusted from 0.5 to 10.0 liters.

POWER-ON DEFAULT ALARM LIMIT

The respiratory volume monitor's factory-set default alarm limit for low minute volume is 3.0 liters. The monitor automatically sets this limit on power-up.

APNEA-VOLUME ALAMM LIMITS

The respiratory volume monitor continuously monitors the expiratory flow in the patient breathing system. By processing the expiratory flow patterns, the monitor can determine if a "valid" breath has occurred. A valid breath must have a tidal volume greater than 80 ml.

If a valid breath is not detected for a period of at least 15 seconds, an apnea-volume Caution condition is generated. The red "APNEA" LED indicator lights continuously, the Caution message "APNEA-VOL" 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 red "APNEA" LED indicator begins to flash on and off, a continuously repeating audible alarm sounds, and the Caution message "APNEA-VOL" is upgraded to a Warning on the central alarm display. Also, the display areas pertaining to the Respiratory Volume Monitor will be blanked.

As soon as a valid breath is detected, alarm annunciation ceases, and a Tidal Volume reading can appear in the display window. However, a full minute of respiratory activity must be registered before the Minute Volume and Respiratory Rate can be displayed.

LOW MINUTE VOLUME

If at any time the monitor measures a Minute Volume less than the low Minute Volume alarm limit, the Caution message "MIN VOL LOW" appears on the central alarm display and an intermittent audible alarm sounds. As soon as the monitor measures a Minute Volume equal to or greater than the low alarm limit, alarm annunication ceases.

* Volume-related alarms can be disabled with the "VOLUME ALARMS DISABLE" key.

REVERSE FLOW

If the respiratory volume monitor measures a reverse flow through the sensor greater than 20 ml, a single-tone audible alarm sounds and the Advisory message "REVERSE FLOW" appears on the central alarm display. A forward flow greater than 20 ml will clear the alarm condition, but the "REVERSE FLOW" alarm message will remain on the screen for about ten seconds after the resumption of forward flow. "Latching" the alarm message in this manner allows the operator to note an intermittent reverse flow condition.

SENSOR DISCONNECT

If the respiratory volume monitor 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 SEN DISC" and "VOL ALRM OFF" appear on the central alarm display and the digital and bargraph display areas are blanked. Reconnecting the sensor cord will clear the alarm condition.

CENTRAL ALARM DISPLAY

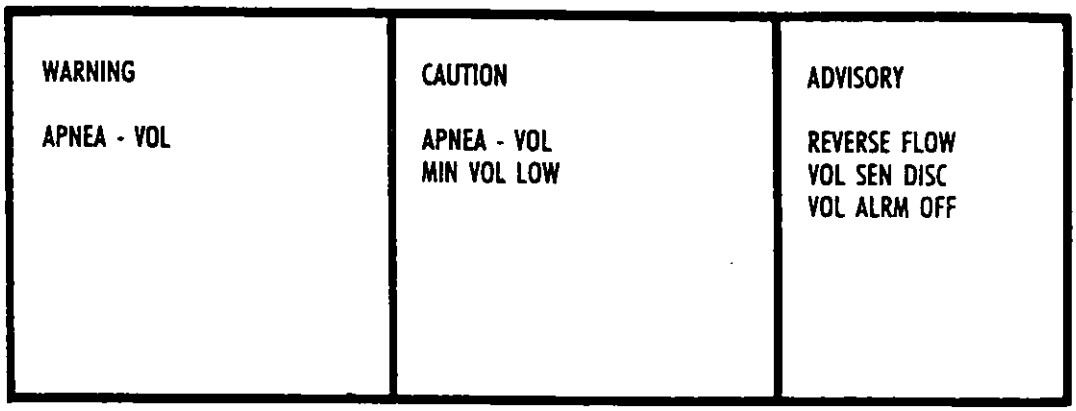


FIGURE 10-16: CENTRAL ALARM DISPLAY WITH ALL POSSIBLE RESPIRATORY VOLUME MONITOR ALARM MESSAGES

Any time that the volume alarms have been disabled with the alarms disable/enable key, the Advisory message "VOL ALRM OFF" appears on the central alarm display. (This alarm condition is also generated by sensor cord disconnection.)

PART NUMBER: 4109610A **PROCEDURE: REPLACEMENT**
DESCRIPTION: CRT & INSUL ASM-5 IN (LEFT)

PART(S) REQUIRED: 4109610A CRT & INSUL ASM-5 IN
SPECIAL TOOL(S) : ESD CONTROL EQUIPMENT

1. Turn the SYSTEM POWER switch to STAND BY.

2. Unplug the NARKOMED 2B.

3. Disable the DC BATTERY CB1 circuit breaker.

4. Remove the seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO securing 4109666A SHELF ASM-CRT BOX-NM2B.

5. Lift the rear of 4109666A SHELF ASM-CRT BOX-NM2B and disconnect 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.

6. Remove 4109666A SHELF-ASM CRT BOX-NM2B.

7. Use ESD precautionary procedures. .

8. Disconnect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B.

9. Disconnect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B

10. Disconnect 4109559A CABLE ASM-RIBBON 20CONDX11.5 from the left 4109610A CRT & INSUL ASM-5 IN.

11. Remove the four (4) 7709004P SCR-BTN HD SKT 6-32X1/4L SS BO securing the left 4109610A CRT & INSUL ASM-5 IN.

12. Remove the left 4109610A CRT & INSUL ASM-5 IN from 4109647A CRT BOX ASM-NM2B.

13. Record the manufacturer's serial number on the left 4109610A CRT & INSUL ASM-5 IN being removed.
    NOTE: Serial number label is on the side of the frame.
    Example: MOD#115-71 DMC-5 SER# 8743 00 74

14. Record the manufacturer's serial number on the new 4109610A CRT & INSUL ASM-5 IN.

15. Postion the new 4109610A CRT & INSUL ASM-5 IN in 4109647A CRT BOX ASM-NM2B.

16. Secure 4109610A CRT & INSUL ASM-5 IN to 4109647A CRT BOX ASM-NM2B with the four (4) 7709004P SCR-BTN SKT 6-32X1/4L SS BO.

17. Connect 4109559A CABLE ASM-RIBBON 20CONDX11.5 to

the left 4109610A CRT & INSUL ASM-5 IN.

18. Connect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B.

19. Connect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B

20. Remove the ESD control equipment.

21. Position 4109666A SHELF ASM-CRT BOX-NM2B on top of the NARKOMED 2B.

22. Attach 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4109666A SHELF ASM-CRT BOX-NM2B to 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.

23. Install 4109666A SHELF ASM-CRT BOX-NM2B.

24. Secure 4109666A SHELF ASM-CRT BOX-NM2B with seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO.

25. Enable DC BATTERY CB1 circuit breaker.

26. Plug the NARKOMED 2B into a live receptacle.

27. Perform a complete Periodic Manufacture Service on the NARKOMED 2B.

PART NUMBER: 4109490P **PROCEDURE: REPLACEMENT**
DESCRIPTION: SWITCH PANEL-NM2B CRT

PART(S) REQUIRED: 4109490P SWITCH PANEL-NM2B CRT
SPECIAL TOOL(S) : ESD CONTROL EQUIPMENT

1. Turn the SYSTEM POWER switch to STAND BY.
2. Unplug the NARKOMED 2B.
3. Disable the DC BATTERY CB1 circuit breaker.
4. Remove the seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO securing 4109666A SHELF ASM-CRT BOX-NM2B.
5. Lift the rear of 4109666A SHELF ASM-CRT BOX-NM2B and disconnect 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.
6. Remove 4109666A SHELF-ASM CRT BOX-NM2B.
7. Use ESD precautionary procedures. .
8. Disconnect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B.
9. Disconnect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B
10. Disconnect 4109559A CABLE ASM-RIBBON 20CONDX11.5 from J4 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
11. Disconnet 4109563A CABLE ASM-RIBBON 14CONDX9.5 from J7 on 4109683A CHASSIS ASM-PROCESSOR-NM2B.
12. Disconnect 4109490P SWITCH PANEL-NM2B CRT from J1 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
13. Disconnect 4109560A CABLE ASM-RIBBON 20CONDX3.5 from J3 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
14. Disconnect 4109573A CABLE ASM-RIBBON 15CONDX4.5 from J8 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
15. Disconnect 4109550A CABLE ASM-RIBBON 14CONDX3.5 from J6 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
16. Disconnect 4109570A WIRE HARNESS-POWER-NM2B from J5 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
17. Disconnect 4108960A PANEL ASM-SPIROMED (B) IF from J9 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
18. Disconnect 4110136A PANEL ASM-NM2B-02 INTERFACE from J10 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

19. Disconnect 4109491P SWITCH PANEL-NM2B ALARMS from J2 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

20. Disconnect 4108996A PANEL ASM-BAROMED (B) INTERFACE from the solenoid on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

21. Disconnect and mark any cables that are connected to DATA IN, DATA OUT, PORT A, or PORT B.

22. Loosen the four (4) captive screws securing 4109638A CHASSIS ASM-PROCESSOR-NM2B to 4109647A CRT BOX ASM-NM2B.

23. Remove 4109638A CHASSIS ASM-PROCESSOR-NM2B from 4109647A CRT BOX ASM-NM2B.

24. Remove the four (4) 7709004P SCR-BTN HD SKT 6-32X1/4L SS BO securing the right 4109610A CRT & INSUL ASM-5 IN.

25. Remove the right 4109610A CRT & INSUL ASM-5 IN from 4109647A CRT BOX ASM-NM2B.

26. Remove the four (4) 7709004P SCR-BTN HD SKT 6-32X1/4L SS BO securing the left 4109610A CRT & INSUL ASM-5 IN.

27. Remove the left 4109610A CRT & INSUL ASM-5 IN from 4109647A CRT BOX ASM-NM2B.

28. Remove the two (2) 7709014P SCR-BTN HD 4-40X5/16L SSBO securing 4109533F PLATE-CRT SW PANEL SUPPORT to 4109630A BEZEL ASM-CRT BOX-NM2B.

29. Remove 4109533F PLATE-CRT SW PANEL SUPPORT from 4109630A BEZEL ASM-CRT BOX-NM2B.

30. Remove the four (4) 7709014P SCR-BTN HD 4-40X5/16L SSBO securing 4109534F PLATE-ALARMS SW PANEL SUPPORT to 4109630A BEZEL ASM-CRT BOX-NM2B.

31. Remove 4109534F PLATE-ALARMS SW PANEL SUPPORT from 4109630A BEZEL ASM-CRT BOX-NM2B.

32. Remove 4109629A FILTER PANEL & SWITCH ASM-NM2B from 4109630A BEZEL ASM-CRT BOX-NM2B.

33. Peel the old 4109490P SWITCH PANEL-NM2B CRT from 4109539F FILTER-CONTRAST ENHANCE-NM2B.

34. Remove the backing from the new 4109490P SWITCH PANEL-NM2B CRT.

35. Attach 4109490P SWITCH PANEL-NM2B CRT to 4109539F

FILTER-CONTRAST ENHANCE-NM2B.

36. Position the 4109629A FILTER PANEL & SWITCH ASM-NM2B into 4109630A BEZEL ASM-CRT BOX-NM2B.

37. Position 4109534F PLATE-ALARMS SW PANEL SUPPORT into 4109630A BEZEL ASM-CRT BOX-NM2B.

38. Secure 4109534F PLATE-ALARMS SW PANEL SUPPORT to 4109630A BEZEL ASM-CRT BOX-NM2B with the four (4) 7709014P SCR-BTN HD 4-40X5/16L SSBO.

39. Position 4109533F PLATE-CRT SW PANEL ASM into 4109630A BEZEL ASM-CRT BOX-NM2B.

40. Secure 4109533F PLATE-CRT SW PANEL ASM to 4109630A BEZEL ASM-CRT BOX-NM2B with two (2) 7709014P SCR-BTN HD 4-40X5/16L SSBO.

41. Postion the right 4109610A CRT & INSUL ASM-5 IN in 4109647A CRT BOX ASM-NM2B.

42. Secure 4109610A CRT & INSUL ASM-5 IN to 4109647A CRT BOX ASM-NM2B with the four (4) 7709004P SCR-BTN SKT 6-32X1/4L SS BO.

43. Postion 4109610A CRT & INSUL ASM-5 IN in 4109647A CRT BOX ASM-NM2B.

44. Secure 4109610A CRT & INSUL ASM-5 IN to 4109647A CRT BOX ASM-NM2B with the four (4) 7709004P SCR-BTN SKT 6-32X1/4L SS BO.

45. Position 4109638A CHASSIS ASM-PROCESSOR-NM2B in 4109647A CRT BOX ASM-NM2B.

46. Secure 4109638A CHASSIS ASM-PROCESSOR-NM2B to 4109647A CRT BOX ASM-NM2B with the four (4) captive screws.

47. Connect 4108996A PANEL ASM-BAROMED (B) INTERFACE to the solenoid (hose barb closest to the front of the machine) on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

48. Connect 4109491P SWITCH PANEL-NM2B ALARMS to J2 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

49. Connect 4110136A PANEL ASM-NM2B-02 INTERFACE to J10 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

50. Connect 4108906A PANEL ASM-SPIROMED (B) IF to J9 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

51. Connect 4109570A WIRE HARNESS-POWER-NM2B to J5 on

4109638A CHASSIS ASM-PROCESSOR-NM2B.

52. Connect 4109550A CABLE ASM-RIBBON 14CONDX3.5 to J6 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

53. Connect 4109573A CABLE ASM-RIBBON 15CONDX4.5 to J8 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

54. Connect 4109560A CABLE ASM-RIBBON 20CONDX3.5 to J3 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

55. Connect 4109490P SWITCH PANEL-NM2B CRT to J1 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

56. Connect 4109563A CABLE ASM-RIBBON 14CONDX9.5 to J7 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

57. Connect 4109559A CABLE ASM-RIBBON 20CONDX11.5 to J4 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

58. Connect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B.

59. Connect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B

60. Remove the ESD control equipment.

61. Position 4109666A SHELF ASM-CRT BOX-NM2B on top of the NARKOMED 2B.

62. Attach 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4109666A SHELF ASM-CRT BOX-NM2B to 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.

63. Install 4109666A SHELF ASM-CRT BOX-NM2B.

64. Secure 4109666A SHELF ASM-CRT BOX-NM2B with seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO.

65. Connect any cables disconnected from DATA IN, DATA OUT, PORT A, or PORT B.

66. Enable DC BATTERY CB1 circuit breaker.

67. Plug the NARKOMED 2B into a live receptacle.

68. Perform a complete Periodic Manufacture Service on the NARKOMED 2B.

PART NUMBER: 4109610A **PROCEDURE: REPLACEMENT**
DESCRIPTION: CRT & INSUL ASM-5 IN (RIGHT)

PART(S) REQUIRED: 4109610A CRT & INSUL ASM-5 IN
SPECIAL TOOL(S) : ESD CONTROL EQUIPMENT

1. Turn the SYSTEM POWER switch to STAND BY.
2. Unplug the NARKOMED 2B.
3. Disable the DC BATTERY CB1 circuit breaker.
4. Remove the seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO securing 4109666A SHELF ASM-CRT BOX-NM2B.
5. Lift the rear of 4109666A SHELF ASM-CRT BOX-NM2B and disconnect 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.
6. Remove 4109666A SHELF-ASM CRT BOX-NM2B.
7. Use ESD precautionary procedures.
8. Disconnect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B.
9. Disconnect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B
10. Disconnect 4109559A CABLE ASM-RIBBON 20CONDX11.5 from J4 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
11. Disconnet 4109563A CABLE ASM-RIBBON 14CONDX9.5 from J7 on 4109683A CHASSIS ASM-PROCESSOR-NM2B.
12. Disconnect 4109490P SWITCH PANEL-NM2B CRT from J1 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
13. Disconnect 4109560A CABLE ASM-RIBBON 20CONDX3.5 from the right 4109610A CRT & INSUL ASM-5 IN.
14. Remove the four (4) 7709004P SCR-BTN HD SKT 6-32X1/4L SS BO securing the right 4109610A CRT & INSUL ASM-5 IN.
15. Remove the right 4109610A CRT & INSUL ASM-5 IN from 4109647A CRT BOX ASM-NM2B.
16. Record the manufacturer's serial number on the right 4109610A CRT & INSUL ASM-5 IN being removed.
    NOTE: Serial number label is on the side of the frame.
    Example: MOD#115-71 DMC-5 SER# 8743 00 74
17. Record the manufacturer's serial number on the new 4109610A CRT & INSUL ASM-5 IN.

18. Postion the new 4109610A CRT & INSUL ASM-5 IN in 4109647A CRT BOX ASM-NM2B.

19. Secure 4109610A CRT & INSUL ASM-5 IN to 4109647A CRT BOX ASM-NM2B with the four (4) 7709004P SCR-BTN SKT 6-32X1/4L SS BO.

20. Connect 4109560A CABLE ASM-RIBBON 20CONDX3.5 to the right 4109610A CRT & INSUL ASM-5 IN.

21. Connect 4109409P SWITCH PANEL-NM2B CRT to J1 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

22. Connect 4109563A CABLE ASM-RIBBON 14CONDX9.5 to J7 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

23. Connect 4109559A CABLE ASM-RIBBON 20CONDX11.5 to J4 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

24. Connect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B.

25. Connect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B

26. Remove the ESD control equipment.

27. Position 4109666A SHELF ASM-CRT BOX-NM2B on top of the NARKOMED 2B.

28. Attach 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4109666A SHELF ASM-CRT BOX-NM2B to 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.

29. Install 4109666A SHELF ASM-CRT BOX-NM2B.

30. Secure 4109666A SHELF ASM-CRT BOX-NM2B with seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO.

31. Enable DC BATTERY CB1 circuit breaker.

32. Plug the NARKOMED 2B into a live receptacle.

33. Perform a complete Periodic Manufacture Service on the NARKOMED 2B.

PART NUMBER: 4109491P **PROCEDURE: REPLACEMENT**
DESCRIPTION: SWITCH PANEL-NM2B ALARMS

PART(S) REQUIRED: 4109491P SWITCH PANEL-NM2B ALARMS
SPECIAL TOOL(S) : ESD CONTROL EQUIPMENT

1. Turn the SYSTEM POWER switch to STAND BY.
2. Unplug the NARKOMED 2B.
3. Disable the DC BATTERY CB1 circuit breaker.
4. Remove the seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO securing 4109666A SHELF ASM-CRT BOX-NM2B.
5. Lift the rear of 4109666A SHELF ASM-CRT BOX-NM2B and disconnect 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.
6. Remove 4109666A SHELF-ASM CRT BOX-NM2B.
7. Use ESD precautionary procedures.
8. Disconnect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B.
9. Disconnect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B
10. Disconnect 4109559A CABLE ASM-RIBBON 20CONDX11.5 from J4 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
11. Disconnet 4109563A CABLE ASM-RIBBON 14CONDX9.5 from J7 on 4109683A CHASSIS ASM-PROCESSOR-NM2B.
12. Disconnect 4109490P SWITCH PANEL-NM2B CRT from J1 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
13. Disconnect 4109560A CABLE ASM-RIBBON 20CONDX3.5 from J3 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
14. Disconnect 4109573A CABLE ASM-RIBBON 15CONDX4.5 from J8 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
15. Disconnect 4109550A CABLE ASM-RIBBON 14CONDX3.5 from J6 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
16. Disconnect 4109570A WIRE HARNESS-POWER-NM2B from J5 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
17. Disconnect 4108960A PANEL ASM-SPIROMED (B) IF from J9 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
18. Disconnect 4110136A PANEL ASM-NM2B-02 INTERFACE from J10 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

19. Disconnect 4109491P SWITCH PANEL-NM2B ALARMS from J2 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

20. Disconnect 4108996A PANEL ASM-BAROMED (B) INTERFACE from the solenoid on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

21. Disconnect and mark any cables that are connected to DATA IN, DATA OUT, PORT A, or PORT B.

22. Loosen the four (4) captive screws securing 4109638A CHASSIS ASM-PROCESSOR-NM2B to 4109647A CRT BOX ASM-NM2B.

23. Remove 4109638A CHASSIS ASM-PROCESSOR-NM2B from 4109647A CRT BOX ASM-NM2B.

24. Remove the four (4) 7709004P SCR-BTN HD SKT 6-32X1/4L SS BO securing the right 4109610A CRT & INSUL ASM-5 IN.

25. Remove the right 4109610A CRT & INSUL ASM-5 IN from 4109647A CRT BOX ASM-NM2B.

26. Remove the four (4) 7709004P SCR-BTN HD SKT 6-32X1/4L SS BO securing the left 4109610A CRT & INSUL ASM-5 IN.

27. Remove the left 4109610A CRT & INSUL ASM-5 IN from 4109647A CRT BOX ASM-NM2B.

28. Remove the two (2) 7709014P SCR-BTN HD 4-40X5/16L SSBO securing 4109533F PLATE-CRT SW PANEL SUPPORT to 4109630A BEZEL ASM-CRT BOX-NM2B.

29. Remove 4109533F PLATE-CRT SW PANEL SUPPORT from 4109630A BEZEL ASM-CRT BOX-NM2B.

30. Remove the four (4) 7709014P SCR-BTN HD 4-40X5/16L SSBO securing 4109534F PLATE-ALARMS SW PANEL SUPPORT to 4109630A BEZEL ASM-CRT BOX-NM2B.

31. Remove 4109534F PLATE-ALARMS SW PANEL SUPPORT from 4109630A BEZEL ASM-CRT BOX-NM2B.

32. Remove 4109629A FILTER PANEL & SWITCH ASM-NM2B from 4109630A BEZEL ASM-CRT BOX-NM2B.

33. Peel the old 4109491P SWITCH PANEL-NM2B ALARMS from 4109539F FILTER-CONTRAST ENHANCE-NM2B.

34. Remove the backing from the new 4109491P SWITCH PANEL-NM2B ALARMS.

35. Attach 4109491P SWITCH PANEL-NM2B ALAARMS to

4109539F FILTER-CONTRAST ENHANCE-NM2B.

36. Position the 4109629A FILTER PANEL & SWITCH ASM-NM2B into 4109630A BEZEL ASM-CRT BOX-NM2B.

37. Position 4109534F PLATE-ALARMS SW PANEL SUPPORT into 4109630A BEZEL ASM-CRT BOX-NM2B.

38. Secure 4109534F PLATE-ALARMS SW PANEL SUPPORT to 4109630A BEZEL ASM-CRT BOX-NM2B with the four (4) 7709014P SCR-BTN HD 4-40X5/16L SSBO.

39. Position 4109533F PLATE-CRT SW PANEL ASM into 4109630A BEZEL ASM-CRT BOX-NM2B.

40. Secure 4109533F PLATE-CRT SW PANEL ASM to 4109630A BEZEL ASM-CRT BOX-NM2B with two (2) 7709014P SCR-BTN HD 4-40X5/16L SSBO.

41. Postion the right 4109610A CRT & INSUL ASM-5 IN in 4109647A CRT BOX ASM-NM2B.

42. Secure 4109610A CRT & INSUL ASM-5 IN to 4109647A CRT BOX ASM-NM2B with the four (4) 7709004P SCR-BTN SKT 6-32X1/4L SS BO.

43. Postion 4109610A CRT & INSUL ASM-5 IN in 4109647A CRT BOX ASM-NM2B.

44. Secure 4109610A CRT & INSUL ASM-5 IN to 4109647A CRT BOX ASM-NM2B with the four (4) 7709004P SCR-BTN SKT 6-32X1/4L SS BO.

45. Position 4109638A CHASSIS ASM-PROCESSOR-NM2B in 4109647A CRT BOX ASM-NM2B.

46. Secure 4109638A CHASSIS ASM-PROCESSOR-NM2B to 4109647A CRT BOX ASM-NM2B with the four (4) captive screws.

47. Connect 4108996A PANEL ASM-BAROMED (B) INTERFACE to the solenoid (hose barb closest to the front of the machine) on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

48. Connect 4109491P SWITCH PANEL-NM2B ALARMS to J2 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

49. Connect 4110136A PANEL ASM-NM2B-02 INTERFACE to J10 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

50. Connect 4108906A PANEL ASM-SPIROMED (B) IF to J9 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

51. Connect 4109570A WIRE HARNESS-POWER-NM2B to J5 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

52. Connect 4109550A CABLE ASM-RIBBON 14CONDX3.5 to J6 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

53. Connect 4109573A CABLE ASM-RIBBON 15CONDX4.5 to J8 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

54. Connect 4109560A CABLE ASM-RIBBON 20CONDX3.5 to J3 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

55. Connect 4109490P SWITCH PANEL-NM2B CRT to J1 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

56. Connect 4109563A CABLE ASM-RIBBON 14CONDX9.5 to J7 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

57. Connect 4109559A CABLE ASM-RIBBON 20CONDX11.5 to J4 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

58. Connect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B.

59. Connect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B

60. Remove the ESD control equipment.

61. Position 4109666A SHELF ASM-CRT BOX-NM2B on top of the NARKOMED 2B.

62. Attach 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4109666A SHELF ASM-CRT BOX-NM2B to 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.

63. Install 4109666A SHELF ASM-CRT BOX-NM2B.

64. Secure 4109666A SHELF ASM-CRT BOX-NM2B with seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO.

65. Connect any cables disconnected from DATA IN, DATA OUT, PORT A, or PORT B.

66. Enable DC BATTERY CB1 circuit breaker.

67. Plug the NARKOMED 2B into a live receptacle.

68. Perform a complete Periodic Manufacture Service on the NARKOMED 2B.

PART NUMBER: 4109629A **PROCEDURE: REPLACEMENT**
DESCRIPTION: FILTER PANEL & SWITCH ASM NM2B

PART(S) REQUIRED: 4109629A FILTER PANEL & SWITCH ASM NM2B
SPECIAL TOOL(S) : ESD CONTROL EQUIPMENT

1. Turn the SYSTEM POWER switch to STAND BY.
2. Unplug the NARKOMED 2B.
3. Disable the DC BATTERY CB1 circuit breaker.
4. Remove the seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO securing 4109666A SHELF ASM-CRT BOX-NM2B.
5. Lift the rear of 4109666A SHELF ASM-CRT BOX-NM2B and disconnect 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.
6. Remove 4109666A SHELF-ASM CRT BOX-NM2B.
7. Use ESD precautionary procedures.
8. Disconnect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B.
9. Disconnect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B
10. Disconnect 4109559A CABLE ASM-RIBBON 20CONDX11.5 from J4 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
11. Disconnet 4109563A CABLE ASM-RIBBON 14CONDX9.5 from J7 on 4109683A CHASSIS ASM-PROCESSOR-NM2B.
12. Disconnect 4109490P SWITCH PANEL-NM2B CRT from J1 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
13. Disconnect 4109560A CABLE ASM-RIBBON 20CONDX3.5 from J3 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
14. Disconnect 4109573A CABLE ASM-RIBBON 15CONDX4.5 from J8 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
15. Disconnect 4109550A CABLE ASM-RIBBON 14CONDX3.5 from J6 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
16. Disconnect 4109570A WIRE HARNESS-POWER-NM2B from J5 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
17. Disconnect 4108960A PANEL ASM-SPIROMED (B) IF from J9 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
18. Disconnect 4110136A PANEL ASM-NM2B-02 INTERFACE from J10 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

35. Secure 4109534F PLATE-ALARMS SW PANEL SUPPORT to 4109630A BEZEL ASM-CRT BOX-NM2B with the four (4) 7709014P SCR-BTN HD 4-40X5/16L SSBO.

36. Position 4109533F PLATE-CRT SW PANEL ASM into 4109630A BEZEL ASM-CRT BOX-NM2B.

37. Secure 4109533F PLATE-CRT SW PANEL ASM to 4109630A BEZEL ASM-CRT BOX-NM2B with two (2) 7709014P SCR-BTN HD 4-40X5/16L SSBO.

38. Postion the right 4109610A CRT & INSUL ASM-5 IN in 4109647A CRT BOX ASM-NM2B.

39. Secure 4109610A CRT & INSUL ASM-5 IN to 4109647A CRT BOX ASM-NM2B with the four (4) 7709004P SCR-BTN SKT 6-32X1/4L SS BO.

40. Postion the new 4109610A CRT & INSUL ASM-5 IN in 4109647A CRT BOX ASM-NM2B.

41. Secure 4109610A CRT & INSUL ASM-5 IN to 4109647A CRT BOX ASM-NM2B with the four (4) 7709004P SCR-BTN SKT 6-32X1/4L SS BO.

42. Position the 4109638A CHASSIS ASM-PROCESSOR-NM2B in 4109647A CRT BOX ASM-NM2B.

43. Secure 4109638A CHASSIS ASM-PROCESSOR-NM2B to 4109647A CRT BOX ASM-NM2B with the four (4) captive screws.

44. Connect 4108996A PANEL ASM-BAROMED (B) INTERFACE to the solenoid (hose barb closest to the front of the machine) on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

45. Connect 4109491P SWITCH PANEL-NM2B ALARMS to J2 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

46. Connect 4110136A PANEL ASM-NM2B-02 INTERFACE to J10 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

47. Connect 4108906A PANEL ASM-SPIROMED (B) IF to J9 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

48. Connect 4109570A WIRE HARNESS-POWER-NM2B to J5 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

49. Connect 4109550A CABLE ASM-RIBBON 14CONDX3.5 to J6 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

50. Connect 4109573A CABLE ASM-RIBBON 15CONDX4.5 to J8 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

51. Connect 4109560A CABLE ASM-RIBBON 20CONDX3.5 to J3

on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

52. Connect 4109490P SWITCH PANEL-NM2B CRT to J1 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

53. Connect 4109563A CABLE ASM-RIBBON 14CONDX9.5 to J7 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

54. Connect 4109559A CABLE ASM-RIBBON 20CONDX11.5 to J4 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

55. Connect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B.

56. Connect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B

57. Remove the ESD control equipment.

58. Position 4109666A SHELF ASM-CRT BOX-NM2B on top of the NARKOMED 2B.

59. Attach 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4109666A SHELF ASM-CRT BOX-NM2B to 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.

60. Install 4109666A SHELF ASM-CRT BOX-NM2B.

61. Secure 4109666A SHELF ASM-CRT BOX-NM2B with seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO.

62. Connect any cables disconnected from DATA IN, DATA OUT, PORT A, or PORT B.

63. Enable DC BATTERY CB1 circuit breaker.

64. Plug the NARKOMED 2B into a live receptacle.

65. Perform a complete Periodic Manufacture Service on the NARKOMED 2B.

PART NUMBER: 4109638A **PROCEDURE: REPLACEMENT**
DESCRIPTION: CHASSIS ASM-PROCESSOR-NM2B

PART(S) REQUIRED: 4109638A CHASSIS ASM-PROCESSOR-NM2B
SPECIAL TOOL(S) : ESD CONTROL EQUIPMENT

1. Turn the SYSTEM POWER switch to STAND BY.
2. Unplug the NARKOMED 2B.
3. Disable the DC BATTERY CB1 circuit breaker.
4. Remove the seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO securing 4109666A SHELF ASM-CRT BOX-NM2B.
5. Lift the rear of 4109666A SHELF ASM-CRT BOX-NM2B and disconnect 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.
6. Remove 4109666A SHELF-ASM CRT BOX-NM2B.
7. Use ESD precautionary procedures.
8. Disconnect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B.
9. Disconnect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B
10. Disconnect 4109559A CABLE ASM-RIBBON 20CONDX11.5 from J4 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
11. Disconnet 4109563A CABLE ASM-RIBBON 14CONDX9.5 from J7 on 4109683A CHASSIS ASM-PROCESSOR-NM2B.
12. Disconnect 4109490P SWITCH PANEL-NM2B CRT from J1 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
13. Disconnect 4109560A CABLE ASM-RIBBON 20CONDX3.5 from J3 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
14. Disconnect 4109573A CABLE ASM-RIBBON 15CONDX4.5 from J8 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
15. Disconnect 4109550A CABLE ASM-RIBBON 14CONDX3.5 from J6 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
16. Disconnect 4109570A WIRE HARNESS-POWER-NM2B from J5 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
17. Disconnect 4108960A PANEL ASM-SPIROMED (B) IF from J9 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.
18. Disconnect 4110136A PANEL ASM-NM2B-02 INTERFACE from J10 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

19. Disconnect 4109491P SWITCH PANEL-NM2B ALARMS from J2 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

20. Disconnect 4108996A PANEL ASM-BAROMED (B) INTERFACE from the solenoid on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

21. Disconnect and mark any cables that are connected to DATA IN, DATA OUT, PORT A, or PORT B.

22. Loosen the four (4) captive screws securing 4109638A CHASSIS ASM-PROCESSOR-NM2B to 4109647A CRT BOX ASM-NM2B.

23. Record the serial number of 4109638A CHASSIS ASM-PROCESSOR-NM2B being removed.

24. Remove 4109638A CHASSIS ASM-PROCESSOR-NM2B from 4109647A CRT BOX ASM-NM2B.

25. Position the new 4109638A CHASSIS ASM-PROCESSOR-NM2B in 4109647A CRT BOX ASM-NM2B.

26. Secure 4109638A CHASSIS ASM-PROCESSOR-NM2B to 4109647A CRT BOX ASM-NM2B with the four (4) captive screws.

27. Connect 4108996A PANEL ASM-BAROMED (B) INTERFACE to the solenoid (hose barb closest to the front of the machine) on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

28. Connect 4109491P SWITCH PANEL-NM2B ALARMS to J2 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

29. Connect 4110136A PANEL ASM-NM2B-02 INTERFACE to J10 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

30. Connect 4108906A PANEL ASM-SPIROMED (B) IF to J9 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

31. Connect 4109570A WIRE HARNESS-POWER-NM2B to J5 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

32. Connect 4109550A CABLE ASM-RIBBON 14CONDX3.5 to J6 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

33. Connect 4109573A CABLE ASM-RIBBON 15CONDX4.5 to J8 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

34. Connect 4109560A CABLE ASM-RIBBON 20CONDX3.5 to J3 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

35. Connect 4109490P SWITCH PANEL-NM2B CRT to J1 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

36. Connect 4109563A CABLE ASM-RIBBON 14CONDX9.5 to J7 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

37. Connect 4109559A CABLE ASM-RIBBON 20CONDX11.5 to J4 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

38. Connect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B.

39. Connect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B

40. Remove the ESD control equipment.

41. Position 4109666A SHELF ASM-CRT BOX-NM2B on top of the NARKOMED 2B.

42. Attach 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4109666A SHELF ASM-CRT BOX-NM2B to 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.

43. Install 4109666A SHELF ASM-CRT BOX-NM2B.

44. Secure 4109666A SHELF ASM-CRT BOX-NM2B with seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO.

45. Connect any cables disconnected from DATA IN, DATA OUT, PORT A, or PORT B.

46. Enable DC BATTERY CB1 circuit breaker.

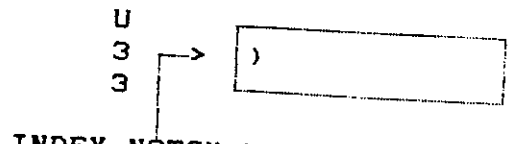
47. Plug the NARKOMED 2B into a live receptacle.

48. Perform a complete Periodic Manufacture Service on the NARKOMED 2B.

PART NUMBER: 4109699M **PROCEDURE: REPLACEMENT**
DESCRIPTION: FIRMWARE-NM2B

PART(S) REQUIRED: 4109699M FIRMWARE-NM2B
: 4109733P INSTR MAN-NM2B
SPECIAL TOOL(S) : ESD CONTROL EQUIPMENT

1. Turn the SYSTEM POWER switch to STAND BY.
2. Unplug the NARKOMED 2B.
3. Disable the DC BATTERY CB1 circuit breaker.
4. Remove the seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO securing 4109666A SHELF ASM-CRT BOX-NM2B.
5. Lift the rear of 4109666A SHELF ASM-CRT BOX-NM2B and disconnect 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.
6. Remove 4109666A SHELF-ASM CRT BOX-NM2B.
7. Use ESD precautionary procedures.
8. Disconnect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B.
9. Disconnect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B
10. Remove the two (2) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO securing the front of 4109538F COVER-PROCESSOR CHASSIS-NM2B.
11. Loosen the two (2) 7709004P SCR-BTN HD SKT 6-32X1/4L SS BO securing the rear of 4109538F COVER-PROCESSOR CHASSIS-NM2B.
12. Slide 4109538F COVER-PROCESSOR CHASSIS-NM2B towards the front of NARKOMED 2B.
13. Remove 4109538F COVER-PROCESSOR CHASSIS-NM2B.
14. Record the version of 4109699M FIRMWARE-NM2B to be removed.
15. Carefully remove 4109699M FIRMWARE-NM2B from U33 socket.
16. Record the version of 4109699M FIRMWARE-NM2B to be installed.
17. Insert the new 4109699M FIRMWARE-NM2B into U33 socket



INDEX NOTCH WITH PRINTED CIRCUIT BOARD
FRONT OF THE NARKOMED 2B

18. Check all pins to verify they are in the socket.

19. Carefully position 4109538F COVER-PROCESSOR CHASSIS-NM2B on top of the processor assembly.

20. Slide 4109538F COVER-PROCESSOR CHASSIS-NM2B under the two (2) 7709004P SCR-BTN HD SKT 6-32X1/4L SS BO.

21. Secure the front of 4109538F COVER PROCESSOR CHASSIS-NM2B with the two (2) 7709000P SCR-BTN HD 6-32X3/8L SS BO.

22. Tighten the two (2) 7709004P SCR-BTN HD 6-32X1/4L SS BO (do not over tighten).

23. Connect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B.

24. Connect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B

25. Remove the ESD control equipment.

26. Position 4109666A SHELF ASM-CRT BOX-NM2B on top of the NARKOMED 2B.

27. Attach 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4109666A SHELF ASM-CRT BOX-NM2B to 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.

28. Install 4109666A SHELF ASM-CRT BOX-NM2B.

29. Secure 4109666A SHELF ASM-CRT BOX-NM2B with seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO.

30. Enable DC BATTERY CB1 circuit breaker.

31. Plug the NARKOMED 2B into a live receptacle.

32. Perform a complete Periodic Manufacture Service on the NARKOMED 2B.

33. Remove the old 4109733P INSTR MAN-NM2B from 4109734A BINDER & INSTR ASM-NM2B.

34. Insert the new 4109733P INSTR MAN-NM2B into 4109734A BINDER & INSTR ASM-NM2B.

PART NUMBER: 4110136A **PROCEDURE: REPLACEMENT**
DESCRIPTION: PANEL ASM-NM2B-02 INTERFACE

PART(S) REQUIRED: 4110136A PANEL ASM-NM2B-02 INTERFACE
SPECIAL TOOL(S) : ESD CONTROL EQUIPMENT

1. Turn the SYSTEM POWER switch to STAND BY.

2. Unplug the NARKOMED 2B.

3. Disable the DC BATTERY CB1 circuit breaker.

4. Remove the seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO securing 4109666A SHELF ASM-CRT BOX-NM2B.

5. Lift the rear of 4109666A SHELF ASM-CRT BOX-NM2B and disconnect 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.

6. Remove 4109666A SHELF-ASM CRT BOX-NM2B.

7. Use ESD precautionary procedures.

8. Disconnect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B.

9. Disconnect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B

10. Disconnect 4110136A PANEL ASM-02MED-NM2B-02 INTERFACE terminal from J10 on 4109638A CHASSIS ASM-PROCESSOR-NM2B

11. Disconnect 4106363A SENSOR ASM-02MED from 4110136A PANEL ASM-02MED-NM2B INTERFACE.

12. Remove the four (4) 7709014P SCR-BTN HD SKT 4-40x5/16L SS BO securing 4110024F COVER-INTERFACE HOUSING-NM2B.

13. Remove the two (2) 7709004P SCR-BTN HD SKT 6-32x1/4L SS BO securing 4110136A PANEL ASM-NM2B-02 INTERFACE.

14. Remove the one (1) 7701008P SCR-CAP SKT HD 6-32X3/8L securing 4110136A PANEL ASM-NM2B-02 INTERFACE ground wires.

15. Feed the cable from 4110136A PANEL ASM-NM2B-02 INTERFACE through 4107047P CLIP-POWER 3/8 O and down 4108785F CONDUIT WELD ASM-CABLE.
    NOTE: If a "fish" is attached to the 02Med interface cable and fed through the conduit weld asm-cable before it is removed it will make it easier to install the new cable asm. A 22 gauge wire 60

inches long works well for this.

16. Remove the defective 4110136A PANEL ASM-NM2B-02 INTERFACE.

17. Feed the cable from the new 4110136A PANEL ASM-NM2B-02 INTERFACE up 4108785F CONDUIT WELD ASM-CABLE through 4107047P CLIP-POWER 3/8 O to 4109638A CHASSIS ASM-PROCESSOR-NM2B.

18. Connect 41100136 PANEL ASM-NM2B-02 INTERFACE terminal to J10 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

19. Secure 4110136A PANEL ASM-NM2B-02 INTERFACE with two (2) 7709004P SCR-BTN HD SKT 6-32X1/4L SS BO.

20. Connect 4110136A PANEL ASM-NM2B-02 INTERFACE ground wires using one (1) 7701008P SCR-CAP SKT HD 6-32X3/8L SS.

21. Install 4110024F COVER-INTERFACE HOUSING-NM2B with four (4) 7709014P SCR-BTN HD SKT 4-40X5/16 SS BO.

22. Connect 4106363A SENSOR ASM-02MED to 4110136A PANEL ASM-NM2B-02 INTERFACE.

23. Connect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B.

24. Connect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B

25. Remove the ESD control equipment.

26. Position 4109666A SHELF ASM-CRT BOX-NM2B on top of the NARKOMED 2B.

27. Attach 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4109666A SHELF ASM-CRT BOX-NM2B to 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.

28. Install 4109666A SHELF ASM-CRT BOX-NM2B.

29. Secure 4109666A SHELF ASM-CRT BOX-NM2B with seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO.

30. Enable DC BATTERY CB1 circuit breaker.

31. Plug the NARKOMED 2B into a live receptacle.

32. Perform a complete Periodic Manufacture Service on the NARKOMED 2B.

PART NUMBER: 4108996A **PROCEDURE: REPLACEMENT**
DESCRIPTION: PANEL ASM-BAROMED(B)INTERFACE

PART(S) REQUIRED: 4108996A PANEL ASM-BAROMED (B) INTERFACE
SPECIAL TOOL(S) : ESD CONTROL EQUIPMENT

1. Turn the SYSTEM POWER switch to STAND BY.

2. Unplug the NARKOMED 2B.

3. Disable the DC BATTERY CB1 circuit breaker.

4. Remove the seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO securing 4109666A SHELF ASM-CRT BOX-NM2B.

5. Lift the rear of 4109666A SHELF ASM-CRT BOX-NM2B and disconnect 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.

6. Remove 4109666A SHELF-ASM CRT BOX-NM2B.

7. Use ESD precautionary procedures.

8. Disconnect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B.

9. Disconnect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B

10. Cut 4106068P TIE STRAP-.09W X 4-1/8 BLACK for the 1/8ID hose at 4102164P FTG-RED-1/16ID TO 1/8ID HOSE.

11. Disconnect the 1/8ID hose from 4102164A FTG-RED-1/16ID X 1/8ID HOSE.
    NOTE: Becarefull not to break the plastic hose barb on the solenoid.

12. Disconnect 4109368A HOSE ASM-PATIENT PRESS 38L or 4108528A HOSE ASM-PRESS ALARM W/LUER from 4108996A PANEL ASM-BAROMED (B) INTERFACE.

13. Remove the four (4) 7709014P SCR-BTN HD SKT 4-40x5/16L SS BO securing 4110024F COVER-INTERFACE HOUSING-NM2B.

14. Remove the two (2) 7709004P SCR-BTN HD SKT 6-32x1/4L SS BO securing 4108996A PANEL ASM-BAROMED(B) INTERFACE.

15. Feed the hose from 4108996A PANEL ASM-BAROMED(B) INTERFACE through 4107047P CLIP-POWER 3/8 O and down 4108785F CONDUIT WELD ASM-CABLE.
    NOTE: If a "fish" is attached to the Baromed hose and fed through the conduit weld asm-cable

before it is removed it will make it easier to install the new cable asm. A 22 gauge wire 60 inches long works well for this.

16. Remove the defective 4108996A PANEL ASM-BAROMED(B) INTERFACE.

17. Feed the hose from the new 4108996A PANEL ASM-BAROMED(B) INTERFACE up 4108785F CONDUIT WELD ASM-CABLE through 4107047P CLIP-POWER 3/8 O to 4109638A CHASSIS ASM-PROCESSOR-NM2B.

18. Connect the 1/8ID hose to 4102164P FTG-RED-1/16ID TO 1/8ID HOSE.

19. Install 4106068P TIE STRAP-.09W X 4-1/8L BLACK to secure the 1/8ID hose.

20. Secure 4108996A PANEL ASM-BAROMED(B) INTERFACE with two (2) 7709004P SCR-BTN HD SKT 6-32X1/4L SS BO.

21. Install 4110024F COVER-INTERFACE HOUSING-NM2B with four (4) 7709014P SCR-BTN HD SKT 4-40X5/16 SS BO.

22. Connect 4109368A HOSE ASM-PATIENT PRESS 38L or 4108528A HOSE ASM-PRESS ALARM W/LUER to 4108996A PANEL ASM-BAROMED (B) INTERFACE.

23. Connect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B.

24. Connect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B.

25. Remove the ESD control equipment.

26. Position 4109666A SHELF ASM-CRT BOX-NM2B on top of the NARKOMED 2B.

27. Attach 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4109666A SHELF ASM-CRT BOX-NM2B to 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.

28. Install 4109666A SHELF ASM-CRT BOX-NM2B.

29. Secure 4109666A SHELF ASM-CRT BOX-NM2B with seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO.

30. Enable DC BATTERY CB1 circuit breaker.

31. Plug the NARKOMED 2B into a live receptacle.

32. Perform a complete Periodic Manufacture Service on

the NARKOMED 2B.

PART NUMBER: 4108960A PROCEDURE: REPLACEMENT
DESCRIPTION: PANEL ASM-SPIROMED(B) IF

PART(S) REQUIRED: 4108960A PANEL ASM-SPIROMED(B) IF
SPECIAL TOOL(S) : ESD CONTROL EQUIPMENT

1. Turn the SYSTEM POWER switch to STAND BY.

2. Unplug the NARKOMED 2B.

3. Disable the DC BATTERY CB1 circuit breaker.

4. Remove the seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO securing 4109666A SHELF ASM-CRT BOX-NM2B.

5. Lift the rear of 4109666A SHELF ASM-CRT BOX-NM2B and disconnect 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.

6. Remove 4109666A SHELF-ASM CRT BOX-NM2B.

7. Use ESD precautionary procedures.

8. Disconnect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B.

9. Disconnect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B

10. Disconnect 4108960A PANEL ASM-SPIROMED(B) IF terminal from J9 on 4109638A CHASSIS ASM-PROCESSOR-NM2B

11. Disconnect 4106362A SENSOR ASM-SPIROMED from 4108960A PANEL ASM-SPIROMED(B) IF.

12. Remove the four (4) 7709014P SCR-BTN HD SKT 4-40x5/16L SS BO securing 4110024F COVER-INTERFACE HOUSING-NM2B.

13. Remove the two (2) 7709004P SCR-BTN HD SKT 6-32x1/4L SS BO securing 4108960A PANEL ASM-SPIROMED(B) IF.

14. Remove the one (1) 7701008P SCR-CAP SKT HD 6-32X3/8L securing 4108960A PANEL ASM-SPIROMED(B) IF ground wires.

15. Feed the cable from 4108960A PANEL ASM-SPIROMED(B) IF through 4107047P CLIP-POWER 3/8 O and down 4108785F CONDUIT WELD ASM-CABLE.
    NOTE: If a "fish" is attached to the Spiromed interface cable and fed through the conduit weld asm-cable before it is removed it will make it easier to install the new cable asm. A 22 gauge wire 60 inches long works well

for this.

16. Remove the defective 4108960A PANEL ASM-SPIROMED(B) IF.

17. Feed the cable from the new 4108825A PANEL ASM-SPIROMED(B) IF up 4108785F CONDUIT WELD ASM-CABLE through 4107047P CLIP-POWER 3/8 O to 4109638A CHASSIS ASM-PROCESSOR-NM2B.

18. Connect 41100136 PANEL ASM-NM2B-SPIROMED(B) IF terminal to J9 on 4109638A CHASSIS ASM-PROCESSOR-NM2B.

19. Secure 4108960A PANEL ASM-SPIROMED(B) IF with two (2) 7709004P SCR-BTN HD SKT 6-32X1/4L SS BO.

20. Connect 4108960A PANEL ASM-NM2B-SPIROMED(B) IF ground wires using one (1) 7701008P SCR-CAP SKT HD 6-32X3/8L SS.

21. Install 4110024F COVER-INTERFACE HOUSING-NM2B with four (4) 7709014P SCR-BTN HD SKT 4-40X5/16 SS BO.

22. Connect 4106362A SENSOR ASM-02MED to 4108960A PANEL ASM-SPIROMED(B) IF.

23. Connect J7 BATTERY on 4109634A POWER SUPPLY ASM-NM2B.

24. Connect J1 AC POWER on 4109634A POWER SUPPLY ASM-NM2B

25. Remove the ESD control equipment.

26. Position 4109666A SHELF ASM-CRT BOX-NM2B on top of the NARKOMED 2B.

27. Attach 4109650A WIRE ASM-14GA-GRN/YEL 10LG from 4109666A SHELF ASM-CRT BOX-NM2B to 4107068P ADAPTER-TERM .250X30DEG SINGLE in 4109647A CRT BOX ASM-NM2B.

28. Install 4109666A SHELF ASM-CRT BOX-NM2B.

29. Secure 4109666A SHELF ASM-CRT BOX-NM2B with seven (7) 7709000P SCR-BTN HD SKT 6-32X3/8L SS BO.

30. Enable DC BATTERY CB1 circuit breaker.

31. Plug the NARKOMED 2B into a live receptacle.

32. Perform a complete Periodic Manufacture Service on the NARKOMED 2B.

MANUAL SPHYGMOMANOMETER (OPTIONAL)

A aneroid manual sphygmomanometer can be mounted on the NARKOMED 2B (see Fig. 10-17).

The sphygmomanometer gauge mounts on the left-hand side of the anesthesia machine, above the ventilator bellows, either on a mount on the machine itself or on the underside of the optional boom arm. To install the gauge, tighten the gauge's threaded mounting ring in a clockwise direction over the gauge mount. Then, thread the fitting on the free end of the gauge hose onto the fitting labeled "BP GAUGE" on the upper left side of the anesthesia machine.

To install the blood pressure cuff, first attach the short hose on the cuff to the longer extension hose. The two hoses join with Luer lock fittings. Then, thread the free end of the extension hose over the fitting labeled "BP CUFF" to the left of the "BP GAUGE" fitting on the patient interface panel.

To install the cuff inflation bulb, insert the male Luer fitting (slip-fit type) on the bulb hose into the female Luer fitting (labeled "BP BULB") provided on the front the anesthesia machine to the right of the O2 flush button.

After installation, 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 gauge face plate. The gauge accuracy is $\pm$ 1 % within a range of 75-225 mm Hg and $\pm$ 3% outside of this range.

To check the manual sphygmomanometer for leaks, place the blood pressure cuff around a rigid cylindrical object of approximately the same diameter as a human arm. Inflate the cuff to a pressure of 200 mm Hg, as indicated on the sphygmomanometer gauge. Then, watch the gauge reading for 30 seconds; the gauge indication shall not decrease more than 10 mm Hg within this time period.

To isolate a specific source of leaks, eliminate components from the system and perform the test described above. For example, to exclude the cuff inflation bulb, pinch the cuff inflation hose after inflating the cuff to 200 mm Hg. To exclude the cuff itself, remove the extension hose from the interface panel, occlude the "BP CUFF" fitting, and then pressurize the gauge to a reading of 200 mm Hg.

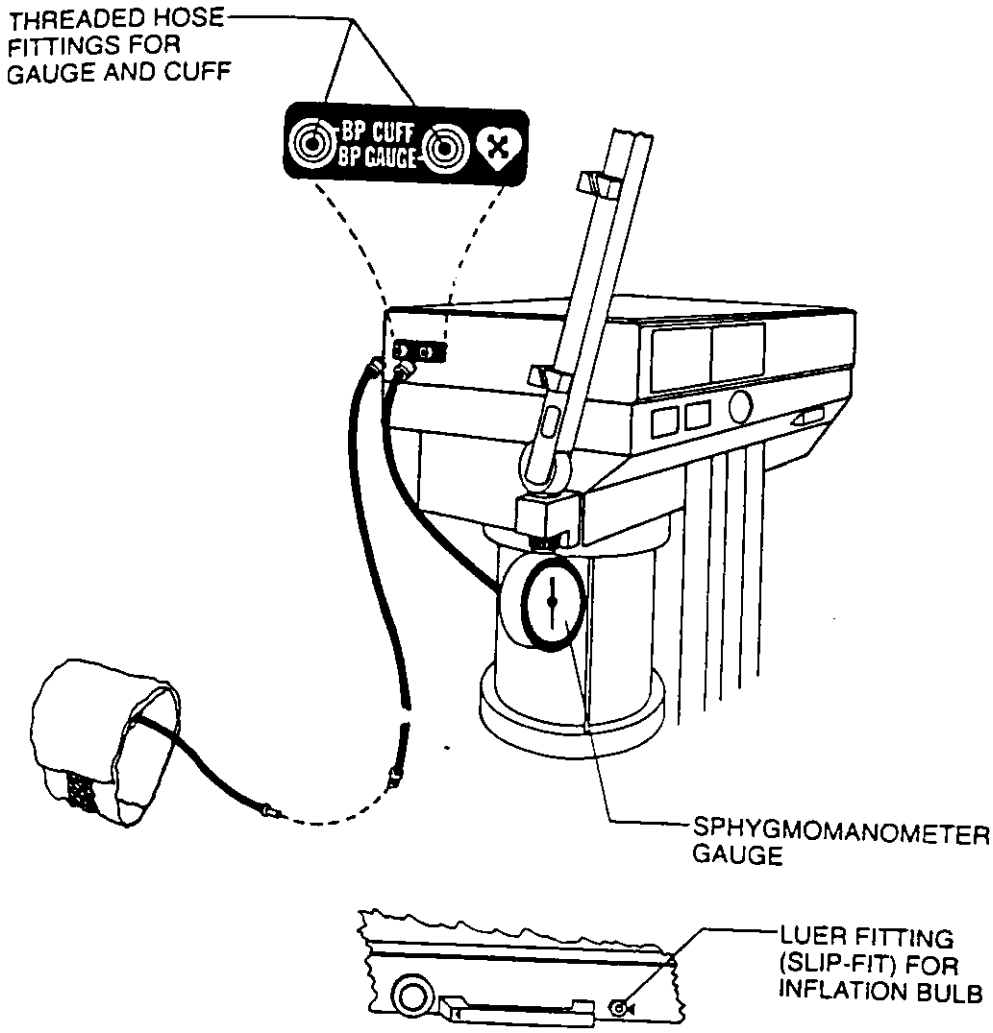


FIGURE 10-17: MANUAL SPHYGMOMANOMETER

In typical usage, the Manual Sphygmomanometer will not require any further cleaning than wipe down with a liquid disinfection agent. However, if further disinfection is required, the sphygmomanometer gauge assembly, hoses, and blood pressure cuff may be removed from the anesthesia machine and sterilized with ethylene oxide gas, followed by appropriate aeration as per the sterilizer manufacturer's instructions.

NOTE: The gauge assembly cannot withstand the heat of autoclaving, and therefore must NOT be autoclaved.