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FOREWORD

This manual is intended to provide the information needed for proper operation of the Datascope MULTINEX and GAS MODULE.

General knowledge of monitoring and an understanding of the features and functions of the Datascope MULTINEX / GAS MODULE are prerequisites for its proper use.

DO NOT OPERATE THIS MONITOR BEFORE READING THESE INSTRUCTIONS.

Information for servicing this instrument is contained in the Datascope MULTINEX / Gas Module Service Manual, Part No. 0070-00-0369. For additional information or assistance, please contact an authorized Datascope representative in your area.

Federal Law restricts this device to sale by or on the order of a physician or other practitioner licensed by state law to use or order the use of this device.

For external communication protocol see Service Manual Supplement: P/N 0070-00-0305, MULTINEX Communication Protocol.

NOTE: In order to ensure the proper performance of your monitoring equipment and to prevent the voiding of the warranty, it is recommended that only parts and accessories provided by Datascope be used with your monitor.

SAFETY CONSIDERATIONS

Please read and adhere to the following safety considerations regarding the use of this instrument.

WARNINGS:

Possible Explosion Hazard - This instrument is not explosion proof and should not be used in the presence of flammable anesthetics.

Internal Electrical Shock Hazard - This unit does not contain any user-serviceable parts. Do not remove instrument covers. Refer servicing to qualified personnel.

Trace Gas Hazard - A health hazard may exist when trace amounts of vaporized anesthetic agents are chronically inspired by operating room personnel. (See Appendix A in NFPA 56A on Inhalation Anesthetics.) During any procedure where such agents are employed, the MULTINEX / Gas Module exhaust output should be connected to a medical gas-scavenging system.

Do not operate this monitor if: some or all of the displays fail to function properly, or the CRT message "FAN FAILURE" occurs.

Insure that the total combined leakage currents do not exceed safe limits.

DO NOT change the voltage selector.

Use only MULTINEX / Gas Module software cartridges in this unit.

CAUTIONS:

NOTE: Prior to applying des. or sev., select **agent id disabled** mode, then select agent. Failure to do so will cause erroneous CO_2, N_2O and agent readings.

Never place fluids on top of the monitor.

Always place the monitor on a flat, rigid surface.

Observe all CAUTION and WARNING labels.

Replace the fuses with specified type and rating.

Grounding reliability can only be achieved when the monitor is connected to an equivalant receptacle marked "Hospital Grade".

RS232 DISCLAIMER - Connection of non-isolated devices to the RS232 Connector on this unit may cause chassis leakage to exceed the specification standards.

EXTERNAL OXIMETER DISCLAIMER - Connection of non-isolated devices to the external oximeter connector on this unit may cause chassis leakage to exceed the specificaiton standards.

UNPACKING

Remove the instrument from the shipping carton and examine it for signs of shipping damage. Save all packing materials, invoice, and bill of lading. These may be required to process a claim with the carrier. Check all materials against the packing list. Contact the Datascope Service Department (800) 288-2121 for prompt assistance in resolving shipping problems.

SERVICING INFORMATION

Datascope maintains a network of service representatives and factory-trained distributors. Prior to requesting service, perform a complete operational check of the instrument to verify proper control settings. If operational problems continue to exist, contact the Datascope Service Department (800) 288-2121 for assistance in determining the nearest field service location.

Please include the instrument model number, the serial number, and a description of the problem with all requests for service.

Any questions regarding the warranty should be directed to:

Domestic Office:

Service Manager
Datascope Corp.
580 Winters Ave.
Paramus, NJ 07652
(800) 288-2121

International Offices:

Service Manager
Datascope B.V.
Dr. W van Royenstraat 8
P.O. Box 26
3870 CA Hoevelaken
Holland
Phone: 31(3325)44911
Fax: 31(3325)72974

Service Manager
Datascope S.A.R.L.
Immeuble Rond Point 93
65 Avenue DU General Gallieni
93100 Montreuil-sous-Bois
France
Phone: 33(1)45139150
Fax: 33(1)45139151

Service Manager
Datascope GmbH
Zeppelinstraße 2-4
D-64625 Bensheim
Germany
Phone: 49(6251)1705-0
Fax: 49(6251)67877

Service Manager
Datascope Medical Co., Ltd.
Lakeview Court
Spitfire Close
Ermine Business Park
Huntingdon, England
Cambs PE186XR
Phone: 44 1 (480)433477
Fax: 44 1 (480)434051

1.0 GENERAL DESCRIPTION AND SPECIFICATIONS

1.1 GENERAL DESCRIPTION

The MULTINEX / GAS MODULE is a breath-by-breath gas analyzer that uses microprocessor technology to calculate and display: End-Tidal CO_2, Inspired CO_2, Inspired and Expired N_2O, Inspired O_2, Inspired and Expired Anesthetic Agents, Respiration Rate, SaO_2, and Pulse Rate.

The monitor features a catheter and breathing tube adaptor; an integral CRT for displays of waveforms, trended data, and user-messages; a user-replaceable software cartridge; an accessible, removable sample cell; external electrical connections for an instrument-connected O_2 cell, an output for an optional recorder; and interfacing connectors for an external oximeter and analog outputs.

Monitor configuration for alarms, displays, analog-outputs, audio controls, and flow rate control is simplified by menus that guide and prompt the operator through each selection.

The MULTINEX is featured in six different unit configurations in addition to the GAS MODULE. The basic unit, the model 4300, features the analytical capabilities for CO_2, N_2O, and O_2.
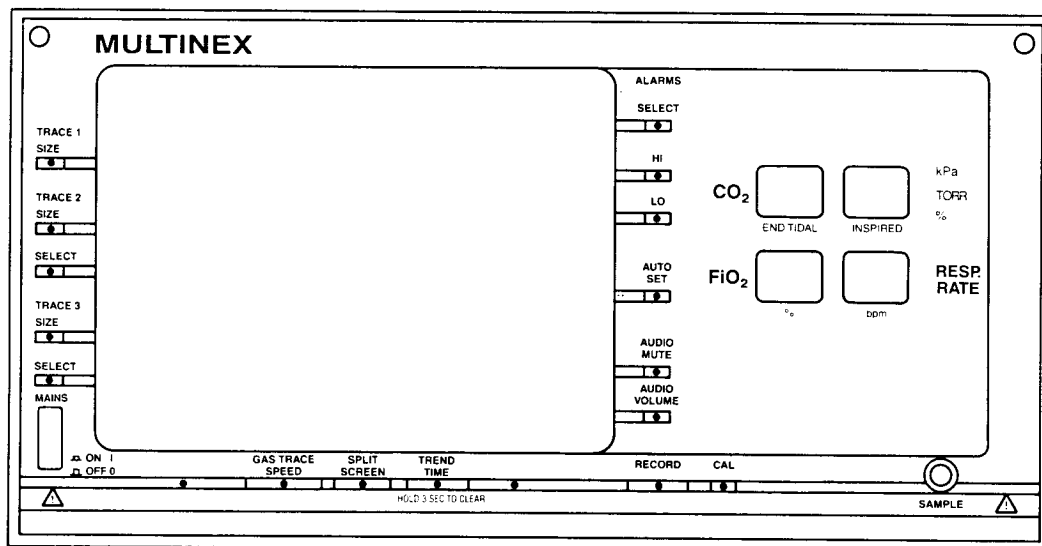
Model 4300

The Model 4200 features the analytical capabilities of the basic unit (CO_2, N_2O, and O_2) plus SaO_2 analysis. It also features a beep volume control key, a patient connector for the oximeter probe, a 2-digit red LED display for SaO_2 data, and a 3-digit red LED display for rate. The SaO_2 and Pulse Rate digital displays update every two seconds, not on each valid breath.
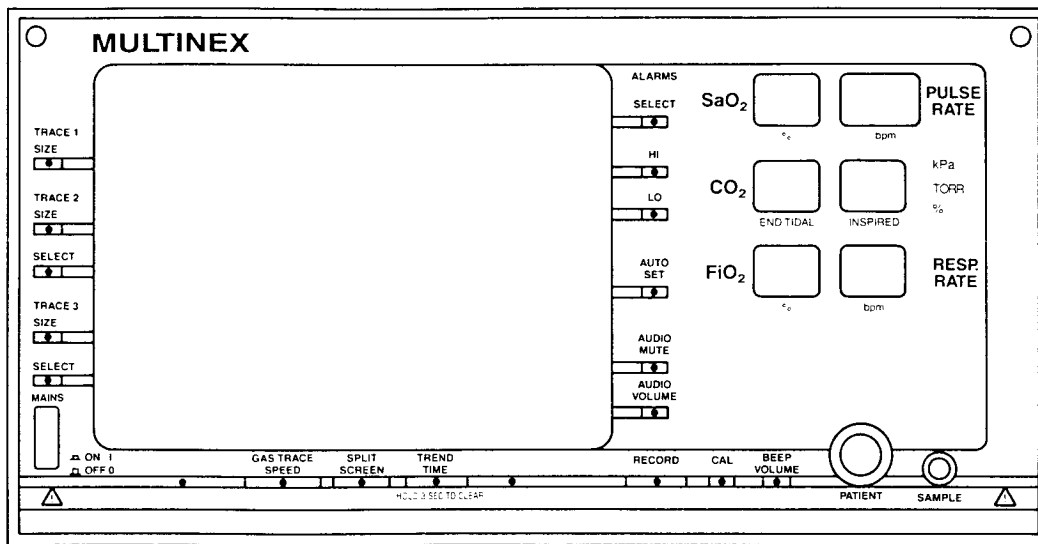
Model 4200

The third configuration for the MULTINEX is the Model 4100ID Plus. It features the analytical capabilities of the basic unit (CO_2, N_2O, and O_2) plus agent identification, either Isoflurane, Halothane, or Enflurane. (If nitrous oxide is used, digital information appears on the CRT.) A front panel "AGENT ID MODE" key is used to select AUTO agent detection, VERIFY agent mode, or agent ID DISABLED mode when using Desflurane or Sevoflurane.

CAUTION: PRIOR TO APPLYING DES. OR SEV., SELECT AGENT ID DISABLED MODE, THEN SELECT AGENT. FAILURE TO DO SO WILL CAUSE ERRONEOUS CO_2, N_2O AND AGENT READINGS.

The unit also features a 2-digit red LED display indicating end tidal concentrations of the selected agent and a 2-digit red LED display indicating inspired concentrations of the selected agent. Both displays update upon the completion of each breath and flicker if new breath data is the same as old breath data.

The fourth configuration, the Model 4100 Plus measures anesthetic agent but does not have agent identification. Instead the user must use the front panel AGENT SELECT key to indicate the anesthetic agent given. The front panel is the same as the 4100ID except that there is no "AGENT ID MODE" key.
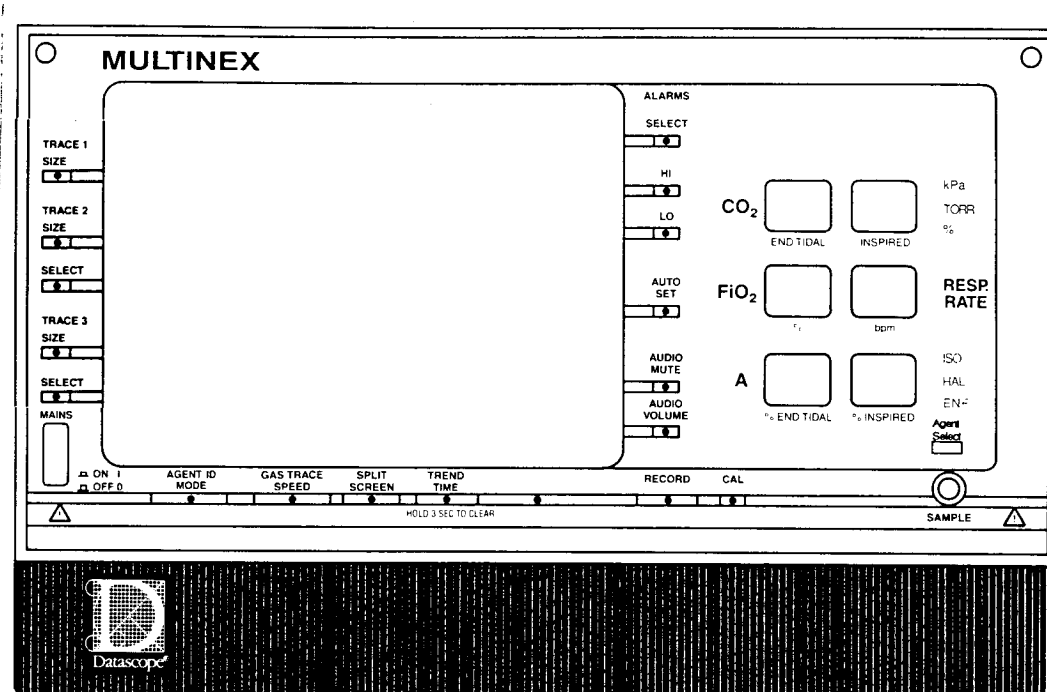
Model 4100 ID PLUS (Model 4100 PLUS)

The fifth configuration, the Model 4000ID Plus, combines all the capabilities of the 4100ID Plus as well as SaO_2.

Accordingly, there is a beep volume control key, a patient connector for the oximeter probe, a 2-digit red LED display for SaO_2 data, a 3-digit red LED display for pulse rate, a 2-digit red LED display to indicate end tidal concentrations of agent, a 2-digit red LED display to indicate inspired concentrations of agent. (If nitrous oxide is used, digtal information appears on the CRT.) A front panel "AGENT ID MODE" is used to select automatic agent detection, verify agent mode, or Agent ID Disabled Mode when using desflurane or sevoflurane.

NOTE: Prior to applying des. or sev., select **agent id disabled** mode, then select agent. Failure to do so will cause erroneous CO_2, N_2O and agent readings.

The sixth configuration, the Model 4000 Plus, measures anesthetic agent but does not have agent identification. Instead the user must use the front panel AGENT SELECT key to indicate the anesthetic agent given. The front panel is the same as the 4000ID except that there is no "AGENT ID MODE" key.
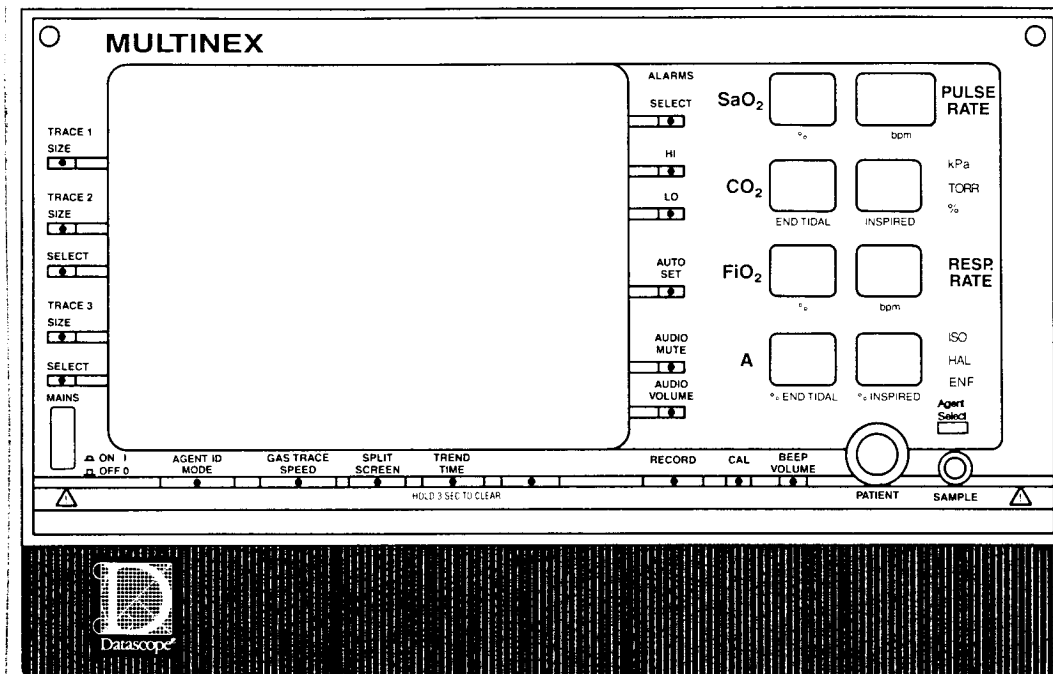
Model 4000 ID PLUS (Model 4000 PLUS)

The seventh configuration is the Gas Module. The Gas Module measures anesthetic agent but does not have agent identification. Instead the user must use the front panel agent SELECT key to indicate the anesthetic agent given.
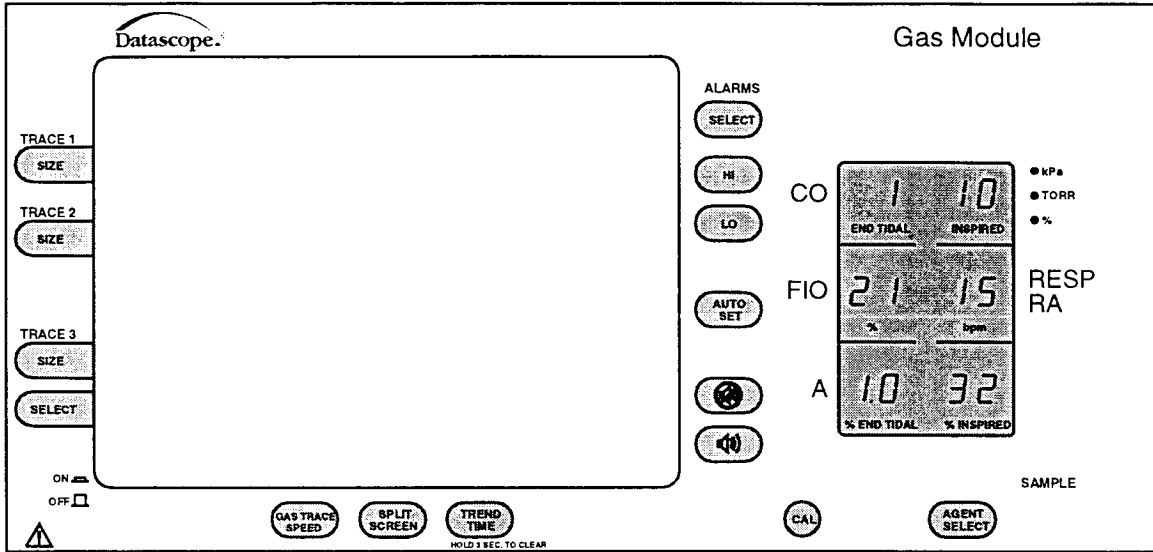
Gas Module

Models	4300	4200	4100ID Plus	4100 Plus	4000ID Plus	4000 Plus	Gas Module
End-Tidal CO_2	●	●	●	●	●	●	●
Inspired CO_2	●	●	●	●	●	●	●
Inspired N_2O	●	●	●	●	●	●	●
Expired N_2O	●	●	●	●	●	●	●
Inspired O_2	●	●	●	●	●	●	●
Inspired O_2 Inspired Anesthetic Agents			●		●		
Expired (Auto ID) Anesthetic Agent			●		●		
Respiration Rate	●	●	●	●	●	●	●
SaO_2		●			●	●	
Pulse Rate		●			●	●	
Inspired (Select) Anesthetic Agents				●		●	●
Expired (Select) Anesthetic Agents				●		●	●

TABLE 1-1
FEATURES OF EACH MODEL

2.0 CONTROLS AND INDICATORS

This section of the Operating Instructions identifies the configurations of the MULTINEX / GAS MODULE and describes each control on each front and rear panel.

Refer to the paragraph numbers listed below for the location of the specific controls and displays.

Step-by-step instructions for operating this instrument are contained in Section 3.0, Operation.

Paragraph Number	Description	Control/Display Number	Page Number
2.1	Front Panels (4000ID Plus, 4100ID Plus, 4200, 4300, Gas Module)	1 - 35	2-2
2.2	Rear Panel	36 - 48	2-10

NOTE: The front panels for Models 4000 Plus and 4100 Plus are identical to the 4000ID Plus and 4100ID Plus, respectively. The only exception is that the 4000 Plus and 4100 Plus do not have the "AGENT ID MODE" key.

NOTE: Prior to applying des. or sev., select agent id disabled mode, then select agent. Failure to do so will cause erroneous CO_2, N_2O and agent readings.

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
▬▬▬	DIRECT CURRENT (DC)		REPLACE FUSE AS MARKED
∼	ALTERNATING CURRENT (AC)		
⏚	PROTECTIVE EARTH (Ground)		
▽	EQUIPOTENTIALITY	⏻	ON / STANDBY SWITCH
⚠	ATTENTION, CONSULT ACCOMPANYING DOCUMENTS / REFER TO MANUAL	⏚	EARTH (Ground)
Ι	ON (power connection to the mains)		
Ο	OFF (power disconnection from the mains)	☼	LAMP
🚶	TYPE B EQUIPMENT		
	TYPE BF EQUIPMENT	ϟ	DANGEROUS VOLTAGE
♥	TYPE CF EQUIPMENT		
♥	DEFIBRILLATOR PROOF OF EQUIPMENT		

2.1 Front Panels

MULTINEX
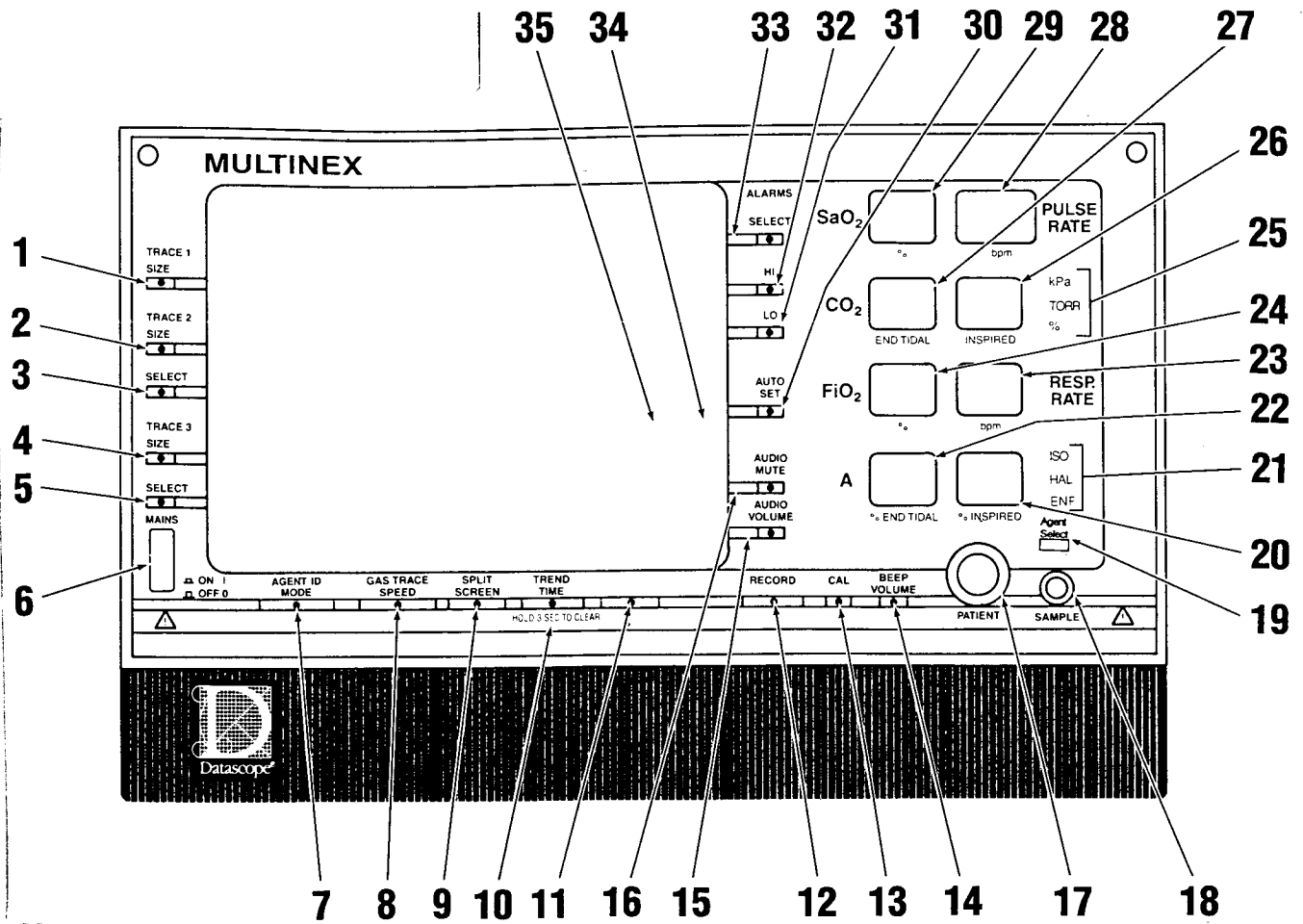
Model 4000 ID PLUS (Model 4000 PLUS)
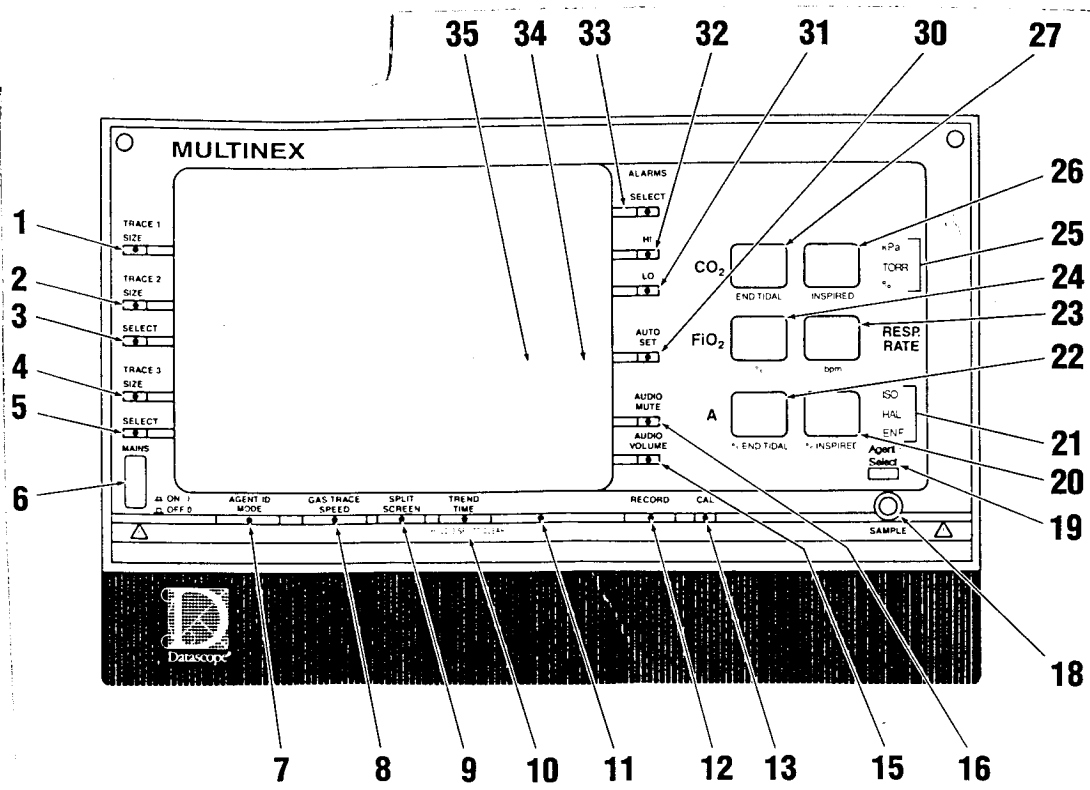
Model 4100 ID PLUS (Model 4100 PLUS)

Model 4200

Model 4300

Gas Module
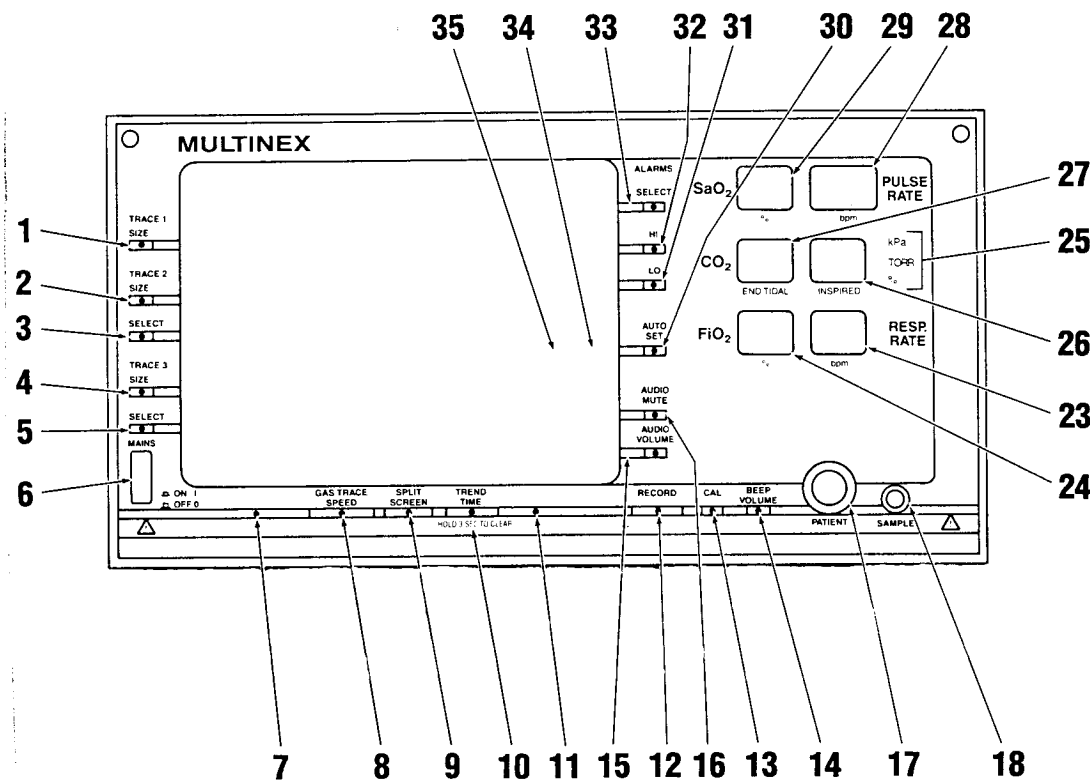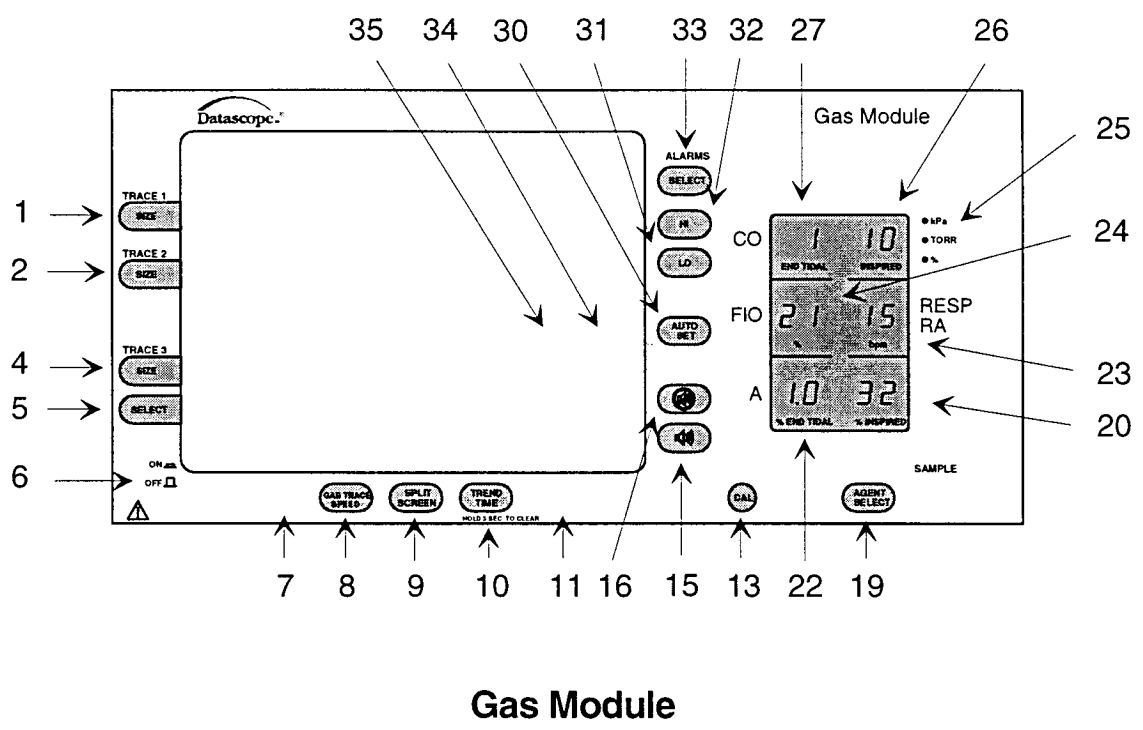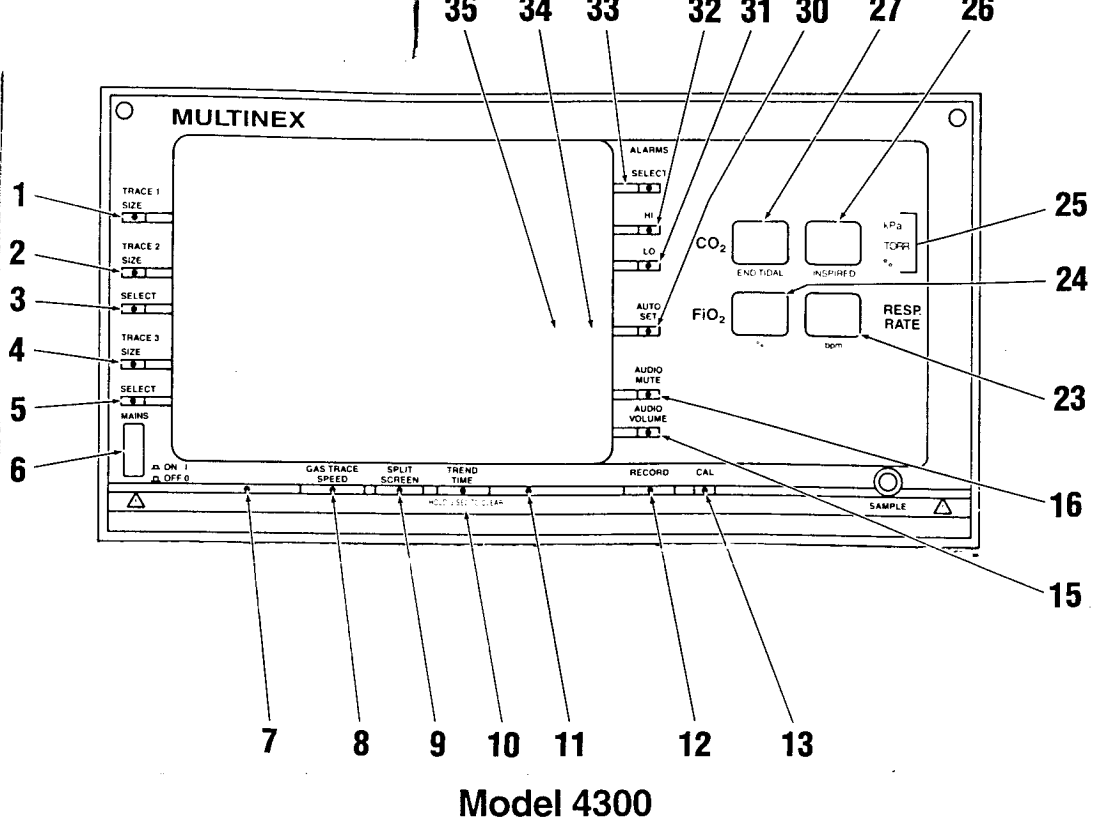
1.	Size - Trace 1	13.	Cal	26.	Inspired CO_2
2.	Size - Trace 2	14.	Beep Volume	27.	$ECTO_2$
3.	Select - Trace 2	15.	Audio Volume	28.	Pulse Rate
4.	Size - Trace 3	16.	Audio Mute	29.	SaO_2
5.	Select - Trace 3	17.	Patient Connector	30.	Auto Set
6.	Power ON/OFF	18.	Sample Luer	31.	Lo
7.	Agent ID mode	19.	Agent Select	32.	Hi
	(Agent ID Units)	20.	Inspired (Agent)	33.	Select
	Left Hidden Key	21.	Illuminated Messages	34.	Inspired N_2O
	(Non-Agent ID Units)	22.	End Tidal (Agent)	35.	Expired N_2O
8.	Trace Speed	23.	Respiration Rate		
9.	Split Screen	24.	Inspired O_2		
10.	Trend Time	25.	Illuminated Messages		
11.	Right Hidden Key		(kPa, Torr, %)		
12.	Record				

1. Size - Trace 1

This key is used to select the scale for the CO_2 waveform/trend display.

2. Size - Trace 2

This key is used to select the scale for the Trace 2 display.

3. Select - Trace 2

This key is used to select a parameter for display on Trace 2. On Agent models the Agent Waveform is always displayed in the Trace 2 position. Therefore, the Select - Trace 2 key is not required on Agent models.

4. Size - Trace 3

This key is used to select the scale for the Trace 3 display.

5. Select - Trace 3

This key is used to select a parameter for display on Trace 3.

6. Power ON/OFF

This pushbutton is used to turn the unit ON or OFF.

7. Agent ID Mode (units with Agent Identification) Left Hidden Key (all other Models)

On units with Agent Identification, this key is used to select agent "AUTO", "VERIFY" or "ID DISABLED" mode and is used in the configuration Menu. On all other models, this key is used during the configuration mode to access the configuration Menu.

8. Gas-Trace Speed

This key is used to select the speed of the gas waveforms displayed on the unit.

9. Split Screen

This key is used to select the portion of the display dedicated to waveform and trend in %, respectively (e.g., 25/75%).

10. Trend Time

This key is used to select the amount of trend time displayed.

11. Right Hidden Key

This key is used during the configuration mode to resume normal operation and to adjust flow rate during normal operation.

12. Record

This key is used to start the printing of screen data on a remote printer.

13. Cal

This key is used to calibrate the instrument.

14. Beep Volume (only available on units equipped with SaO$_2$)

This front panel key is used to control the level of the beep volume.

15. Audio Volume

This key is used to select the sound level for the audible alarm. The selected volume level is displayed on the screen.

16. Audio Mute

This key is used to mute the audio alarm.

17. Patient Connector (units equipped with SaO_2)

A connector used for the oximeter probe.

18. Sample

A female LUER connector used with the catheter to input the patient sample or calibration gas.

19. Agent Select (units with Agent capability)

A switch used to indicate the selected agent (Isoflurane, Halothane, Enflurane, Desflurane or Sevoflurane).

20. Agent - % Inspired (units with Agent capability)

A 2-digit red LED display used to indicate the percentage of inspired agent.

22. Agent - % End Tidal (units with Agent capability)

A 2-digit LED display is used to indicate the percentage of agent end tidal concentrations.

23. Respiration Rate

A 2-digit LED display is used to indicate the respiration rate (0-99 breaths per minute).

24. Inspired O_2

A 2-digit LED display is used to indicate inspired concentrations of oxygen (0-98%).

25. Illuminated Messages (TORR, KPa, %)

When measuring End-Tidal CO_2, this LED backlights the message "TORR, kPa", or "%", depending on the setting of the unit.

26. Inspired CO_2

A 2-digit LED display is used to indicate Inspired CO_2 concentrations in %, kPa, or Torr.

27. ETCO$_2$

A 2-digit LED display is used to indicate Expired CO_2 concentrations in %, kPa, or Torr.

28. Pulse Rate (units equipped with SaO$_2$)

A 3-digit LED display is used to indicate the pulse rate in beats per minute (30-250).

29. SaO$_2$ (units equipped with SaO$_2$)

A 2-digit LED display is used to indicate SaO$_2$ concentrations in units of percent (0-99).

30. Auto Set

This key is used to automatically set and reset the alarm limits.

31. Lo

This key is used to set the selected parameter's low alarm limit.

32. Hi

This key is used to set the selected parameter's high alarm limit.

33. Select

This key is used to select a specific alarm parameter.

34. Inspired N2O

A 2-digit CRT display is used to indicate inspired concentrations of N_2O (0-99%).

35. Expired N2O

A 2-digit CRT display is used to indicate expired concentrations of N_2O (0-99%).

2.2 Rear Panel
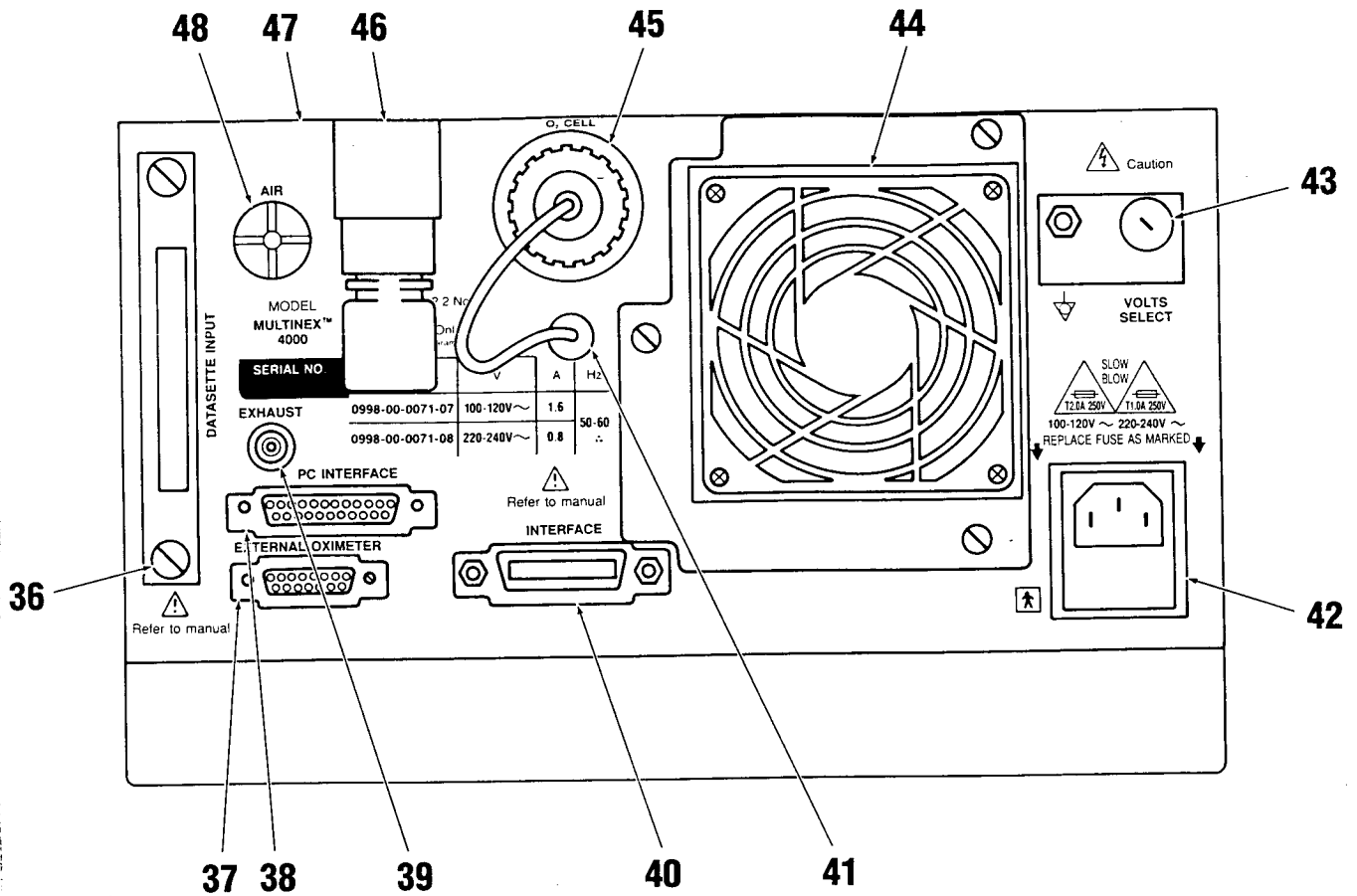
All Models

36. Software Cartridge	42. AC Power Connector and Fuse Module Connector
37. External Oximeter Interface Connector	43. Voltage Selector
38. RS232 Connector	44. Fan
39. Exhaust Luer	45. O$_2$ Cell Mount
40. Datascope Interface Connector	46. Sump
41. External O$_2$ Cell Connector Cable	47. Intake Luer (only available on the 4200 and 4300 models)
	48. Scrubber Cartridge (only available on Agent models)

36. Software Cartridge

A removable cartridge containing an EPROM.

37. External Oximeter Interface Connector

A 15 pin male Sub-D connector.

38. RS232 Connector*

A 25 pin, male Sub-D connector.

39. Exhaust Luer

A male luer fitting used to facilitate the scavenging of patient gases. Do not exceed a 1 mmHg vacuum.

40. Datascope Interface Connector

A 24-pin IEEE #488-1978 type receptacle (Amp Champ P/N 55291-2).

41. External O₂ Cell Connector Cable

An external connection used to determine the concentration of Inspired O_2.

42. AC Power Connector and Fuse Module Connector

A single module used for the AC power cord connection and to house the fuses.

43. Voltage Selector

A two-position rotary switch that is used to select either 90-132V or 198-264V operation.

44. Fan

A device that provides cooling to the unit and access to the sample cell.

* Connection of non-isolated devices to the RS232 Connector on this unit may cause leakage to exceed the specification standards.

45. O$_2$ Cell Mount

An external connection used to mount the O$_2$ cell to the instrument.

46. Sump

Used to collect any fluids that enter the patient sample input; a CRT message indicates when the sump is full.

47. Intake Luer (Non-Agent units only)

Used for a zero-reference gas input during automatic calibration.

48. CO$_2$ Scrubber Cartridge (units with Agent capability)

Removes CO$_2$ from room air for proper CO$_2$ analysis on Agent models.

3.0 OPERATION

This section of the Operating Instructions provides general guidelines and step-by-step instructions for the proper use of the MULTINEX / Gas Module.

Perform all instructions in the order given. Do not omit any instructions. Numbers in parenthesis identify the controls and indicators previously described in Chapter 2, Controls and Indicators.

3.1 General Guidelines

The MULTINEX / Gas Module calculates and displays Inspired O_2, End-Tidal CO_2, Inspired CO_2, Inspired and Expired N_2O, and Respiration Rate.

Inspired and Expired Anesthetic Agent data is only available on units with Agent capability.

NOTE: Prior to applying des. or sev., select agent id disabled mode, then select agent. Failure to do so will cause erroneous CO_2, N_2O and agent readings.

SaO_2 and Pulse Rate data is only available on the 4000 Plus, 4000ID Plus and 4200 models.

Operation of the MULTINEX / Gas Module is based on breath-by-breath measurements via a catheter and a breathing-tube adaptor.

The 7-inch raster type CRT displays a maximum of three trace waveforms, trended data, alarm limits, and user-messages.

Trace 1 always displays the CO_2 waveform.

Trace 2 and Trace 3 are used to display the other available waveforms, i.e., N_2O, Pleth, and Cascaded CO2 (CO2DY). Trace 2 is always the Agent waveform on units with Agent capability.

Each trace area is outlined and scaled with it's appropriate units.

3.2 Initial Set Up

1. Set the front panel AC POWER ON/OFF switch (6) OFF.

2. Check the serial number label and confirm proper voltage configuration. If the instrument voltage selection is not for your particular application, contact a Datascope Service Representative or qualified hospital personnel.

3. If interfacing with other equipment, attach the appropriate interface cable(s) between the MULTINEX / Gas Module rear panel INTERFACE connector and the corresponding INTERFACE connector(s) on the peripheral instrument(s).

4. Attach the line cord to the ac power connector (42) on the MULTINEX and to a properly grounded 3-wire ac receptacle. DO NOT use any adaptors to defeat the U-ground of the cord set.

WARNING: Insure that the total combined leakage currents do not exceed safe limits.

5. Interface the supplied catheter with the breathing-tube adaptor. Follow the instructions included in each package.

6. Attach the supplied catheter (with the breathing tube adaptor) to the sample connector located on the front panel (18). Follow the instructions included in the catheter package.

7. Check for a clean sump. The sump is a disposable item that can be replaced if contaminated. See Section 4.2.3, Sump.

8. Check the sump and O_2 cell for tightness to avoid system leaks.

3.3 Turning Power ON

1. Attach the catheter to the MULTINEX / Gas Module before turning the unit ON.

2. Turn the front panel ON/OFF switch (6) ON.

Observe the illumination of the CRT and digital displays and two audible beeps. The system performs a self-test before proceeding with monitoring. If a problem exists a message will appear identifying it. In some cases a prompt will ask the operator if they wish to continue monitoring (of SaO_2 only). See Section 4.3 for messages and responses.

O_2 cell calibration is the next step in this process and takes two minutes to complete. During O_2 cell calibration, two or three flat traces appear on the screen with the message "O_2CAL: XXX", where XXX denotes the time remaining in seconds until the completion of the O_2 Cal. After the O_2 Cal is complete, the unit calibrates the gas channels and operation begins. The agent channel is not operational for the first five minutes.

The unit is fully operational (reaches full specification) (including agent) after a 5-minute warm-up period. Additional calibrations are recommended at 30 minutes and any time the operator feels the need to re-calibrate (see drift specification).

WARNING: When using the MULTINEX / Gas Module prior to a warm-up period of 5 minutes, its accuracy may not meet specification.

WARNING: Evaporated alcohol or organic vapor will affect the reading of the Halothane, Enflurane or Isoflurane display. Alcohol in the patient's breath cannot be distinguished from an anesthetic agent. A reading of the patient's expired breath on the MULTINEX / Gas Module display should be taken before the administration of an anesthetic agent to establish the presence of alcohol or organic agents.

3.4 Typical Operation

NOTE: The following sequence is presented only to describe to the operator a simple, straight-forward method for using the multinex and **does not** take the place of other instructions described in this manual.

1. Set Up

Connect an ac power cord to the AC Power Connector (42) and into an ac receptacle.

2. Catheter Connection

Attach the catheter to the Sample Connector (18). Attach an appropriate breathing tube adaptor to the catheter.

3. Sensor Connection (Models with SaO_2 option only)

Plug the appropriate Datascope SaO_2 sensor into the Patient Connector (17).

4. Main Power Switch

Press the POWER ON/OFF switch (6) to the ON position.

The unit begins a "self-check" and a two minute calibration for the O_2 cell, followed by a calibration of the CO_2, N_2O and Agent channels.

Auto-calibration occurs during the first 5 minutes.

5. Agent Analysis

a. Agent ID Versions (Models 4000ID Plus, 4100ID Plus) Select the mode of agent identification desired, AUTO, VERIFY or ID DISABLED, using AGENT ID MODE (7). If VERIFY or ID DISABLED is selected, use AGENT SELECT (19) to indicate the agent being delivered.

NOTE: When using Sevoflurane or Suprane, the ID DISABLED mode must be used. The MULTINEX will not AUTO ID or VERIFY Sevoflurane or Suprane.

NOTE: Prior to applying des. or sev., select agent id disabled mode, then select agent. Failure to do so will cause erroneous CO_2, N_2O and agent readings.

b. Agent Versions (Models 4000 Plus, 4100 Plus & Gas Module)
Use AGENT SELECT (19) to indicate the agent being delivered.

6. Operation

The unit contains pre-programmed selections for trace size, speed, selection, trend display, and alarms. The unit is ready to operate immediately after calibration.

To change any of these functions, press the appropriate key (see Sections 3.5, 3.6, 3.7, and 3.8 for more details).

a. Trace - Select:
- Press the appropriate key (Select - Trace 2 (3) or Select - Trace 3 (5)) to select the desired trace.

- Trace 2 (3) - Displays cascaded CO_2*, N_2O, or PLETH (SaO_2 versions only) waveform.

- Trace 3 (5) - Displays a CO_2, N_2O, or PLETH (SaO_2 versions only) waveform.

  NOTE: Trace 1 always displays a CO_2 trace. Trace 2 always displays AGENT on units that measure anesthetic agents.

b. Trace - Size:
- Press the appropriate key (Size - Trace 1 (1), Size - Trace 2 (2), or Size - Trace 3 (4)) to select the size of the trace.

c. Gas Trace Speed (8):
- Press to change the speed of all the displayed gases.

d. Split Screen (9):
- Press to change a portion of the waveform display to a trend presentation. Depressing the key varies the proportion of the displayed waveform and trend.

e. Trend Time (10):
- Selects a time period for the display of trended data. Hold for 3 seconds to clear.

*Cascaded CO_2 allows the CO_2 waveform on trace 1 to be moved to Trace 2 or 3 as Trace 1 is being updated.

7. Alarms

a. Select (33):
- Press to display the alarm parameters on the screen.

- Change the alarm settings by pressing the HI (32) or LO (31) keys.

- Press SELECT (33) to index through the alarm selections. The alarms are set as indicated on the display. The displayed limits disappear after 15 seconds.

- Upon violation or depression of the SELECT key (33), the limits are recalled on the display.

b. Audio Mute (16):
- Press once to silence the audio tone of a violated alarm for two minutes.

- Depress twice within three seconds to cancel all audio alarms for two minutes.

c. Audio Volume (15):
- Controls the sound level of the tone.

d. Auto Set (30):
- Press to automatically set the alarms (CO_2, Pulse Rate, and Inspired Agent only) based on the last five minutes of patient data. Hold for 3 seconds to reset alarms to default settings.

e. Cal (13):
- This button can be used to manually calibrate the CO_2, N_2O and Agent channels whenever needed (see drift specification). It is recommended that the unit be calibrated once at 30 minutes and periodically after that. Note that the corresponding data and displays do not update during a calibration.

- It is normal for the MULTINEX / Gas Module to automatically recalibrate on a periodic basis, if the measurement bench starts to drift.

8. Agent (units with Agent capability only)

a. Agent ID Mode (7)
- Selects the mode of agent identification (4000ID Plus & 4100ID Plus).

- If the AUTO mode is selected and no agent is present, the word "READY" displays on the CRT above the agent trace area. Nothing is illuminated in the agent display window (21). When an Agent is detected, the unit will replace the "READY" message with the name of the Agent identified.

  NOTE: Prior to applying des. or sev., select agent id disabled mode, then select agent. Failure to do so will cause erroneous CO_2, N_2O and agent readings.

- If the VERIFY mode is chosen, the agent selected with the AGENT SELECT key (19) is displayed on the CRT above the agent trace area. When the Agent identified is the same as that selected for verification, a beep tone will be sounded and the agent name listed on the CRT. Otherwise, the message "WRONG AGENT" will appear.

  NOTE: Prior to applying des. or sev., select agent id disabled mode, then select agent. Failure to do so will cause erroneous CO_2, N_2O and agent readings.

- The DISABLE mode is used to disable the ID section and allows the Sevoflurane or Suprane to be selected. These agents must be selected manually and cannot be automatically identified.

b. Agent Select (19) (active in VERIFY and ID DISABLED Mode only):
- Indicates the selected anesthetic agent. Press AGENT SELECT (19) until the selected agent is displayed on the CRT above Trace 2.

  NOTE: N_2O is selected for CRT display via user-configuration. See Section 3.19.

  NOTE: When monitoring one agent and then changing to another, the agent trend display will update for the new agent with a bar between the agent.

  NOTE: Prior to applying des. or sev., select agent id disabled mode, then select agent. Failure to do so will cause erroneous CO_2, N_2O and agent readings.

c. % End Tidal (22)
- Indicates end tidal concentrations of the selected agent (0-8%). Data updates at the completion of each breath. If new breath data is the same as old breath data the display flickers. Flickering indicates a new reading.

d. % Inspired (20):
- Indicates inspired concentrations of the selected agent (0-8%). Data updates at the completion of each breath. If new breath data is the same as old breath data the display flickers. Flickering indicates a new reading.

9. SaO$_2$

a. SaO$_2$ (28)
- Indicates SaO$_2$ concentrations in units of percent (0-99%). Data updates every two seconds.

b. Pulse Rate (28):
- Indicates the SaO$_2$ pulse rate in beats per minute (30-250). Data updates every two seconds.

c. Beep Volume (14):
- Adjusts pulse volume level. Press to sound the beep at the present volume. Press twice within three seconds to change the selected beep volume.

3.5 Waveform Selection and Size

There are five front panel keys (1,2,3,4,5) that control the selection and sizes of the displayed waveforms.

If a selected waveform is not valid for a particular monitor or if that selection already is displayed on another trace, that selection is skipped and the next waveform in the sequence is displayed.

3.5.1 Selection

Trace 1 always displays the CO_2 waveform.

Trace 2 indexes through the following choices (on non-agent units only): N_2O, Pleth, CO_2 Delay (Cascaded CO_2), and Off. Agent units use Trace 2 to display Agent only.

Trace 3 indexes through Pleth, N_2O, and Agent.

3.5.2 Size

The following is a list of the available size selections for the various traces.

	Scale Range		
CO_2:			
TORR:	0 - 80*,	0 - 40,	0 - 100
%:	0 - 10*,	0 - 5,	0 - 12
KPA:	0 - 10*,	0 - 5,	0 - 12
N_2O:	0 - 40*,	0 - 100,	0 - 60
% Agent:	0 - 20*,	0 - 8,	0 - 3
Trends**:			
SaO_2(%):	0 - 100		
Pulse**:	0 - 250*		
Pleth:	1, 2, 4*, 8		

* default values

** Trend SaO_2 and Pulse are available on all models but the 4100 Plus, 4300 and the Gas Module require external oximeters approved to work with MULTINEX. Trend only appears when selected.

3.6 Gas-Trace Speed (8)

1. Press Gas-Trace (8) to change the speed of the erase bar devoted to any gas measurements (CO_2, N_2O, or Agent).

The setting changes the gas trace speed for all displayed gases, (individual settings for different waveforms can not be made.)

The speed of the erase bar can be set to 1, 5, 10, 12.5*, or 25 mm/s.

The plethysmograph trace speed is fixed at 25 mm/s, regardless of the Gas Trace Speed setting.

3.7 Split Screen (9)

1. Press Split Screen (9) to change the proportion of the display dedicated to waveform data and trended data.

Split Screen combinations are as follows:

Waveform/Trend (%)
100/0 (all waveform, no trend)
75/25*
50/50
25/75
0/100 (no waveform, all trend)

The selected split screen setting affects all displayed waveforms.

* default values

3.8 Trend Time (10)

1. Press Trend Time (10) to change the time scales for trend presentations.

The available time scales are as follows:

10 min, 30 min*, 1 hr, 2 hr, 4 hr, 8 hr, 12 hr

(Trend information is always maintained for each parameter, even when not displayed.)

The selected trend time is displayed to fit the trend space allocated by the split screen selection. The Trend Time setting selection applies to all waveforms.

2. Press Trend Time for three or more seconds to clear the trend memory.

When changing alarm limits, a visible gap may appear in the SaO2 and Pulse Rate trend display. This indicates that the data point for that position was not recorded.

NOTE: The SaO_2 trend area displays two parameters, % SaO_2 and Pulse Rate. The SaO_2 waveform is a plethysmograph waveform.

3.9 Record (12)

1. Press Record (12) with the 2000RS set for "CO_2" and "Auto" to print the real-time capnogram and the available digital information.

To record real-time trend of CO_2, the recorder should be set to run at 1 or 5 mm/min. and CO_2 selected.

Using the user configuration mode, % SaO_2 can be super-imposed on the CO_2 real-time trend.

* default values

3.10 Cal (13)

During MULTINEX / Gas Module operation, an internal calibration process can be performed for CO_2, N_2O, and Agent.

1. Press Cal (13) to begin this calibration process.

WARNING: Parameters are not monitored during this calibration.

It is normal for the MULTINEX / Gas Module to automatically recalibrate on a periodic basis, if the measurement bench begins to drift.

3.11 Alarms

Visual alarm data is provided on the right side of the CRT. This data appears upon initial power-up and disappears after 15 seconds.

Press SELECT (33) to recall alarm data at any time. Alarm data is also displayed when AUTO SET (30) is pressed. This information is displayed for 15 seconds.

Alarm limits are considered violated if the displayed value equals or exceeds the upper limit or is equal to or below the lower alarm limit.

Upon an alarm violation, alarm limits appear with the violated parameter highlighted.

The alarm limit visual indicators will remain until the alarm condition no longer exists.

The following chart outlines the available alarm parameters, the low and high alarm ranges, and the audio tones associated with the alarm violation.

Alarm Parameters, Range, and Audio Response

Displays on Models	Parameter	Range	Units Increments	Default	Audio Response
All	$ETCO_2$ (Torr)	High - 20-80 Low - 0-60, Off	5 5	80 Off	Continuous on violation Continuous on violation
All	Inspired O_2 (%)	High - 40-95, Off Low - 18, 20-80	5 5	Off 18	Beep 1/4 s; every 10 s Continuous on violation
All	Inspired CO_2 (Torr)	High - 0-25, Low - 0-25, Off	5 5	15 Off	Beep 1/4 s;on violation Beep 1/4 s; every 10 s
All	Resp. Rate (bpm)	High - 5-95, Off Low - 2-10, Off	5 1	Off 2	Beep 1/4 s; every 10 s Beep 1/4 s; every 10 s
4000ID Plus 4000 Plus 4200	SaO_2 (% SaO_2)	High - 80-99, Off Low - 50-85, Off 86-95, Off	1 5 1	Off 85	Continuous on violation Continuous on violation Continuous on violation
4000ID Plus 4000 Plus 4200	Pulse Rate (bpm)	Hi - 100-250, Off Low - 30-99, Off	5 5	Off Off	Continuous on violation Continuous on violation
4000ID Plus 4000 Plus 4100 Plus Gas Module	Inspired Agent (%)	High - 0-20 Low - 0-3, Off	1 1	6 Off	Continuous on violation Beep 1/4 s; every 10 s
4000ID Plus 4000 Plus 4200	Sensor Off Check Sensor No Pulse	n/a	n/a	n/a	4 second warning tone
4000ID Plus	Wrong Agent	n/a	n/a	n/a	4 second warning tone
4000ID Plus	Mixed Agent	n/a	n/a	n/a	2 beeps

NOTES:

- SaO_2 and Pulse Rate alarms are not available when using an external oximeter. Warning tones and SaO_2 messages will also not be present.

- LED displays always flash once per second during each violation. Violated alarm limit is displayed in reverse graphics on the CRT.

- CO_2 alarms can also be set in % or KPa, but only to whole numbers (1%, 2%, etc...).

- Alarm limits are considered violated if the displayed value equals or exceeds the upper alarm limit or is equal to or below the lower alarm limit.

The MULTINEX / Gas Module alarms on all alarm limit violations and for the following apnea conditions:

Breath not Detected During Normal Monitoring	Audio Response
after: 28-32 seconds	A 1/4 second audible alarm tone at the selected alarm loudness
43-47 seconds	Two 1/4 second audible alarm tones at the selected alarm loudness
60 seconds	A 4 second audible alarm tone at maximum volume followed by a 16 second audible alarm tone at the selected alarm loudness. the total 20 seconds of alarm is modulated at 1 Hz.

If a valid breath is detected during this sequence the alarm timer and CRT message reset.

Initially, the apnea alarm is disabled until the unit detects two initial breaths.

NOTE: During a cal sequence apnea conditions are detected but, alarm is delayed until cal is completed.

3.12 Alarm Keys - Setting Alarms

Six keys are used to control the alarm function of the MULTINEX / Gas Module. They are: AUTO SET (30), SELECT (33), HI (32), LO (31), AUDIO MUTE (16), and AUDIO VOLUME (15).

Alarms can be set manually by using the SELECT (33), HI (32), and LO (31) keys, or automatically.

3.12.1 SEL, HI, and LO

The SELECT, HI, and LO keys are used to manually set the alarm limits.

1. Press SELECT (33) until the desired alarm parameter highlights in reverse graphics.

2. Press HI (32) until the desired high alarm limit appears.

3. Press LO (31) until the desired low alarm limit appears.

4. Press SELECT (33) to repeat the above-stated process for the remaining parameters.

If SELECT remains inactive for two seconds, the currently displayed alarm limits set automatically.

3.12.2 Auto Set - Automatic Setting of Alarms

The Auto Set feature can be used after collecting five minutes of patient data. The unit automatically calculates alarm limits for CO_2, Agent, and Pulse Rate, based on 20% above and below the mean, and automatically updates the limit displays.

1. Press Auto Set (30) to automatically set the alarm limits.

The alarm limits are based on the most recent five minutes of patient data.

Each time AUTO SET (30) is pressed the alarm limits are recalculated based on the past four minutes of patient data. Once set, the alarms are fixed and do not change until this key is pressed again or when the limits are manually changed.

"AUTO ALARMS SET" is displayed on the screen for 20 seconds after all limits have been set. The alarm data will be displayed on the right side of the CRT.

NOTE: Assure that the message "AUTO ALARMS SET" appears on the CRT. If the message does not appear either five minutes of data is not available or alarms were not set. Press AUTO SET (30) again or wait for data to accumulate.

The alarms **do not** update with new data. To set new auto alarm values, press AUTO SET (30) again. This can be done at any time during monitor use.

NOTE: The Pulse Rate Auto Alarms are set 2 and 8 seconds after the "AUTO ALARM SET" message is displayed.

2. Press and hold AUTO SET (30) for 3 seconds to reset alarm limits to the default settings. An "AUTO ALARMS RESET" message will appear on the CRT for 20 seconds.

3.12.3 Audio Mute

The AUDIO MUTE (16) key is used to silence the audio tone produced by a violated alarm limit.

1. Press AUDIO MUTE (16) to silence the audio tone. The alarm is muted for two minutes. The message "MUTED" is displayed on the CRT during this time.

2. Press AUDIO MUTE (16) twice within three seconds to disable all the alarms for two minutes. The message "ALL MUTED" is displayed on the CRT during this time.

Audio Mute is automatically canceled during the two minute time period if the parameters come back within acceptable limits and if all the alarms have not been "ALL MUTED".

Violated alarm limits are displayed in reverse graphics and the corresponding LEDs are flashed at a 1 Hz rate.

3.12.4 Audio Volume

The AUDIO VOLUME key (15) is used to control the loudness of the alarm tone.

1. Press AUDIO VOLUME (15) to sound the tone at the present alarm volume.

2. Press AUDIO VOLUME twice within 3 seconds to change the alarm audio level.

A CRT display, to the left of the AUDIO VOLUME key, provides a visual indication of audio loudness. The OFF selection is the only level which remains displayed.

The alarm volume range is: OFF, Low, Medium, and High. The default is set at Low.

The audio volume level is displayed for 15 seconds.

3.13 Digital Displays

The digital displays for $ETCO_2$, Inspired CO_2, Inspired O_2, and Respiration Rate are each shown in a separate 2-digit, LED. The digital displays for Inspired and Expired N_2O are each shown in a separate 2-digit CRT display (when alarms not visible).

The MULTINEX / Gas Module will first display instantaneous readings of Inspired and Expired CO_2 (Mode A) until the detection of two valid breaths (Mode B). Updated values for all the parameters are then displayed at the completion of each breath. (Breath completion is defined by the CO_2 channel). N_2O and agent values synchronize with CO_2.

The unit switches to Mode A whenever a breath is not detected for 30 seconds. Additionally, Respiration Rate (23) is blank whenever a breath is not detected within a period of two times the immediate previous breath rate period.

The unit can be user-configured to display CO_2 values that are compensated for water vapor and/or altitude (see section 3.21.1). When either of these options are selected, the CO_2 header above Trace 1 changes as shown below:

Header Display	Compensation for Water Vapor?	Altitude?
CO_2	No	Yes
CO_2W	Yes	Yes
PCO_2	No	No
PCO_2W	Yes	No

The Digital Displays chart, on pages 3-19 and 3-20, describes specific information for each parameter.

The digital displays flicker upon breath completion if the updated data remains the same.

3.14 Trend Displays

Trend information for the gas parameters, CO_2, N_2O, and anesthetic agent, are displayed to the right of their respective real time waveforms. A single vertical line can represent a single breath, or the average of multiple breaths occurring over a period of time. The period of time represented by a single vertical trend line depends on the SPLIT SCREEN trend percentage and the TREND TIME selected.

Trend information for the SaO_2 and pulse rate are displayed together on the right of the plethysmograph waveform. As trend data accumulates the upper set of points represent the SaO_2 trend. The range of the SaO_2 trend display is the entire vertical size of the rectangle that encloses it, with the top line representing 100% SaO_2, and the bottom line representing 60% SaO_2.

The lower set of data represents the pulse rate trend. The range for this parameter is defined similarly to the SaO_2, with the top line representing 250 BPM and the bottom line representing 0 BPM.

For all trend displays, the earliest information appears farthest to the right with the most recent information appearing at the left of the trend partition.

3.15 Sampling Flow Rate/O$_2$ Cal Adjust Sequence

1. To display the sampling flow rate, first press the ALARM SELECT key (33), then press the RIGHT HIDDEN key (11). Use the ALARM HI key (32) to change the sampling flow rate to another selection. The monitor will default to the originally displayed flow rate at each power up unless changed in the user configuration mode.

2. The O_2 CAL ADJUST +/- is a utility that enables the operator, while in the run mode, to adjust the O_2 display within the O_2 accuracy tolerance.

To enter the O_2 CAL ADJUST +/- mode, press the ALARM SELECT key (33), then press the RIGHT HIDDEN key (11). Use the ALARM SELECT key to highlight O_2 CAL ADJUST +/-. Adjust O_2 display by pressing the HI and/or LO keys to raise or lower the displayed O_2 reading at each power up.

Digital Displays						
	Range	Display	Displays at end of each breath in units of	Indicates new breath but same breath data	Alarm Limit Violation	Apnea Detection
ETCO2	0-76 TORR* 0-10% 0-10 KPA	2-digit amber LED	0-1 % 0.1 KPA 1 TORR	display flickers	display flashes at 1 Hz	shows current instantaneous level of Exp'd CO2 (Mode A) until detection of 2 new valid breaths (Mode B)
Insp. CO2**	0-76 TORR 0-10% 0-10 KPA	2-digit amber LED	0-1 % 0.1 KPA 1 TORR	display flickers	display flashes at 1 Hz	display blanks
Insp. O2	0-99%	2-digit amber LED	1%	display flickers	display flashes at 1 Hz	shows current instantaneous level of Insp. O_2 (Mode A) until detection of 2 new valid breaths (Mode B)
Resp. Rate	0-98 breaths/min	2-digit amber LED	1 BPM	display flickers	display flashes at 1 Hz	displays blanks*
Insp. N_2O	0-99%	2-digit CRT display	1%	display flickers		displays blanks
Exp. N_2O	0-99%	2-digit CRT display	1%	display flickers		shows current instantaneous level of Exp. N_2O (Mode A) until detection of 2 new valid breaths (Mode B)
SaO2	0-99%	2-digit amber LED	1%	display flickers	display flashes at 1 Hz	
Agent ET	0-7%, Halothane 0-7.5%,Enflurane 0-7.5%,Isoflorane 0-20%,Desflurane 0-9%,Sevoflurane	2-digit amber LED	.1% Desflurane - .1% (0-9.9%) 1% (10-20%)	display flickers	display flashes at 1 Hz	shows current instantaneous level of Agent ET (Mode A) until detection of 2 new valid breaths (Mode B)
Agent Inspired	0-7%, Halothane 0-7.5%,Enflurane 0-7.5%,Isoflorane 0-20%,Desflurane 0-9%,Sevoflurane	2-digit amber LED	.1% Desflurane - .1% (0-9.9%) 1% (10-20%)	display flickers	display flashes at 1 Hz	displays blanks
Pulse Rate	30-250 BPM	2-digit amber LED	1 BPM	display flickers	display flashes at 1 Hz	

* Display also blanks if breaths are not detected within a period of two times the previous breath rate period.

** CO2 readings can be compensated for water vapor and/or altitude via the user-configuration. (See Section 3.21.1 and 6.4 for details)

3.16 O$_2$ Cell (45)

The O$_2$ cell is used to determine the concentration of Inspired O$_2$. Replace the O$_2$ cell whenever "--" appears in the O$_2$ display following the power-up O$_2$ Cal. See Section 4.4, Replaceable Items.

3.17 Sump (46)

The disposable sump is used to collect fluids that enter the unit. It should be checked after each use. Replace or empty the sump when full. See Section 4.4, Replaceable Items.

3.18 Scrubber Cartridge (48)

The scrubber cartridge is used to accurately calibrate the CO$_2$ channel on Agent units. Replace the cartridge every 6 months or whenever a CRT message directs you to do so. See Section 4.4, Replaceable Items.

3.19 Software Cartridge (36)

The unit has incorporated, on the rear panel, a user-replaceable software cartridge. This provides the operator with easy acess for software upgrade/replacement. Replace the cartridge when necessary. See Section 4.4, Replaceable Items. **NOTE:** Ensure that the correct software cartridge is being used with the model MULTINEX it is intended to be used with.

3.20 Intake and Exhaust Luers (47, 39)

The Intake Luer is used to sample room air to establish calibration accuracy for the various gas sensors. Do not block or inhibit the flow of air through this port.

The Exhaust Luer is provided as a waste gas port, outputting to the scavenge gas input on anesthesia machines. Do not block or inhibit the flow of gas, or pull a constant vacuum greater than 1 mmHg.

3.21 User Configuration

3.21.1 User Configuration Mode

User-configuration menus for Display Parameters, CO_2/SaO_2 Output, Audio Control, Flow Rate Control, Alarm Limits, Trace Options, and Agent Default are available on the MULTINEX / Gas Module.

Access each of the above-stated menus through the Main Menu when in the User-Configuration Mode.

1. Press and hold SELECT (33) while turning the MULTINEX / Gas Module ON. Hold SELECT pressed until the first beep is heard.

2. Choose User Configuration (left hidden key (7)).

The Main Menu displays on the CRT.

		ALARMS
TRACE 1 SIZE	MAIN MENU — Select	SELECT
TRACE 2 SIZE	Enter — Display Parameters	HI
	CO2/SaO2 Output	LOW
SELECT	Audio Control	AUTO SET
TRACE 3 SIZE	Flow Rate Control	
	Exit	AUDIO MUTE
SELECT		AUDIO VOLUME
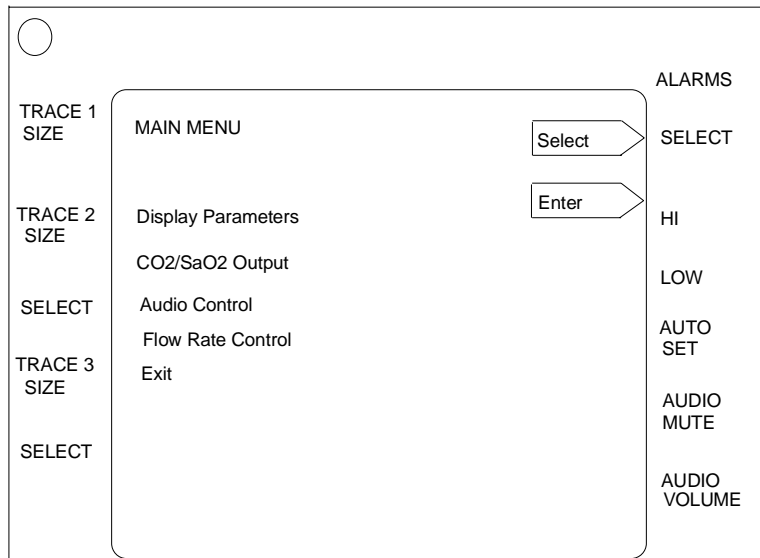
SELECT and ENTER are displayed on the CRT next to the Alarm SELECT (33) and HI (32) keys.

3. Press SELECT (33) to choose a particular menu.

4. Press "Enter" (HI (32)) to access menu choice.

5. Choose "Exit" in the menu to obtain the previous menu display.

6. Proceed to the main menu. Choose EXIT (right hidden key (11)) to resume normal operation. The normal MULTINEX / Gas Module screen displays.

The following lists the menus found in User-Configuration.

MAIN MENU	CONFIGURABLE ITEMS	SETTINGS
DISPLAY PARAMETERS	CO_2 Units	TORR, KPA, %, Exit
	CO_2 Pressure Compensation	CO_2 at sea level (760mmHg) CO_2 at local barometric pressure Exit
	CO_2 Water Vapor Compensation	No compensation Compensate for water vapor Exit
	Gas Trace Speed Default	1, 5, 10, 12.5, 25mm/sec, Exit

	Gas Trace Scale Default	CO2: 0-40 Torr, 0-5 KPA, 0-5%
		               0-80 Torr, 0-10 KPA, 0-10%
		               0-100 Torr, 0-12 KPA, 0-12%
		               Exit
		N_2O: 0-40, 0-60, 0-100, Exit
		AGENT: 0-2%, 0-4%, 0-8%*, Exit
		Exit

	Trend/Trace Partition Default	0/100%, 25/75%, 50/50%, 75/25%, 100/0%, Exit
	Trend Time Default	10 min, 30 min, 1 hr, 2 hr, 4 hr, 8 hr, 12hr, Exit
	N_2O Display Option	Disable, Enable, Exit
	EXIT	
CO_2/SaO_2 OUTPUT	CO_2 Only	
	CO_2/SaO_2 Multiplexed	
	EXIT	
AUDIO CONTROL	Minimum Default Volume	Off, Low, Exit
	Audio Level Default	Low High Medium Exit
	EXIT	
FLOW RATE CONTROL		50 cc, 100 cc, 150 cc, 200 cc, Exit

MAIN MENU	CONFIGURABLE ITEMS	SETTINGS	
ALARM LIMITS		HI SCALE	LO SCALE
	$InspCO_2$ (TORR)	00,05,10,15,20,25	00,05,10,15,20,25,OFF
	$InspN_2O$	Not Available	Not Available
	InspAgent	00,01,02,03,04,05,06 ...20	00,01,02,03,OFF
	SaO_2	OFF,80,81,82,83,84, 85,86,87,...99	50,55,60,65,70,75, 80,85,86,87,88,89,90 91,92,93,94,95
	Pulse Rate	100,105,110,115, 120,125,130,...250	OFF,30,35,40,45,50, 55,60,...100
	$ETCO_2$ (TORR)	20,25,30,35,40,45, 50,55,60,65,70,75,80	OFF,00,05,10,15,20,25, 30,35,40,45,50,55,60
	$ExpN_2O$	Not Available	Not Available
	ExpAgent	Not Available	Not Available
	FIO_2	OFF,40,45,50,55,60, 65,70,75,80,85,90,95	18,20,25,30,35,40,45, 50,55,60,65,70,75,80
	Resp Rate	OFF,05,10,15,20,25, 30,35,40,45,50,55,...90,95	OFF,02,03,04,05, 06,07,08,09,10
	EXIT		
TRACE OPTION (Agent Models)	2 Trace Mode	CO_2/Agent	
	3 Trace Mode	CO_2/Agent/Pleth CO_2/Agent/CO_2 Delay	
	EXIT		
TRACE OPTION (Non-Agent Models)	2 Trace Mode	CO_2/Pleth CO_2/N_2O CO_2/CO_2 Delay	
	3 Trace Mode	CO_2/Pleth/N_2O CO_2/N_2O/Pleth CO_2/CO_2 Delay/N_2O CO_2/CO_2 Delay/Pleth	
	EXIT		
AGENT DEFAULT (Agent Models)	Agent Monitored	ISO, HAL, ENF, DES, SEV	
	EXIT		
AGENT DEFAULT (Agent Models)	Agent ID Mode	Verify ISO, Verify HAL, Verify ENF, Auto ID, ID DISABLED	
	EXIT		

3.21.2 Typical Configuration Menu Sequence

Shown below is a typical menu sequence for changing CO_2 units from TORR to %.

1. Press SELECT (33) while turning the MULTINEX / Gas Module on.

2. Press left hidden key (7) to obtain Main Menu.

3. Press SELECT (33) until Display Parameter is displayed in reverse graphics.
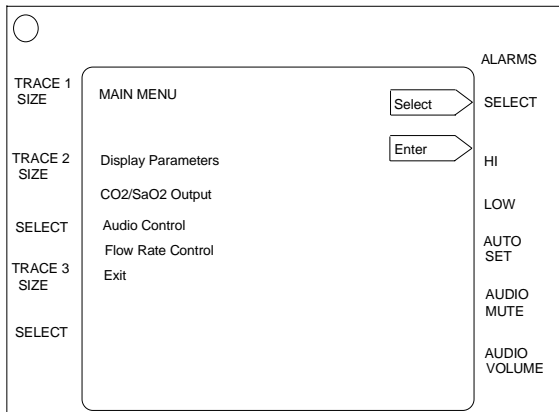
MAIN MENU screen: TRACE 1 SIZE MAIN MENU — Select — ALARMS / SELECT Enter — HI Display Parameters — LOW CO2/SaO2 Output — AUTO SET TRACE 2 SIZE — Audio Control Flow Rate Control — AUDIO MUTE TRACE 3 SIZE — Exit SELECT — AUDIO VOLUME	**4.** Press ENTER (HI (32)).
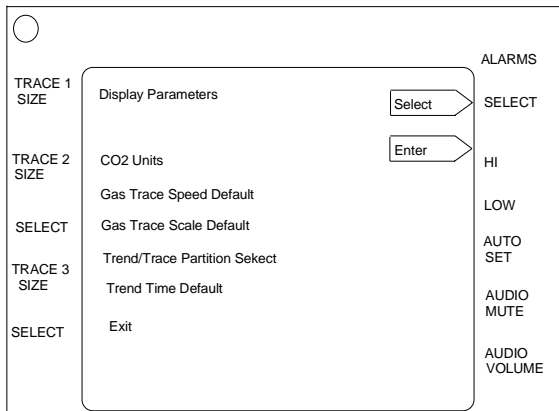
5. Press SELECT (33) and choose CO_2 Units.

6. Press ENTER (HI (32).

Display Parameters screen:

TRACE 1 SIZE — Display Parameters — Select — ALARMS / SELECT
Enter — HI
TRACE 2 SIZE — CO2 Units
Gas Trace Speed Default — LOW
Gas Trace Scale Default — AUTO SET
SELECT
Trend/Trace Partition Sekect
TRACE 3 SIZE — Trend Time Default — AUDIO MUTE
SELECT — Exit — AUDIO VOLUME
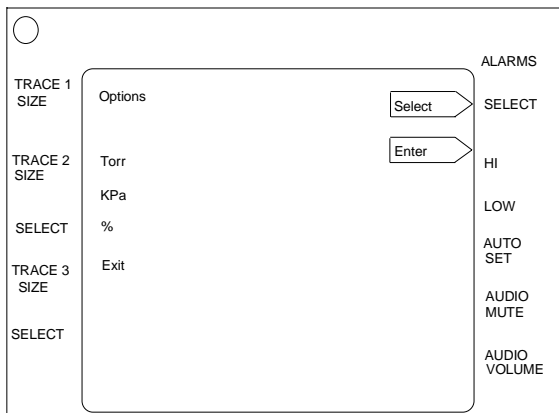
7. Press SELECT (33) and choose %.

8. Press ENTER (HI (32)).

Options screen:

TRACE 1 SIZE — Options — Select — ALARMS / SELECT
Enter — HI
TRACE 2 SIZE — Torr
KPa — LOW
SELECT — % — AUTO SET
TRACE 3 SIZE — Exit — AUDIO MUTE
SELECT — AUDIO VOLUME

3.21.3 CO$_2$/SaO$_2$ Output Configuration

This menu allows two selections:

- CO$_2$ Only
- CO$_2$/SaO$_2$ Multiplexed

The output configuration refers to the CO$_2$ analog output on pin 16 of the Datascope Interface Connector (40).

When the CO$_2$/SaO$_2$ Multiplexed mode is selected, a pulse one tenth of a second long is added to the CO$_2$ waveform every 10 seconds. The height of the pulse shows the current SaO$_2$ value. Scaled at 1% SaO$_2$ per mm., with a range of 60% to 100% SaO$_2$.

3.22 Interfacing

The MULTINEX / Gas Module can interface with various equipment to provide the following communication facilities to external devices:

- Analog outputs to compatible chart recorders
- Analog plethysmograph input from external oximeters
- Datascope Bus Connector for Datascope 2000RS (not applicable to Gas Module)
- Patient Data, Limits and Status to personal computers

3.22.1 With Datascope ACCUSAT

An externally derived ACCUSAT plethsmograph can be displayed on the CRT of models 4300, 4100 Plus, Gas Module and 4100ID Plus.

1. Connect interface cable (0012-00-0547) between the MULTINEX / Gas Module rear panel INTERFACE connector (40) and the interface connector on the rear panel of the ACCUSAT.

2. Select PLETH on the MULTINEX / Gas Module.

NOTE: Models 4000ID Plus, 4000 Plus, and 4200 use an internal oximeter.

3.22.2 Interfacing with the 3000 or 3000A Monitor

1. Connect the interface cable (0012-00-0547) between the MULTINEX rear panel INTERFACE connector (40) and the interface connector on the rear panel of the 3000 or 3000A. See section 5.3 in the Operating Instructions for the procedure on how to mount these units together.

2. When the 3000 Monitor is interfaced with Multinex Multi-Gas Monitor, the recorder will annotate the monitored gases at the top edge of the strip chart recording. When CO_2 is selected as the source, an 11.5cm long recording strip of CO_2 waveform (9.2 seconds for 12.5mm/sec, 115 seconds for 1mm/sec) is output along with time, date, and CO_2 scale annotated on the top edge of the recording.

3. When another source is selected (other than CO_2), that source is recorded on a 52cm long strip with the time, date, signal source specifics and scale on the top edge of the recording. The full data stream is also printed: NIBP sys/map/dia, ET, SpO_2, Resp Rate, FIO_2, Insp CO_2, Exp CO_2, Exp N_2O, Insp N_2O, Exp (Agent Name), Insp (Agent Name).

4. CO_2 trend and Agent (generic) trend is available on screen display, whileCO_2 (trace 3) waveform option is NOT available. Recorder and Screen displays are independent.

3.22.2.1 Software Compatibility: Multinex Plus / 3000 / 3000A

1. When interfacing a 3000 or 3000A with a Multinex Plus, (all other non-Plus, models are fully compatible) the software revision of each monitor must be at or above the software versions listed below. Incompatible software versions can result in improper agent labels being annotated for DES and SEV.

3000A	Datasette Revision D
3000	Datasette Revision N
Multinex Plus	Datasette Revision Q

2. The 3000 software (Datasette) revision appears in the upper left corner of the LCD display while in a service diagnostic screen, as "DS: (Rev Level)". Refer to the 3000 Service Manual section 4.4.10 steps A-F for diagnostic screen access instructions.

3. The Multinex software (Datasette) revision is displayed in the lower left corner of the Service Diagnostic Menu screen. Refer to the Multinex Plus Service Manual section 2.6 for screen access instructions.

If necessary, software upgrades are available through Datascope. Contact the Datascope Technical Support Department at 1-800-288-2121, for details.

3.22.3 Connectors

The three interface connectors on the MULTINEX are, a 15-pin male sub-D connector, a
25-pin female sub-D connector, and a 24-pin female IEEE 488 style connector. Each pin
assignment is detailed below. Do not apply voltage to output pins as damage may occur.
Maximum non-destructive voltages are lised for each output pin.

15-pin Male Sub D (External Oximeter)	Voltage	Do Not Apply Voltages >/=
1. Chassis Ground		
2. TXD3 Transmit Data to external oximeter	RS-232C	RS-232C Limits
3. RXD3 Receive Data from external oximeter	RS-232C	RS-232C Limits
4. N/C		
5. N/C		
6. N/C		
7. Digital Reference		
8. N/C		
9. Respiration Rate analog output	0-1 V	+12.0 V
10. Plethysmograph analog input from external oximeter equivalent to 0-100 % SaO_2	0-1 V	+12.0 V
11. CO_2 Analog Output	0-1 V	+12.0 V
12. N_2O Analog Output	0-1 V	+12.0 V
13. O_2 Analog Output	0-1 V	+12.0 V
14. Agent Analog Output	0-1 V	+12.0 V
15. Analog Reference	0-1 V	+12.0 V

25-pin Female Sub D (PC Interface)	Voltage	Do Not Apply Voltages >/=
1. Chassis Ground	RS-232C	
2. TXD1 Transmit Data to external PC	RS-232C	RS-232C Limits
3. RXD1 Receive Data to external PC	RS-232C	RS-232C Limits
4. RTS1 Request to Send	RS-232C	RS-232C Limits
5. CTS1 Clear to Send	RS-232C	RS-232C Limits
6. N/C		
7. Signal Ground		
8. N/C		
9. N/C		
10. N/C		
11. N/C		
12. N/C		
13. N/C		
14. N/C		
15. N/C		
16. N/C		
17. N/C		
18. N/C		

19. N/C		
20. N/C		
21. Plethysmograph Analog Output	(4200, 4000 Plus & 4000ID Plus only)	+12.0 V
22. % SaO_2 Analog Output	(4200, 4000 Plus & 4000ID Plus only)	+12.0 V
23. Pulse Rate Analog Output	(4200, 4000 Plus & 4000ID Plus only)	+12.0 V
24. N/C		
25. Analog Reference		

24-pin IEEE (Interface)	Voltage	Do Not Apply Voltages >/=
1. N/C		
2. N/C		
3. N/C		
4. N/C		
5. N/C		
6. N/C		
7. N/C		
8. N/C		
9. Digital Communications to 2000RS	0 V, 5 V	+12.0 V
10. N/C		
11. N/C		
12. Shield Ground		
13. N/C		
14. N/C		
15. Control Line to 2000RS Motor	0 V, 5 V	+5.3 V
16. CO_2/SAT Multiplexed Analog Output to 2000RS	0 - 1.2 V	+14.0 V
17. N/C		
18. N/C		
19. N/C		
20. N/C		
21. Digital Reference		
22. N/C		
23. N/C		
24. Analog Reference		

3.22.4 Interfacing to Personal Computers

The MULTINEX / Gas Module allows users with properly equipped personal computers to remotely access patient data, alarm limits and MULTINEX operational status over a wire cable (not supplied). Personal computers must have RS232 serial communications capabilities with the following characteristics:

- Format:ASCII
- Data Bits:8
- Stop Bits:1
- Parity Bit:None
- Baud Rate:2400
- Mark:-l0V
- Space:+l0V

Connection to the MULTINEX / Gas Module is done by wire cable connected to the 25-Pin RS232 connector described in 3.20.2.

WARNING: Connection of non-insulated devices to the RS232 connector on this unit may cause chasis leakage currents to exceed the specification standards. It is the user's responsibility to ensure that leakage currents do not exceed safe limits.

Refer to computer operator's manual for specific wiring requirements.

Once properly connected and configured, the computer can request data by simple commands. See Appendix for details on using the PC interface.

3.23 OPTIONAL UNIT CONFIGURATIONS

3.23.1 Units Equipped with SaO$_2$

The additional features of the Model 4200 that are added to the basic unit are as follows:

1. The BEEP VOLUME key (14) is used to select the audible beep volume level. The default setting for beep volume is LOW. If both the alarm and beep volume tones activate at the same time, the alarm volume appears to be modulated on and off by the beep (at the present volume).

Press BEEP VOLUME (14) to sound the beep at the present volume.

Press twice within 3 seconds to change the selected beep volume.

2. A patient connector (17) for the oximeter probe.

3. A 2-digit, LED display (29) used to indicate SaO_2 (0-99% SaO_2).

4. A 3-digit, LED display (28) used to indicate pulse rate (30-250 beats per minute (bpm).

5. When either of the following messages appear above the CRT window associated with PLETH, the SaO_2 and Pulse Rate readings should not be used for patient management purposes as the unit is not specified to work in these ranges.

>   "Pulse Rate <30"

>   "Pulse Rate >250"

6. The SaO_2 warning tone will be present (see section 3.11).

3.23.2 Units Equipped with Anesthetic Agent

The additional features of the agent models that are added to the basic unit are:

1. A 2-digit, LED display (22) used to indicate End Tidal concentrations of the selected agent (0-9.9%).

2. A 2-digit, LED display (20) used to indicate Inspired concentrations of the selected agent (0-9.9%).
The display updates upon the completion of each breath. If new breath data is the same as old breath data, the display flickers. Flickering indicates a new reading.

3. A momentary-action AGENT ID MODE key (7) is used to select the auto or verify mode of operation for agent identification (4000ID Plus& 4100ID Plus only).

4. A momentary-action AGENT SELECT key (19) is used to indicate the selected anesthetic agent (models 4000 Plus, 4100 Plus & Gas Module). This key also indicates the selected anesthetic agent in the verify mode (models 4000ID Plus, 4100ID Plus).

Agent selections include Isoflurane, Halothane, and Enflurane. A red LED (21) indicates which agent has been selected. The default setting is Isoflurane.

3.24 SaO$_2$ Sensor Selection

A. Introduction

A wide range of sensors are available for connection to the Datascope MULTINEX / Gas Module. The sensors cover both short-term and long-term monitoring needs on patients ranging from neonates to large adults.

The DATASENSOR is intended for short-term adult monitoring.

The FLEXISENSOR$^{®}$ SD, available in five different sizes, provides both short-term and long-term monitoring for large adults, adults, pediatrics, infants, and neonates. The FLEXISENSOR$^{®}$ SD is used when the DATASENSOR is not convenient or suitable.

The ear sensor is intended for long-term adult monitoring.

A range of disposable bandages are available for use with the FLEXISENSOR$^{®}$ SDs. They are available in 3 styles, SENSOR GUARD™ (used for large adults, adults and pediatrics), Coban with SENSOR GUARD™ (used for infants) and LIGHTGUARD™ (used for neonates). **NOTE:** Use only Datascope bandages with the Datascope FLEXISENSOR$^{®}$ SDs.

Use of the sensors does not cause any penetration of the skin, nor is there any electrical contact or transfer of excessive heat to the patient.

The sensor is composed of a light emitting diode (emitter) and a photodiode (detector). The emitter discharges two colors (wave lengths) of light into the patient's extremity (finger, toe, ear). The detector receives that amount of light not absorbed by the blood or tissue components. The MULTINEX / Gas Module then uses the relative absorption of the two light wavelengths to compute and display SaO$_2$ and Rate measurements.

The key benefits of the sensors are:

- Electrocautery Noise (ESU) Rejection

  The sensor configuration of both the DATASENSOR and the FLEXISENSOR$^{®}$ SD provide uninterrupted monitoring and absence of false alarms during the use of ESU (ESU can be set at any power level). This design prevents electro-surgical noise entering the monitor, via the sensor, and interfering with unit operation.

- Monitoring Restless Patients

Motion artifact rejection is achieved in several ways.

1. The sensor design used with their recommended bandages assures a snug fit of the sensor to the patient.

2. Light emitting diodes (LEDs) and detectors gather a strong signal from the patient.

3. Software in the MULTINEX / Gas Module evaluates the shape of each pulse and automatically rejects noisy and unreliable pulses.

4. When in the presence of motion, the software adjusts the "averaging-period", increasing it to a maximum of 15 seconds during motion, and automatically reducing it during quiet periods to obtain a fast response. This combination reduces the number of monitoring interruptions and false alarms from patient motion.

- Tracking of Weak Peripheral Pulse Levels

  Many patients suffer poor peripheral perfusion due to hypothermia, hypovolemia, reduced cardiac output, etc. The MULTINEX is designed to automatically increase its gain to track patients with poor peripheral perfusion.

- Rejection of Ambient Light

  Many monitoring situations involve high levels of ambient light, i.e., operating room lights, neonatal phototherapy, heat warmers, etc. The MULTINEX sensors, and bandages each contribute to the rejection of ambient light. The monitor automatically measures and corrects for high levels of ambient light. The enclosed design of the DATASENSOR prohibits the interference of high levels of ambient light on adults with sensor operation. And the opaque material used in the composition of the bandages, which are used with the FLEXISENSOR$^®$ SD, helps keep out ambient light.

- Patient Comfort

  The FLEXISENSOR$^®$ SD line is designed to work with a disposable bandage of three styles (SENSOR GUARD™, Coban and LIGHTGUARD™) which conform comfortably and safely to the particular patient's anatomy.

- Can Be Re-sterilized (ETO sterilization - 3 times)

- Patient Isolation

- Ease of Application and Removal

B. Sensor Selection and Application

Selection of a specific sensor is based on the patient's size, physical condition, and expected monitoring duration.

General guidelines for the selection of a sensor are provided in the Sensor Selection Table, page 3-37.

For optimal Datasensor and FLEXISENSOR$^{®}$ ensure that cable side is placed in the correct position. See figures below.
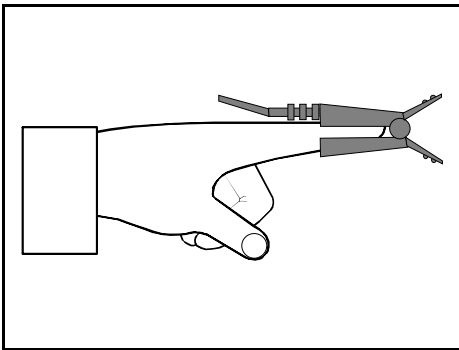
Datasensor Placement   Flexisensor$^{®}$ Placement
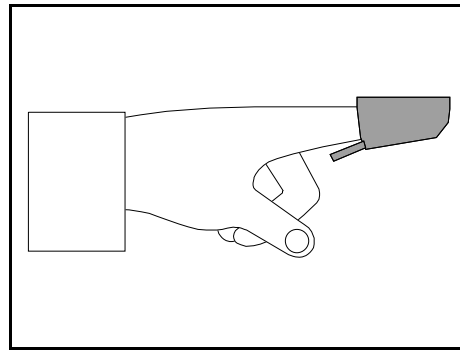
Detailed instructions for the application of a sensor to a patient are provided in each sensor package.

C. Sensor Connection to the MULTINEX

1. Align the cable connector on the sensor assembly with the SaO_2 Connector (17) on the MULTINEX.

2. Push the cable connector into the SaO_2 Connector. Confirm that the cable connector is securely in place.

NOTE: To obtain maximum cable use, do not twist the cable connector when attaching to or disconnecting from the MULTINEX / Gas Module monitoring system.

D. Sensor Inspection

Before use, always inspect sensors, cables, and connectors for damage, ie., cuts and abrasions. Do not use the sensor, cable or connector if damaged. Replace with a good working sensor.

For long sensor life:

- Do not drop on the floor or give other sharp shocks to the sensor(s).

- Between use, store the sensors in the optional FLEXISENSOR$^®$ SD Organizer, or coil the sensor cable and store.

- Avoid running any cart, bed, or any piece of equipment over the sensor cable.

- Avoid strong pulls on the sensor cable (10 lbs/4kg).

- Watch for cracks in the DATASENSOR housing.

- Watch for cracks, cuts, rips, fogging, or signs of moisture in the FLEXISENSOR$^®$ SD.

NOTE: For accessory part number information see Section 5.2, "Optional Accessories".

E. Sensor Performance

For the BEST performance of all Datascope sensors:

- DO NOT PLACE any sensor on an extremity with an arterial catheter or blood pressure cuff in place. Placement of an arterial catheter or blood pressure cuff on an extremity may obstruct normal blood flow. False pulse rate information may result if the FLEXISENSOR SD is placed on that same extremity. Place the sensor on the limb opposite the site of the arterial catheter or blood pressure cuff.

- Encourage the patient to remain still. Patient motion may affect the sensor's performance. If it is not possible for the patient to remain still, replace the sensor bandage on the FLEXISENSOR$^®$ SD to assure good adhesion, or change the site of the DATASENSOR.

- Check the DATASENSOR site every 2 hours and check the FLEXISENSOR$^®$ SD site every 8 hours on adults and every 4 hours on neonatal patients for indications of skin abrasions, sensor displacement, sensor damage, or circulation impairment. Check the sensor site every 4 hours if the ear clip is used. If necessary, remove and reapply the sensor. If any of the above mentioned indications occur, immediately remove the sensor and find an alternate site.

NOTE: Check the sensor site more frequently on infant and active patients.

- Placement of the DATASENSOR may be difficult on patients with long fingernails or artificial nails (over 1/4" long). Incorrect placement can also reduce the acquired sensor signal, and therefore compromise performance. Select an alternate site (toe) or use a FLEXISENSOR® SD if the sensor can not be placed on the patient's finger correctly or if the fingernails interfere with the acquisition of a reliable signal.

- Use of the DATASENSOR is not recommended for long-term monitoring (4-6 hours). Pressure from the spring mechanism on the DATASENSOR may cause minor skin damage to the finger/toe used. For monitoring situations exceeding 4-6 hours, either reposition the DATASENSOR every 2-4 hours to a different site (finger/toe) or use a FLEXISENSOR® SD with its appropriate bandage.

- Do not over-tighten the sensor bandages. Excessive pressure on the monitoring site can affect SaO_2 readings and may reduce readings below true SaO_2. Excessive pressure can also result in pressure necrosis and other skin damage.

- Sensor configuration provides uninterrupted monitoring in the following situations:

   Electrocautery Noise - ESU rejection is designed into the sensors.

   Motion Artifact - The monitor's software adjusts the "averaging period" increasing it during motion and reducing it during inactivity. This decreases the number of monitoring interruptions and false alarms.

   Weak Peripheral Pulses - The monitor's gain is automatically increased to track pulses on patients with decreased peripheral perfusion.

Sensors		Large Adult (LA)	Adult (A)	Pediatric (P)	Infant (I)	Neonate (N)	Adult Ear (AE)	Datasensor
Approximate Patient Weight		>80kg/ >176 lbs	30 - 90kg/ 66 - 198 lbs	10 - 40kg/ 22 - 88 lbs	4.5 - 10kg/ 10 - 22 lbs	Up to 5kg/ Up to 11 lbs	>40kg/ >88 lbs	40+ kg/ 90+ lbs
Where Used		Fingers, Toes	Fingers, Toes	Fingers, Toes	Feet, Palms, Big Toes	Feet, Palms, Heel, Calf	Adult Ear	Fingers, Toes
Long or Short Term Monitoring		Long & Short Term	Long & Short Term	Long & Short Term	Long & Short Term	Long & Short Term	Long & Short Term	Short Term
ESIS		Included	Included	Included	Included	Included	Included	Included
Reusable		Yes Up to 20 Uses	Yes Up to 20 Uses	Yes Up to 20 Uses	Yes Up to 20 Uses	Yes Up to 20 Uses	Yes Up to 20 Uses	Yes 6-Months
Bandage Type		Adhesive, Disposable	Adhesive, Disposable	Adhesive, Disposable	Non-Adhesive*, Disposable	Non-Adhesive*, Disposable	N/A	N/A
Part Numbers*	Sensors	0998-00-0076-06	0998-00-0076-05	0998-00-0076-04	0998-00-0074-03	0998-00-0074-04	0998-00-0074-05	0600-00-0026-xx
	Bandages	0683-00-0409-01	0683-00-0409-02	0683-00-0409-03	0683-00-0415	0683-00-0440	N/A	N/A

SENSOR SELECTIONS

*See Accessories, Chapter 5, for more detailed information.

3.25 Performance Verification

To ensure proper performance of the MULTINEX / Gas Module, a verification test should be done by administering the MULTINEX Calibration Gas (Datascope Part Number 0683-00-0320) into the sample inlet and verifying performance to the specification. See the figure below.

For safety reasons, the MULTINEX calibration gas contains Freon rather than one of the three halogenated agents (Halothane, Enflorane, or Isoflorane). The ability of the MULTINEX / Gas Module to directly measure Freon-22 was incorporated for calibration and performance testing purposes.

Use the Freon mode (Test Mode) when verifying MULTINEX / Gas Module performance. This test mode directly measures the contents of the MULTINEX cal gas.

TEE−FITTING

Flow Restrictor

MULTINEX

Excess Gas Pressure
Vented to room Air at
Higer Pressure Levels

CALIBRATION
GAS

Assure that adequate gas flow from the canister
exists, so as to exceed the minimum demand of
the Multinex / Gas Module. The minimum flow
through the flow restrictor should be no less
than 300 cc/min.
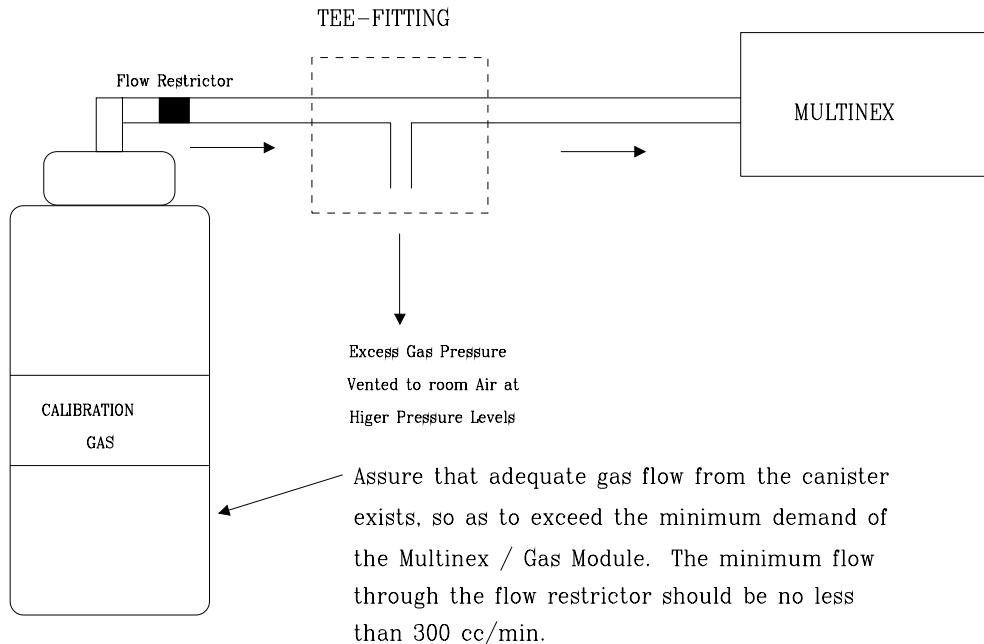
SET UP FOR TESTING THE MULTINEX / Gas Module

Models with Agent Capability and ID Versions

1. Turn on the MULTINEX / Gas Module and wait 15 minutes for full warm-up.

2. Attach a sample catheter.

3. Press the ID Mode Key (7) to disable the ID function on units with Agent capability.
   Press the Right Hidden Key (11) five times to enter the Freon Mode.

The Freon ("TEST") mode is entered when all three agent selections are blank and Freon is displayed above the agent trace.

4. Apply a steady stream of MULTINEX calibration gas.

The contents of the MULTINEX calibration gas is 60% N_2O, 29% O_2, 6% Freon-22, and 5% CO_2 (38 Torr). Verify that the MULTINEX / Gas Module numeric displays reflect these values, plus or minus the specified accuracy, while in the Test Mode. See the specifications in Chapter for the specified accuracy of each parameter.

5. For non-ID units, press the AGENT SELECT key (19) to exit the freon mode. For Agent ID versions, press the "AGENT ID MODE" key (7) to return to normal operation.

MODELS 4200 and 4300

The MULTINEX Models 4200 and 4300 do not have a test mode for performance verification.

1. Turn on the MULTINEX and wait 15 minutes for full warm-up.

2. Attach a sample catheter.

3. After 15 minutes, press the "CAL" key (13) on the front panel.

4. When the "CAL IN PROGRESS" message disappears, apply a steady stream of MULTINEX calibration gas into the sample catheter.

The contents of the MULTINEX calibration gas is 60% N_2O, 29% O_2, 6% Freon-22, and 5% CO_2 (38 Torr). Verify that the MULTINEX / Gas Module numeric displays reflect these values, plus or minus the specified accuracy, while in the Test Mode. See the specifications in Chapter 6 for the specified accuracy of each parameter.

4.0 USER MAINTENANCE

This section of the manual outlines routine maintenance and general troubleshooting guidelines.

The MULTINEX / Gas Module is designed for stable operation over long periods of time and under normal circumstances should not require technical maintenance beyond that described in this section. It is recommended that gas channel accuracy be checked once per year. Contact qualified hospital personnel or Datascope for further information.

4.1 Care and Cleaning of Monitor

The instrument enclosure may be cleaned with a mild soap and water solution or ammoniated window cleaner. DO NOT apply large amounts of liquid. DO NOT use abrasive cleaning agents or organic solvents.

To prevent scratches on the front panel display screen, blow or carefully brush the dust and dirt particles with a soft sponge or a fine, soft-haired brush. DO NOT use abrasives. Fingerprints and stains may be removed by using a liquid lens cleaner and a soft cloth. DO NOT wipe a dry screen or use alcohol or chlorinated hydrocarbon solvents.

4.2 Replaceable Items

The following items are operator-replaceable:

- Catheters and Breathing Tube Adaptors
- O_2 Cell
- Sump
- Scrubber Cartridge
- Software Cartridge

The replaceable O_2 cell, sump, scrubber cartridge, catheters, breathing tube adaptors, and external cables should be periodically inspected for signs of use or damage.

4.2.1 Catheters and Breathing Tube Adaptors

Replace the catheter and the endotrachial tube adaptor after each procedure. A package of 12 replacement catheters and breathing tube adaptors is available from Datascope Corp. and authorized Datascope representatives. See Section 5.2, Optional Accessories.

Replacement

Prior to first use, sterilize the endotrachial tube adaptor by ETO sterilization, 12% ETO $140^{o}F$ maximum.

NOTE: Use care when inspecting and storing these single-use items. The catheter and endotrachial tube are fragile, Datascope can not assure that after first use, the catheters and breathing tube adaptors will not deteriorate and therefore compromise MULTINEX / Gas Module performance.

4.2.2 O_2 Cell

Replace O_2 cell when the O_2 display shows "--" after initial power up O_2 cal.

O_2 cells are available from Datascope Corp. and authorized Datascope Representatives. See Section 5.2, Optional Accessories.

Replacement can be made without opening the unit or making any internal or external adjustments.

NOTE: Vent the new O_2 cell for 24 hours prior to installation.

Replacement

1. Turn unit OFF.

2. Unplug the wire that protrudes from the rear panel to the O_2 cell

3. Unscrew the O_2 cell from the pneumatic connector.

4. Dispose the O_2 cell and the rubber gasket in accordance with hospital procedure

5. Vent the new O_2 cell for 24 hours prior to installation

6. Install a new rubber gasket and thread the new O_2 cell onto the pneumatic connector.

7. Attach wire to the O_2 cell.

8. Turn the unit ON. Observe the two minute O_2 cell calibration.

9. Verify that room air readings are 21%.

An O_2 cell is required on the 4000ID Plus and 4100ID Plus models to achieve accurate CO_2 readings.

4.2.3 Sump

The disposable sump bottle can be cleaned or replaced at the conclusion of each monitor use or when the sump fills. A package of 12 replacement sumps is available from Datascope Corp. and from authorized Datascope Representatives. See Section 5.2, Optional Accessories.

Replacement

1. To remove, gently rotate the sump in a counter-clockwise direction.

2. Visually inspect the inside of the sump holder for liquid droplets and moisture. Dry with a cotton swab if necessary.

3. Verify that the "O" ring seal remains inside the sump body.

4. Replace with a new sump. If a replacement is not available, clean the old sump in a soap and water solution. DO NOT AUTOCLAVE. DO NOT GAS STERILIZE.

4.2.4 Scrubber Cartridge

Replace the scrubber cartridge, used on agent models when the cartridge turns a blue or purple color or every 6 months. The date of first use should be written on the cartridge label to determine when six months have elapsed. A package of 12 replacement cartridges is available from Datascope Corp. and from authorized Datascope Representatives. See Section 5.2, Optional Accessories.

Replacement

1. Grasp the end of the cartridge and pull it straight out from the rear panel.

2. Write date of installation on label in area provided.

3. Push in the new cartridge until it reaches the stop.

NOTE: Failure to replace a depleted scrubber cartridge can result in large CO_2 errors.

WARNING: Scrubber cartridge contains soda lime. Do not eat, breath in, or come in contact with cartridge contents. Dispose of according to approved hospital procedure for soda lime. See Appendix, Section 6.2, for the Material Safety Data sheets.

4.2.5 Software Cartridge

Replace the software cartridge anytime necessary.

Replacement

1. Disconnect power to the unit.

2. Unscrew the two retaining screws holding the top and bottom of the cartridge.

3. Use the handle and pull the cartridge straight out. Verify that the correct Dattasette is being used with the unit.

4. Line up the new cartridge so the PROM chip is on the left side of unit.

5. Apply even pressure to the top and bottom of the cartridge and push it in until the metal stop rests against the rear panel.

6. Tighten the two retaining screws to secure the cartridge.

7. Turn the MULTINEX / Gas Module ON. Verify basic operation by observing a successful self test and by sampling a few breaths.

8. Return the old cartridge to Datascope Corp.

4.2.6 Fuses

If replacement of a fuse is required, the unit should be referred to qualified service personnel, as internal damage may be present. The correct fuse type and rating is shown below. Use only the fuses supplied by Datascope Corp.

Line Voltage	Type	Rating	Datascope P/N
90-132 V	3AG	T2.0A, 250 V	0159-03-0015
198-264 V	5 X 20 mm	T1.0A, 250 V	0159-23-0001

4.3 Troubleshooting Guidelines

This section contains messages that may appear on the screen to alert the user to take action. Take the action indicated for Operator Response if any of the following messages should display.

If service is required, contact a Datascope Service Representative. Internal servicing should only be preformed by qualified personnel.

Chart 6 - Troubleshooting Guidelines

Message	Operator Response/Meaning
APNEA	No breaths detected during a 30-second period.
PURGING	No operator response needed; unit clearing catheter obstruction.
OCCLUSION	Replace or clean catheter; unit unable to clear catheter obstruction.
SUMP FULL	Sump bottle full; empty sump.
CAL IN PROGRESS	No operator response, normal operation; unit performing auto-zero. It is normal for the MULTINEX / Gas Module to automatically recalibrate on a periodic basis.
FAN FAILURE	Fan has stopped rotating; turn unit off.
UNIT WARMING UP	Unit usable but not within specifications (units with Agent capability only).
SYSTEM FAULT	CO_2, N_2O, Agent measurement system self test unsuccessful. Power cycle the monitor.
SO_2 SENSOR OFF	Apply sensor to patient.
SO_2 INTERFERENCE	Noisy signal due to patient motion or ESU.
PULSE LEVEL WEAK	Pulse signal detectable but not weak.
NO PULSE	Pulse not detactable.

Message	Operator Response/Meaning
PULSE SEARCH	Temporary message while searching for pulse.
CHECK SO$_2$ SENSOR	Inadequate signal received by detector.
PULSE RATE <30	Pulse Rate detectable but less than 30 beats per minute.
PULSE RATE >250	Pulse Rate detectable but greater than 250 beats per minute.
SaO$_2$ UNCALIBRATED	SaO$_2$ value displayed is below specified accuracy rate.
SaO$_2$ FAILURE	SaO$_2$ self-test unsuccessful. Power cycle the monitor.
DOWNLOADING	SaO$_2$ program code being sent to SaO$_2$ PCBs.
FRONT PANEL KEY BOARD IS NOT CONNECTED	Power-up, self-test failure. Unit needs service.
USER CONFIGURATION ERROR-DEFAULT CONFIGURATION SELECT	The unit has detected an erroneous change to the user configuration and automatically selected a default configuration.
FULL CALIBRATION REQUIRED*	Power-up, self-test failure. (Agent units with SaO$_2$ only). Unit needs to be recalibrated except for SaO$_2$.
GAS MEASUREMENT RESPONSE FAILURE*	Power-up, self-test failure (units with Agent capability only)
GAS MEASUREMENT SYSTEM SELF-TEST FAILURE*	Power-up, self-test failure. (units with Agent capability only)
READY	While in the agent auto ID mode, unit is ready for agent identification (units with Agent ID capability only).

Message	Operator Response/Meaning
XXX WRONG AGENT YYY	While in the confirmation mode, indicates the agent detected, YYY, does not agree with the agent selected, XXX (units with Agent ID capability only).
XXX AGENT ID DISABLED	Indicates agent ID is disabled and XXX is the agent selected (units with Agent ID capability only).
MIXED AGENTS XXX, YYY	Indicates XXX agent is mixed with agent YYY (units with Agent ID capability only).
NO ID: SELECT AGENT	Indicates agent ID is not working (units with Agent ID capability only).

*For these messages the following message appears:

SELF TEST FAILURE-- PRESS TRACE 1 TO CONTINUE	Operator query. Press Trace 1 SIZE to continue monitoring SaO_2 If the only error is user configuration, normal operation will begin with default values.

4.4 Frequent "PURGING" Events due to Moisture in the Breathing Circuit and/or Improperly Sized Accessories.

In the process of monitoring respiratory gases, moisture may appear in the sample line. This moisture takes the form of either liquid or humidified gas coming from the patient circuit. The Multinex / Gas Module incorporates a moisture elimination system that first separates and then collects moisture typically found under normal conditions. This internal protection is adequate to maintain the pneumatic integrity between preventive maintenance intervals. When additional patient humidification requires using an external heated humidifier, consider using combinations of external accessories as required. These accessories, hydrophobic filter and Nafion™ tubing, are effective at limiting the excessive amount of liquid and humidity that can overwhelm internal systems.

The hydrophobic filter (0378-00-0027) stops humidity and water from advancing into the Multinex / Gas Module. This filter will occlude when saturated. For most economical and effective use, place the external filter on the sample inlet (located on the front panel) of the Multinex / Gas Module. Replace the filter when frequent "PURGING" messages begin to appear. See the filter's packaging information for complete usage instructions.

The external Nafion™ tubing (0008-00-0259) is an externally placed dehumidifying tube that the patient sample passes through before entering the Multinex / Gas Module. Humidified gas will be dehumidified to the ambient (outside) humidity level prior to it entering the Multinex / Gas Module. This will allow the internal Nafion– tubing to liberate any remaining humidity before advancing further inside the Multinex / Gas Module. For most economical and effective use, place the Nafion– tubing between the sample line and the breathing circuit connection. This will assure that the humidified patient sample is dehumidified before condensing inside the length of the sample line.

Nafion– tubing begins to loose it's properties when particles, accompanying the patient sample, line the inner walls of the Nafion™ tubing. When the Nafion™ has reached the end of it's useful life, humidified patient sample is once again visible inside the sample tubing. See the Nafion™ tubing's packaging information for complete usage instructions. Using this device results in fewer "PURGING" events.

A humidity trap is another device that controls the amount of humidity that enters the sample line. This device is often referred to as a Heat/Moisture Exchanger (or HME). The HME prevents the patient's natural humidity and warmth from escaping into the breathing circuit and sample line. The patient's next inhalation delivers the previously exhaled moisture and heat back to the patient's lungs. Using this device results in fewer "PURGING" events.

Improperly sized sample lines also cause frequent "PURGING" events. The Multinex / Gas Module is designed to use sample lines of a particular inner diameter and length. Smaller tubing IDs or longer lengths will result in frequent "PURGING" events. Use Datascope Sample Lines (0683-00-0405-XX) for best, and most reliable performance.

Use appropriate accessories to reduce breathing circuit moisture, and install the Multinex Preventive Maintenance Kit (0040-00-0128 or -0129) at regular intervals to reduce the incidence of unscheduled service and the number of "PURGING" events.

5.0 ACCESSORIES

5.1 Standard Accessories (Domestic and European)

DESCRIPTION	PART NUMBER 110 VAC	PART NUMBER 220 VAC
Standard Accessories Kit	0020-00-0117-01	0020-00-0117-02
1 Breathing Tube Adapter - Mask Elbow	0683-00-0242-11	0683-00-0242-11
1 Breathing Tube Adaptor - Straight Tee	0683-00-0242-21	0683-00-0242-21
1 Operating Instructions	0070-00-0368	0070-00-0368
1 Abbreviated Operating Instructions	0070-00-0238	0070-00-0238
1 Catheter Bore .050 dia., 10' length	0683-00-0405-21	0683-00-0405-21
1 Catheter Bore .050 dia., 5' length	0683-00-0405-11	0683-00-0405-11
Cable Assy., 3 CNDCT AC line 10'	0012-25-0001	
Cable Assy., 3 CNDCT AC line 2.5 M		0012-25-0002

5.2 Optional Accessories

DESCRIPTION	PART NUMBER
O_2 Cell	0600-00-0002
Interface Cable to 2000RS (5ft)	0012-00-0271-02
Package (12) Replacement Breathing Tube Adapters - Mask Elbow	0683-00-0242-12
Package (12) Replacement Breathing Tube Adapters - Straight Tee	0683-00-0242-22
Package (12) 10 ft. cat. .050 dia	0683-00-0405-22
Package (12) 5 ft. cat. .050 dia	0683-00-0405-12
Package (12) Replacement Sump Bottles (7.5ml)	0202-04-0001-12
Package (12) Replacement Sump Bottles (15ml)	0202-04-0002-12
Package (12) Replacement Sump Bottles (30ml)	0202-04-0003-12
Package (1) Replacement ACCUSORB Cartridges	0997-00-0222
Nasal Cannula (10 pieces)	0683-00-0424-10
Sample Cell (4200, 4300)	0683-00-0420
Sample Cell (4000ID, 4100ID, 4000ID Plus, 4100ID Plus)	0683-00-0419
Service Manual	0070-00-0250

DESCRIPTION	PART NUMBER
MULTINEX Calibration Gas (Also used with Gas Module)	0683-00-0320
CO_2 Calibration Gas	0683-00-0414
O_2 Calibration Gas	0683-00-0411
N_2O Calibration Gas	0683-00-0413
Gas Scavenging Adaptor Assy (19x19 tee with hose and luer fitting)	0997-00-0132
Interface Cable to ACCUSAT	0012-00-0547
DATASENSOR w/3' Cable	0600-00-0026-01
DATASENSOR w/12' Cable	0600-00-0026-02
DATASENSOR Starter Kit	0020-00-0071-01

FLEXISENSOR S.D. Series with SENSOR GUARD Disposable Bandages:

Starter Kits: - Each kit includes one instrument cable, one FLEXISENSOR S.D. sensor and (with the exception of the Adult Ear sensor) one package of SENSOR GUARD bandages (24/pack LA, A, P; 12/pack I, N).

Large Adult (LA) non-sterile	0998-00-0094
Adult (A) non-sterile	0998-00-0093
Pediatric (P) non-sterile	0998-00-0092
Infant (I)	0998-00-0083
Neonate (N)	0998-00-0090
Adult Ear (AE)* non-sterile	0998-00-0091

FLEXISENSOR S.D. 3 Packs: - Contains 3 sensors of the same size.

Large Adult (LA) non-sterile	0998-00-0076-06
Adult (A) non-sterile	0998-00-0076-05
Pediatric (P) non-sterile	0998-00-0076-04
Infant (I)	0998-00-0074-03
Neonate (N)	0998-00-0074-04
Adult Ear (AE) non-sterile	0998-00-0074-05
Ear Clip	0380-00-0169

SENSOR GUARD Bandages:

Large Adult (LA) (3 packs of 24)	0683-00-0409-01
Adult (A) (3 packs of 24)	0683-00-0409-02
Pediatric (P) (3 packs of 24)	0683-00-0409-03
Infant (I) (36 bandages)	0683-00-0415
Neonatal Light Guard	0683-00-0440-03

* Adult Ear FLEXISENSOR is supplied with an ear clip and no bandage.

DESCRIPTION	PART NUMBER
Instrument Cable	0012-00-0516-02
FLEXISENSOR S.D. Organizer	0683-00-0421
Cable Assembly, N200 Oximeter Interface	0012-00-0611
Cable Assembly, N100 Oximeter Interface	0012-00-0563
Fuse, 90-132V, 3GA, T2.0A, 250V	0159-03-0015
Fuse, 198-264V, 5x20mm, T1.0A, 250V	0159-23-0001

Preventive Maintenance Kits:

Kits include: O2 Cell, Nafion Tube, Sample Cell ACCUSORB Cartridge, Particle Filters, and MULTINEX Cal Gas

4000ID, 4100ID, 4000ID Plus, 4100ID Plus	0040-00-0128
4200, 4300	0040-00-0129

5.3 Mounting Instructions

5.3.1 MULTINEX TO THE 3000A MONITOR (all versions except 4000ID Plus & 4100ID Plus)

1. Attach front stacking brackets (1) to the 3000A.

2. Align mounting tabs on brackets with mounting slots on the lower front panel of the MULTINEX and slide into place.

3. Attach rear mounting brackets (2) to the back of the 3000A and fasten with screws (3). Tabs on the brackets should be inserted into the rear of the MULTINEX.
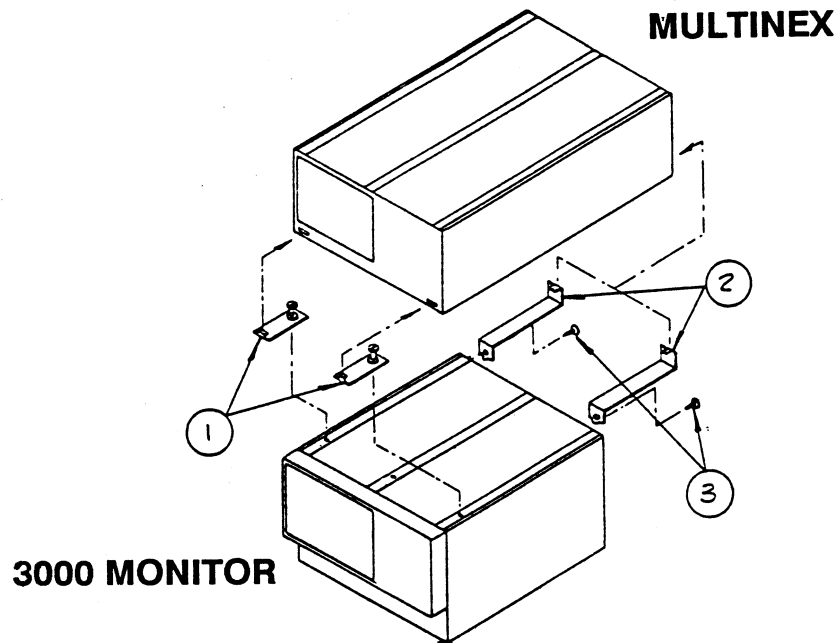
	PART NUMBER	QTY
MOUNTING KIT	0020-00-0058	
Kit Includes:		
Bracket, Stacking MULTINEX to 3000A Front	0406-00-0479	2
Bracket, Stacking MULTINEX to 3000A Rear	0406-00-0478	2
Bracket, Front Stacking	0406-00-0451	2
Bracket, Rear Stacking	0406-00-0477	2
Screw, Captive #4-40	0214-08-0001	4
Directions, Mounting	0065-00-0060	1
Instructions, MULTINEX to 3000A	0065-00-0061	1

5.3.2 MULTINEX TO OTHER UNITS

1. Select location for unit to be mounted onto the MULTINEX (left, center, right).

2. Fasten front stacking bracket (1) to the top of the MULTINEX.

3. Align the base of the peripheral unit with the mounting bracket and pull forward to lock into place.

4. Attach rear mounting bracket (2) to the appropriate location and fasten with screw (3).

5. Lock peripheral unit into place. Unit should be unable to be rotated in any direction.
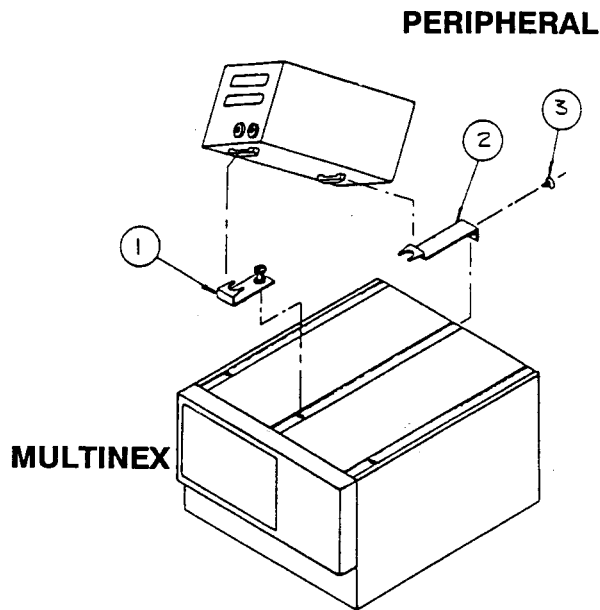
	PART NUMBER	QTY
MOUNTING KIT	0020-00-0055	
Kit Includes:		
Bracket, Front Stacking	0406-00-0451	3
Bracket, Rear Stacking	0406-00-0450	3
Screw, Captive #4-40	0214-08-0001	3
Directions, Mounting	0065-00-0059	1

5.3.3 DRAWER BOX ASSEMBLY (all versions except 4000ID Plus & 4100ID Plus)

1. Attach the adapter plate (P/N 0386-00-0137) onto the drawer box assembly (P/N 0997-00-0257) using the four screws (P/N 0214-08-0003) supplied with the assembly.

2. Attach the adapter plate to the bottom of the MULTINEX. Insure that the front tabs slide into the front panel slots on the MULTINEX.

3. Using the two screws (P/N 0214-08-0002) secure the adapter plate to the MULTINEX rear panel.

4. Mount the drawer box assembly to assembly shelf using the four screws (0214-08-0002).

NOTE: For Agent ID versions, an adapter box will raise the MULTINEX ID so that it is the same height as the 3000A. This box does not include a drawer. Use P/N 0020-00-0061-02 for this option.
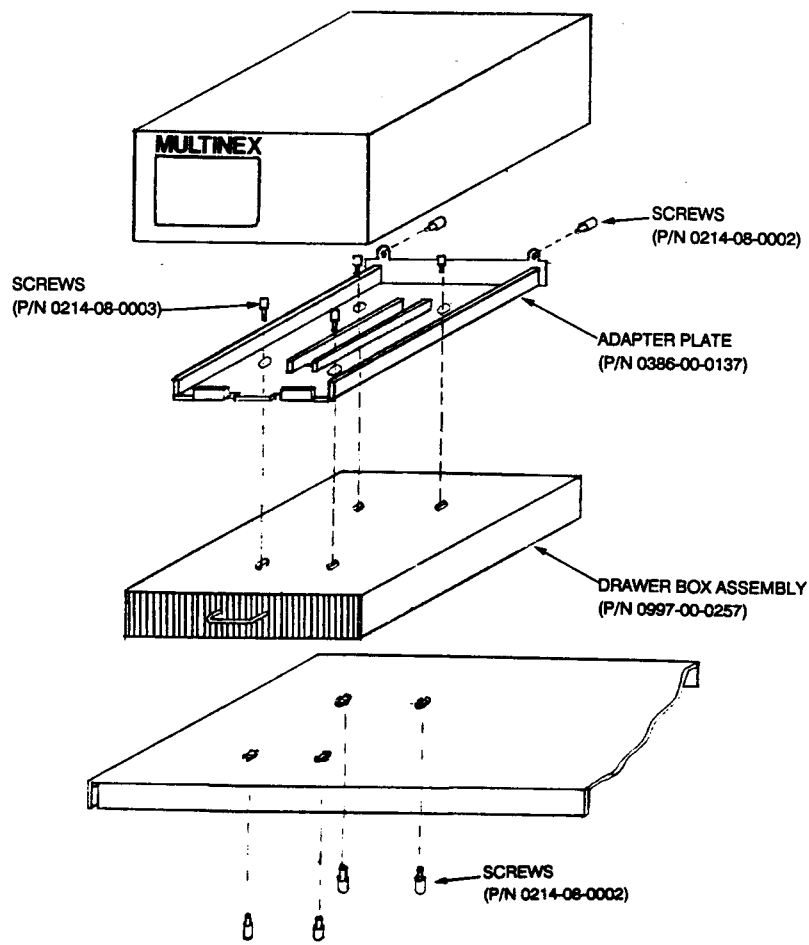
6.0 APPENDIX

6.1 Warranty

Datascope Corp. warrants that its products will be free from defect in workmanship and materials for a period of one year from the date of purchase except that disposable or one-use products are warranted to be free from defects in workmanship and materials up to a date one year from the date of purchase, or the date of first use, whichever is sooner.

Datascope Corp. shall not be liable for any incidental, special, or consequential loss, damage or expense directly or indirectly arising from the use of its products. Liability under this warranty and the buyer's exclusive remedy under this warranty, is limited to servicing or replacing, at Datascope Corp's option, at the factory or at an authorized Datascope Distributor any product which shall under normal use and service appear to the Company to have been defective in material or workmanship.

No agent, employee, or representative of Datascope Corp. has any authority to bind Datascope Corp. to any affirmation, representation, or warranty concerning its products, and any affirmation, representation, or warranty made by any agent, employee, or representative shall not be enforceable by buyer.

This warranty is expressly in lieu of any other expressed or implied warranties, including any implied warranty of merchantability or fitness, and of any other obligation on the part of the seller.

Damage to any product or parts through misuse, neglect, accident or by affixing any nonstandard accessory attachments, or by any customer modification voids this warranty. Datascope Corp. makes no warranty whatever in regard to trade accessories, such being subject to the warranty of their respective manufacturers.

A condition of this warranty is that this equipment or any accessories which are claimed to be defective be returned when authorized by Datascope, freight prepaid to Datascope Corp., Paramus, New Jersey. Datascope Corp. shall not have any responsibility in the event of loss or damage in transit.

The O_2 Cells are warranted for six months, the SaO_2 Datasensors are warranted for six months, and the SaO_2 Flexisensor SD's are warranted for 30 days or first use, whichever occurs first.

Accessory items such as Nafion, disk filters and sample cells are warranted for 90 days from date of shipment.

The ACCUSORB cartridge is warranted for 30 days or first use, whichever occurs fits.

6.2 Extended Warranty

Datascope Corp. warrants that components within the monitor unit will be free from defects in workmanship and materials for the number of years shown on the Datascope invoice. Under this extended warranty, Datascope Corp. will repair or replace any defective component at no charge for labor and/or materials. This extended warranty does not cover consumables such as, but not limited to batteries, displays, external cables, sensors, the O_2 cell, external tubing, the sample cell, the sump or the Accusorb scrubber cartridge.

Recommended preventative maintenance, as prescribed in the service manual, is the responsibility of the user, and is not covered by this warranty.

Except as otherwise provided herein, the terms, conditions and limitations of Datascope Corp.'s standard warranty shall remain in effect.

SAFETY DATA

W. R. GRACE & CO. - CONN. , DEWEY AND ALMY CHEMICAL DIVISION
55 HAYDEN AVENUE
LEXINGTON, MA 02173

EMERGENCY PHONE NO. (617) 861-6600
-------------------------------SECTION I - IDENTIFICATION----------------------------

PRODUCT (TRADE) NAME: SODASORB® Absorbent

General Chemical Description: Alkaline carbon dioxide absorbent

NOTE: These sheets cover all types of SODASORB:
       -all mesh ranges: FINES, 4-8, 6-12
       -all grades: IND-A,F,H,HP,L,W; REG-A,H,HC,L
       -all moisture levels: 0-2% (L), 0-7% (F), 8-12% (HC), 10-14% (A),
                              12-19% (FINES IND H), 14-16% (H,HP), 16-18% (W).

--------------------------------SECTION II-INGREDIENTS----------------------------

Hazardous Ingredients	Content by Weight	Maximum Exposure Value (8 hour time-weighted average) OSHA PEL*	ACGIH TLV**
Calcium hydroxide [CAS#1305-62-0]	above 73%	not listed	5 mg/cubic meter
Potassium hydroxide [CAS#1310-58-3]	below 5%	not listed	2 mg/cubic meter (ceiling limit)
Sodium hydroxide [CAS#1310-73-2]	below 3%	2 mg/cubic meter	2 mg/cubic meter (ceiling limit)

             * 29 CFR Section 1910.1000, July 1, 1987
    ** 1987-1988 recommendation, American Conference of Governmental Industrial Hygienists

Other Ingredients   % by Weight

modifiers (includes pH indicator, IND series only)   below 1

--------------------------------SECTION III-PHYSICAL DATA----------------------------

Solubility in Water: slightly soluble   Specific Gravity (water=1): approx. 2
Appearance and Odor: White granules; no odor
Volatiles, including water (% by weight): below 20

--------------------------------SECTION IV-FIRE AND EXPLOSION HAZARD DATA----------------------------

Flash Point: Non-flammable (See Section VIII)

--------------------------------SECTION V-REACTIVITY DATA----------------------------

Product is stable; hazardous polymerization will not occur.
Will react (be neutralized) with acids. May react with chloroform slightly, producing
sodium formate, carbon monoxide, and phosgene.   May react with trichloroethylene,
producing dichloracetylene, carbon monoxide, and phosgene.
  PREPARED 03/02/89   PAGE : 1 OF 2

SODASORB® Absorbent

------------------------------**SECTION VI-SPILL OR LEAK PROCEDURES**------------------------------

Handling Precautions: See Section VIII.

For small spills: Scoop up and place in closed fibre-board or lined metal containers.
Rinse area with water. Wash area with soapy water and rinse.
For large spills: Scrape or shovel into containers.

Dispose of all product wastes and water rinses in accordance with current local, state,
and Federal regulations.

Material is not a hazardous waste as defined in 40 CFR Sec. 261.3.

------------------------------**SECTION VII-HEALTH HAZARD DATA**------------------------------

Threshold Limit Values: See Section II.

	Signs & Symptoms of Acute Exposure	Emergency First Aid Procedures
Inhalation:	Dust can cause irritation and injury to the respiratory system.	Remove to fresh air.
Eyes:	Severe irritation upon contact.	Immediately flush eyes with water for at least 15 minutes; get medical attention.
Skin:	Irritation upon direct contact.	Wash affected area with water; if irritation occurs and persists, get medical attention. Remove contaminated clothing.
Ingestion:	Harmful if swallowed.	Dilute with weak vinegar solution or a 5% solution of ammonium chloride if these are available. If not, dilute with large quantities of water. Do not induce vomiting. Get medical attention.

GET MEDICAL ATTENTION IF SYMPTOMS PERSIST

------------------------------**SECTION VIII-SPECIAL PRECAUTIONS**------------------------------
Handling and Storing

    Keep all SODASORB that has been used with highly flammable anesthetics away from
    heat, sparks, and open flames, as residual amounts of these materials will be
    present.
-   Avoid breathing dust.
-   Avoid skin and eye contact.
-   Keep from freezing. Do not use any material exposed to below-freezing
    temperatures.

    The Sodasorb Manual of Carbon Dioxide Absorption is available upon request.

6.4 SPECIFICATIONS

Dimensions:	4300, 4200 4100 Plus, 4000 Plus Gas Module	4100ID Plus, 4000ID Plus
Height	6.5 in. (16.5 cm)	8.625in. (21.9cm)
Width	12 in. (30.5 cm)	12in. (30.5cm)
Length	19 in. (48.3 cm)	19in. (48.3cm)
Weight	25 lbs.	30 lbs.
Power Cord Length	10 ft.	10 ft.
Catheter ft. (.050 "I.D.")	5 ft. (.050 "I.D.") 10 ft. (.050 "I.D.")	5 ft. (.050 "I.D.")

Power Requirements:

Voltage Input	90-132 VAC, 50/60 Hz, 198-264 VAC, 50/60 Hz

Maximum Leakage Current:

Chassis	less than 100 microamperes
Patient	less than 20 microamperes

Maximum Device SPL:	68 dBA (does not include audio output)

Power Consumption:	145 W maximum

Analog Signal Specifications:

Output Impedance	120 ohms, max.
Output Stability	Compensation for capacitive loads up to 0.01 uF (5,000 ft of twisted pair cable)
Short Circuit Protection	At typical operating temperatures, output can be shorted to ground indefinitely

Digital Signal Specifications:

Input Active Low	0.5 V max. at 1.0 mA
Input Active High	$5.0 \text{ V} \pm 1 \text{ V}$
Output Low Voltage	± 0.5 V max. at 9 mA sink current
Output High Voltage	5.0 V +0 V, -1 V at 40 uA

6.5 ENVIRONMENTAL CHARACTERISTICS

Operating Temperature	10°C to $35^{o}\text{C}*$
Operating Humidity	85% max. non-condensing
Shock and Vibration	Meets ECRI (Dept. of Commerce PB 296-892) Subclass B, device Class 1 Environmental Test Methods for Shock.
Shipping	Meets NTSA Test Procedure lA (less than 100 lbs.)
Storage Temperature	-20° to $+50^{o}\text{C}**$

*Operation between 25°C and 35°C for more than 5 continuous days may effect the life of the O_2 cell.

**Storage at 41°C to 50°C for more than 5 continuous days may effect the life of the O_2 cell.

Storage Humidity	0 to 85%, non-condensing.
Operating Altitude	Sea level -500 to 7,000 feet.*
Operating Attitude	Meets all stated performance specifications while operating with the rear feet on a rigid, flat surface.
Electrostatic Discharge Susceptibility	CONFORMS TO IEC 801-2; 1991, Level 3 severity.
Electromagnetic Interference Susceptibility	No malfunction occurs when the device operates near any source of EMI: including telemetry, radio communications equipment, or electro-surgical devices where the field strength and/or proximity to such sources is a typical operating environment for this type of device. Tested per IEC 801-3.
Magnetic Interference	The unit produces less than 225 mGauss of magnetic interference when and as measured 3/4" from any surface, except the front. The front measures </=1000 mGauss of magnetic interference.
Line Noise	The unit performs to the specifications with $\pm$600 V random line interference. (Recommended test instrument - Berkley 3020 Line Noise Generator.)
Line Dropout	AC line dropouts of up to 40 ms every 10 s; will not interfere with system operation.

*Automatic calibration at desired altitude is assumed to achieve stated accuracy.

6.6 PERFORMANCE SPECIFICATIONS

NOTE: All performance specifications are achieved throughout the environmental operating conditions listed in Section 1.3, Environmental Characteristics, and while observing the following operational guidelines:

1. Allow 15 minutes for warm-up.

2. Calibrate the unit as instructed. See the calibration procedure in the MULTINEX / Gas Module Service Manual, (0070-00-0250). (The calibration procedure should only be performed by qualified service representatives.)

3. Use the specified breathing tube adaptor and I.D. catheter.

4. The maximum breath rate should not exceed 99 breaths per minute (bpm).

5. The flow rate is fixed by the microprocessor control at 150 mL/min. for the 4300/4200 and 200 mL/min for the 4100ID/4000ID. It may be user-adjusted for 50, 100, 150 or 200 mL/min.

NOTE: The Gas Module, 4000ID Plus, 4000 Plus, 4100ID Plus, and 4100 Plus models are units with analytical agent capabilities while the 4200 and 4300 models are units without analytical agent capability.

1. CO_2 Display:

	Torr	%	KPa
Range	O - 76	0 - 9.9	O - 9.9
Resolution	1	0.1	0.1
Repeatability (breath to breath)	± 1	± 0.1	± 0.1
Rate	2 - 98 breaths per minute		

Accuracy (Torr)

Input Range (Torr)	4200 / 4300	Gas Module / 4000 Plus / 4100 Plus / 4000IDPlus / 4100ID Plus
0 - 19.9	+ 1.5	+ 1.5
20 - 39.9	± 2.0	± 1.5
40 - 59.9	± 2.5	± 2.5
60 - 76.0	± 3.0	± 4.0

Models

NOISE (peak to peak max)	4200 / 4300	Gas Module / 4000 Plus / 4100 Plus / 4000IDPlus 4100ID Plus
Torr	Torr	Torr
0-40	±0.2	±0.5
41-60	±0.2	±2.0
61-80	±0.2	±3.0
Drift (zero)	1 hour	24 hours
	<0.5 Torr or equivalent	<1.5 Torr or equivalent

Response time to final reading models 4200, 4300	250 ms max at 150 cc/min flow
4000 Plus, 4100 Plus, 4000ID Plus, 4100ID Plus, Gas Module	250 ms max at 200 cc/min flow
Interference from 0 - 95% N_2O	± 1 Torr (or equivalent %, KPA)
Interference from 0 - 100% H_2O Saturated N_2	≤0.1%, relative.

Interference from 5% to 95% O_2
models
4200, 4300 $\pm$ 2 Torr

4000 Plus, 4100 Plus,
4000ID Plus, 4100ID Plus, Gas Module   compensated

Update   Upon 2nd breath completion
                                                    $\geq$5 Hz - before breath detection

Error due to breath rate   -.0015 of DC value x BPM

2. CO$_2$ Analog Output (waveform)

Range   0- lV

Scale Factors   0 - lV equivalent to 0 - 10%

Accuracy $\pm$ 30 mV or $\pm$ 5%, whichever is greater

Noise   <15mV p-p

Repeatability $\pm$ 15mV

Interference from $\pm$ 15mV
0-95% N_2O

Interference from $\pm$ 30mV
0 - 100% H_2O Saturated N_2

Interference from   15 mV
5% CO_2, 95% N_2O

Interference from $\pm$ 30mV
5% CO_2, 95% O_2

3. N₂O Display

Range	0 - 99%
Resolution	1%
Rate	2 - 98 breaths per minute

Accuracy	Models	Gas Module /
Input Range (%)	4200 / 4300	4000ID Plus / 4100ID Plus
0-40	$\pm$3%	$\pm$2.5%
41-99	$\pm$5.0%	$\pm$6.0%

Repeatability	1%

	Models	Gas Module / 4000 Plus / 4100 Plus
Noise	4200 / 4300	4000ID Plus / 4100ID Plus
	$\pm$1%	$\pm$3%
Drift (zero)	1 hour(%)	24 hours(%)
	2.0%	5.0%

Response time to final reading 4200, 4300	360 ms. max.
4000 Plus, 4100 Plus, 4000ID Plus, 4100ID Plus, Gas Module	540 mx. max
Update	Synchronous with CO_2 update.
Error due to breath rate	-.002 of DC value x BPM

4. N$_2$O Analog Output (waveform)

Range	0 - 1.0V
Scale Factor	0 - 1.0V equivalent to 0 - 100%
Accuracy	$\pm$ 30 mV or $\pm$ 5%, whichever is greater
Noise	15 mV p-p
Repeatability	$\pm$ 15 mV

5. O$_2$ Display

Range	0 - 99%
Resolution	1%
Rate	2 - 98 breaths per minute
Accuracy	$\pm$ 3% absolute or 6% of reading, whichever is greater
Noise	<0.5% of full scale
Repeatability	$\pm$ 1%
Interference from 0 - 100%, N$_2$O combined with O$_2$	<0.5% of full scale
Error due to breath rate	<0.005 of DC value x BPM, %O$_2$
Response time (Step change from 21% O$_2$ to 100% O$_2$	60 seconds to within 3 digits of final reading.
Update	Synchronous with CO$_2$

6. O₂ Analog Output (waveform)

Range	0 - 1.0V
Scale Factor	0 - 1.0V equivalent to 0 - 100%
Accuracy	$\pm$ 30 mV or $\pm$ 5%, whichever is greater
Noise	<15 mV pp
Repeatability	$\pm$ 15 mV

7. Anesthetic Agent (Halothane, Isoflourane, Enflurane, Desflurane, Sevoflurane):

   A. Agent Display

	Halothane	Enflurane	Isoflourane	Desflurane	Sevoflurane
Range	0-7%	0-7.5%	0-7.5%	0-20%	0-9%
Resolution	0.1%	0.1%	0.1%	0.1%(0-9.9%) 1%(10-20%)	0.1%
Rate	2-98 breaths/min	2-98 breaths/min	2-98 breaths/min	2-98 breaths/min	2-98 breaths/min

   B. Accuracy (within 30 minutes of last cal)

Input Range (%)	Halothane	Enflurane	Isoflourane	Desflurane	Sevoflurane
0 - 5	$\pm$0.3%*	$\pm$0.2%	$\pm$0.2%	$\pm$0.2%	$\pm$0.2%
5 - max. value	$\pm$0.3%	$\pm$0.3%	$\pm$0.3%	$\pm$6% of value	$\pm$6% of value
Noise	$\pm$0.2%	$\pm$0.1%	$\pm$0.1%	$\pm$0.1%	$\pm$0.1%

*The Accuracy for Halothane is +0.3% for the first 60 minutes then goes to +0.2%.

	Halothane	Enflurane	Isoflourane	Desflurane	Sevoflorane
Response time to final reading	500ms max	500ms max	500ms max	500ms max	500ms max
Update	Upon breath completion	Upon breath completion	Upon breath completion	Upon breath completion	Upon breath completion
Repeatability	±0.1%	±0.1%	±0.1%	±0.1%	±0.1%
Drift	Included in above accuracy specifications.				

C. Agent Identification - Models 4000ID Plus, 4100ID Plus

SOLITARY AGENT IDENTIFICATION

SENSITIVITY:	Halothane	Enflurane	Isoflourane
Minimum Concentration (@STP)	0.2%	0.2%	0.2%

Minimum single agent
detection time: (@STP)   15 seconds @ 200cc/min.

SECONDARY AGENT IDENTIFICATION (@STP)
THRESHOLD (after 15 minute warmup) 0.2%+5% of primary agent

Minimum secondary agent (@STP)
identification time: 30 seconds @ 200cc/min

8. Anesthetic Agent Analog Output

(1 waveform for Agent selected for monitoring):

Range	0 - 1.0V
Scale Factor	0 - 1.0V equivalent to 0 - 10%
Accuracy	± 30mV or ± 5%, whichever is greater
Noise	<15mV p-p
Repeatability	± 15mV

9. Respiration Rate Display

Range   2 - 98 breaths per minute

Resolution   1 breath per minute

Accuracy $\pm$ 1 BPM or $\pm$ 3% of reading, whichever
                                       is greater with inspired/expired duty cycle
                                       between 10% and 90%.

Update   Upon breath completion. Synchronous
                                       with CO_2.

10. Respiration Rate Analog Output (DC level)

Range   0 - 1.0V

Scale Factor   0 - 1.0 equivalent to 0 - 100 BPM

Accuracy   + 10 mV or +3%, whichever is greater.

11. Plethysmograph Analog Output:

Range   0 - 2.5V full scale output into 1K ohm
                                       maximum load.

Scale   None

12. Pleth CRT Display

Noise   1mm max.

13. SaO₂ Display

Range	0 - 99%
Resolution	1%
Update	Every 2 seconds

Accuracy (%)

270 - 100	$<\pm2\%$ SaO$_2$ (1 S.D.)
60 - 69	$<\pm4\%$ SaO$_2$ (1 S.D.)
0 - 59	Unspecified

Drift	none
Warm-up Time	15 sec.

Response Time to step change
of % SaO₂ from 60 - 95%
(@ 72 bpm)   8 sec. to 95% of final value

14. SaO₂ Analog Output (DC Level)

Range	0 - 2.5V full scale output into 1k max. load
Resolution	40%/volt
Accuracy	$\pm$ 2% of full scale

15. Pulse Rate Display

Range	30 - 250 bpm
Resolution	1 bpm
Accuracy	+3 bpm or 3%, whichever is greater.
Update	Every 2 seconds

Response time to step change
of % SaO₂ from 60 - 120 bpm   8 seconds to 95% of final value

16. Pulse Rate Output (DC Level)

Range   0 - 2.5 V full scale output into 1K max. load

Resolution   100 BPM/volt

Accuracy $\pm$2% of full scale

17. Audio Settings

Volume dBA SPL   An internal non-volatile memory can be
                                        set for a minimum alarm volume at OFF,
High > / =72   volume level 1
Medium > / =64
Low > / =56   All recognized audio key depressions
                                        generate a short tone at the low volume level.

6.7 SAFETY CHARACTERISTICS

Risk currents per AAMI "Safe Current Limits for Electromedical Apparatus".

1. Source Current - Chassis   Less than 100uA measured from
                                        chassis to ground through standard
                                        AAMI load.

2. Source Current - Patient Circuit   Less than 10uA measured from
(models 4000ID Plus, 4000 Plus and   any lead of patient cable to
4200)   ground through standard AAMI
                                        load at the connector or SaO_2 sensor.

3. Sink Current - Patient Circuit   Less than 20uA measured from any
(models 4000ID Plus, 4000 Plus and   lead of patient cable to ground
4200)   through standard AAMI load in
                                        series with 120K ohm resistance,
                                        and isolated 120V/60 Hz voltage
                                        at the connector or SaO_2 sensor.

4. Isolation Voltage   1500V RMS at 60 Hz from any lead or
                                        combination of patient leads to AC
                                        hot or neutral for one minute.

5. Ground Resistance   Less than 0.1 ohm (110 volts) from
                                        power connector U-blade to exposed
                                        metal parts (0.2 ohm for 220V).

6.8 SYSTEM COMPATIBILITY

All output signals (analog and digital) processed through the interface connectors, are protected against short circuits to ground and can withstand normal static discharges as detailed in Section 1.4, Performance Specifications.

The monitor, when connected to a 2000RS Recorder, provides a permanent record-keeping of (not applicable for Gas Module):

- Inspired/Expired CO_2 waveform recorded at 12.5 mm/s.
- Inspired/Expired CO_2 real-time trend recorded at 1 or 5 mm/min.
- Inspired/Expired CO_2 values in TORR.
- Inspired O_2 values in percent.
- Breath Rate values in breaths/min.
- Inspired O_2 values in percent
- Breath Rate values in breaths/min.
- SaO_2 values in % SaO_2
- Pulse Rate values in beats per minute.

The 2000RS Recorder prints all digital values on the chart border.

6.9 CONFIGURATIONS

Model #	Line Voltage (Vac)	Current in Amps	Frequency (Hz)	Basic Features	Datascope Part Number
4000ID Plus	90-132	1.6	50/60	CO_2, N_2O, Agent ID, SaO_2	0998-00-0071-17
4000 Plus	90-132	1.6	50/60	CO_2,N_2O,O_2,Agent,SaO_2	0998-00-0071-13
4000ID Plus	198-264	0.8	50/60	CO_2, N_2O, Agent ID, SaO_2	0998-00-0071-18
4000 Plus	198-264	0.8	50/60	CO_2,N_2O,O_2,Agent,SaO_2	0998-00-0071-14
4100ID Plus	90-132	1.6	50/60	CO_2, N_2O, O_2, Agent ID	0998-00-0071-19
4100 Plus	90-132	1.6	50/60	CO_2,N_2O,O_2,Agent	0998-00-0071-15
4100ID Plus	198-264	0.8	50/60	CO_2, N_2O, O_2, Agent ID	0998-00-0071-20
4100Plus	198-264	0.8	50/60	CO_2,N_2O,O_2, Agent	0998-00-0071-16
4200	90-132	1.6	50/60	CO_2,N_2O,O_2, SaO_2	0998-00-0071-05
4200	198-264	0.8	50/60	CO_2,N_2O,O_2,SaO_2	0998-00-0071-06
4300	90-132	1.6	50/60	CO_2,N_2O,O_2	0998-00-0071-07
4300	198-264	0.8	50/60	CO_2,N_2O,O_2	0998-00-0071-08
Gas Module	90-132	1.6	50/60	$CO2$,N_2O,$O2$,Agent	0998-00-0071-21
Gas Module	198-264	0.8	50/60	$CO2$, N_2O,$O2$,Agent	0998-00-0071-22

6.10 AGENCY COMPLIANCES

The Datascope MULTINEX / Gas Module is designed to comply with the following agency standards:

- CSA Standard C-22.2, No. 125
- LA County (UL 544 as a mandate)
- IEC 601-1 (on request for any model)
- VDE 871B (on request for any model)
- BS5724 (on request for any model)

Datascope maintains a policy of continual product improvement and reserves the right to change materials and specifications without notice.

6.11 CO_2 Displays

Shown below are the optional display configurations available for the CO_2 display. See Section 3.21.1 for details on how to select the display configuration.

CO_2 (TORR) Dry CO_2 in TORR at sea level (760mmHg)

CO_2 (%) Dry fractional CO_2 in percent

CO_2 (KPa) Dry CO_2 in KPa at sea level (101.33 KPa)

CO_2W (TORR) Wet CO_2 in TORR at sea level (760mmHg)

CO_2W (%) Wet fractional CO_2 in percent

CO_2W (KPa) Wet CO_2 in KPa at local barometric pressure

PCO_2 (TORR) Dry CO_2 in TORR at local barometric pressure

PCO_2 (KPA) Dry CO_2 in KPa at local barometric pressure

PCO_2W (TORR) Wet CO_2 in TORR at local barometric pressure

PCO_2W (KPa) Wet CO_2 in KPa at local barometric pressure

6.12 Anesthetic Agent Identification

The MULTINEX 4000ID and 4100ID identify or confirm the presence of a single or combination of vaporized anesthetic agents. Isoflurane, Enflurane or Halothane can be identified by the MULTINEX.

Modes of Operation

A. Auto Identification Mode (Auto ID).

In this mode the MULTINEX identifies and measures any gas which is applied. When the gas is changed by the anesthetist, the MULTINEX senses this and identifies the new gas. It also qualifies the presence of a second agent of a lesser proportion, if present. The Auto ID mode utilizes several CRT messages which advise the anesthetist of respiratory gas status. See Section 4.3,
Troubleshooting Guidelines.

The MULTINEX ID will track agents above 0.2%. At the end of the case when the vaporizer is off, the agent identified will remain for 30 minutes before the monitor displays READY.

B. Verify Mode

In this mode the anesthetist is required to select the anesthetic agent desired to be confirmed. Once selected, the agent is confirmed and measured. If anesthetic agents are changed after the initial selection, the new agent must be selected in order to continue monitoring (to be confirmed). The confirmation mode utilizes several CRT messages which advise the anesthetist of respiratory gas status. See Section 4.3, Troubleshooting Guidelines.

C. Manual Anesthetic Agent Selection (DISABLED mode)

This mode allows the unit to work with Sevoflurane and Desflurane, which can only be selected manually. It also operates as the default mode in the event of a failed ID bench. The MANUAL SELECT mode utilizes a single CRT message which alerts the anesthetist that the MULTINEX is in the manual mode.

NOTE: Prior to applying des. or sev., select **agent id disabled** mode, then select agent. Failure to do so will cause erroneous CO_2, N_2O and agent readings.